SCHAEFFLER

Rolling Bearings

Technical principles and product data for the design of rolling bearing arrangements

https://www.schaeffler.de/std/1D65

SCHAEFFLER

§ Although we have prepared and checked all of the data in this catalogue with a great deal of care, we cannot guarantee 100% accuracy. We reserve the right to make corrections.

This catalogue is intended for general information only, in order to make reference to our product range. In particular, it neither serves as technical advice nor as guidance, and the illustrations and descriptions contained herein should not be regarded as assured product characteristics.

The continuous availability of the described products cannot be guaranteed. We also reserve the right to deliver comparable products to those described herein, where there is a phase-out or changeover of production, provided that:

- There are only negligible technical deviations from the description provided here
- The other product is, in abstract terms, at least equivalent in quality
- The change is also reasonable to you as the customer in all other respects, taking account of our interests.

June 2018. Older catalogue versions will be completely replaced by this version.

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Rolling Bearings

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Contents

Foreword

✎ Schaeffler provides trendsetting solutions for Industrial and Automotive applications

Schaeffler is a leading worldwide supplier of rolling bearings, spherical plain bearings, plain bearings, linear products, accessories specific to bearings and comprehensive maintenance products and services.
We have in excess of 40 000 catalogue products manufactured as standard, providing an extremely wide portfolio that gives secure coverage of applications from all 60 designated industrial market sectors.

✎ Keys to success

The central factors responsible for this success are our outstanding strength in innovation, our global focus on local customer proximity, highly developed manufacturing methods, extremely high quality standards in all processes and our ability to transform specific customer requirements quickly and accurately into cost-effective solutions.
Against this background of expertise, knowledge and experience together with our wide range of catalogue items, we see ourselves as a high performance, customer focussed partner.

Research and development

✎ Research and development as a global approach

As a company looking to the future, we are especially active in the field of research and development. The key areas in this respect include not only research into fundamental principles, materials technology, tribology and calculation but also extensive inspection and test methods as well as activities to optimise manufacturing technology. This is oriented towards ensuring the continuous development, improvement and application of our products in the long term. We carry out research and development on a global basis. Our development centres are linked with each other worldwide and are thus in a position to exchange current information on a very short timescale as well as access and communicate the most recent data. This ensures that a uniform level of knowledge and information is available worldwide.

✎ Innovations – progressive and future-oriented

With more than 2 300 patent applications a year and over 24 000 active patents and patent applications, Schaeffler ranks second among Germany's most innovative companies, according to the German Patent and Trademark Office. This makes us one of the most innovative leaders in the industry.

1

Rolling bearings for the machine generation Industry 4.0 – measurable added value through the digital functional expansion of products

Quality

✎ Quality – precise and reliable

Our manufacturing expertise and holistic quality management system ensure a level of product quality that far exceeds the industry average. “Zero defects” is our objective. We have matched all our processes to this target. In addition, our many years of experience in forming, forging, heat treatment, surface technologies, grinding, honing and assembly ensure that our products fulfil the high quality level.

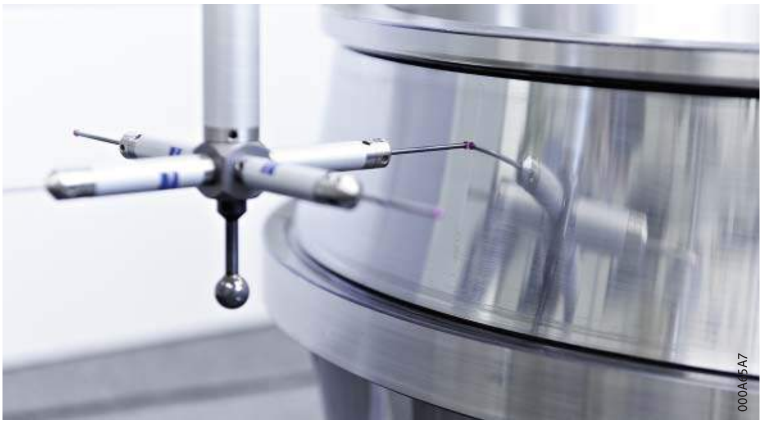
✎ Numerous awards for Schaeffler products

Ongoing quality inspections are a defined component of the manufacturing process. These are integrated as a feedback function in the manufacturing process. As a result, all products continuously fulfil the same high standard of quality. This high standard of quality is verified by numerous awards and certificates to international standards.

All Schaeffler locations worldwide are certified in accordance with DIN EN ISO 9001:2008, ISO/TS 16949:2009. With the validation and certification of our manufacturing sites, we are taking a pioneering role in environmental protection. All larger manufacturing sites are certified to ISO 14001 and are also validated in accordance with the more stringent EC ECO Management and Audit Scheme (EMAS).

2

Inner ring of a spherical roller bearing under quality control



Worldwide presence

✎ Close proximity to the customer worldwide in engineering and production

Close proximity to our customers is just one of the defining characteristics of Schaeffler. With around 170 locations worldwide, we are right there where our customers need us. We offer engineering, production and service on the ground, in the region and for the region. Together with our customers, we develop exactly those solutions that precisely fulfil the necessary functions and thus contribute to perfect meshing of all the components. In this way, our individually applied know-how sustainably supports the valuable brand promise of our customers. Our manufacturing locations provide seamless supply through short response times and customer-oriented service.

3

Schaeffler locations worldwide

Product Catalogue HR 1

✎ Rolling Bearing Catalogue HR 1 – the Engineering Compendium

Catalogue HR 1 is a fundamental information, selection and advisory tool for technical issues relating to the wide-ranging field of rotary rolling bearings. Since its first appearance, it has become established worldwide as an important engineering compendium for the calculation and design of rolling bearing arrangements. It describes the rolling bearings in accordance with DIN EN ISO that are required for original equipment manufacture, distribution and the aftermarket, specific rolling bearing accessories and further rolling bearing types and design variants. It shows which products can be considered for a bearing arrangement, the factors that must be taken into consideration in the design, the tolerances required on the adjacent construction and how the bearing arrangement is sealed. It gives detailed information on the calculation of bearing rating life, on temperatures and loads, on the lubricants that are most suitable for the bearing arrangement and, last but not least, on the correct mounting and maintenance of the products.

✎ The catalogue has been completely revised

The catalogue has been completely revised in comparison with the previous valid edition. The emphasis in this revision was not simply on the updating of technical information and the inclusion of new products, but also on achieving the best possible ease of use for our customers. Among the volume of changes, the following examples can be given: as far as possible, the chapters now have the same structure. As a result, information applicable to multiple chapters is easier to find. Pictograms give simpler navigation within the book and contribute to better understanding of the data and descriptions. Selection matrices at the start of the product chapters provide clear and concise information on specific product features, thus allowing the designer to quickly make a preliminary assessment of whether the bearing is fundamentally suitable for the envisaged application. In terms of the sequence of information, the structure of the dimension tables now follows standard practice in the design of a rolling bearing arrangement. Links make reference to relevant electronic media and lead directly there.

✎ Current level of technology and manufacture

The data in the catalogue represent the current level of technology and manufacture as of June 2018. They reflect not only progress in rolling bearing technology but also the experience gathered from numerous applications. Any data in earlier publications that do not correspond to the data in this catalogue are therefore invalid.

✎ Benefits to you

Catalogue HR 1 stands for pioneering bearing arrangement technology, application-focussed representation, the highest product and performance density and continuous development. The benefits to you:

- Selection of products from a vast product range
- Maximum benefit, since the most suitable product is used in the right place
- Extensive worldwide product availability
- Short delivery times
- Long-term supply capability
- Security of planning for the long view
- Simplified stockholding
- Market-competitive prices
- Global service
- Comprehensive, application-focussed advice.

! This catalogue essentially describes standard products. Since these are used in numerous applications, we cannot make a judgement as to whether any malfunctions will cause harm to persons or property. It is always and fundamentally the responsibility of the designer and user to ensure that all specifications are observed and that all necessary information is communicated to the end user. This applies in particular to applications in which product failure and malfunction may constitute a hazard to human life.

Other product publications

✎ Other technical publications

This catalogue contains a large proportion of the core rotary rolling bearing range of the brands INA and FAG. Furthermore, we develop and manufacture many other products and systems that are of significant interest in terms of technical progress and cost-effectiveness for rotary and linear bearing arrangements as well as for the automotive sector. These are covered in separate technical publications that can be obtained upon request.

✎ Product ranges for specific market sectors

Special product ranges are available for specific market sectors. In addition to standard products, these also include special solutions. The range extends from simple, application-specific bearings via complete, ready-to-fit systems to special solutions that can be used to fulfil the most complex bearing technology requirements with high functional security and cost-effectiveness. Contact our Application Support Service at the earliest possible stage and benefit from the broad knowledge and considerable experience of these specialists for your projects.

Mobility for Tomorrow

✎ Our objective: to fulfil tomorrow's challenges in partnership with you

Globalisation, urbanisation, digitalisation, scarcity of resources and the growing demand for affordable mobility are leading to increasingly dynamic market requirements. As a leader in innovation and technology, we have been making an important contribution to the mobility of the future for many years. With our products and our knowledge, we can continue to fulfil the challenges of your market in relation to rolling bearing arrangements in partnership with you. To this end, this catalogue is an important instrument.

4

Mobility of the future

1 X-life

Schaeffler X-life rolling bearings of the brands INA and FAG are products with a particularly high performance density, which are identified by the premium brand XL. Their enhanced quality and performance are not, however, a special additional technical feature, which is available as an optional addition to a standard bearing design, but are fundamentally the Schaeffler standard for these products.

World leader

With its extensive range of X-life bearings, Schaeffler is a leader in the premium products segment over comparable competitors.

The success of X-life is signified by four factors

The high performance standard of rolling bearings is achieved through the systematic use of state-of-the-art production techniques and extensive changes to the internal construction of the bearing ➤10|1.

1
X-life premium quality, achieved by means of extensive technical enhancements to the products

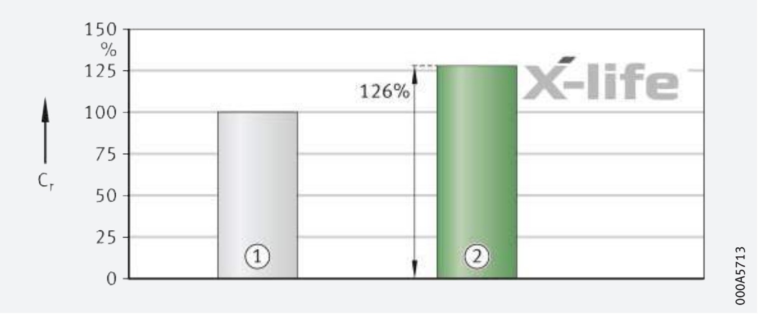
The more favourable load distribution in the bearing results in a higher dynamic load carrying capacity

These design and production engineering measures lead to better and more uniform surfaces and contact zones, resulting in a considerable improvement in load distribution within the bearing and a significant reduction in frictional torque. This in turn leads to higher basic dynamic load ratings compared to the previous standard and thus to a longer bearing operating life ➤10|2.

2
Cylindrical roller bearing with cage: comparison of basic dynamic load rating C_r with bearings without X-life quality

C_r = radial basic dynamic load rating

① *Bearing without X-life quality*
② *X-life cylindrical roller bearing*



1.1 Advantages for the user

✎ Significantly increased customer benefits due to X-life

If a current standard bearing is substituted for an X-life bearing, this will give the designer a completely new level of design ➤10|◫2 and ➤11|◫3:

- First of all, he will benefit from the longer bearing rating life and the extension of the maintenance intervals. This in turn improves the "Total Cost of Ownership" and the reliability of the specific machine or equipment.
- However, he can also use the higher basic load rating to place higher loads on the bearings, while achieving the same rating life.
- If he keeps to the old load and rating life, he can use a smaller bearing in place of the previous size and thus make the overall design more compact and lower in mass.

✎ Additional advantages

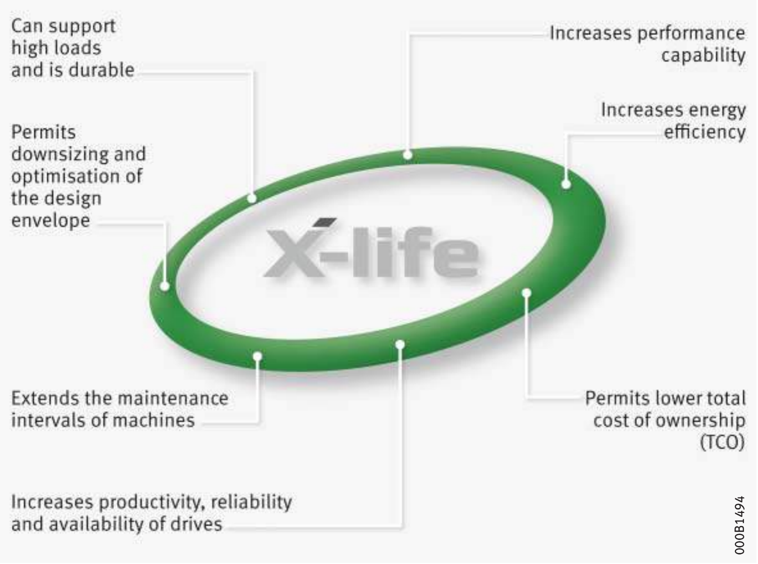
Other arguments in favour of using X-life bearings are their lower friction and lower noise levels, properties that are of central importance for many applications.

✎ Lower operating costs, higher machine availability

In conclusion, X-life characteristics improve the overall cost-efficiency of a bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment ➤11|◫3.

X-life rolling bearings in this catalogue include the suffix XL in the designation. The bearings are described in detail in the specific product chapters.

◫ **3**
Extensive customer benefits of X-life



2 *medias professional*

*✎ **medias** can be used for dynamic selection of bearings for an application*

***medias** professional*, the proven selection and information system, presents the INA and FAG catalogue products in electronic format. As with the printed catalogue, this gives our customers product information on both brands in a single data source. This saves time and gives easier handling.

✎ The link to the program

***medias** professional* is available online; see link. The program is available in several languages, is easy to navigate and is particularly clear thanks to the use of numerous pictures, diagrams and models. There are also highly representative application examples, classified by market sector.

*✎ **medias** address*

medias ➤ *https://medias.schaeffler.com*

✎ Expanded area of application

Datasheets on the bearing series can be generated as PDF files. It includes a lubricant database and also the web2CAD link for direct download and inclusion of 3D models.

✎ Calculations can be carried out quickly with BEARINX

***medias** professional* focusses on the individual bearing. The complete shaft can be simulated and any influences arising from its deformation on the bearings can be determined using the calculation program BEARINX. This program can also be made available to direct customers as BEARINX-online via the Internet (for conditions, see the INA/FAG homepage).

✎ Comprehensive, reliable, fast, digital

In conclusion, ***medias** professional* is a comprehensive, reliable system to help you help yourself answer many questions on rolling bearing technology by electronic means, quickly and at any location.

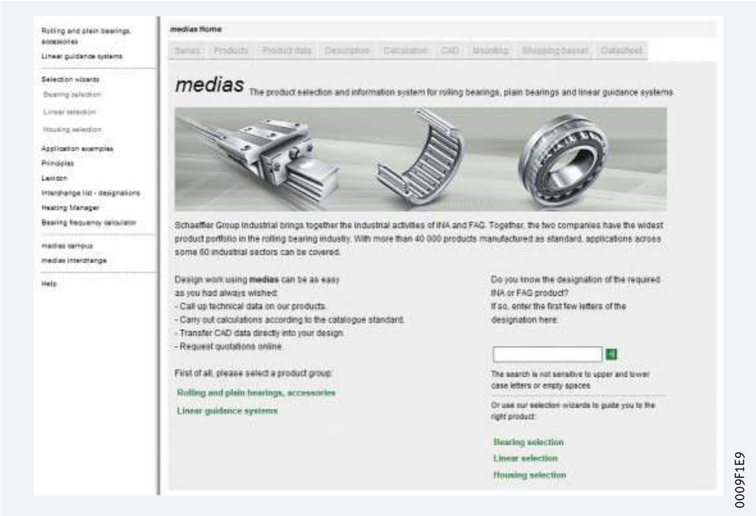
2.1 medias

✎ Product characteristics, design envelope and basic load ratings

The ***medias*** homepage guides the user dynamically by means of the product characteristics to delimitation according to design envelope and/or basic load ratings through to selection of the suitable rolling bearing from predetermined designs ➤*12*|Fig. *1* to ➤*13*|Fig. *4*.

Fig. **1**
***medias** homepage*

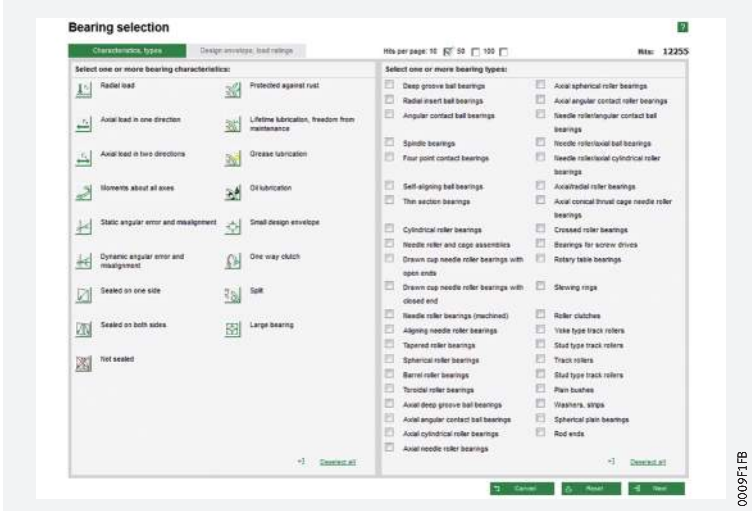
Rapid bearing selection by means of dynamic method



2

Bearing selection in accordance with product characteristics

Load directions, angular defects and misalignments (dynamic, static), sealing, corrosion protection etc.



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3

Input of data relating to dimensions and basic load ratings

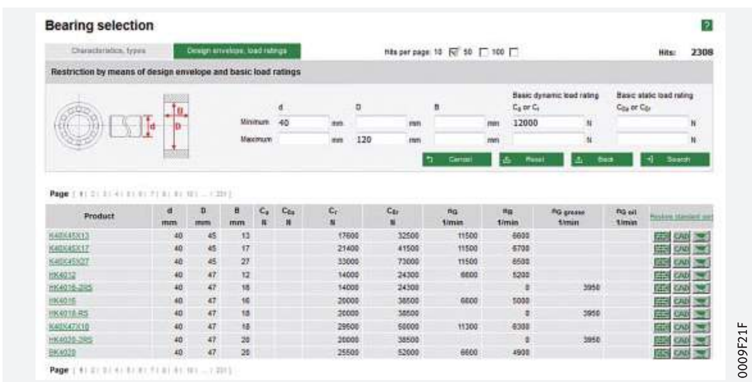
Bore diameter, outside diameter, width, basic load ratings

0009F20D

4

Input of data relating to dimensions and basic load ratings

Stepwise process with the aid of wizards leads to the required bearing



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3 BEARINX

BEARINX is one of the leading programs for the calculation of rolling bearings. The program was developed at Schaeffler at the beginning of the 1990s and is a powerful tool for the design of rolling bearing arrangements in complex systems, starting from shaft and linear guidance systems through to sophisticated gearboxes ➤14|Fig. 1 and ➤15|Fig. 2. The bearings are not considered in a simple rigid, isolated form using reference conditions but at the location in the calculation model with the elasticities, loads and displacements that the complete system exerts on the bearing position.

In the in-house version, the detailed analysis options are available worldwide to every Schaeffler engineer. In line with the current status of standardisation, the adjusted reference rating life is calculated in accordance with ISO/TS 16281 and DIN 26281.

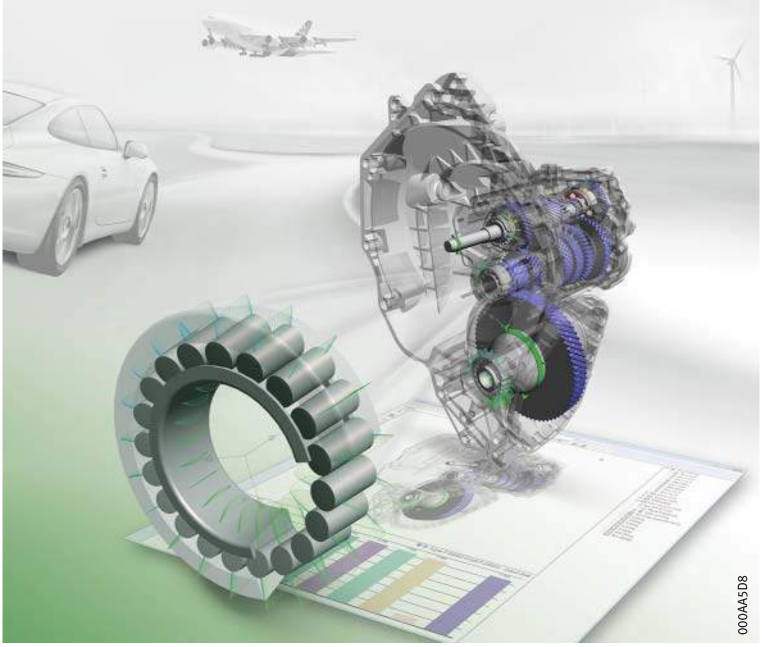
Values taken into consideration in calculation using BEARINX

The calculation models take account of factors including:

- the nonlinear, elastic deflection behaviour of every individual rolling contact
- the elastic behaviour of shafts and housings (FE influencing factor matrices can be incorporated)
- the influences of fit, temperature and speed on the operating clearance or preload of the bearings and on contact angle
- the profiles of rollers and raceways or raceway osculations
- the actual contact pressure taking account of the misalignment and profiling of rolling elements
- the influence of lubrication, contamination and actual contact pressure on the fatigue life.

Fig. 1
Manual automotive gearbox in elastic housing

Source: General Motors



✎ Further calculation possibilities with BEARINX

Optional calculation options, including:

- frictional torque calculation
- rotor dynamics
- export options, for example to BEARINX-MAP (three-dimensional bearing maps for further processing in MBS programs).

✎ Documentation of the results

Comprehensive documentation of results with diagrams, tables, graphics and animations of the model allow appropriate presentation of the design to the customer.

3.1 BEARINX customer versions

✎ Customer versions: calculation modules derived from the in-house version

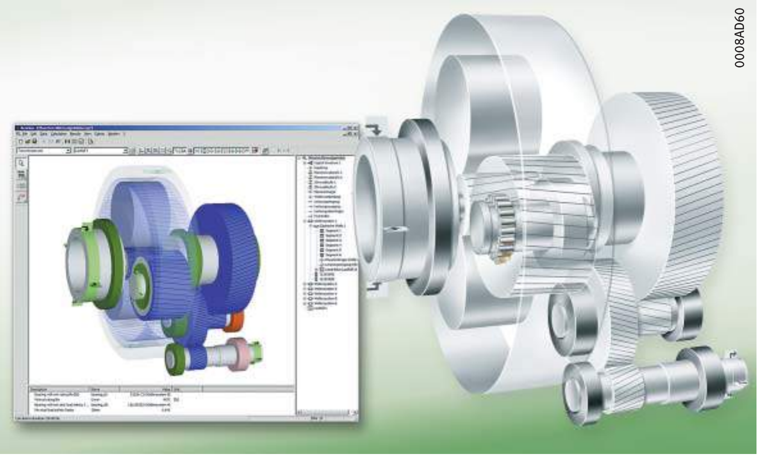
In order that selected customer groups can assure themselves of our calculation possibilities in BEARINX and can be included intensively and at an early stage as a development partner in product development, Schaeffler makes available calculation modules derived from the in-house version ➤ *https://www.schaeffler.de/Calculation*:

✎ Calculation possibilities matched to various target groups

- BEARINX-online Easy Module for "everyone"
  - BEARINX-online Easy Linear
  - BEARINX-online Easy Friction
  - BEARINX-online Easy Linearsystem
  - BEARINX-online Easy Ballscrew
  - BEARINX-online Easy RopeSheave
  - BEARINX-online Easy EMachine
  - BEARINX-online Easy Pump
- BEARINX-online calculations for Schaeffler customers, sales partners and colleges
  - BEARINX-online Shaft Calculation
  - BEARINX-online Spindle Calculation
  - BEARINX-online Linear Calculation
- BEARINX-VIP as a local version for development partners.

! When finalising the design, it is recommended that the in-house version should be used in order to benefit from the advisory and calculation services of Schaeffler.

2
Calculation of a planetary gearbox for a wind turbine using BEARINX



✎ Can be used free-of-charge by colleges

Colleges in particular can benefit from our offering, since BEARINX-online calculations can be made available free of charge for educational purposes.

Information about the customer versions and the possibility of applying for registration/usage can be found on the Schaeffler Internet portal at: ➤ *https://www.schaeffler.de/Calculation*

3.2 BEARINX-online Shaft Calculation

✎ The customer himself can model and investigate complex shaft systems

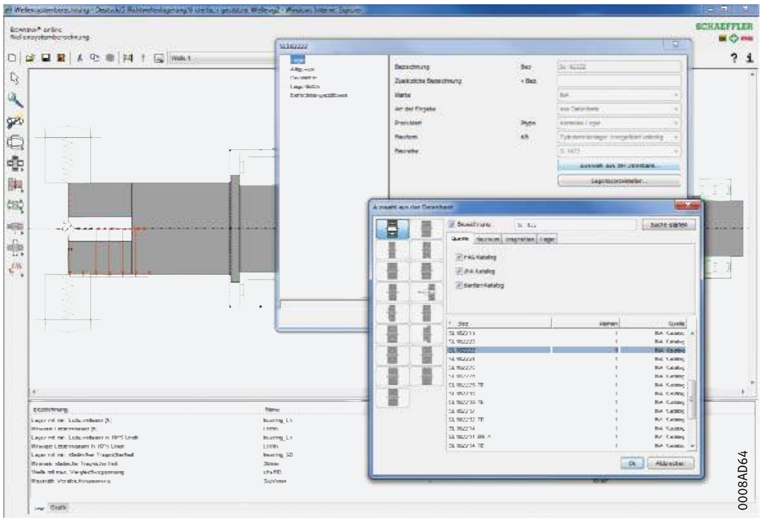
The customer version used most often is the BEARINX-online Shaft Calculation ➤ 16 | ▭ 3. It is derived from the system level of the in-house version and offers the customer the possibility of modelling coaxially nested shaft systems himself online and analysing variants.

!

As in the case of the in-house version, BEARINX-online Shaft Calculation makes it possible to determine precisely the load distribution in the rolling bearing, taking account of shaft deflection and the nonlinear deflection behaviour of the rolling contacts.

▭ **3**

Shaft calculation and bearing selection with BEARINX – screen representation



✎ Bearing selection is carried out by means of a product database to which BEARINX is linked

The BEARINX customer versions access a bearing database which holds all catalogue bearings of the Schaeffler brands. Special bearings are available by agreement. The internal component data, which are stored in non-viewable form, are incorporated in the rating life calculation.
As a result, the quality of the calculation results is significantly higher than those of a bearing approximation, since the profile data not only of the raceways but also of the rolling elements are taken into consideration.

✎ Extract from the performance portfolio of online shaft calculation using BEARINX

BEARINX-online Shaft Calculation – an overview:

- Simple modelling of shaft systems with the aid of wizards
- Calculation of the adjusted reference rating life in accordance with DIN 26281 (ISO/TS 16281)
- Results documentation can be stored locally
- Graphical representation of shaft reactions (shaft deflection and shaft inclination)
- Calculation of bearing rigidity at the operating point (optional)
- Rigid and elastic adjustment of bearings in the relevant shaft system
- Operating clearance calculation by means of wizards.

§

Use is regulated by contract and requires initial participation in a training course and payment of a fee to cover costs. No maintenance or licence fees are incurred.

!

The calculations are performed online. There is no need for installation at the customer. The application files are stored for each customer in a separate directory on a powerful calculation server. Where necessary, application files can be interchanged: the customer can request checking of his calculation model or, vice versa, the Schaeffler engineering service can provide an application file or a special bearing.

4 Criteria for bearing selection

4.1 Features of individual bearing types

✎ HR 1 contains an extensive range of bearing types

The Schaeffler catalogue HR 1 describes a multitude of bearing types, from which the designer can choose the one that best suits his needs. Due to the variety of applications and the different influences on the bearing position, it is not, however, possible to give generally applicable rules here for the selection of the bearing type. When deciding on a specific bearing type, it is often necessary to weigh up several criteria.

✎ Factors that are usually important in the selection of bearings

The aim of the following descriptions is to assist the designer. They make reference to factors that play a primary role in the selection of the bearing type. More precise data on the individual bearing types, their characteristics and the available designs can be found in the specific product chapters.

✎ Product matrix

Important features of the bearing types are described in an overview in the matrix ➤*30*|▦ *1*.

✎ Criteria for selection of bearing type

Product characteristics that can play a role in selection of the bearing type are, for example:

- the available design envelope ➤*18*
- the load values, load directions and the bearing arrangement concept (arrangement of the bearings) ➤*20*
- the speeds of the bearings ➤*24*
- the accuracy of the bearings ➤*24*
- the axial displacement capability of the bearing rings (non-locating bearing function) ➤*25*
- the compensation of misalignments ➤*26*
- quiet running ➤*27*
- the rigidity of the bearing arrangement ➤*28*
- the friction in the bearings ➤*28*
- the mounting and dismounting of the bearings ➤*28*
- the sealing of the bearings and of the bearing position
- the lubrication of the bearings.

This catalogue does not give the entire range of Schaeffler rolling bearings. Dedicated catalogues and technical descriptions are generally available for products which are not described here. These publications can be requested from Schaeffler: ➤*https://www.schaeffler.de/std/1D51*.

4.2 Comparison of design envelope for particular bearing types

In many applications, it is frequently the case that one of the main dimensions of the rolling bearing is fixed by the overall design of the machine or piece of equipment. Due to the strength specifications of the shaft, this is generally the bore diameter of the bearing.

✎ Bearings for small and large shaft diameters

For small shaft diameters, suitable bearings are ball bearings – especially deep groove ball bearings – and needle roller bearings. Where large diameters are present, the bearings available are cylindrical, tapered, spherical and toroidal roller bearings, as well as deep groove ball bearings, but not excluding needle roller bearings.

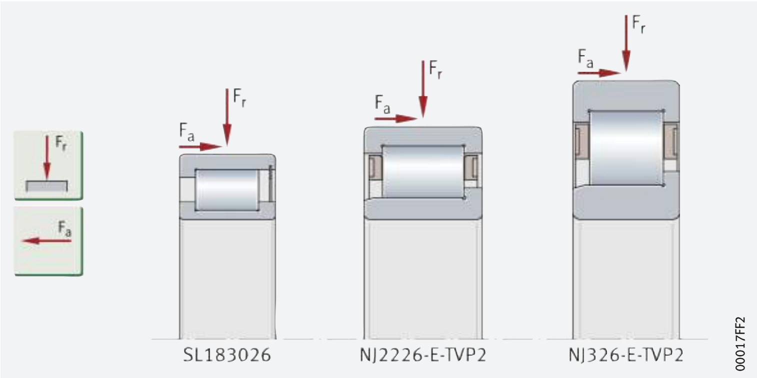
✎ Comparison of cylindrical roller bearings

A load carrying capacity of approximately the same magnitude can be achieved both with bearings that are narrow and have a large outside diameter and also with bearings that are wide and have a smaller outside diameter.

1

Cylindrical roller bearings with approximately comparable basic load rating C_0

SL183026 has a full complement roller set



Bearings with small cross-sectional height

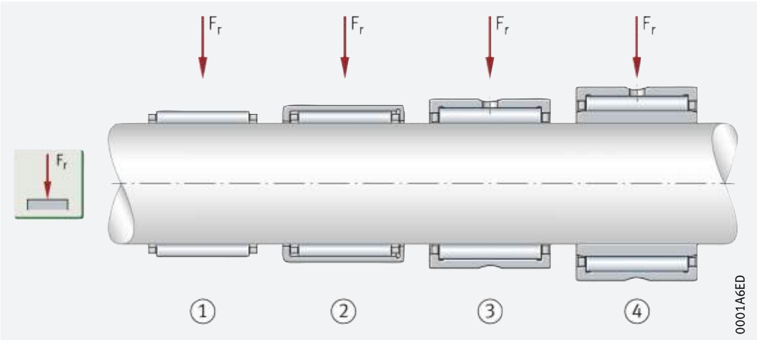
✎ Low cross-sectional height and high load carrying capacity

If the design envelope is restricted in a radial direction – for example in high performance gearboxes for vehicles – bearings with a small cross-sectional height such as roller and needle roller and cage assemblies, drawn cup needle roller bearings with or without an inner ring, are particularly suitable ➤18| 2. These bearings have high radial load carrying capacity due to the line contact with low section height.

2

Bearings with small cross-sectional height – comparison of radial section height

① Needle roller and cage assembly
② Drawn cup needle roller bearing with open ends
③ Needle roller bearing without inner ring
④ Needle roller bearing with inner ring



Bearings with small axial design envelope and combined load

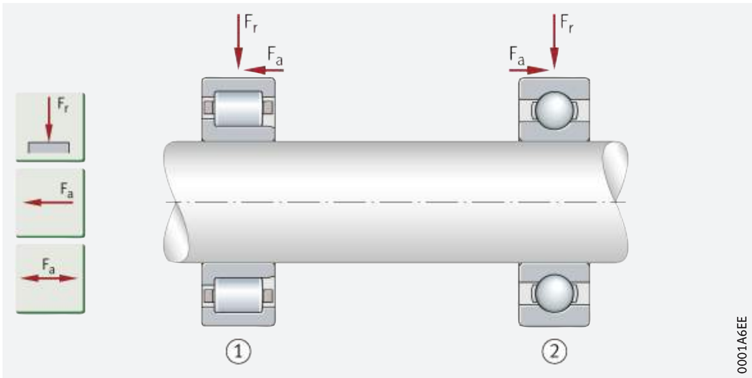
✎ Bearings for small axial design envelope and combined load

If the design envelope is small in an axial direction, the bearings suitable for bearing positions subjected to radial and axial load are certain series of cylindrical roller bearings – e.g. semi-locating bearings NJ in conjunction with deep groove ball bearings or combined needle roller bearings ➤19|3 and ➤19|4.

3

Semi-locating bearing for supporting axial forces in one direction in conjunction with a deep groove ball bearing

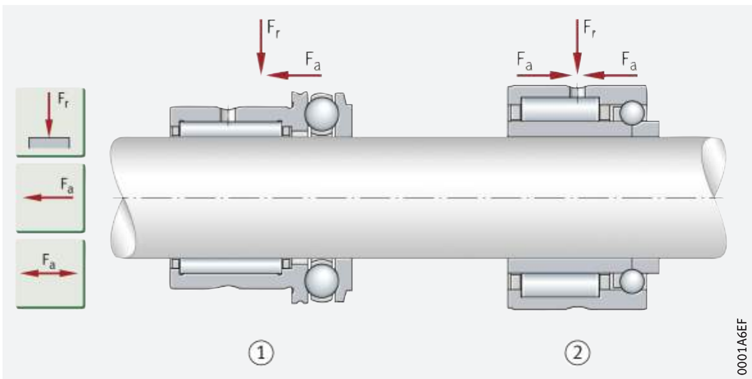
1. *Cylindrical roller bearing NJ (semi-locating bearing)*
2. *Deep groove ball bearing (locating bearing, functioning here as a semi-locating bearing)*



4

Combined needle roller bearings for supporting high radial forces and axial forces in one or both directions

1. *Needle roller/axial deep groove ball bearing, without inner ring, without end cap for axial forces in one direction*
2. *Needle roller/angular contact ball bearing with inner ring, for axial forces in both directions*



Bearings with pure axial load carrying capacity

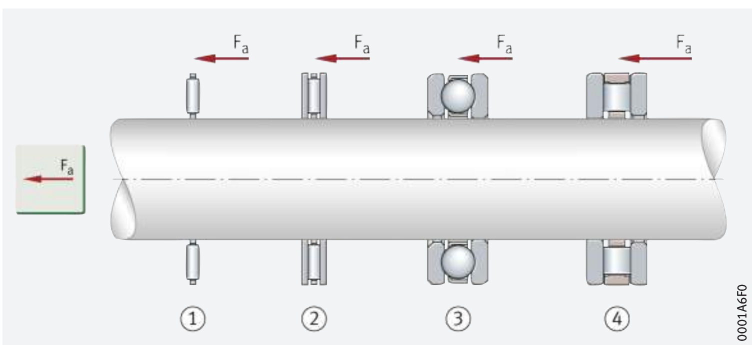
✎ Bearings for bearing arrangements under axial load only

If the bearing arrangement is under axial load only, suitable bearings are axial needle roller and axial cylindrical roller and cage assemblies, axial needle roller and axial cylindrical roller bearings and axial deep groove ball bearings with a small axial section height ➤19|5.

5

Axial bearings – comparison of cross-sections

1. *Axial needle roller and cage assembly*
2. *Axial needle roller bearing*
3. *Axial deep groove ball bearing*
4. *Axial cylindrical roller bearing*



4.3 Load value and load directions

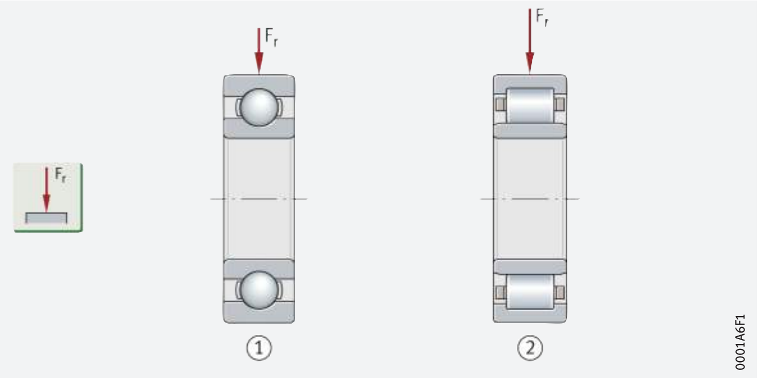
Influence of load on bearing type and bearing size

The load determines the type and size of the bearing

The bearing size is normally determined by the external load ➤20|6. In selection of the bearing, it must be noted that roller bearings can be subjected to higher loads due to the line contact than ball bearings of the same size.

6
Radial load carrying capacity – comparison of deep groove ball bearing/cylindrical roller bearing

① *Deep groove ball bearing – lower radial load carrying capacity*
② *Cylindrical roller bearing NU – higher radial load carrying capacity*



Bearings for predominantly radial loads

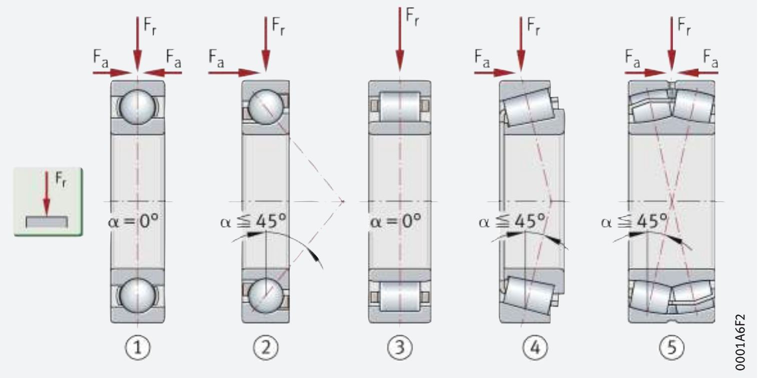
In the case of radial loads, the forces act perpendicular to the bearing axis

If radial loads (so-called transverse forces) are present – these are forces perpendicular to the longitudinal axis of the shaft – bearings are used that support exclusively or predominantly radial forces, which are therefore radial ball bearings and radial roller bearings.

Cylindrical roller bearings N and NU, needle roller and cage assemblies, drawn cup needle roller bearings with open ends, needle roller bearings and toroidal roller bearings can support radial forces only ➤20|7.

7
Radial bearings, bearings for predominantly radial load

① *Deep groove ball bearing, open*
② *Angular contact ball bearing*
③ *Cylindrical roller bearing NU*
④ *Tapered roller bearing*
⑤ *Spherical roller bearing*



Bearings for predominantly axial loads

If mainly axial forces are present – these are forces in the direction of the longitudinal axis of the shaft – bearings are used that support exclusively or predominantly axial forces.

✎ Low to moderate axial loads

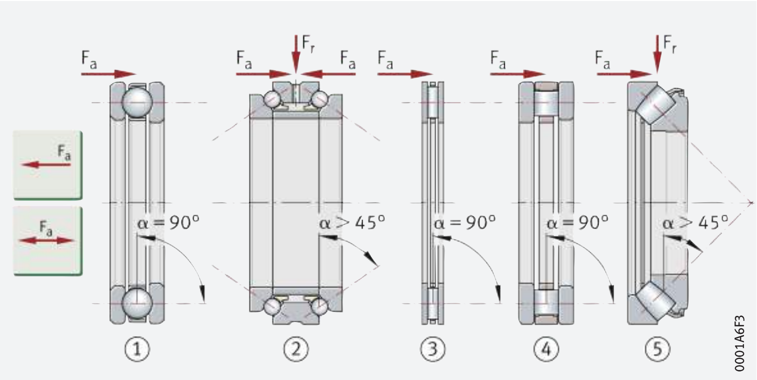
If low to moderate pure axial loads are present, suitable bearings are axial deep groove ball bearings and four point contact bearings ➤21|▭8. If axial load in one direction is present, single direction axial deep groove ball bearings can be used.

✎ Moderate to high axial loads

If moderate to high axial loads in one direction are present, the bearings available are axial needle roller bearings, axial cylindrical roller bearings, axial tapered roller bearings and axial spherical roller bearings ➤21|▭8. Axial cylindrical roller bearings or axial spherical roller bearings arranged adjacent to each other in pairs are suitable for high axial loads of alternating direction.

▭8
Bearings for predominantly axial load

① *Axial deep groove ball bearing, single direction*
② *Axial angular contact ball bearing, double row, double direction*
③ *Axial needle roller bearing, single direction*
④ *Axial cylindrical roller bearing, single direction*
⑤ *Axial spherical roller bearing*



Bearings for combined loads

Certain rolling bearings can be subjected to combined loads (radial and axial).

! The axial load carrying capacity of a bearing is determined by the nominal contact angle α. The greater this angle, the higher the axial load carrying capacity of the bearing. An indication of its axial load carrying capacity is also provided by the bearing-specific axial load factor Y in the product tables; the smaller this factor, the higher the axial load capacity.

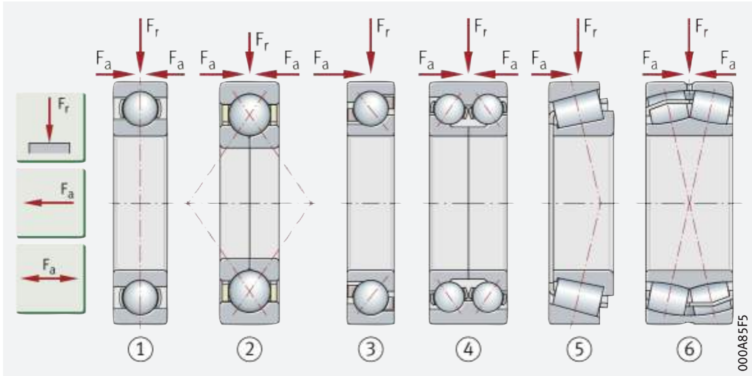
✎ Suitable bearings for combined load

Suitable bearings are deep groove ball bearings, four point contact bearings, single and double row angular contact ball bearings, spherical roller bearings and single row tapered roller bearings ➤22|▭9. Self-aligning ball bearings and cylindrical roller bearings NJ (semi-locating bearing) and NU (locating bearing) + L-section ring HJ (= semi-locating bearing unit) ➤22|▭10 can also be used.

! Axial loads present in one direction only can be supported by single row angular contact ball bearings and tapered roller bearings, cylindrical roller bearings NJ as well as NU + HJ and axial spherical roller bearings. For alternating load directions, these bearings must always be mounted with a second bearing (the second bearing must provide support in the opposing direction). For mounting in sets, single row angular contact ball bearings as universal bearings and matched tapered roller bearing sets comprising two single bearings are available.

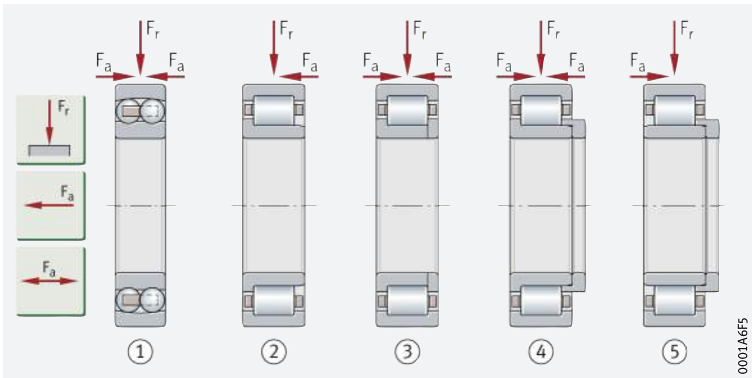
9
Bearings for combined load

1. *Deep groove ball bearing*
2. *Four point contact bearing*
3. *Single row angular contact ball bearing*
4. *Double row angular contact ball bearing*
5. *Tapered roller bearing*
6. *Spherical roller bearing*



10
Bearings for combined load

1. *Self-aligning ball bearing (locating bearing)*
2. *Cylindrical roller bearing NJ (semi-locating bearing)*
3. *Cylindrical roller bearing NUP (locating bearing)*
4. *Cylindrical roller bearing NJ + HJ (locating bearing)*
5. *Cylindrical roller bearing NU + HJ (semi-locating bearing)*



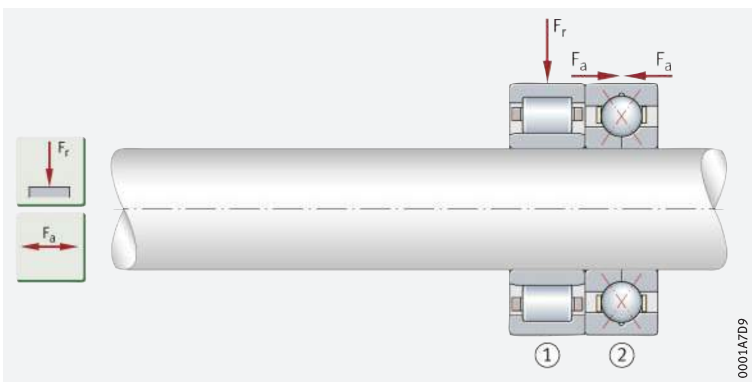
✎ The axial load can also be supported by means of a separate bearing

If the axial load component is too high, the axial load can also be supported by means of a separate bearing. In addition to a pure axial bearing, radial bearings – e.g. deep groove ball bearings and cylindrical roller bearings ➤22 | 11 or four point contact bearings capable of supporting axial forces in both directions – can be used.

! If the four point contact bearing is to be used as an axial bearing only, the outer ring must have radial clearance in the housing.

11
Cylindrical roller bearing and four point contact bearing for supporting combined load

1. *Cylindrical roller bearing NU, radial bearing*
2. *Four point contact bearing, axial bearing (the outer ring must not be radially retained if the bearing is subjected to purely axial load)*



Bearings for supporting tilting moments

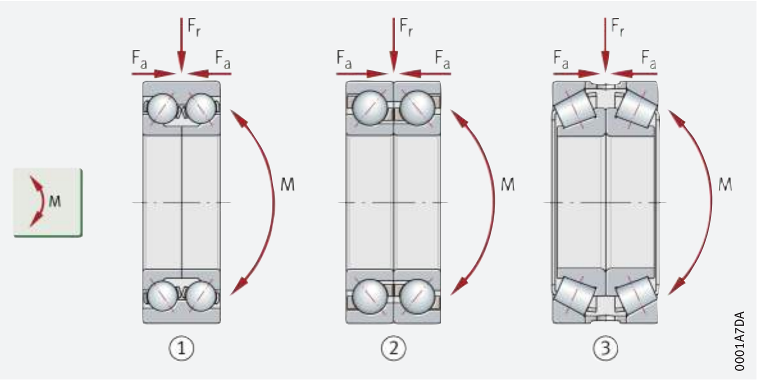
Moment load under eccentric force application

If a load acts eccentrically, the bearing is subjected to tilting moments. In addition to double row deep groove ball bearings and angular contact ball bearings, suitable bearings in this case are in particular the single row angular contact ball bearings or tapered roller bearings matched in and X or O arrangement ➤23|12.

12
Bearings for supporting tilting moments

M = *tilting moment*

① *Angular contact ball bearing, double row*
② *Angular contact ball bearing set, comprising two matched single row angular contact ball bearings, O arrangement*
③ *Tapered roller bearing set, comprising two matched single row tapered roller bearings, X arrangement*



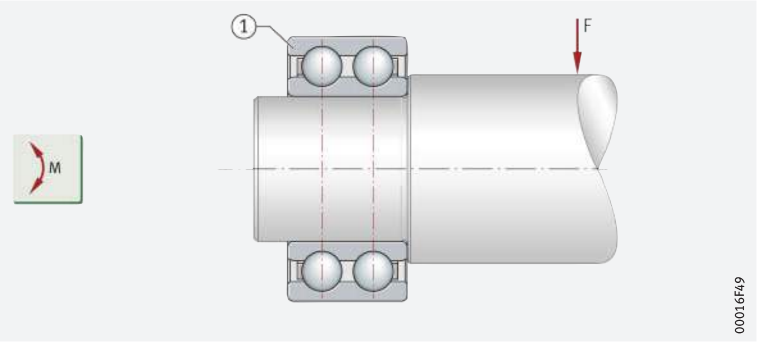
Double row deep groove ball bearing

In ➤23|13, the tilting moment produced by the eccentrically acting force F is supported by a double row deep groove ball bearing.

13
Unilateral bearing arrangement of shaft

M = *tilting moment*
F = *eccentrically acting radial force*

① *Deep groove ball bearing, double row*



4.4 Speed suitability

Bearings for high and very high speeds

✎ *The permissible speed is restricted by the operating temperature*

In general, the highest speed achievable by rolling bearings is determined by the permissible operating temperature. This is dependent on the frictional heat generated in the bearing, the heat introduced from external sources and the heat dissipated from the bearing arrangement.

When conditions are in equilibrium, the bearing temperature is constant.

✎ *Bearings for very high speeds*

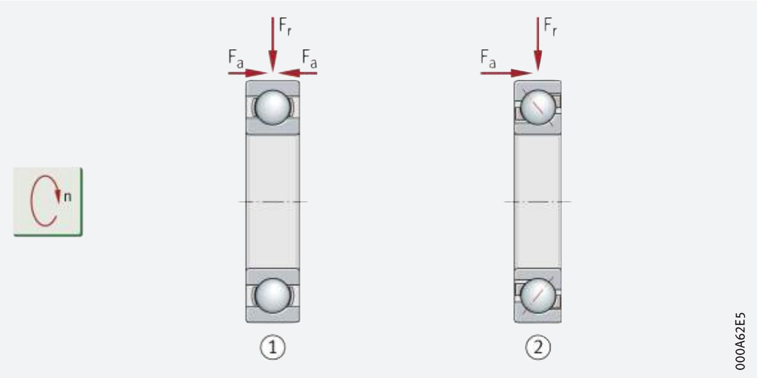
The highest speeds are achieved by single row bearings with particularly low friction. Under pure radial load, these are open deep groove ball bearings, while under combined load they are angular contact ball bearings ➤24 | 14.

!

Due to their design, the permissible speeds for axial bearings are generally lower than those for radial bearings.

14
Bearings for high and very high speeds

① *Deep groove ball bearing, single row, open*
② *Angular contact ball bearing, single row, open*



4.5 Accuracy

✎ *Bearings with increased accuracy*

For most applications, the normal dimensional and running accuracy of rolling bearings is sufficient (tolerance class Normal). Where there are increased demands on running accuracy and in bearing arrangements with very high speeds, such as in the case of main spindles for machine tools, bearings with increased accuracy are necessary ➤1172.

4.6 Axial displacement facility

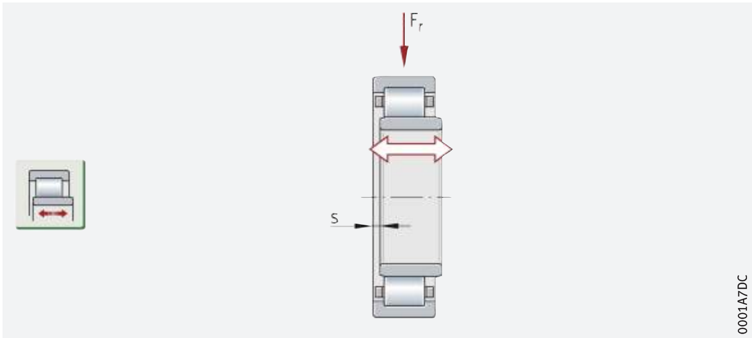
Compensation within the bearing

✎ Axial displacement occurs within the bearing

A shaft is normally supported using a locating bearing and a non-locating bearing. The locating bearing gives tight axial guidance of the shaft in both directions. Non-locating bearings can be displaced in an axial direction and thus prevent the locating bearing and non-locating bearing from bracing against each other. In this way, non-locating bearings compensate for changes in axial length and thermal elongation ➤25|15.

15
Cylindrical roller bearing NU, non-locating bearing, length compensation within bearing

s = *axial displacement distance*

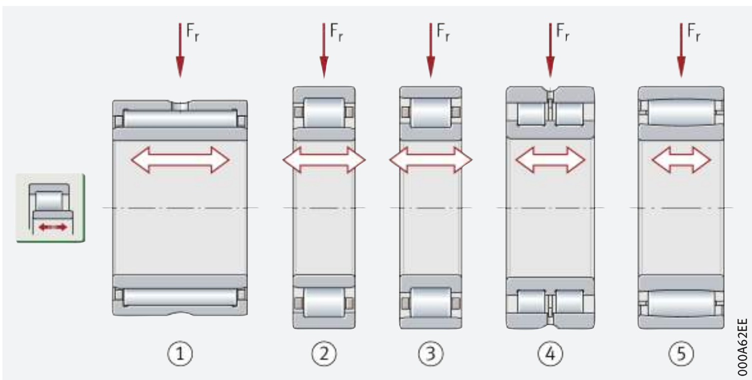


✎ Suitable non-locating bearings for compensation within the bearing

Bearings suitable as non-locating bearings for compensations with the bearing include, in particular, cylindrical roller bearings NU and N with one ribless ring (inner or outer ring), cylindrical roller bearings NJ, some designs of full complement cylindrical roller bearings (SI bearings), needle roller bearings and toroidal roller bearings ➤25|16.

16
Non-locating bearings for compensation within bearing

1. *Needle roller bearing*
2. *Cylindrical roller bearing NU*
3. *Cylindrical roller bearing N*
4. *Cylindrical roller bearing SL0248*
5. *Toroidal roller bearing*



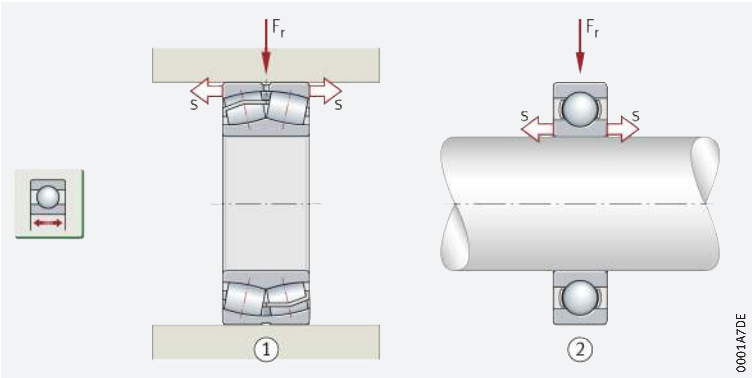
Compensation by means of sliding seat on a bearing ring

Non-separable bearings such as deep groove ball bearings and spherical roller bearings can also be used as non-locating bearings. However, one of the two bearing rings must then have a loose fit and must not be in axial contact, so that the relevant ring can be displaced on the seating surface ➤26|17.

17
Length compensation by means of sliding seat

s = axial displacement distance (loosely fitted bearing ring)

① Spherical roller bearing, outer ring capable of displacement (with loose fit)
② Deep groove ball bearing, inner ring capable of displacement (with loose fit)



4.7 Compensation of misalignments

Skewing has a negative effect on bearing function and reduces the bearing operating life

If skewing occurs between the shaft and housing – for example if bearing seats are not aligned, the shaft deforms under load or the bearing positions are a considerable distance apart – this must be compensated by means of suitable bearings (self-aligning bearings). Misalignments should also be expected if individual housings, such as plummer block or flanged housings, are used. Similar effects (alignment inaccuracies of the bearing positions) are caused by angular defects between the radial seating surface and the lateral contact surface of a rolling bearing ring.

Self-aligning rolling bearings

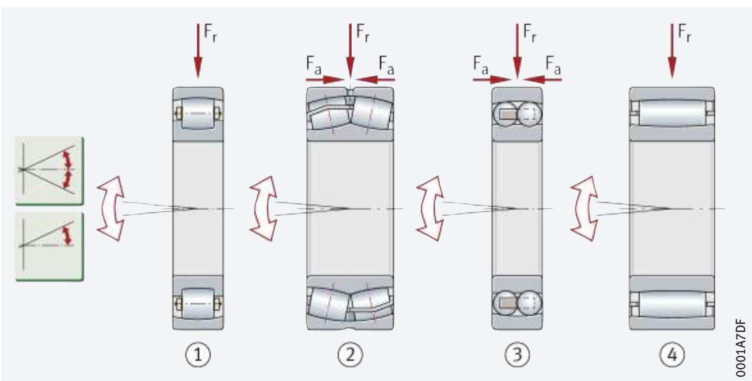
Dynamic and static compensation of misalignments and angular defects

Misalignments and angular defects can be compensated within certain limits by means of self-aligning rolling bearings (see product chapter). These include bearings such as barrel roller bearings, spherical roller bearings, self-aligning ball bearings, toroidal roller bearings and axial spherical roller bearings ➤26|18. These bearings have a concave outer ring raceway in which the inner ring together with the rolling element set can swivel.

The rings may only be swivelled while being simultaneously rotated, otherwise the raceways will be damaged.

18
Bearings for static and dynamic adjustment motions

① Barrel roller bearing (non-locating bearing)
② Spherical roller bearing (locating bearing)
③ Self-aligning ball bearing (locating bearing)
④ Toroidal roller bearing (non-locating bearing)



Bearings for compensation of static angular defects

✎ *Radial insert ball bearings and aligning needle roller bearings are suitable for static adjustment motions*

Radial insert ball bearings and aligning needle roller bearings have a crowned (spherical) outer ring outside surface and can align themselves on the concave mating surface after mounting ➤27|🖻19. These bearings are suitable for static adjustment motions. They must not, however, be used for dynamic adjustment motions, oscillating motions etc.

Axial deep groove ball bearings

❗ Axial deep groove ball bearings cannot support tumbling motion of the shaft and therefore react with high sensitivity to angular defects.

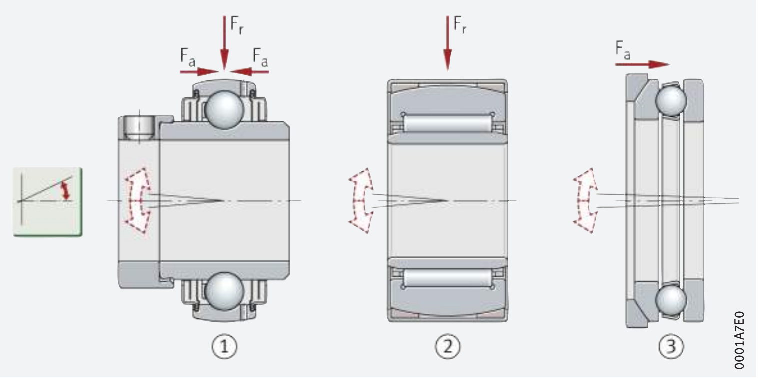
✎ *Bearings with spherical housing locating washer*

If the contact surface in the housing is not perpendicular to the rotational axis of the bearing, the angular defect can be compensated by means of axial deep groove ball bearings with a spherical housing locating washer and support washer ➤27|🖻19.

🖻 **19**

Bearings for static angular defects (adjustment motions)

1. *Radial insert ball bearing (radial bearing)*
2. *Aligning needle roller bearing (radial bearing)*
3. *Axial deep groove ball bearing with spherical housing locating washer and support washer*



Self-alignment facility of deep groove ball bearings

✎ *Single row deep groove ball bearings have only a small self-alignment facility*

In deep groove ball bearings, misalignments lead to unfavourable running of the balls and induce additional loads in the bearing that shorten the operating life of the bearing. In order to keep these loads at a low level, only small adjustment angles are therefore permitted as a function of the load for single row deep groove ball bearings.

❗ Double row deep groove ball bearings cannot undergo angular motion. When using these bearings, therefore, misalignments are not permissible.

Self-alignment facility of cylindrical roller bearings, tapered roller bearings, needle roller bearings

✎ *The self-alignment facility is smaller than in the case of deep groove ball bearings*

The self-alignment facility of cylindrical, tapered and needle roller bearings is smaller than that of deep groove ball bearings. The transverse form of the rolling elements and raceways of these roller bearings is designed such that, at the stated adjustment angles, the load on the material at the rolling contact is still uniform enough that the basic rating life is not impaired.

❗ Where angular defects are larger than those indicated in the product chapters, rollers and needle rollers are no longer subjected uniformly to load over their full length. As a result, unacceptably high edge pressures may occur.

4.8 Quiet running

✎ *Deep groove ball bearings have very low running noise*

In small electrical devices, such as office equipment or household applications, low running noise is often required. Deep groove ball bearings are particularly suitable for such requirements ➤24|🖻14. A noise evaluation of the series is permitted by means of the Schaeffler Noise Index ➤69. It is advantageous to apply axial adjustment to the bearings, for example by means of disc springs.

4.9 Rigidity

✎ *Roller bearings are more rigid than ball bearings*

The rigidity of a rolling bearing is determined by the type, bearing size and operating clearance. The rigidity increases with the number of rolling elements supporting the load. A particularly high level of system rigidity is the objective, for example in main spindle bearing arrangements and rotary table bearing arrangements in machine tools and in pinion bearing arrangements.

! The rigidity of roller bearings is higher, due to the contact conditions between the rolling elements and raceways (line contact), than the rigidity of ball bearings.

4.10 Friction

✎ *Bearings with low bearing friction*

In addition to the introduction and dissipation of heat, the decisive factor for the operating temperature of a bearing arrangement is bearing friction. Bearings with particularly low friction include open deep groove ball bearings, single row angular contact ball bearings and cylindrical roller bearings with cage under radial load ➤20| 7 and ➤24| 14. Comparatively high friction is generated in bearings with contact seals, full complement cylindrical roller bearings and axial roller bearings.

4.11 Mounting and dismounting

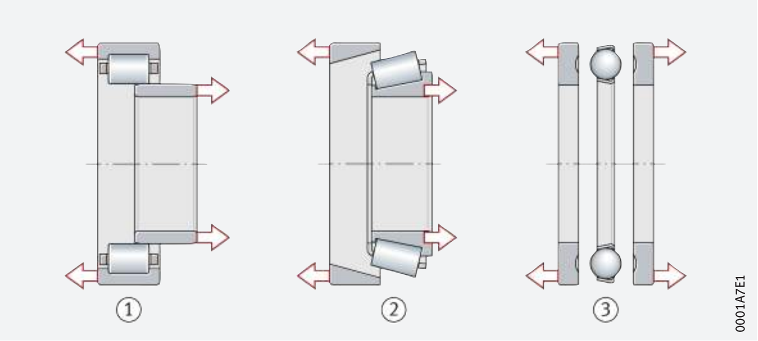
Separable (non self-retaining) and non-separable bearings

✎ *In the case of separable bearings, the bearing rings can be mounted independently of each other*

Bearings that are not self-retaining simplify the mounting and dismounting of bearings, since the bearing parts can be mounted individually. This is also an advantage if both rings have a tight fit. Separable bearings include four point contact bearings, double row angular contact ball bearings with a split inner ring, certain cylindrical roller bearings, tapered roller bearings, axial deep groove ball bearings, axial spherical roller bearings, axial cylindrical roller bearings and certain needle roller bearings ➤28| 20.

20
Separable bearings

① *Cylindrical roller bearing NU*
② *Tapered roller bearing*
③ *Axial deep groove ball bearing*



✎ *Non-separable bearings*

Deep groove ball bearings, single row angular contact ball bearings, self-aligning ball bearings, barrel roller bearings and spherical roller bearings are not generally separable.

Bearings with tapered bore

✎ With a tapered shaft seat, the radial internal clearance in the bearing can be set to a defined value

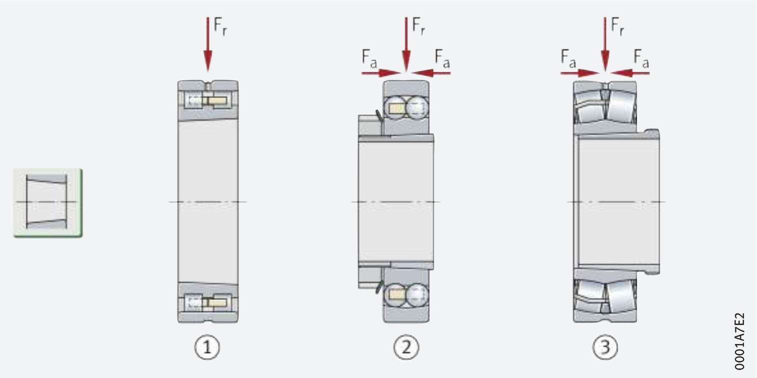
Bearings with a tapered bore can be mounted directly on a tapered shaft seat, for example in the case of single row and double row cylindrical roller bearings of a high precision variant. During mounting of these bearings, the radial internal clearance can be set to a defined value.

✎ Mounting and dismounting of bearings can be aided by means of adapter and withdrawal sleeves

Where the requirements for running accuracy are low, adapter and extraction sleeves can be used to locate self-aligning ball bearings, barrel roller bearings and spherical roller bearings with a tapered bore on a cylindrical shaft seat in particular ➤29|Figure *21*. The mounting and dismounting of such bearing arrangements is particularly simple.

Figure 21
Bearings with tapered bore, adapter and withdrawal sleeve

① *Cylindrical roller bearing, double row*
② *Self-aligning ball bearing with adapter sleeve*
③ *Spherical roller bearing with withdrawal sleeve*



4.12 Matrix for preselection of bearing type

✎ Suitable for an initial preliminary assessment

The matrix shows the features and characteristics of common bearing types ➤30|Table *1*. It can used to make an initial preliminary assessment of whether the selected bearing is suitable for the application.

✎ Limits of the matrix

If the focus is on criteria that cannot be resolved using the matrix, technical advice should be sought from Schaeffler. This also covers new types of bearing arrangements where relevant experience is not available or is insufficient, or where applications run under extreme operating conditions, high safety requirements apply or a possible risk to personal safety is involved.

When using the matrix, it must also be taken into consideration that certain characteristics are not dependent exclusively on the bearing type. For example, the preload of a tapered roller bearing arrangement may influence the rigidity of the bearing arrangement. This cannot, however, be derived from the matrix. A similar situation is present in the case of spindle bearings for the support of main spindles in machine tools. Depending on whether the bearings are designed with steel or ceramic balls, the preload may increase at very high speeds due to the high centrifugal forces in the bearing – the centrifugal forces act on the rolling elements and change their position in the bearing. In hybrid bearings – bearings with ceramic balls – this effect is far less pronounced than in bearings with steel balls.

In selection of the bearing type, attention must also be paid to the work involved in mounting and dismounting of the bearings, the costs of the bearing arrangement and the availability of the bearings. Decisions cannot be made on these points by means of the matrix.

1
Bearing types, designs and characteristics

The matrix gives an overview of the types and design features of rolling bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

Design features and suitability

- +++ extremely suitable
- ++ highly suitable
- \+ suitable
- (+) suitable with restrictions
- – not suitable/not applicable
- ✓ available

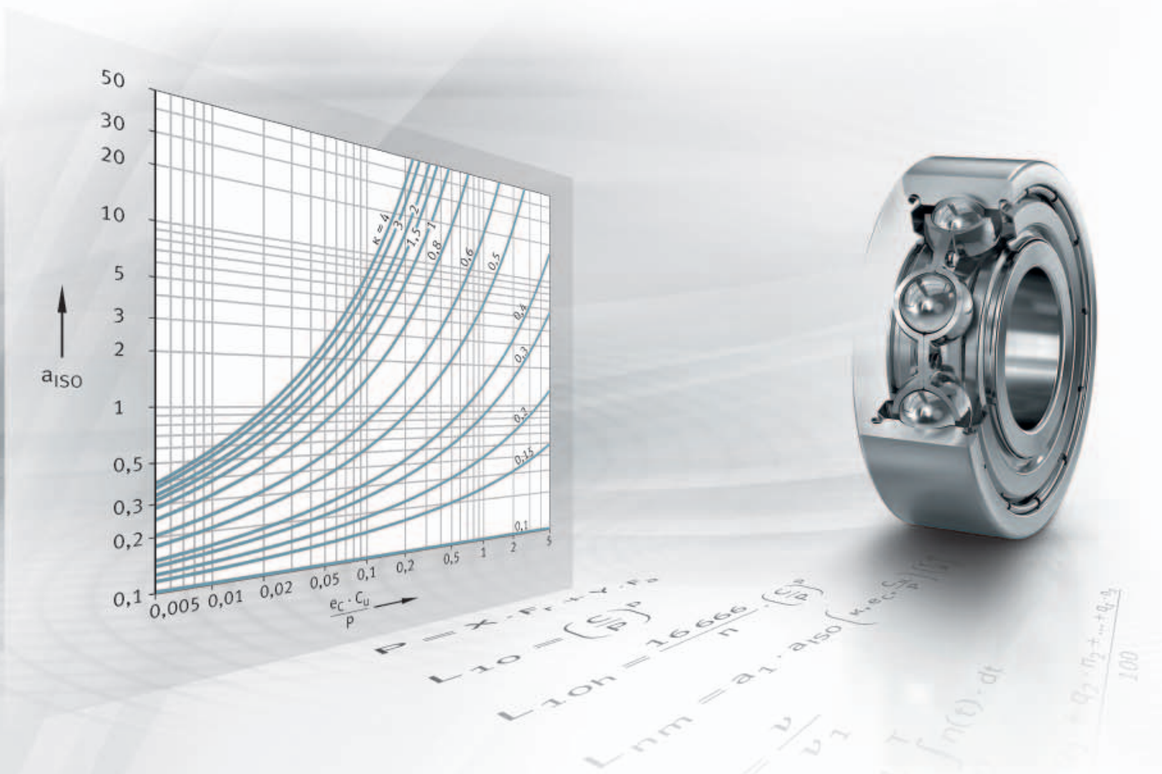
Design features and suitability		Radial bearings: Deep groove ball bearings	Angular contact ball bearings	Four point contact bearings	Self-aligning ball bearings	Cylindrical roller bearings, non-locating
Load carrying capacity	radial	++	++	(+)	++	+++
	axial, one direction	++[1]	++	++	(+)	–
	axial, both directions	++[1]	++	++	(+)	–
	moments	+[1]	++[1]	(+)	–	–
Compensation of angular misalignments	static	(+)[1]	–	–	+++	(+)
	dynamic	(+)[1]	–	–	+++	(+)
Bearing design	cylindrical bore	✓	✓	✓	✓	✓
	tapered bore	–	–	–	✓	–
	separable	–	✓[1]	✓	–	✓[1]
Lubrication	greased	✓[1]	✓[1]	–	✓[1]	–
Sealing	open	✓	✓	✓	✓	✓
	non-contact	✓[1]	✓	–	–	–
	contact	✓[1]	✓	–	✓[1]	–
Suitability for	high speeds	+++[1]	+++[1]	(+)	+	++
	high running accuracy	++	++[1]	(+)	–	++
	low-noise running	+++	++	(+)	(+)	+
	high rigidity	+	++	+	(+)	+++[1]
	reduced friction	+++	++	+	++	++
	length compensation within bearing	–	–	–	–	+++
	non-locating bearing arrangement	+	+	–	+	+++
	locating bearing arrangement	++	+++[1]	++	+	–
X-life bearings		–	✓[1]	✓[1]	–	✓[1]
Bearing bore[1] [2] d in mm	from	2	5	17	5	15
	to	260	180	200	150	710
Product chapter	from page ➤	**208**	**278**	**346**	**366**	**408**

[1] *Certain bearing designs.*

[2] *Alternatively, inside diameter in bearings without an inner ring.*

	Radial bearings									Axial bearings			
	Cylindrical roller bearings, semi-locating	Cylindrical roller bearings, locating	Tapered roller bearings	Barrel roller bearings	Spherical roller bearings	Toroidal roller bearings	Needle roller bearings: machined, drawn cup, cages	Combined needle roller bearings	Crossed roller bearings	Axial deep groove ball bearings	Axial cylindrical roller bearings	Axial needle roller bearings	Axial spherical roller bearings
	+++	+++	+++	+++	+++	+++	+++	+++	++	–	–	–	+
	+	+	+++	+	++	–	–	+++[1)]	+++	++	++	++	+++
	–	+	+++[1)]	+	++	–	–	++[1)]	+++	++[1)]	–	–	–
	–	–	(+)	–	–	–	–	–	++	–	–	–	–
	(+)	(+)	(+)	+++	+++	+++	++[1)]	–	–	(+)[1)]	–	–	+++
	(+)	(+)	(+)	+	+	++	–	–	–	–	–	–	+
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	–	–	–	✓	✓	✓	–	–	–	–	–	–	–
	✓[1)]	✓[1)]	✓[1)]	–	–	–	✓[1)]	✓[1)]	–	✓	✓	✓	✓
	–	✓[1)]	✓[1)]	–	✓[1)]	–	✓[1)]	✓[1)]	✓	–	–	–	–
	✓	✓	✓[1)]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	–	–	–	–	–	–	–	–	–	–	–	–	–
	–	✓[1)]	✓[1)]	–	✓[1)]	–	✓[1)]	–	–	–	–	–	–
	++	++	+[1)]	+	+	+[1)]	+++	+++[1)]	(+)	+	(+)	++	+
	++	++	++	(+)	+[1)]	++	++[1)]	++[1)]	++	+	++	–	+
	(+)	(+)	(+)	(+)	+[1)]	+	+	(+)	+	(+)	(+)	+	(+)
	+++[1)]	+++[1)]	+++[1)]	++	++	+++[1)]	+++[1)]	+++	+	++	++	+++	++
	++	++	+	+	+	+[1)]	++[1)]	++[1)]	+	+	(+)	+++	++
	(+)	–	–	–	–	+++	+++[1)]	(+)	–	–	–	(+)	–
	+	–	(+)[1)]	+	+	+++	+++	–	–	–	–	–	–
	+	++	+++	+	++	–	–	+[1)]	+	+++	++	–	(+)
	✓[1)]	✓[1)]	✓[1)]	–	✓[1)]	✓	✓[1)]	✓	–	–	–	–	✓
	15 500	15 400	15 673,1	20 260	20 1800	70 900	2 415	7 70	70 500	10 260	15 320	4 160	60 1600
	408	**408**	**554**	**638**	**662**	**796**	**852**	**910**	**1138**	**1038**	**1072**	**1096**	**1114**

Technical principles



1 Load carrying capacity and life

✎ *"Expanded calculation of the adjusted rating life"*

Schaeffler introduced the "Expanded calculation of the adjusted rating life" in 1997. This method was standardised for the first time in DIN ISO 281 Appendix 1 and has been a constituent part of the international standard ISO 281 since 2007. As part of the international standardisation work, the life adjustment factor a_{DIN} was renamed as a_{ISO} but without any change to the calculation method.

1.1 Fatigue theory as a principle

DIN ISO

The basis of the rating life calculation in accordance with ISO 281 is Lundberg and Palmgren's fatigue theory which always gives a final rating life.

However, modern, high quality bearings can exceed by a considerable margin the values calculated for the basic rating life under favourable operating conditions. Ioannides and Harris have developed a further model for fatigue in rolling contact that expands on the Lundberg and Palmgren theory and gives a better description of the performance capability of modern bearings.

✎ *Values which must be taken into account in the "Expanded calculation of the adjusted rating life"*

The method "Expanded calculation of the adjusted rating life" takes account of the following influences:

- the bearing load
- the fatigue limit of the material
- the extent to which the surfaces are separated by the lubricant
- the cleanliness in the lubrication gap
- additives in the lubricant
- the internal load distribution and frictional conditions in the bearing.

The influencing factors, especially those relating to contamination, are extremely complex. A great deal of experience is essential for an accurate assessment. As a result, please consult Schaeffler for further advice.

!

The tables and diagrams in this chapter can only give guide values.

1.2 Dimensioning of rolling bearings

The required size of a rolling bearing is dependent on the demands made on its:

- rating life
- load carrying capacity
- operational reliability.

1.3 Dynamic load carrying capacity and life

✎ *Basic dynamic load ratings*

The dynamic load carrying capacity is described in terms of the basic dynamic load ratings. The basic dynamic load ratings are based on DIN ISO 281.

The basic dynamic load ratings for rolling bearings are matched to empirically proven performance standards published in previous FAG and INA catalogues.

The fatigue behaviour of the material determines the dynamic load carrying capacity of the rolling bearing.

Dynamic load carrying capacity

The dynamic load carrying capacity is described in terms of the basic dynamic load rating and the basic rating life.

Factors influencing the fatigue life

The fatigue life is dependent on:

- the load
- the operating speed
- the statistical probability of the first appearance of failure.

Basic dynamic load rating C

The basic dynamic load rating C applies to rotating rolling bearings. It is:

- a constant radial load C_r for radial bearings
- a constant, concentrically acting axial load C_a for axial bearings.

The basic dynamic load rating C is that load of constant magnitude and direction which a sufficiently large number of apparently identical bearings can endure for a basic rating life of one million revolutions.

1.4 Calculation of the rating life

Calculation methods

The methods for calculating the rating life are:

- basic rating life L_{10} and L_{10h} to ISO 281 ➤*35*|ƒ *1* and ➤*35*|ƒ *2*
- expanded adjusted rating life L_{nm} to ISO 281 ➤*37*.

1.5 Basic rating life

L_{10} or L_{10h}

The basic rating life in millions of revolutions (L_{10}) is determined in accordance with ➤*35*|ƒ *1*, the basic rating life in operating hours (L_{10h}) is determined in accordance with ➤*35*|ƒ *2*.

ƒ 1
Rating life in revolutions

$$L_{10} = \left(\frac{C}{P}\right)^p$$

ƒ 2
Rating life in operating hours

$$L_{10h} = \frac{16\,666}{n} \cdot \left(\frac{C}{P}\right)^p$$

Legend

L_{10}	10^6	The basic rating life in millions of revolutions, that is reached or exceeded by 90% of a sufficiently large number of apparently identical bearings before the first indications of material fatigue appear
L_{10h}	h	The basic rating life in operating hours, that is reached or exceeded by 90% of a sufficiently large number of apparently identical bearings before the first indications of material fatigue appear
C	N	Basic dynamic load rating, see product tables
P	N	Equivalent dynamic bearing load
p	–	Life exponent; for roller bearings: $p = 10/3$ for ball bearings: $p = 3$
n	min^{-1}	Operating speed (nominal speed).

1.6 Equivalent dynamic bearing load

The basic rating life L_{10} in accordance with ➤35|ƒ 1 is defined for a load of constant magnitude acting in a constant direction. In the case of radial bearings, this is a purely radial load, while in the case of axial bearings it is a purely axial load.

✎ Equivalent dynamic load P is identical to the combined load occurring in practice

If the load and speed are not constant, equivalent operating values can be determined that induce the same fatigue as the actual loading conditions. Equivalent operating values for variable load and speed ➤45|1.9.

Equivalent dynamic radial bearing load

The equivalent dynamic load P on a bearing subjected to combined load (with a radial and axial load) is calculated in accordance with ➤36|ƒ 3.

ƒ 3
Equivalent dynamic radial bearing load

$$P = X \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic radial bearing load
X	–	Radial load factor; see product tables
F_r	N	Radial load
Y	–	Axial load factor; see product tables
F_a	N	Axial load.

The calculation in accordance with ➤36|ƒ 3 cannot be applied to radial needle roller bearings, axial needle roller bearings and axial cylindrical roller bearings. Combined loads are not permissible with these bearings. For radial needle roller bearings ➤36|ƒ 4, for axial bearings ➤36|ƒ 5.

ƒ 4
Equivalent dynamic radial bearing load

$$P = F_r$$

Legend

P	N	Equivalent dynamic radial bearing load
F_r	N	Radial load.

Equivalent dynamic axial bearing load

✎ In axial bearings with α = 90°, only axial loads are possible

Axial deep groove ball bearings, axial cylindrical roller bearings, axial needle roller bearings and axial tapered roller bearings with the nominal contact angle $\alpha = 90°$ can only support purely axial forces. For concentric axial load ➤36|ƒ 5.

ƒ 5
Equivalent dynamic axial bearing load

$$P_a = F_a$$

Legend

P_a	N	Equivalent dynamic axial bearing load
F_a	N	Axial load.

✎ In axial bearings with α ≠ 90°, axial and radial loads are possible

Axial angular contact ball bearings, axial spherical roller bearings and axial tapered roller bearings with the nominal contact angle $\alpha \neq 90°$ can support not only an axial force F_a but also a radial force F_r. The equivalent dynamic axial load P_a is thus determined in accordance with ➤36|ƒ 6.

ƒ 6
Equivalent dynamic axial bearing load

$$P_a = X \cdot F_r + Y \cdot F_a$$

Legend

P_a	N	Equivalent dynamic axial bearing load
X	–	Radial load factor; see product tables
F_r	N	Radial load
Y	–	Axial load factor; see product tables
F_a	N	Axial load.

1.7 Expanded adjusted rating life

The calculation of the expanded adjusted rating life L_{nm} was standardised for the first time in DIN ISO 281 Appendix 1 and included in the global standard ISO 281 in 2007. It replaces the previously used adjusted rating life L_{na}. Computer-aided calculation to DIN ISO 281 Appendix 4 has been specified since 2008 in ISO/TS 16281 and standardised in DIN 26281 since 2010.

The expanded adjusted rating life L_{nm} is calculated in accordance with ➤37|ƒ 7.

ƒ 7
Expanded adjusted rating life

$$L_{nm} = a_1 \cdot a_{ISO}\left(\kappa, e_C, \frac{C_u}{P}\right) \cdot \left(\frac{C}{P}\right)^p$$

Legend

L_{nm}	10^6	Expanded adjusted rating life in millions of revolutions in accordance with ISO 281:2007
a_1	–	Life adjustment factor for a requisite reliability other than 90% ➤37|▦ 1
a_{ISO}	–	Life adjustment factor for operating conditions
κ	–	Viscosity ratio
e_C	–	Life adjustment factor for contamination
C_u	kN	Fatigue limit load; see product tables
C	kN	Basic dynamic load rating; see product tables
P	kN	Equivalent dynamic bearing load
p	–	Life exponent.

Fatigue limit load C_u

The fatigue limit load C_u in accordance with ISO 281 is defined as the load below which, under laboratory conditions, no fatigue occurs in the material. The fatigue limit load C_u serves as a calculation value for determining the life adjustment factor a_{ISO} and not as a design criterion. With poor lubrication or contamination of the lubricant in particular, it is also possible for the material to undergo fatigue at loads which are significantly below the fatigue limit load C_u.

Life adjustment factor a_1

The values for the life adjustment factor a_1 were redefined in ISO 281:2007 and differ from the previous data ➤37|▦ 1.

▦ 1
Life adjustment factor a_1

Requisite reliability %	Expanded adjusted rating life L_{nm}	Life adjustment factor a_1
90	L_{10m}	1
95	L_{5m}	0,64
96	L_{4m}	0,55
97	L_{3m}	0,47
98	L_{2m}	0,37
99	L_{1m}	0,25
99,2	$L_{0,8m}$	0,22
99,4	$L_{0,6m}$	0,19
99,6	$L_{0,4m}$	0,16
99,8	$L_{0,2m}$	0,12
99,9	$L_{0,1m}$	0,093
99,92	$L_{0,08m}$	0,087
99,94	$L_{0,06m}$	0,08
99,95	$L_{0,05m}$	0,077

Life adjustment factor a_{ISO}

Influences on the life adjustment factor

The standardised method for calculating the life adjustment factor a_{ISO} essentially takes account of:

- the load on the bearing
- the lubrication conditions (viscosity and type of lubricant, speed, bearing size, additives)
- the fatigue limit of the material
- the type of bearing
- the residual stress in the material
- the environmental conditions
- contamination of the lubricant.

f 8
Life adjustment factor for operating conditions

$$a_{ISO} = f\left[\frac{e_C \cdot C_u}{P}, \kappa\right]$$

Legend

a_{ISO}	–	Life adjustment factor for operating conditions ➤39 | 1 to ➤40 | 4
e_C	–	Life adjustment factor for contamination ➤43 | 2
C_u	N	Fatigue limit load; see product tables
P	N	Equivalent dynamic bearing load
κ	–	Viscosity ratio ➤41 For κ > 4 calculation should be carried out using κ = 4. This calculation method cannot be used for κ < 0,1.

Taking account of EP additives in the lubricant

In accordance with ISO 281, EP additives in the lubricant can be taken into consideration in the following way:

- For a viscosity ratio κ < 1 and a contamination factor $e_C \geqq 0,2$, calculation can be carried out using the value κ = 1 for lubricants with EP additives that have proven effective.
  Under severe contamination (contamination factor $e_C < 0,2$), the effectiveness of the additives under these contamination conditions must be demonstrated. The effectiveness of the EP additives can be demonstrated in the actual application or on a rolling bearing test rig FE8 to DIN 51819-1.
- If the EP additives are proven effective and calculation is carried out using the value κ = 1, the life adjustment factor must be restricted to $a_{ISO} \leqq 3$. If the value a_{ISO} calculated for the actual value κ is greater than 3, this value can be used in calculation.

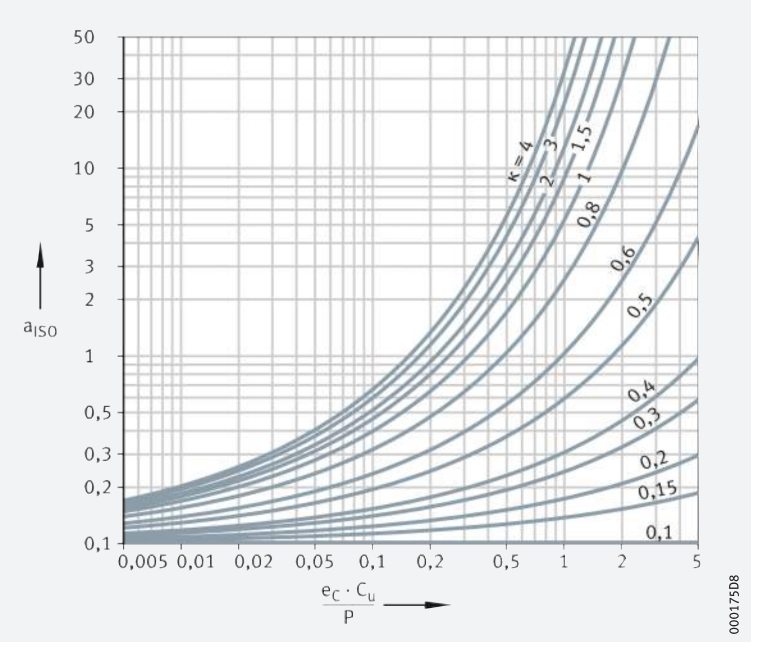
For practical purposes, the life adjustment factor should be restricted to $a_{ISO} \leqq 50$. This limit value also applies if $e_C \cdot C_u/P > 5$. For a viscosity ratio κ > 4, the value κ = 4 should be used; if κ < 0,1, the calculation is not valid.

The life adjustment factor a_{ISO} can – depending on the bearing type – be determined from ➤39 | 1 to ➤40 | 4.

1

Life adjustment factor a_{ISO} for radial roller bearings

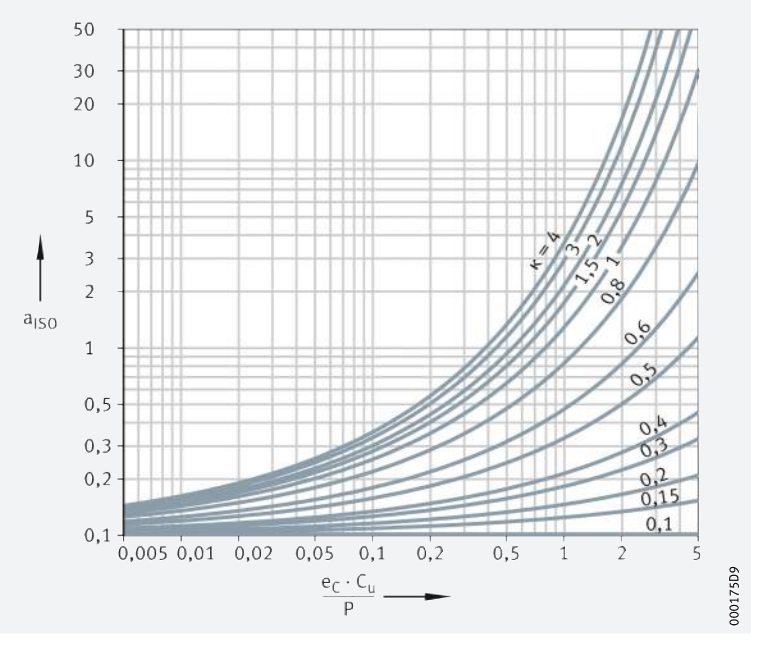
a_{ISO} = *life adjustment factor*
C_u = *fatigue limit load*
e_C = *contamination factor*
P = *equivalent dynamic bearing load*
κ = *parameter for the lubrication regime (viscosity ratio)*



2

Life adjustment factor a_{ISO} for axial roller bearings

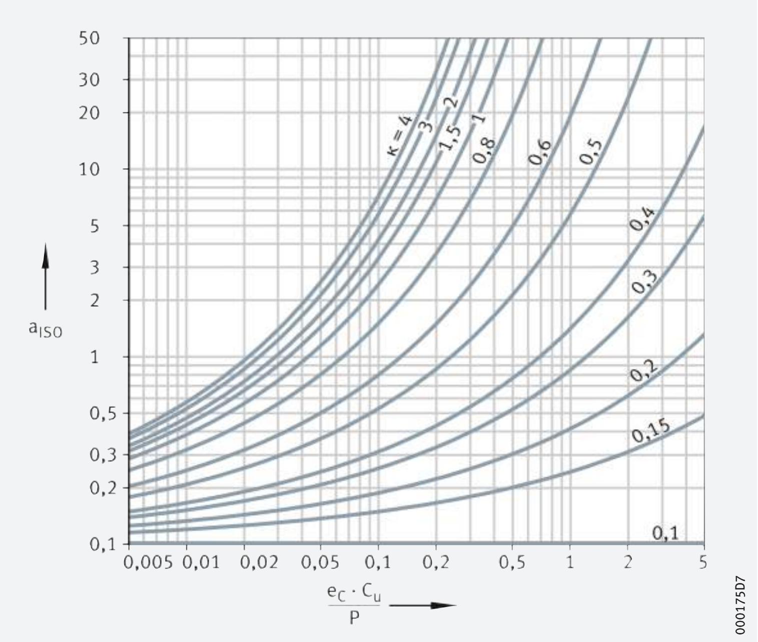
a_{ISO} = *life adjustment factor*
C_u = *fatigue limit load*
e_C = *contamination factor*
P = *equivalent dynamic bearing load*
κ = *parameter for the lubrication regime (viscosity ratio)*



3

Life adjustment factor a_{ISO} for radial ball bearings

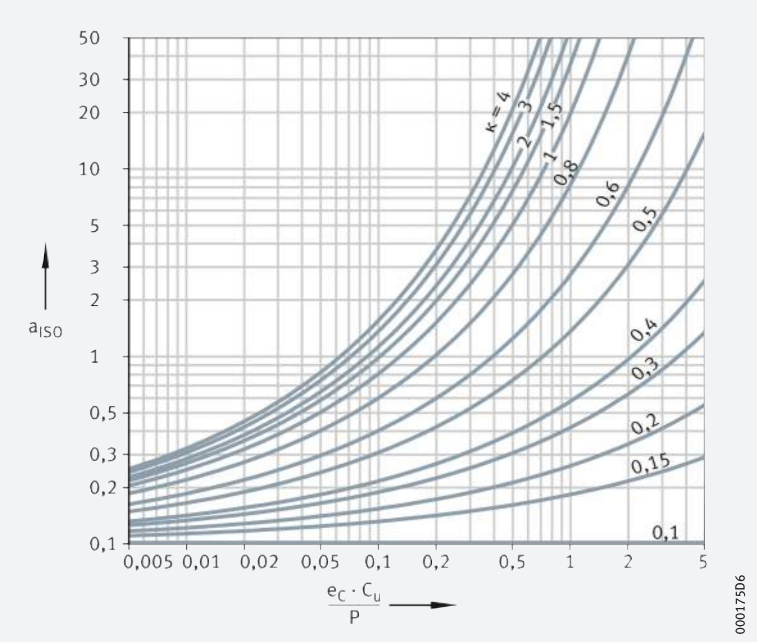
a_{ISO} = *life adjustment factor*
C_u = *fatigue limit load*
e_C = *contamination factor*
P = *equivalent dynamic bearing load*
κ = *parameter for the lubrication regime (viscosity ratio)*



4

Life adjustment factor a_{ISO} for axial ball bearings

a_{ISO} = *life adjustment factor*
C_u = *fatigue limit load*
e_C = *contamination factor*
P = *equivalent dynamic bearing load*
κ = *parameter for the lubrication regime (viscosity ratio)*



Viscosity ratio κ

The viscosity ratio κ is an indication of the quality of lubricant film formation ➤41 | ƒ 9.

ƒ 9
Viscosity ratio

$$\kappa = \frac{\nu}{\nu_1}$$

Legend

κ	–	Viscosity ratio
ν	mm^2/s	Kinematic viscosity of the lubricant at operating temperature
ν_1	mm^2/s	Reference viscosity of the lubricant at operating temperature.

✎ Reference viscosity
The reference viscosity ν_1 is determined from the mean bearing diameter $d_M = (D + d)/2$ and the operating speed n ➤42 | 5.

✎ Nominal viscosity
The nominal viscosity of the oil at +40 °C is determined from the required operating viscosity ν and the operating temperature ϑ, ➤42 | 6.
In the case of greases, ν is the operating viscosity of the base oil.

In the case of heavily loaded bearings with a high proportion of sliding contact, the temperature in the contact area of the rolling elements may be up to 20 K higher than the temperature measured on the stationary ring (without the influence of any external heat sources).

Taking account of EP additives in calculation of the expanded adjusted rating life L_{nm} ➤38.

✎ ν_1 for n < 1000 min⁻¹ or n ≧ 1000 min⁻¹
The reference viscosity ν_1 is calculated for $n < 1\,000\ min^{-1}$ in accordance with ➤41 | ƒ 10, for $n \geqq 1\,000\ min^{-1}$ in accordance with ➤41 | ƒ 11.
By differentiating between these cases, the effect of starvation at high speeds is taken into account.

ƒ 10
Reference viscosity

$$\nu_1 = 45\,000 \cdot n^{-0,83} \cdot d_M^{-0,5}$$

ƒ 11
Reference viscosity

$$\nu_1 = 4\,500 \cdot n^{-0,5} \cdot d_M^{-0,5}$$

Legend

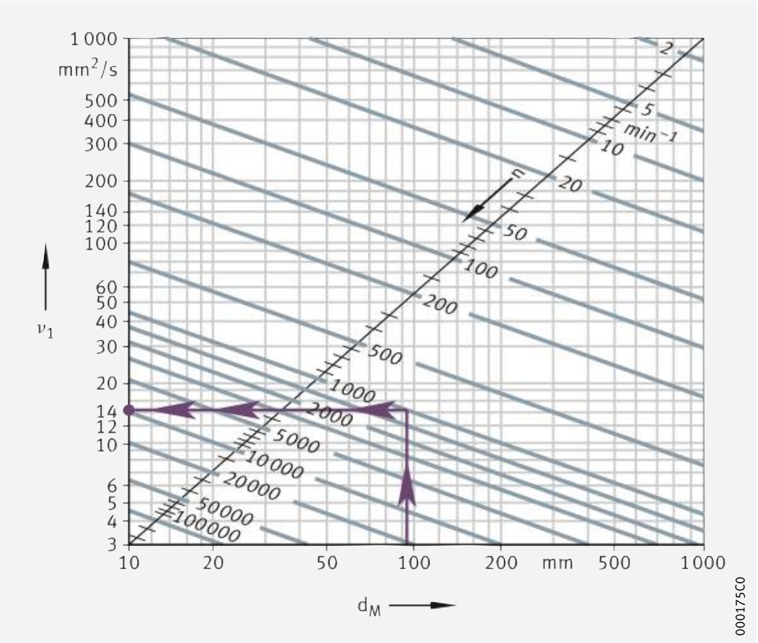
ν_1	mm^2/s	Reference viscosity of the lubricant at operating temperature
n	min^{-1}	Operating speed
d_M	mm	Mean bearing diameter $d_M = (D + d)/2$.

✎ ν_1 for synthetic oils
In accordance with ISO 281:2007, the equations ➤41 | ƒ 10 and ➤41 | ƒ 11 can also be used in approximate terms for synthetic oils, such as oils based on synthetic hydrocarbons (SHC) for example.

5

Reference viscosity ν_1

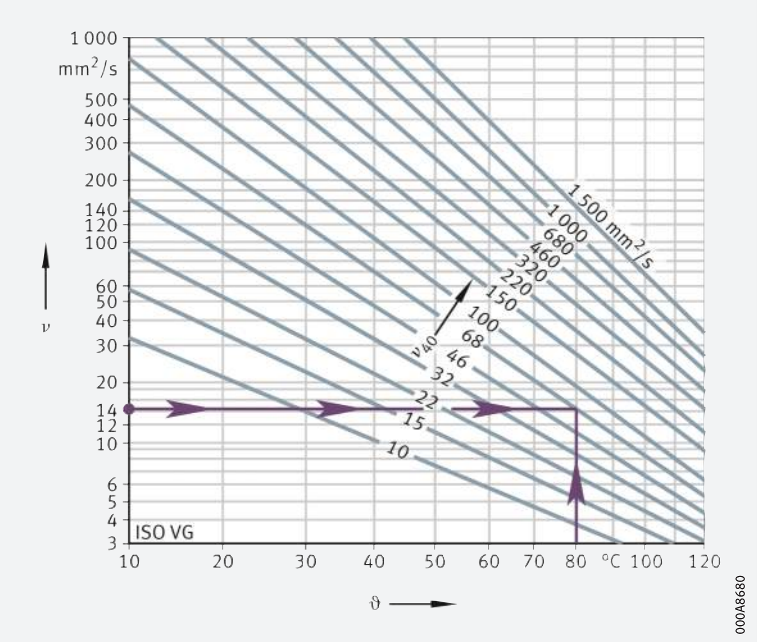
ν_1 = reference viscosity
d_M = mean bearing diameter; (d + D)/2
n = operating speed



6

ν/ϑ diagram for mineral oils

ν = operating viscosity
ϑ = operating temperature
ν_{40} = viscosity at +40 °C



Life adjustment factor for contamination

Contamination factor e_C

The life adjustment factor for contamination e_C takes account of the influence of contamination in the lubrication gap on the rating life ➤43 | 2.

The rating life is reduced by solid particles in the lubrication gap and is dependent on:

- the type, size, hardness and number of particles
- the relative lubrication film thickness
- the bearing size.

Due to the complex interactions between these influencing factors, it is only possible to give approximate guide values. The values in the tables are valid for contamination by solid particles (factor e_C). No account is taken of other contamination such as that caused by water or other fluids. Under severe contamination ($e_C \rightarrow 0$) the bearings may fail due to wear. In this case, the operating life is substantially less than the calculated life.

➤43 | 2 shows guide values for the contamination factor e_C. The values are given in DIN ISO 281. An aid to selecting the appropriate cleanliness class is given in DIN ISO 281 Appendix 3. This appendix also gives guidance on achieving the individual cleanliness classes.

2
Guide values for the contamination factor e_C

d_M = mean bearing diameter (d + D)/2

Contamination	Contamination factor e_C			
	$d_M < 100$ mm		$d_M \geqq 100$ mm	
	from	to	from	to
Very high cleanliness: ■ Particle size within the order of magnitude of the lubricant film thickness ■ Laboratory conditions.	1		1	
High cleanliness: ■ Oil filtered through extremely fine filter ■ Sealed, greased bearings.	0,8	0,6	0,9	0,8
Standard cleanliness: ■ Oil filtered through fine filter.	0,6	0,5	0,8	0,6
Slight contamination: ■ Slight contamination of oil.	0,5	0,3	0,6	0,4
Typical contamination: ■ Bearing contaminated by wear debris from other machine elements.	0,3	0,1	0,4	0,2
Heavy contamination: ■ Bearing environment is heavily contaminated ■ Bearing environment inadequately sealed.	0,1	0	0,1	0
Very heavy contamination	0		0	

1.8 Requisite minimum load

!

In order to prevent damage due to slippage, a minimum radial or axial load must be applied to the bearings ➤44 | 3.

3
Recommended minimum radial and axial load for rolling bearings

Bearing type	Recommended minimum load
Deep groove ball bearings	$P > C_0/100$
Angular contact ball bearings	$P > C_0/100$
Self-aligning ball bearings	$P > C_0/100$
Cylindrical roller bearings	$P > C_0/60$
Tapered roller bearings	$P > C_0/60$
Barrel roller bearings	$P > C_0/60$
Spherical roller bearings	$P > C_0/100$
Toroidal roller bearings, full complement or with cage	$P > C_0/75$
Needle roller bearings	$P > C_0/60$
Axial deep groove ball bearings	$F_{a\,min} = 1000 \cdot A \cdot \left(\frac{n_{max}}{1000}\right)^2$
Axial cylindrical roller bearings[1)]	$F_{a\,min} = 0{,}0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8}\right)^2$
Axial needle roller bearings	$F_{a\,min} = 0{,}0005 \cdot C_{0a} + 3 \cdot \left(\frac{C_{0a} \cdot n}{10^8}\right)^2$
Axial spherical roller bearings[2)]	$F_{a\,min} = 0{,}0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8}\right)^2$

1) Factor k_a ➤44 | 4
2) Factor k_a ➤44 | 5

4
Factor k_a for axial cylindrical roller bearings

Series	Factor k_a
K811	1,4
K812	0,9
K893	0,7
K894	0,5

5
Factor k_a for axial spherical roller bearings

Series	Factor k_a
292..-E	0,6
293..-E1(E)	0,9
294..-E1(E)	0,7

1.9 Equivalent operating values

Equivalent operating values for non-constant loads and speeds

The rating life equations assume a constant bearing load P and constant bearing speed n. If the load and speed are not constant, equivalent operating values can be determined that induce the same fatigue as the actual loading conditions.

The operating values calculated here already take account of the life adjustment factors a_{ISO}. They must not be applied again when calculating the adjusted rating life.

Variable load and speed

If the load and speed vary over a time period T, the speed n and the equivalent bearing load P ➤45|ƒ12 and ➤45|ƒ13 are calculated as follows. If only a basic rating life is to be calculated, the terms $1/a_{ISO}$ can be omitted from the equations ➤45|ƒ12 to ➤46|ƒ19.

ƒ12 *Equivalent speed*

$$n = \frac{1}{T}\int_0^T n(t) \cdot dt$$

ƒ13 *Equivalent bearing load*

$$P = \sqrt[p]{\frac{\int_0^T \frac{1}{a_{ISO}(t)} \cdot n(t) \cdot F^p(t) \cdot dt}{\int_0^T n(t) \cdot dt}}$$

Variation in steps

If the load and speed vary in steps over a time period T, n and P are calculated as follows ➤45|ƒ14 and ➤45|ƒ15.

ƒ14 *Equivalent speed*

$$n = \frac{q_1 \cdot n_1 + q_2 \cdot n_2 + \ldots + q_z \cdot n_z}{100}$$

ƒ15 *Equivalent bearing load*

$$P = \sqrt[p]{\frac{\frac{1}{a_{ISO\,i}} \cdot q_i \cdot n_i \cdot F_i^p + \ldots + \frac{1}{a_{ISO\,z}} \cdot q_z \cdot n_z \cdot F_z^p}{q_i \cdot n_i + \ldots + q_z \cdot n_z}}$$

Variable load at constant speed

If the function F describes the variation in the load over a time period T and the speed is constant, P is calculated as follows ➤45|ƒ16.

ƒ16 *Equivalent bearing load*

$$P = \sqrt[p]{\frac{1}{T}\int_0^T \frac{1}{a_{ISO}(t)} \cdot F^p(t) \cdot dt}$$

Load varying in steps at constant speed

If the load varies in steps over a time period T and the speed is constant, P is calculated as follows ➤45|ƒ17.

ƒ17 *Equivalent bearing load*

$$P = \sqrt[p]{\frac{\frac{1}{a_{ISO\,i}} \cdot q_i \cdot F_i^p + \ldots + \frac{1}{a_{ISO\,z}} \cdot q_z \cdot F_z^p}{100}}$$

Constant load at variable speed

If the speed varies but the load remains constant, the following applies ➤46| ƒ 18.

ƒ 18
Equivalent speed

$$n = \frac{1}{T} \int_0^T \frac{1}{a_{ISO}(t)} \cdot n(t) \cdot dt$$

Constant load with speed varying in steps

If the speed varies in steps, the following applies ➤46| ƒ 19.

ƒ 19
Equivalent speed

$$n = \frac{\frac{1}{a_{ISO\,i}} \cdot q_i \cdot n_i + \ldots + \frac{1}{a_{ISO\,z}} \cdot q_z \cdot n_z}{100}$$

Swivel motion

The equivalent speed is calculated in accordance with ➤46| ƒ 20.

If the swivel angle is smaller than twice the pitch angle of the rolling elements, there is a risk of false brinelling.

ƒ 20
Equivalent speed

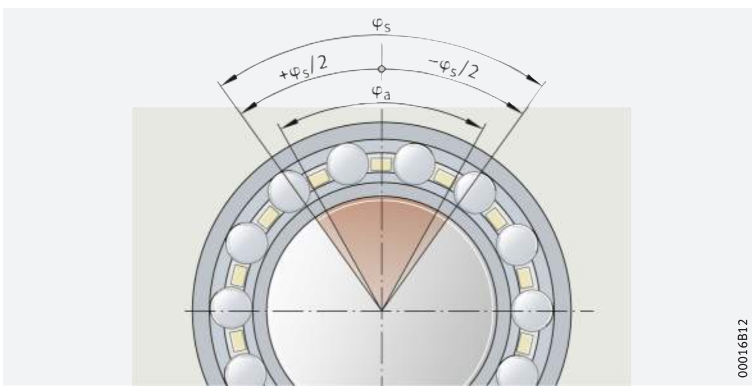
$$n = n_{osc} \cdot \frac{\varphi}{180°}$$

Legend

n	min^{-1}	Equivalent speed
T	min	Time period under consideration
P	N	Equivalent bearing load
p	–	Life exponent; for roller bearings: $p = 10/3$ for ball bearings: $p = 3$
$a_{ISO\,i}$, $a_{ISO}(t)$	–	Life adjustment factor a_{ISO} for current operating condition
n_i, $n(t)$	min^{-1}	Bearing speed for current operating condition
q_i	%	Duration of operating condition as a proportion of the total operating period; $q_i = (\Delta t_i/T) \cdot 100$
F_i, $F(t)$	N	Bearing load during the current operating condition
n_{osc}	min^{-1}	Frequency of swivel motion
φ	°	Swivel angle ➤46| 7.

7
Swivel motion, swivel angle

Complete swivel motion = $2 \cdot \varphi_s$
φ_s = swivel angle of the bearing
φ_a = swivel angle at which every point on the outer raceway is overrolled



1.10 Guide values for dimensioning

Guide values for rating life

The values for the recommended rating life are guide values for normal operating conditions ➤47|6 to ➤51|22. In addition, the tables give the operating life values that are usually achieved in practice at various mounting locations.

Do not overspecify the bearings, otherwise it may not be possible to observe the requisite minimum load. Recommended minimum load ➤44|1.8 and product chapter.

6 *Motor vehicles*

Mounting location	Recommended rating life h			
	Ball bearings		Roller bearings	
	from	to	from	to
Motorcycles	400	2 000	400	2 400
Passenger car powertrains	500	1 100	500	1 200
Passenger car gearboxes protected against contamination	200	500	200	500
Passenger car wheel bearings	1 400	5 300	1 500	7 000
Light commercial vehicles	2 000	4 000	2 400	5 000
Medium commercial vehicles	2 900	5 300	3 600	7 000
Heavy commercial vehicles	4 000	8 800	5 000	12 000
Buses	2 900	11 000	3 600	16 000
Internal combustion engines	900	4 000	900	5 000

7 *Rail vehicles*

Mounting location	Operating life Millions of kilometres	
	from	to
Wheelset bearings for freight wagons	0,1	0,1
Urban transport vehicles	1	2
Passenger carriages	2	3
Goods wagons	1	2
Tipper wagons	1	2
Powered units	2	3
Locomotives, external bearings	2	4
Locomotives, internal bearings	2	4
Shunting and industrial locomotives	0,5	1
Gearboxes for rail vehicles	0,5	2

8 *Shipbuilding*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Marine thrust bearings	–	–	20 000	50 000	30 000	80 000
Marine shaft bearings	–	–	50 000	200 000	30 000	80 000
Large marine gearboxes	14 000	46 000	20 000	75 000	30 000	80 000
Small marine gearboxes	4 000	14 000	5 000	20 000	5 000	20 000
Boat propulsion systems	1 700	7 800	2 000	10 000	2 000	10 000

9
Agricultural machinery

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Tractors	1 700	4 000	2 000	5 000	5 000	10 000
Self-propelled machinery	1 700	4 000	2 000	5 000	2 000	6 000
Seasonal machinery	500	1 700	500	2 000	500	2 000

10
Construction machinery

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Dozers, loaders	4 000	7 800	5 000	10 000	5 000	10 000
Excavators, travelling gear	500	1 700	500	2 000	500	2 000
Excavators, slewing gear	1 700	4 000	2 000	5 000	2 000	5 000
Vibratory road rollers, unbalance generators	1 700	4 000	2 000	5 000	5 000	30 000
Vibrator bodies	500	1 700	500	2 000	500	2 000

11
Electric motors

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Electric motors for household appliances	1 700	4 000	–	–	500	1 000
Series motors	21 000	32 000	35 000	50 000	20 000	30 000
Large motors	32 000	63 000	50 000	110 000	40 000	50 000
Wind energy generators	–	–	–	–	100 000	200 000
Generators	–	–	–	–	40 000	50 000

continued ▼

11
Electric motors

Mounting location	Recommended rating life h				Operating life km	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Electric traction motors for	14 000	21 000	20 000	35 000	–	
mainline operation	–	–	–	–	2 000 000	2 500 000
trams	–	–	–	–	1 000 000	1 000 000
suburban and underground trains	–	–	–	–	1 500 000	1 500 000

continued ▲

12
Rolling mills, steelworks equipment

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Rolling mill frames	500	14 000	500	20 000	2 000	10 000
Rolling mill gearboxes	14 000	32 000	20 000	50 000	20 000	40 000
Roller tables	7 800	21 000	10 000	35 000	20 000	40 000
Centrifugal casting machines	21 000	46 000	35 000	75 000	30 000	60 000

13 *Machine tools*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Headstock spindles, milling spindles	14 000	46 000	20 000	75 000	10 000	30 000
Drilling spindles	14 000	32 000	20 000	50 000	1 000	20 000
External grinding spindles	7 800	21 000	10 000	35 000	10 000	20 000
Hole grinding spindles	–				500	2 000
Workpiece spindles in grinding machines	21 000	63 000	35 000	110 000	20 000	30 000
Machine tool gearboxes	14 000	32 000	20 000	50 000	10 000	20 000
Presses, flywheels	21 000	32 000	35 000	50 000	20 000	30 000
Presses, eccentric shafts	14 000	21 000	20 000	35 000	10 000	20 000
Electric tools and compressed air tools	4 000	14 000	5 000	20 000	100	200

14 *Woodworking machinery*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Milling spindles and cutter blocks	14 000	32 000	20 000	50 000	10 000	20 000
Saw frames, main bearings	–	–	35 000	50 000	–	
Saw frames, connecting rod bearings	–	–	10 000	20 000	–	
Circular saws	4 000	14 000	5 000	20 000	10 000	20 000

15 *Gearboxes in general machine building*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Universal gearboxes	4 000	14 000	5 000	20 000	5 000	20 000
Geared motors	4 000	14 000	5 000	20 000	5 000	20 000
Large gearboxes, stationary	14 000	46 000	20 000	75 000	20 000	80 000

16 *Conveying equipment*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Belt drives, mining	–	–	75 000	150 000	10 000	30 000
Conveyor belt rollers, mining	46 000	63 000	75 000	110 000	10 000	30 000
Conveyor belt rollers, general	7 800	21 000	10 000	35 000	10 000	30 000
Belt drums	–	–	50 000	75 000	10 000	30 000
Bucket wheel excavators, travel drive	7 800	21 000	10 000	35 000	5 000	15 000
Bucket wheel excavators, bucket wheel	–	–	75 000	200 000	30 000	50 000
Bucket wheel excavators, bucket wheel drive	46 000	83 000	75 000	150 000	30 000	50 000
Winding cable sheaves	32 000	46 000	50 000	75 000	50 000	80 000
Sheaves	7 800	21 000	10 000	35 000	8 000	30 000
Tunnel-boring machines: drill head main bearings	–	–	–	–	5 000	10 000

17 *Pumps, fans, compressors*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Ventilators, fans	21 000	46 000	35 000	75 000	20 000	100 000
Large fans	32 000	63 000	50 000	110 000	10 000	–
Piston pumps	21 000	46 000	35 000	75 000	20 000	50 000
Centrifugal pumps	14 000	46 000	20 000	75 000	20 000	50 000
Hydraulic axial and radial piston engines	500	7 800	500	10 000	1 000	20 000
Gear pumps	500	7 800	500	10 000	1 000	20 000
Compressors	4 000	21 000	5 000	35 000	30 000	80 000

18 *Centrifuges, stirrers*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Centrifuges	7 800	14 000	10 000	20 000	40 000	60 000
Large stirrers	21 000	32 000	35 000	50 000	40 000	50 000

19 *Textile machinery*

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Spinning machines, spinning spindles	21 000	46 000	35 000	75 000	10 000	50 000
Weaving and knitting machines	14 000	32 000	20 000	50 000		

20
Plastics processing

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Plastics worm extruders	14 000	21 000	20 000	35 000	20 000	100 000
Rubber and plastics calenders	21 000	46 000	35 000	75 000		

21
Crushers, mills, screens

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Jaw crushers	–	–	20 000	35 000	25 000	40 000
Gyratory crushers, roll crushers	–	–	20 000	35 000		
Rigid hammer mills, hammer mills, impact crushers	–	–	50 000	110 000	40 000	40 000
Tube mills	–	–	50 000	100 000	100 000	100 000
Vibration grinding mills	–	–	5 000	20 000	30 000	60 000
Grinding track mills	–	–	50 000	110 000	60 000	100 000
Vibrating screens	–	–	10 000	20 000	10 000	30 000
Briquette presses	–	–	35 000	50 000	40 000	40 000
Rotary kiln radial support rollers	–	–	50 000	110 000	100 000	–
Roller presses	–	–	–	–	40 000	40 000

22
Paper and printing machinery

Mounting location	Recommended rating life h				Operating life h	
	Ball bearings		Roller bearings			
	from	to	from	to	from	to
Paper machinery, wet section	–	–	110 000	150 000	50 000	100 000
Paper machinery, dry section	–	–	150 000	250 000	–	
Guide rolls					50 000	120 000
Dryer rolls					50 000	150 000
M.G. cylinders					50 000	200 000
Paper machinery, refiners	–	–	80 000	120 000	50 000	100 000
Paper machinery, calenders	–	–	80 000	110 000	50 000	100 000
Printing machinery	32 000	46 000	50 000	75 000	30 000	60 000

1.11 Static load carrying capacity

Plastic deformation limits the static load carrying capacity

If high, static or shock loads occur, the raceways and rolling elements may undergo plastic deformation. This deformation limits the static load carrying capacity of the rolling bearing with respect to the permissible noise level during operation of the bearing.

Basic static load rating

If a rolling bearing operates with only infrequent rotary motion or completely without rotary motion, its size is determined in accordance with the basic static load rating C_0.

In accordance with DIN ISO 76, this is:

- a constant radial load C_{0r} for radial bearings
- a constant, concentrically acting axial load C_{0a} for axial bearings.

The basic static load rating C_0 is that load under which the Hertzian pressure at the most heavily loaded point between the rolling elements and raceways reaches the following values:

- for roller bearings, 4 000 N/mm^2
- for ball bearings, 4 200 N/mm^2
- for self-aligning ball bearings, 4 600 N/mm^2.

Under normal contact conditions, this load causes a permanent deformation at the contact points of approx. 1/10 000 of the rolling element diameter.

Static load safety factor

In addition to dimensioning on the basis of the fatigue life, it is advisable to check the static load safety factor. Guide values and shock loads occurring during operation in accordance with ➤52|▦23 must be taken into consideration.

ƒ 21
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor; guide values ➤52|▦23
C_{0r}, C_{0a}	N	Basic radial or axial static load rating; see product tables
P_{0r}, P_{0a}	N	Radial or axial equivalent static bearing load ➤53|ƒ22.

Guide values for static load safety factor

Guide values for the requisite static load safety factor S_0 are given in DIN ISO 76:2009-01 and in ➤52|▦23. Guide values for axial spherical roller bearings and high precision bearings: see corresponding product description. For drawn cup needle roller bearings, $S_0 \geqq 3$ is necessary.

▦ 23
Static load safety factor S_0 for ball and roller bearings – guide values

Operating conditions and application	Static load safety factor S_0 min.	
	Ball bearings	Roller bearings
Low-noise, smooth running, free from vibrations, high rotational accuracy	2	3
Normal, smooth running, free from vibrations, normal rotational accuracy	1	1,5
Pronounced shock loading[1)]	1,5	3

1) If the order of magnitude of the shock loading is not known, the values used for S_0 should be at least 1,5. If the order of magnitude of the shock loading is known precisely, lower values are possible.

1.12 Equivalent static bearing load

The equivalent static load P_0 is a calculated value. It corresponds to a radial load in radial bearings and a concentric axial load in axial bearings.

P_0 induces the same load at the centre point of the most heavily loaded contact point between the rolling element and raceway as the combined load occurring in practice.

ƒ 22
Equivalent static bearing load

$$P_0 = X_0 \cdot F_r + Y_0 \cdot F_a$$

Legend

P_0	N	Equivalent static bearing load
X_0	N	Radial load factor; see product tables or product description
F_r, F_a	N	Largest radial or axial load present
Y_0	N	Axial load factor; see product tables or product description.

! The calculation cannot be applied to radial needle roller bearings, axial needle roller bearings and axial cylindrical roller bearings. Combined loads are not permissible with these bearings.

In the case of radial needle roller bearings and all radial cylindrical roller bearings:
$P_0 = F_{0r}$
For axial needle roller bearings and axial cylindrical roller bearings:
$P_0 = F_{0a}$

1.13 Operating life

! The operating life is defined as the life actually achieved by the bearing. It may differ significantly from the calculated life.

✎ Possible factors influencing the operating life

This may be due to wear or fatigue as a result of:

- deviating operating data
- misalignments between the shaft and housing
- insufficient or excessive operating clearance
- contamination
- insufficient lubrication
- excessive operating temperature
- oscillating bearing movement with very small swivel angles (false brinelling)
- high vibration and false brinelling
- very high shock loads (static overloading)
- prior damage during mounting.

✎ The operating life cannot be calculated

Due to the wide variety of possible installation and operating conditions, it is not possible to precisely predetermine the operating life. The most reliable way of arriving at a close estimate is by comparison with similar applications.

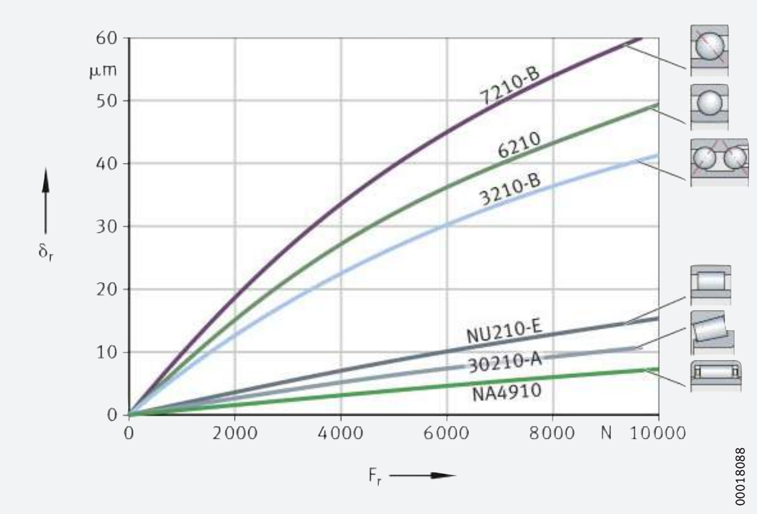
2 Rigidity

Roller bearings are more rigid than ball bearings

The rigidity of a rolling bearing is dependent on the bearing type, size and operating clearance. The rigidity increases with the number of rolling elements supporting the load. Due to the line contact between the rolling elements and raceways, it is higher in roller bearings than in ball bearings. ➤54|Fig. 1 shows typical characteristic curves for the radial deflection of various bearings with the same bore diameter.

Fig. 1
Radial deflection of various radial bearings of bore diameter d = 50 mm

δ_r = radial deflection
F_r = radial load



2.1 Calculation of the radial or axial displacement

Progressive deflection rate

Rolling bearings have a progressive deflection rate. The displacement values for needle and cylindrical roller bearings can be determined using approximation equations ➤54|f 1 and ➤54|f 2.

The equations are valid for bearings without misalignment and with a rigid surrounding structure. In axial bearings, a concentrically acting load is assumed.

f 1 *Radial displacement*

$$\delta_r = \frac{1}{c_s} \cdot F_r^{0,84} + \frac{s}{2}$$

f 2 *Axial displacement*

$$\delta_a = \frac{1}{c_s} \cdot \left[\left(F_{aV} + F_a \right)^{0,84} - F_{aV}^{0,84} \right]$$

f 3 *Rigidity parameter*

$$c_s = K_c \cdot d^{0,65}$$

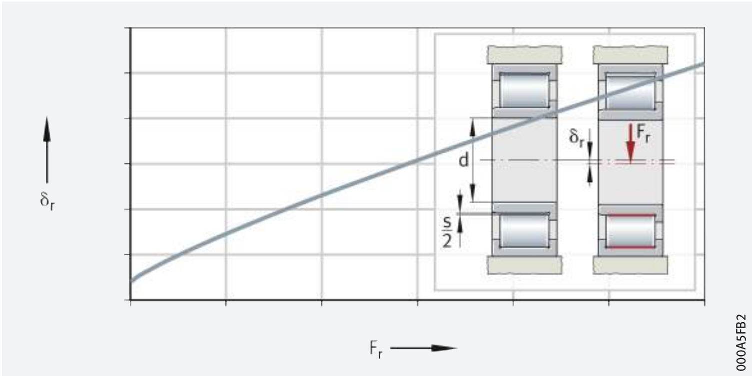
Legend

c_s	$N^{0,84}/\mu m$	Rigidity parameter
d	mm	Bearing bore diameter
δ_r	µm	Radial displacement between shaft axis and centre of bore ➤55|Fig. 2
δ_a	µm	Axial displacement between shaft locating washer and housing locating washer ➤55|Fig. 3
s	µm	Radial operating clearance of fitted, unloaded bearing
F_r	N	Radial load
F_a	N	Axial load
F_{aV}	N	Axial preload force
K_c	–	Factor for determining the rigidity parameter ➤55|Table 1.

2

Radial cylindrical roller bearings, radial displacement

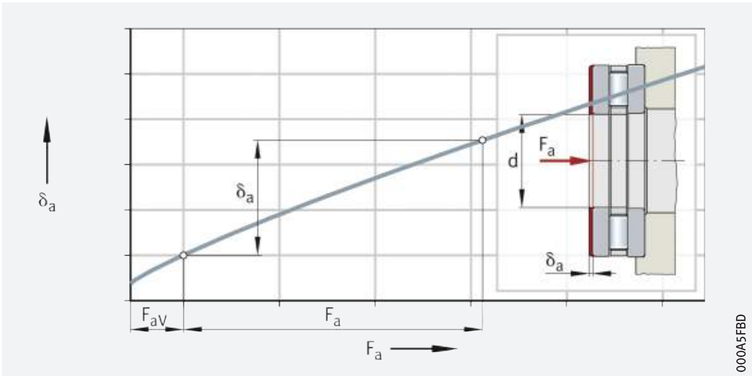
δ_r = *radial displacement*
F_r = *radial load*



3

Axial cylindrical roller bearing, axial displacement

δ_a = *axial displacement*
F_a = *axial load*
F_{aV} = *axial preload force*



1

Factor K_c

Bearing series	Factor K_c	Series	Factor K_c
SL1818	12,8	K811, 811, K812, 812	36,7
SL1829, SL1830, SL1923	16	K893, 893, K894, 894	59,7
SL1850, SL0148, SL0248, SL0249	29,2	NJ2..-E	11,1
NA48	24,9	NJ3..-E	11,3
NA49	23,5	NJ22..-E	15,4
NA69	37,3	NJ23..-E	16,9
NKIS	21,3	NU10	9,5
NKI	$4,4 \cdot B^{0,8}/d^{0,2}$	NU19	11,3
HK, BK	$4,2 \cdot C^{0,8}/d^{0,2}$	NN30..-AS-K	18,6

This simplified calculation cannot be applied to other bearing types. The displacement and rigidity at the operating point can be determined using the calculation program BEARINX-online.

3 Friction and increases in temperature

Frictional components

The friction in a rolling bearing is made up of several components ➤56 | ⊞ 1. Due to the large number of influencing factors, such as dynamics in speed and load, tilting and skewing resulting from installation, actual frictional torques and frictional power may deviate significantly from the calculated values.

If the frictional torque is an important design criterion, please consult Schaeffler.

The calculation module BEARINX-online Easy Friction, which is available from Schaeffler free of charge, can be used to calculate and analyse the frictional torque.

⊞ **1**
Frictional component and influencing factor

Frictional component	Influencing factor
Rolling friction	Magnitude of load
Sliding friction of rolling elements Sliding friction of cage	Magnitude and direction of load Speed and lubrication conditions, running-in condition
Fluid friction (flow resistance)	Type and speed Type, quantity and operating viscosity of lubricant
Seal friction	Type and preload of seal

Influencing factors on idling friction

The idling friction is dependent on the lubricant quantity, speed, operating viscosity of the lubricant, seals and the running-in condition of the bearing.

3.1 Heat dissipation

Friction is converted into heat. This must be dissipated from the bearing. The equilibrium between the frictional power and heat dissipation allows calculation of the thermally safe operating speed n_{ϑ} ➤65 | 4.3.

Lubricant

Lubricating oil dissipates a portion of the heat. Recirculating oil lubrication with additional cooling is particularly effective. Grease does not give dissipation of heat.

Shaft and housing

Heat dissipation via the shaft and housing is dependent on the temperature difference between the bearing and the surrounding structure. Any additional adjacent sources of heat or thermal radiation must be taken into consideration.

3.2 Determining the friction values

The speed and load must also be known. The type of lubrication, lubrication method and viscosity of the lubricant at operating temperature are further important factors in calculation.

ƒ **1**
Total frictional torque

$$M_R = M_0 + M_1$$

ƒ **2**
Frictional power

$$N_R = M_R \cdot \frac{n}{9\,550}$$

For $\nu \cdot n \geqq 2\,000$:

f **3**
Frictional torque as a function of speed

$$M_0 = f_0 \cdot (\nu \cdot n)^{2/3} \cdot d_M{}^3 \cdot 10^{-7}$$

For $\nu \cdot n < 2\,000$:

f **4**
Frictional torque as a function of speed

$$M_0 = f_0 \cdot 160 \cdot d_M{}^3 \cdot 10^{-7}$$

Frictional torque as a function of load for needle roller and cylindrical roller bearings:

f **5**
Frictional torque as a function of load

$$M_1 = f_1 \cdot F \cdot d_M$$

Frictional torque as a function of load for ball bearings, tapered roller bearings and spherical roller bearings:

f **6**
Frictional torque as a function of load

$$M_1 = f_1 \cdot P_1 \cdot d_M$$

Legend

M_R	Nmm	Total frictional torque
M_0	Nmm	Frictional torque as a function of speed
M_1	Nmm	Frictional torque as a function of load
N_R	W	Frictional power
n	min^{-1}	Operating speed
f_0	–	Bearing factor for frictional torque as a function of speed ➤58 | 1 and ➤58 | 2 to ➤61 | 14
f_1	–	Bearing factor for frictional torque as a function of load ➤58 | 2 to ➤61 | 14
ν	mm^2/s	Kinematic viscosity of lubricant at operating temperature. In the case of grease, the decisive factor is the viscosity of the base oil at operating temperature
F_r, F_a	N	Radial load for radial bearings, axial load for axial bearings
P_1	N	Decisive load for frictional torque. For ball bearings, tapered roller bearings and spherical roller bearings ➤61 | 3.3
d_M	mm	Mean bearing diameter (d + D)/2.

Bearing factors

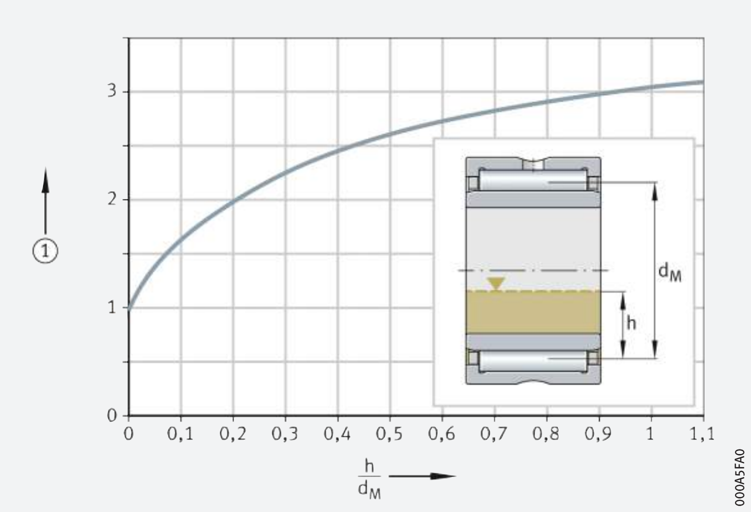
The bearing factors f_0 and f_1 are mean values from series of tests and correspond to the data in accordance with ISO 15312. They are valid for bearings after running-in and with uniform distribution of lubricant.
In the freshly greased state, the bearing factor f_0 can be two to five times higher.

If oil bath lubrication is used, the oil level must reach the centre of the lowest rolling element. If the oil level is higher, f_0 may be up to three times the value given in the table ➤58 | 1.

1
Increase in the bearing factor f_0, as a function of the oil level

h = *oil level*
d_M = *mean bearing diameter (d +D)/2*

① *Increase in the bearing factor f_0*



2
Bearing factor f_0, f_1 for needle roller bearings, drawn cup needle roller bearings with open ends or with closed end, needle roller and cage assemblies

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
NA48	3	5	0,0005
NA49	4	5,5	
RNA48	3	5	
RNA49	4	5,5	
NA69	7	10	
RNA69			
NKI, NK, NKIS, NKS, NAO, RNO, RNAO, K	(12 · B)/(33 + d)	(18 · B)/(33 + d)	
NK..-TW, NKI..-TW, NK..-D	(10 · B)/(33 + d)	(15 · B)/(33 + d)	
HK, BK	(24 · B)/(33 + d)	(36 · B)/(33 + d)	
HN	(30 · B)/(33 + d)	(45 · B)/(33 + d)	

3
Bearing factor f_0, f_1 for cylindrical roller bearings, full complement

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
SL1818	3	5	0,00055
SL1829	4	6	
SL1830	5	7	
SL1822	5	8	
SL0148, SL0248	6	9	
SL0149, SL0249	7	11	
SL1923	8	12	
SL1850	9	13	

4
Bearing factor f_0, f_1 for cylindrical roller bearings with cage

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
LSL1923	1	3,7	0,00020
ZSL1923	1	3,8	0,00025
NU2..-E, NNU41	1,3	2	0,00030
NU3..-E			0,00035
NU4			0,00040
NU10, NU19			0,00020
NU22..-E	2	3	0,00040
NU23..-E	2,7	4	0,00040
NU30..-E, NN30..-E	1,7	2,5	0,00040

5
Bearing factor f_0, f_1 for axial roller bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
AXK, AXW	3	4	0,0015
810, K810, 811, K811	2	3	
812, K812			
893, K893			
894, K894			

6
Bearing factor f_0, f_1 for combined bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
ZARN, ZARF	3	4	0,0015
NKXR	2	3	
NX, NKX	2	3	$0{,}001 \cdot (P_0/C_0)^{0{,}33}$
ZKLN, ZKLF	4	6	
NKIA, NKIB	3	5	0,0005

7
Bearing factor f_0, f_1 for tapered roller bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
302, 303, 329, 320, 330, JK0S, T4CB, T4DB, T7FC	2	3	0,0004
313, 322, 323, 331, 332, T2EE, T2ED, T5ED	3	4,5	

8
Bearing factor f_0, f_1 for axial and radial spherical roller bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
213..-E1	2,3	3,5	$0{,}0005 \cdot (P_0/C_0)^{0{,}33}$
222..-E1	2,7	4	
223	3	4,5	$0{,}0008 \cdot (P_0/C_0)^{0{,}33}$
238, 239, 230			$0{,}00075 \cdot (P_0/C_0)^{0{,}5}$
231	3,7	5,5	$0{,}0012 \cdot (P_0/C_0)^{0{,}5}$
232	4	6	$0{,}0016 \cdot (P_0/C_0)^{0{,}5}$
240	4,3	6,5	$0{,}0012 \cdot (P_0/C_0)^{0{,}5}$
248, 249, 241	4,7	7	$0{,}0022 \cdot (P_0/C_0)^{0{,}5}$
292..-E	1,7	2,5	0,00023
293..-E	2	3	0,00030
294..-E	2,2	3,3	0,00033

9
Bearing factor f_0, f_1 for toroidal roller bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
C22..-K	3,7	5,5	$0{,}0012 \cdot (P_0/C_0)^{0,5}$
C22..-V	4	6	
C23..-K	3,8	5,7	$0{,}0014 \cdot (P_0/C_0)^{0,5}$
C23..-V	4,3	6,5	
C30..-K	3,3	5	
C30..-V, C31..-V	4	6	
C31..-K	3,7	5,5	
C32..-K	3,8	5,7	$0{,}0016 \cdot (P_0/C_0)^{0,5}$
C39..-K	3,3	5	$0{,}0014 \cdot (P_0/C_0)^{0,5}$
C40..-K, C41..-K	5	7,5	$0{,}0018 \cdot (P_0/C_0)^{0,5}$
C40..-V, C41..-V	6	9	

10
Bearing factor f_0, f_1 for deep groove ball bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
618	1,1	1,7	$0{,}0005 \cdot (P_0/C_0)^{0,5}$
160, 60, 619	1,1	1,7	$0{,}0007 \cdot (P_0/C_0)^{0,5}$
622, 623	1,1	1,7	$0{,}0009 \cdot (P_0/C_0)^{0,5}$
62	1,3	2	
63, 630, 64	1,5	2,3	
60..-C	1,1	1,5	$0{,}0006 \cdot (P_0/C_0)^{0,5}$
62..-C	1,3	1,7	$0{,}0007 \cdot (P_0/C_0)^{0,5}$
63..-C	1,5	2	
42..-B	2,3	3,5	$0{,}0010 \cdot (P_0/C_0)^{0,5}$
43..-B	4	6	

11
Bearing factor f_0, f_1 for angular contact ball bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
708, 719, 70..-B	1,3	2	$0{,}001 \cdot (P_0/C_0)^{0,33}$
718..-B			
72..-B			
73..-B	2	3	
74..-B	2,5	4	
30..-B	2,3	3,5	
32..-B			
38..-B			
33..-B	4	6	
32..-BD	2	3	
33..-BD	3,5	5	

12
Bearing factor f_0, f_1 for self-aligning ball bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
10, 112	1,7	2	$0{,}0003 \cdot (P_0/C_0)^{0,4}$
12	1,7	2,5	
13	2,3	3,5	
22	2	3	
23	2,7	4	

13
Bearing factor f_0, f_1 for four point contact bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
QJ2	1,3	2	$0{,}001 \cdot (P_0/C_0)^{0{,}33}$
QJ3	2	3	
QJ10	1,3	2	

14
Bearing factor f_0, f_1 for axial deep groove ball bearings

Series	Bearing factor f_0		Bearing factor f_1
	Grease and oil mist	Oil bath and recirculating oil	
511, 512, 513, 514, 532, 533, 534	1	1,5	$0{,}0012 \cdot (F_a/C_0)^{0{,}33}$
522, 523, 524, 542, 543, 544	1,3	2	

3.3 Load P_1 for ball bearings, tapered roller bearings, spherical roller bearings

✎ P_1 for single bearings and bearing pairs

The calculation equations for load value P_1, which is the decisive load for frictional torque as a function of load M_1, are dependent on the bearing type ➤61 | 15. If $P_1 \leqq F_r$, then $P_1 = F_r$.

15
Decisive load P_1

Bearing type	Decisive load P_1	
	for single bearings	for bearing pairs
Deep groove ball bearings	$3{,}3 \cdot F_a - 0{,}1 \cdot F_r$	–
Angular contact ball bearings, single row	$F_a - 0{,}1 \cdot F_r$	$1{,}4 \cdot F_a - 0{,}1 \cdot F_r$
Angular contact ball bearings, double row	$1{,}4 \cdot F_a - 0{,}1 \cdot F_r$	–
Four point contact bearings	$1{,}5 \cdot F_a + 3{,}6 \cdot F_r$	–
Tapered roller bearings	$2 \cdot Y \cdot F_a$ or F_r use the larger value	$1{,}21 \cdot Y \cdot F_a$ or F_r use the larger value
Spherical roller bearings	$1{,}6 \cdot F_a/e$ if $F_a/F_r > e$ $F_r \cdot \{1 + 0{,}6 \cdot [F_a/(e \cdot F_r)]^3\}$ if $F_a/F_r \leqq e$	
Cylindrical roller bearings	F_r, the frictional component of axial load F_a must be taken into account using M_2	

3.4 Frictional torque for axially loaded radial cylindrical roller bearings

M_2 = frictional torque as a function of axial load

In radial cylindrical roller bearings under axial load, sliding friction between the end faces of the rolling elements and the ribs on the rings leads to an additional frictional torque M_2. The total frictional torque M_R is calculated in accordance with ➤62 | ƒ 7, the frictional torque as a function of the axial load M_2 is calculated in accordance with ➤62 | ƒ 8.

ƒ 7
Total frictional torque

$$M_R = M_0 + M_1 + M_2$$

Legend

M_R	Nmm	Total frictional torque for axially loaded cylindrical roller bearings
M_0	Nmm	Frictional torque as a function of speed
M_1	Nmm	Frictional torque as a function of radial load
M_2	Nmm	Frictional torque as a function of axial load ➤62	ƒ 8.

ƒ 8
Frictional torque as a function of axial load

$$M_2 = f_2 \cdot F_a \cdot d_M$$

Legend

f_2	–	Bearing factor as a function of the bearing series and of operating parameter $\nu \cdot n \cdot d_M$ ➤63	2 and ➤63	3
F_a	N	Axial dynamic bearing load
d_M	mm	Mean bearing diameter (d + D)/2.

Bearings in TB design

Higher axial load carrying capacity and lower axial frictional torque in bearings of TB design

In the case of bearings of TB design (rollers with a toroidal roller end), the axial load carrying capacity was significantly improved through the use of new calculation and manufacturing methods. Optimum contact conditions between the roller and rib are ensured by means of a special curvature of the roller end faces. As a result, axial surface pressures on the rib are significantly reduced and a lubricant film with improved load carrying capacity is achieved. Under normal operating conditions, wear and fatigue at the rib contact running and roller end faces is completely eliminated. In addition, axial frictional torque is reduced by up to 50%. The bearing temperature during operation is therefore significantly lower.

Bearing factor k_B

The bearing factor k_B in the equations takes into consideration the size and thus the load carrying capacity of the hydrodynamic contacts at the bearing ribs ➤62 | 16.

16
Bearing factor k_B

Series	Factor k_B
SL1818, SL0148	4,5
SL1829, SL0149	11
SL1830, SL1850	17
SL1822	20
LSL1923, ZSL1923	28
SL1923	30
NJ2..-E, NJ22..-E, NUP2..-E, NUP22..-E	15
NJ3..-E, NJ23..-E, NUP3..-E, NUP23..-E	20
NJ4	22

Bearing factor f_2 for cylindrical roller bearings

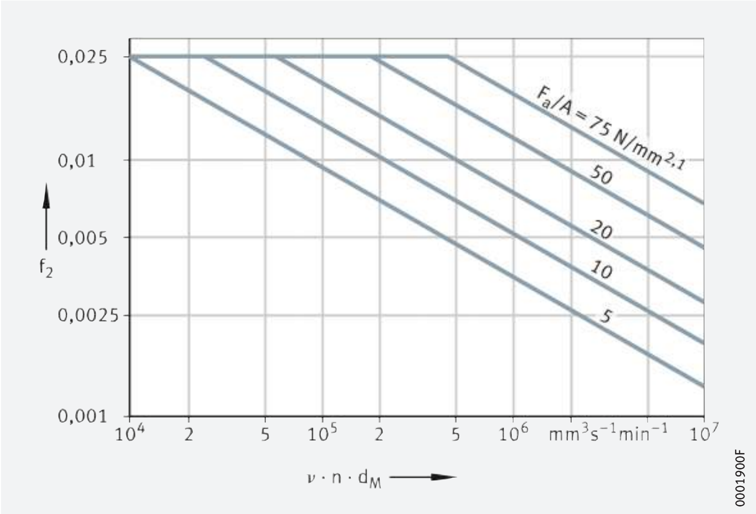
The bearing factor f_2 can vary significantly. The values in the diagrams are valid for recirculating oil lubrication with an adequate quantity of oil ➤63|2 and ➤63|3; the curves should not be extrapolated.

f_2 as a function of operating parameter and series

➤63|2 gives the values for bearings without toroidal end face, ➤63|3 gives the factors for cylindrical roller bearings with toroidal end face (TB design).

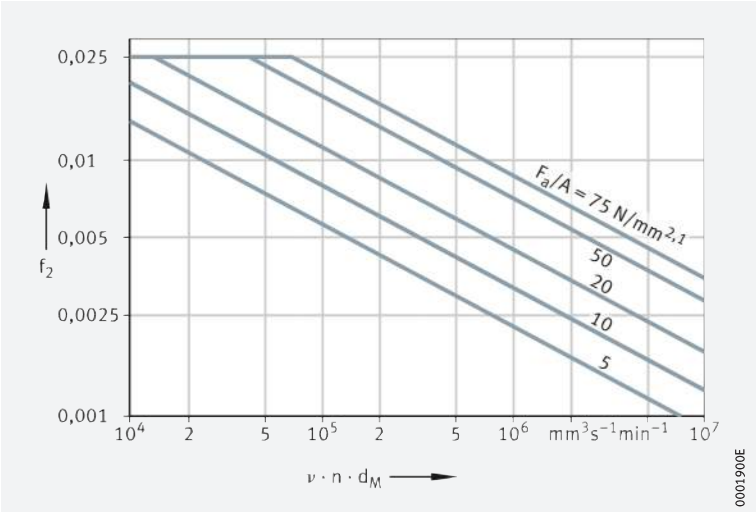
2
Radial cylindrical roller bearing in standard design, bearing factor f_2 as a function of the operating parameter $\nu \cdot n \cdot d_M$

f_2 = bearing factor
ν = operating viscosity
n = operating speed
d_M = mean bearing diameter
$\nu \cdot n \cdot d_M$ = operating parameter
F_a = axial dynamic bearing load
A = bearing parameter



3
Radial cylindrical roller bearing in TB design, bearing factor f_2 as a function of the operating parameter $\nu \cdot n \cdot d_M$

f_2 = bearing factor
ν = operating viscosity
n = operating speed
d_M = mean bearing diameter
$\nu \cdot n \cdot d_M$ = operating parameter
F_a = axial dynamic bearing load
A = bearing parameter



Bearing parameter A for calculating M_2

In order that the bearing factor f_2 can be determined for the calculation of M_2 in ➤63|2 and ➤63|3, bearing parameter A must be obtained in accordance with ➤63|9.

9
Bearing parameter

$$A = k_B \cdot 10^{-3} \cdot d_M^{2,1}$$

Legend

A	–	Bearing parameter
k_B	–	Bearing factor as a function of the bearing series ➤62|16
d_M	mm	Mean bearing diameter (d + D)/2.

4 Speeds

The calculation of reference speeds is standardised in ISO 15312. The stated reference speeds have been calculated in accordance with this standard.

4.1 Limiting speed

The limiting speed n_G is based on practical experience and takes account of additional criteria such as smooth running, sealing function and centrifugal forces.

The limiting speeds indicated in the product tables must not be exceeded even under favourable operating conditions without prior consultation with Schaeffler.

4.2 Thermal speed rating

✎ $n_{\vartheta r}$ is used to calculate n_{ϑ}

The thermal speed rating $n_{\vartheta r}$ is used as an ancillary value when calculating the thermally safe operating speed n_{ϑ}. This is the speed at which, under defined reference conditions, a bearing operating temperature of +70 °C is achieved.

The thermal speed rating is not a speed limit for the application of a bearing. It is primarily for the purpose of comparing the speed suitability of different bearing types under defined reference conditions.

A speed limit taking account of the thermal balance can be calculated using the thermally safe operating speed.

Reference conditions

The reference conditions are based on the normal operating conditions of the most significant bearing types and sizes.

They are defined as follows in ISO 15312:

- mean ambient temperature $\vartheta_{Ar} = +20$ °C
- mean bearing temperature at the outer ring $\vartheta_r = +70$ °C
- load on radial bearings $P_1 = 0{,}05 \cdot C_{0r}$
- load on axial bearings $P_1 = 0{,}02 \cdot C_{0a}$
- heat dissipation via the bearing seating surfaces ➤64 | ƒ 1 to ➤64 | ƒ 4:

for radial bearings, bearing seat $A_r \leqq 50\,000\ \text{mm}^2$ ➤64 | ƒ 1:

ƒ 1 Heat flow density

$$q_r = 0{,}016\ \text{W/mm}^2$$

for radial bearings, bearing seat $A_r > 50\,000\ \text{mm}^2$ ➤64 | ƒ 2:

ƒ 2 Heat flow density

$$q_r = 0{,}016 \cdot \left(\frac{A_r}{50\,000}\right)^{-0{,}34}\ \text{W/mm}^2$$

for axial bearings, bearing seat $A_r \leqq 50\,000\ \text{mm}^2$ ➤64 | ƒ 3:

ƒ 3 Heat flow density

$$q_r = 0{,}020\ \text{W/mm}^2$$

for axial bearings, bearing seat $A_r > 50\,000\ \text{mm}^2$ ➤64 | ƒ 4:

ƒ 4 Heat flow density

$$q_r = 0{,}020 \cdot \left(\frac{A_r}{50\,000}\right)^{-0{,}16}\ \text{W/mm}^2$$

The following lubricants and lubrication methods are suitable:

- conventional mineral oils without EP additives and with the following kinematic viscosity ν_r at $\vartheta_r = +70$ °C,
  - for radial rolling bearings $\nu_r = 12$ mm²/s (ISO VG 32)
  - for axial rolling bearings $\nu_r = 24$ mm²/s (ISO VG 68)
- oil bath lubrication with an oil level up to the centre of the lowest rolling element
- lubricant contamination within the permissible values
- grease lubrication of radial bearings using a lithium soap grease with a mineral oil base and no EP additives (base oil viscosity 22 mm²/s at +70 °C); grease filling corresponds to 30% of the free bearing cavity.

4.3 Thermally safe operating speed

The thermally safe operating speed n_ϑ is calculated in accordance with DIN 732:2010. The basis for the calculation is the heat balance in the bearing, the equilibrium between the frictional power as a function of speed and the heat dissipation as a function of temperature.
When conditions are in equilibrium, the bearing temperature is constant.

Preconditions for calculation

The permissible operating temperature determines the thermally safe operating speed n_ϑ of the bearing. The preconditions for calculation are correct mounting, normal operating clearance and constant operating conditions.

Calculation not applicable

The calculation method is not valid for:

- sealed bearings with contact seals, since the maximum speed is restricted by the permissible sliding speed at the seal lip
- yoke and stud type track rollers
- aligning needle roller bearings
- axial deep groove and axial angular contact ball bearings.

Limiting speed n_G

The limiting speed n_G must always be observed.

Calculate thermally safe operating speed

Precondition

In order to calculate the thermally safe operating speed n_ϑ at a constant operating temperature ϑ, the frictional power generated and the total dissipated heat flow of the rolling bearing must be in equilibrium ➤65|ƒ5, Parameters ➤68.

ƒ 5 *Equilibrium*

$$N_R = \dot{Q}$$

Equilibrium between frictional power and heat flow

The generated frictional power of the rolling bearing is calculated using the total frictional torque ➤65|ƒ6. The total dissipated heat flow $\dot{Q}$ is calculated in accordance with ➤65|ƒ7.
The frictional power is equal to the dissipated heat flow ➤65|ƒ8.

ƒ 6 *Frictional power*

$$N_R = M_R \cdot \omega = \left[10^{-7} \cdot f_0 \cdot \left(\nu \cdot n_\vartheta\right)^{\frac{2}{3}} \cdot d_M{}^3 + f_1 \cdot P_1 \cdot d_M\right] \cdot \frac{\pi \cdot n_\vartheta}{30 \cdot 10^3}$$

ƒ 7 *Total dissipated heat flow*

$$\dot{Q} = \dot{Q}_S + \dot{Q}_L + \dot{Q}_E$$

ƒ 8 *Equilibrium between frictional power and heat flow*

$$\left[10^{-7} \cdot f_0 \cdot \left(\nu \cdot n_\vartheta\right)^{\frac{2}{3}} \cdot d_M{}^3 + f_1 \cdot P_1 \cdot d_M\right] \cdot \frac{\pi \cdot n_\vartheta}{30 \cdot 10^3} = \dot{Q}_S + \dot{Q}_L + \dot{Q}_E$$

Conversion to more manageable form

➤65| 8 can only be solved iteratively. The introduction of the lubricant parameter K_L, the load parameter K_P and the speed ratio f_n has made this more manageable ➤66| 9.

9

Equilibrium in more manageable form

$$K_L \cdot f_n^{\frac{5}{3}} + K_P \cdot f_n = 1$$

Speed ratio f_n

The speed ratio f_n can be calculated by means of iteration or in the normal operating range of $0,01 \leqq K_L \leqq 10$ and $0,01 \leqq K_P \leqq 10$ ➤66| 10 and ➤66| 1.

10

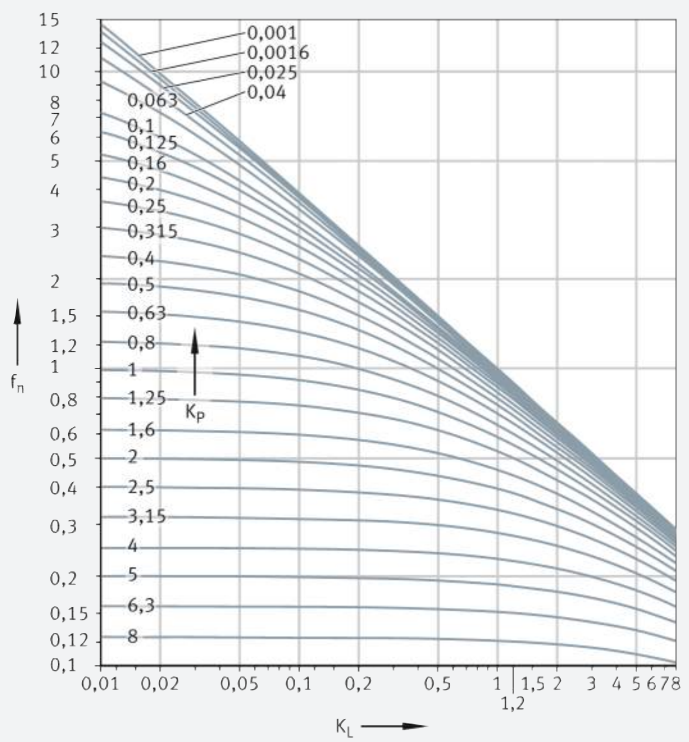
Speed ratio

$$f_n = \frac{490,77}{1 + 498,78 \cdot K_L^{0,599} + 852,88 \cdot K_P^{0,963} - 504,5 \cdot K_L^{0,055} \cdot K_P^{0,832}}$$

1

Speed ratio f_n as a function of lubricant parameter and load parameter

f_n = speed ratio
K_L = lubricant parameter
K_P = load parameter



Thermally safe operating speed

The thermally safe operating speed n_ϑ is calculated by multiplying the thermal speed rating $n_{\vartheta r}$ by the speed ratio f_n ➤67 | 11.

11
Thermally safe operating speed

$$n_\vartheta = n_{\vartheta r} \cdot f_n$$

Lubricant parameter K_L

The lubricant parameter K_L is calculated in accordance with ➤67 | 12.

12
Lubricant parameter

$$K_L = 10^{-6} \cdot \frac{\pi}{30} \cdot n_{\vartheta r} \cdot \frac{10^{-7} \cdot f_0 \left(\nu \cdot n_{\vartheta r}\right)^{\frac{2}{3}} \cdot d_M{}^3}{\dot{Q}}$$

Load parameter K_P

The load parameter K_P is calculated in accordance with ➤67 | 13.

13
Load parameter

$$K_P = 10^{-6} \cdot \frac{\pi}{30} \cdot n_{\vartheta r} \cdot \frac{f_1 \cdot P_1 \cdot d_M}{\dot{Q}}$$

Heat dissipation via the bearing seating surfaces

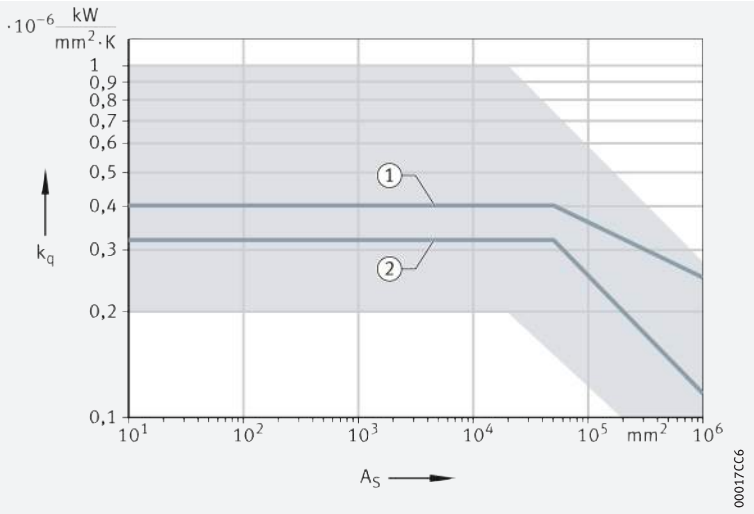
Heat dissipation via the bearing seating surfaces is calculated in accordance with ➤67 | 14.

14
Heat dissipation via the bearing seating surfaces

$$\dot{Q}_S = k_q \cdot A_S \cdot \Delta\vartheta_A$$

2
Heat transfer coefficient k_q as a function of the bearing seating surface

k_q = *heat transfer coefficient, as a function of the bearing seating surface*
A_S = *heat-dissipating bearing seating surface*
① *Reference condition for axial bearings*
② *Reference condition for radial bearings*



Heat dissipation via the lubricant

Heat dissipation via the lubricant is calculated in accordance with ➤67 | 15.

15
Heat dissipation via the lubricant

$$\dot{Q}_L = 0{,}0286 \frac{\text{kW}}{\text{l/min} \cdot \text{K}} \cdot \dot{V}_L \cdot \Delta\vartheta_L$$

Legend

N_R	W	Frictional power
$\dot{Q}$	kW	Total dissipated heat flow
M_R	Nmm	Total frictional torque
f_0	–	Bearing factor for frictional torque as a function of speed
ν	mm^2/s	Kinematic viscosity of the lubricant at operating temperature
n_ϑ	min^{-1}	Thermally safe operating speed
d_M	mm	Mean bearing diameter (D + d)/2
d	mm	Bearing bore diameter
D	mm	Bearing outside diameter
f_1	–	Bearing factor for frictional torque as a function of load
P_1	N	Decisive load: radial load for radial bearings, axial load for axial bearings.
$\dot{Q}_S$	kW	Heat flow dissipated via the bearing seating surfaces
$\dot{Q}_L$	kW	Heat flow dissipated by the lubricant
$\dot{Q}_E$	kW	Heat flow. For heating by external source (+), for cooling by external source (–)
K_L	–	Lubricant parameter
f_n	–	Speed ratio
K_P	–	Load parameter
$n_{\vartheta r}$	min^{-1}	Thermal speed rating; see product tables
k_q	10^{-6} kW/ ($mm^2 \cdot K$)	Heat transfer coefficient, as a function of the bearing seating surface ➤67 | 2. This is dependent on the housing design and size, the housing material and the installation position. For normal installation, the coefficient of heat transition for bearing seating surfaces up to 25 000 mm^2 is between $0,2 \cdot 10^{-6}$ kW/($mm^2 \cdot K$) and $1,0 \cdot 10^{-6}$ kW/($mm^2 \cdot K$)
A_S	mm^2	Heat-dissipating bearing seating surface: In general, $A_S = A_r$
A_r	mm^2	Heat-dissipating bearing seating surface under reference conditions. Radial bearings: $A_r = \pi \cdot B \cdot (D + d)$ Axial bearings: $A_r = \pi/2 \cdot (D^2 - d^2)$ Tapered roller bearings: $A_r = \pi \cdot T \cdot (D + d)$ Axial spherical roller bearings: $A_r = \pi/4 \cdot (D^2 + d_1{}^2 - D_1{}^2 - d^2)$
$\Delta\vartheta_A$	K	Difference between mean bearing temperature and ambient temperature
$\dot{V}_L$	l/min	Oil flow
$\Delta\vartheta_L$	K	Difference between oil inlet temperature and oil outlet temperature

5 Noise

5.1 Schaeffler Noise Index

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

Until now, the Noise Index has only been available for the main series of radial deep groove ball bearings, radial angular contact ball bearings, tapered roller bearings and cylindrical roller bearings. Additional bearing types and series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

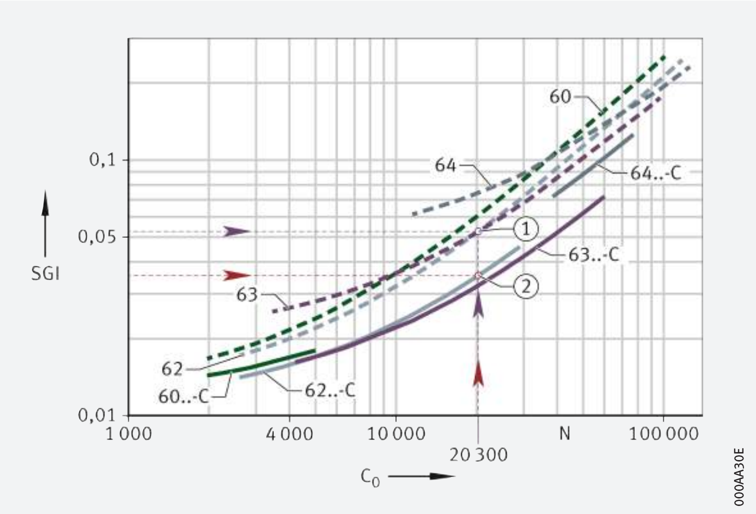
Example of Noise Index calculation

If the requisite basic load rating is known for an application, the bearing arrangement can also be designed using the Noise Index as an additional performance characteristic. If the requisite basic static load rating is C_0 = 20 300 N for example, various ball bearings are available with a different SGI value ➤*69*| *1*. As a result, the calculation can be carried out for the bearing application using the smallest SGI value. Bearings of Generation C offer a particular advantage here.

1

Example: comparison of deep groove ball bearings using the Schaeffler Noise Index

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*
① = *standard series 62*
② = *series 62..-C (Generation C)*



6 Lubrication

6.1 Basic principles

Lubrication and maintenance are important for the reliable operation and long operating life of rolling bearings.

Functions of the lubricant

The lubricant should:

- form a lubricant film on the contact surfaces that is sufficiently capable of supporting loads and thus preventing wear and premature fatigue
- dissipate heat in the case of oil lubrication
- give additional sealing of the bearing, in the case of grease lubrication, against the entry of both solid and fluid contaminants
- dampen running noise
- give protection against corrosion.

Selection of the type of lubrication

✎ Oil or grease lubrication

It should be determined as early as possible in the design process whether bearings should be lubricated using grease or oil.

The following factors are decisive in determining the type of lubrication and quantity of lubricant:

- the operating conditions
- the type and size of the bearing
- the adjacent construction
- the lubricant feed.

Grease lubrication

✎ Criteria for grease lubrication

In the case of grease lubrication, the following criteria must be considered:

- very little design work required
- the sealing action
- the reservoir effect
- long operating life with little maintenance work (lifetime lubrication possible in certain circumstances)
- if relubrication is required, it may be necessary to provide collection areas for old grease and feed ducts
- no heat dissipation by the lubricant
- no rinsing out of wear debris and other particles.

Oil lubrication

✎ Criteria for oil lubrication

In the case of oil lubrication, the following criteria must be considered:

- good lubricant distribution and supply to contact areas
- dissipation of heat possible from the bearing (significant principally at high speeds and/or loads)
- rinsing out of wear debris
- very low friction losses with minimal quantity lubrication
- more work required on feed and sealing.

Under extreme operating conditions (such as very high temperatures, vacuum, aggressive media), it may be possible to use special lubrication methods, such as solid lubricants, in consultation with Schaeffler.

Design of lubricant feeds

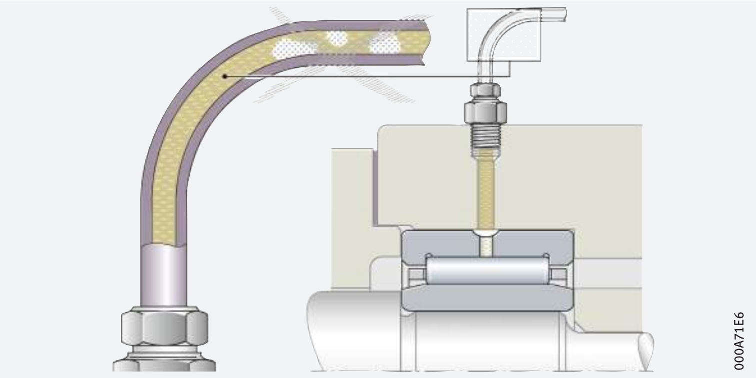
Observe guidelines

The feed lines and lubrication holes in the housings and shafts ➤71|1 and ➤71|2

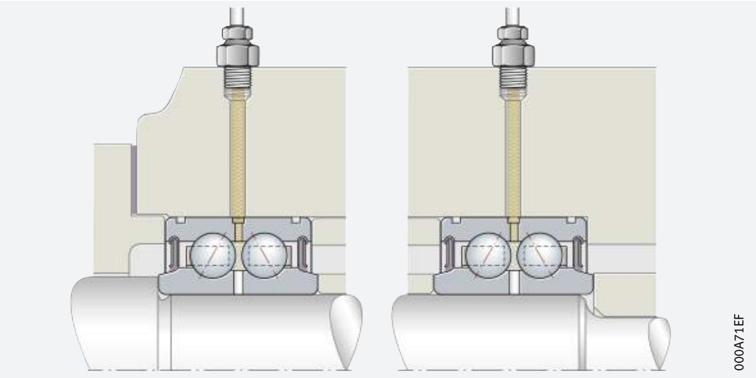
- should lead directly to the lubrication hole in the rolling bearing
- should be as short as possible.

A separate feed must be provided for each bearing.
Ensure that the feed lines are filled ➤71|1; the feed line should be bled if necessary. Follow the instructions provided by the lubrication device manufacturer.

1
Lubricant feed lines



2
Arrangement of feed lines to more than one bearing on a shaft



Further information

Comprehensive information on the lubrication of rolling bearings is contained in Technical Product Information ➤ *TPI 176*. This publication can be requested from Schaeffler.

6.2 Grease lubrication

Greases can be differentiated in terms of their thickeners of varying composition and base oils. The base oils of greases are covered by the information in the section Oil lubrication ➤*81*.

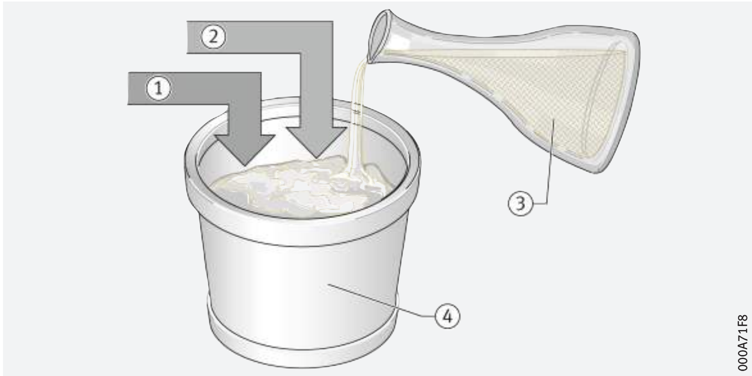
Composition of a grease

Conventional greases have metal soaps as thickeners and a mineral base oil ➤72|3. They also contain additives. These have a specific influence on, for example, the characteristics in relation to wear prevention, corrosion prevention or resistance to ageing. These combinations of additives are not, however, fully effective across every temperature and load range.

Greases exhibit widely varying behaviour in response to environmental influences such as temperature and moisture.

3
Type of grease

① *Thickener*
② *Additives*
③ *Base oil*
④ *Grease*



Lubricants must always be checked for their compatibility with:

- other lubricants
- anti-corrosion agents
- thermoplastics, thermosets and elastomers
- light and non-ferrous metals
- coatings
- colouring agents and paints
- and the environment. When considering compatibility with the environment, attention must be paid to toxicity, biodegradability and water pollution class.

Type of grease

The characteristics of a grease are dependent on:

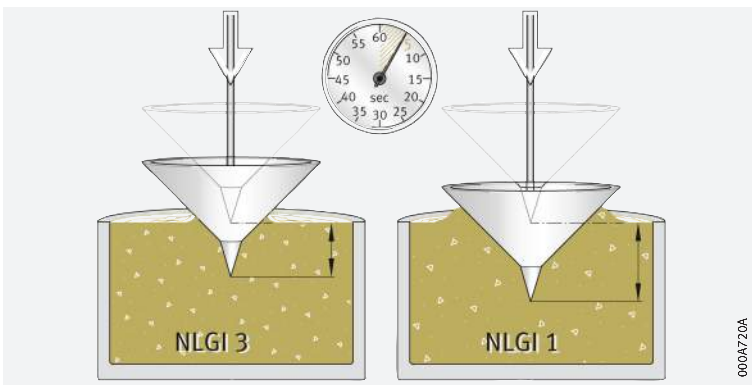
- the base oil
- the viscosity of the base oil (this is significant for the speed range)
- the thickener (the shear strength is significant for the speed range)
- the additives.

Consistency of greases

Greases are subdivided into consistency classes (NLGI classes to DIN 51818). For rolling bearings, classes 1, 2, 3 should be used in preference ➤72 | 4.

4
Consistency of greases

NLGI classes



Selection of suitable grease

The grease is determined by the operating conditions

Rolling bearing greases K to DIN 51825 are suitable.

Greases should be selected in accordance with the operating conditions of the bearing:

- temperature
- pressure conditions ➤74
- speed ➤74
- water and moisture ➤74.

Operating temperature range

✎ The grease must correspond to the operating temperatures

The operating temperature range of the grease must correspond to the range of possible operating temperatures in the rolling bearing.

Grease manufacturers indicate an operating temperature range for their rolling bearing greases K to DIN 51825.

The upper value is determined in accordance with DIN 51821 by means of testing on the FAG rolling bearing grease test rig FE9. At the upper operating temperature, a 50% failure probability rate (F_{50}) of at least 100 hours must be achieved in this test.

The lower value is defined in accordance with DIN 51825 by means of flow pressure. The flow pressure of a grease is the pressure required to press a stream of grease through a defined nozzle. For greases of type K, the flow pressure at the lower operating temperature must be less than 1 400 mbar.

The use of flow pressure in determining the lower operating temperature only indicates, however, whether the grease can be moved at this temperature. This cannot be used to give an indication of its suitability for use in rolling bearings at low temperatures.

In addition to the lower operating temperature of a grease, therefore, the low temperature frictional torque is also determined in accordance with ASTM D 1478 or IP 186/93. At the lower operating temperature, the starting torque must not exceed 1 000 Nmm and the running torque must not exceed 100 Nmm.

Schaeffler recommends that greases should be used in accordance with the bearing temperature normally occurring in the standard operating range, in order to achieve a reliable lubricating action and an acceptable grease operating life ➤73 | 5.

At low temperatures, greases release very little base oil. This can result in lubricant starvation. Schaeffler therefore recommends that greases are not used below the lower continuous limit temperature $\vartheta_{\text{lower limit}}$ on a permanent basis ➤73 | 5. This is approx. 20 K above the lower operating temperature of the grease as stated by the grease manufacturer.

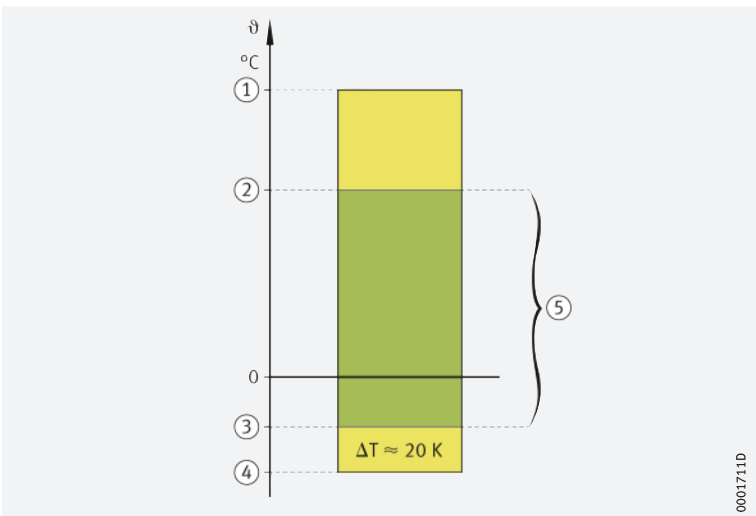
The upper continuous limit temperature $\vartheta_{\text{upper limit}}$ must not be exceeded if a temperature-induced reduction in the grease operating life is to be avoided; see Grease operating life ➤75.

! At consistently low temperatures (for example in cold store applications), it must be ensured that the grease releases sufficient oil in relation to the bearing type.

5
Operating temperature range

ϑ = operating temperature
ΔT = temperature difference

① *Upper operating temperature according to grease manufacturer*
② $\vartheta_{\text{upper limit}}$
③ $\vartheta_{\text{lower limit}}$
④ *Lower operating temperature according to grease manufacturer*
⑤ *Standard operating range*



Pressure properties

✎ The pressure properties are dependent on the viscosity

The viscosity at operating temperature must be sufficiently high for the formation of a lubricant film capable of supporting loads. At high loads, greases with EP characteristics ("extreme pressure") and high base oil viscosity should be used (KP grease to DIN 51825). Such greases should also be used for bearings with substantial sliding or line contact.

Silicone greases should only be used at low loads ($P \leqq 0,03 \cdot C$).

! Greases with solid lubricants should preferably be used for applications with mixed or boundary friction conditions. The solid lubricant particle size must not exceed 5 µm.

Speed

✎ Speed parameter $n \cdot d_M$ is a criterion for grease selection

Greases should be selected in accordance with the speed parameter $n \cdot d_M$ for grease ➤90|▦6:

- For rolling bearings running at high speeds or with a low starting torque, greases with a high speed parameter should be used
- For bearings running at low speeds, greases with a low speed parameter should be used.

Under centrifugal accelerations $> 500 \cdot g$, separation (of the thickener and base oil) may occur. In this case, please consult the lubricant manufacturer.

! The consistency of polycarbamide greases can be altered by shear stresses to a greater extent than that of metal soap greases.

Water and moisture

✎ Water reduces the operating life

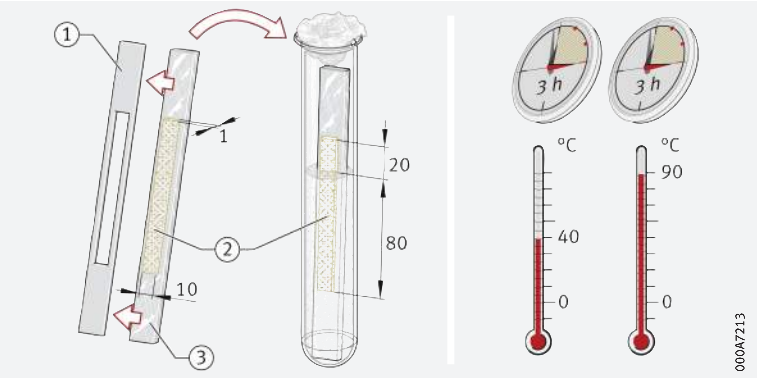
Water in the grease has a highly detrimental effect on the operating life of bearings:

- the static behaviour of greases in the presence of water is assessed in accordance with DIN 51807 ➤74|6
- the anti-corrosion characteristics can be tested according to DIN 51802 (Emcor test) – information is given in the grease manufacturer's data sheets.

6

Behaviour in the presence of water in accordance with DIN 51807

① *Blank*
② *Grease sample*
③ *Glass slide*



Grease operating life

The grease operating life t_{fG} applies where this is below the calculated bearing life and the bearings are not lubricated.

A guide value can be determined in approximate terms in accordance with ➤75|ƒ 1:

ƒ **1**
Guide value for grease operating life

$$t_{fG} = t_f \cdot K_T \cdot K_P \cdot K_R \cdot K_U$$

Legend

t_{fG}	h	Guide value for grease operating life
t_f	h	Basic grease operating life
K_T, K_P, K_R, K_U	–	Correction factors for temperature, load, oscillation and environment.

! If a grease operating life > 3 years is required, this must be agreed in consultation with the lubricant manufacturer.

Guidelines on calculating the grease operating life ➤76.

Basic grease operating life

This applies under the preconditions according to ➤75|▦ 1.

▦ **1**
Preconditions for the basic grease operating life

	Precondition
Bearing temperature	< upper continuous limit temperature $\vartheta_{upper\ limit}$
Load ratio	$C_0/P = 20$
Speed and load	Constant
Load in main direction	Radial in radial bearings, axial in axial bearings
Axis of rotation	Horizontal for radial bearings
Inner ring	Rotating
Environmental influences	No disruptive influences

The basic grease operating life t_f is dependent on the bearing-specific speed parameter $k_f \cdot n \cdot d_M$ and is calculated using ➤75|⌕ 7.

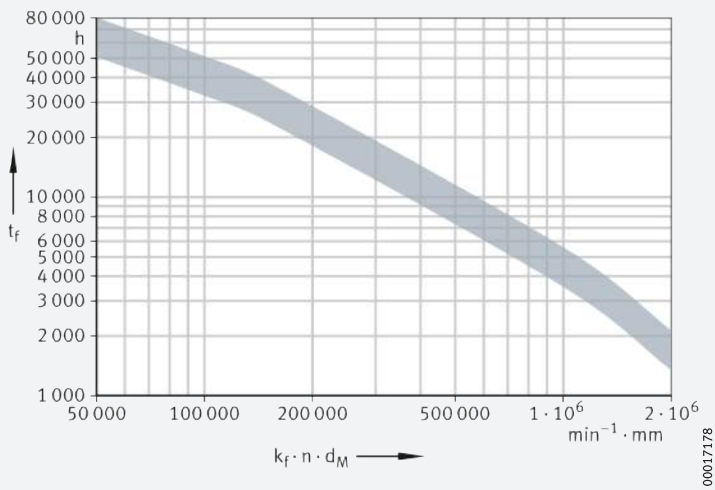
Legend

k_f	–	Bearing type factor ➤76|▦ 2
n	min^{-1}	Operating speed or equivalent speed
d_M	mm	Mean bearing diameter (d + D)/2.

Calculation of basic grease operating life

⌕ **7**
Calculation of basic grease operating life

t_f = *basic grease operating life*
$k_f \cdot n \cdot d_M$ = *bearing-specific speed parameter*



2
Factor k_f – as a function of bearing type

Bearing type	Factor k_f
Deep groove ball bearings, single row, Generation C	0,8
Deep groove ball bearings, single row	1
Deep groove ball bearings, double row	1,5
Angular contact ball bearings, single row	1,6
Angular contact ball bearings, single row, X-life	1,3
Angular contact ball bearings, double row	2
Angular contact ball bearings, double row, X-life	1,6
Spindle bearings, $\alpha = 15°$	0,75
Spindle bearings, $\alpha = 25°$	0,9
Four point contact bearings	1,6
Four point contact bearings, X-life	1,3
Self-aligning ball bearings	1,45
Axial deep groove ball bearings	5,5
Axial angular contact ball bearings, single row	1,8
Axial angular contact ball bearings, double row	2
Cylindrical roller bearings, single row	2
Cylindrical roller bearings LSL, ZSL	3
Cylindrical roller bearings, double row	3
Cylindrical roller bearings, full complement	6
Tapered roller bearings	4
Spherical roller bearings	8
Toroidal roller bearings TORB	8
Needle roller and cage assemblies, needle roller bearings	3,6
Drawn cup needle roller bearings	4,2
Yoke type track rollers, stud type track rollers with cage, stud type track rollers with full complement cylindrical roller set	20
Yoke type track rollers, stud type track rollers, full complement needle roller set	40
Ball bearing type track rollers, single row	1
Ball bearing type track rollers, double row	2
Yoke type track rollers PWTR, stud type track rollers PWKR	6
Crossed roller bearings	4,4
Axial needle roller bearings, axial cylindrical roller bearings	58
Radial insert ball bearings, housing units	1

Guidelines on calculating the grease operating life

✎ Combined rolling bearings

The radial and axial bearing components must be calculated separately; the decisive value is the shorter grease operating life.

✎ Rotating outer ring

If the outer ring rotates, there may be a reduction in the grease operating life.

In the case of yoke and stud type track rollers:

- the angular misalignment must be zero
- the effect of the rotating outer ring on the grease operating life is taken into consideration in the bearing type factor k_f.

Restrictions of the calculation

The grease operating life cannot be determined using the method described in the following cases:

- if the grease can leave the bearing arrangement
  - there is excessive evaporation of the base oil
  - in bearing positions without seals
  - in axial bearings with a horizontal axis of rotation
- if air is sucked into the rolling bearing during operation
  - this can cause the grease to oxidise
- for bearing arrangements that have a vertical shaft
- in combined rotary and linear motion (the grease is distributed over the whole stroke length)
- if contamination, water or other fluids enter the bearing
- for spindle bearings
- for drawn cup roller clutches
- for screw drive bearings
- for high precision bearings for combined loads
- for super precision cylindrical roller bearings NN30.

The additional guidelines on lubrication in the product chapters must be observed.

Correction factors for determining the grease operating life

Temperature factor K_T

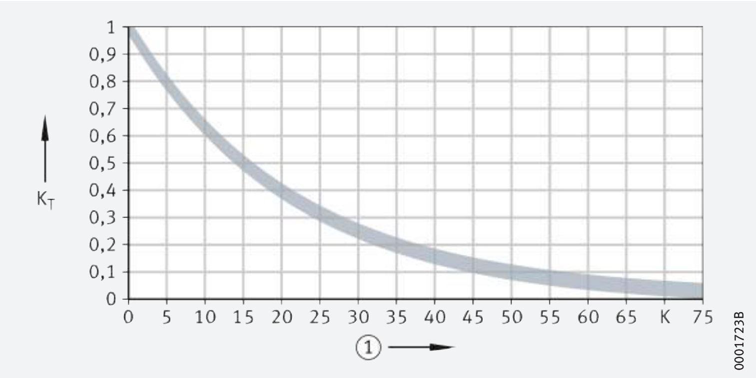
If the bearing temperature is higher than the continuous limit temperature $\vartheta_{upper\ limit}$, K_T must be determined from the diagram ➤77| 8.

The diagram must not be used if the bearing temperature is higher than the upper operating temperature of the grease used ➤90| 6.
If necessary, a different grease must be selected or contact must be made with Schaeffler.

8
Temperature factor

K_T = *temperature factor*

① *K above $\vartheta_{upper\ limit}$*



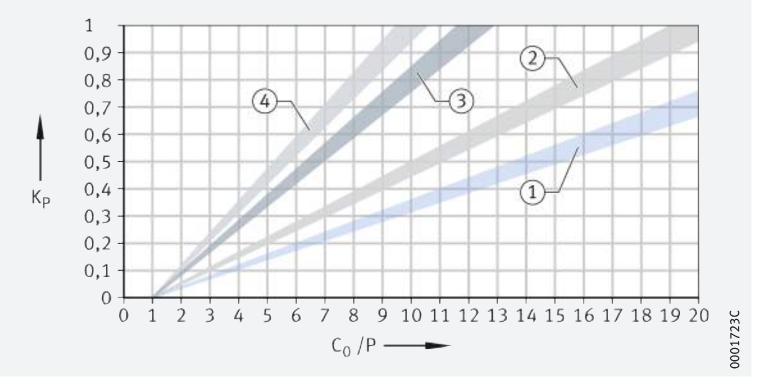
Load factor K_P

The factor K_P is dependent on the bearing and describes the reduction at higher load (this places greater strain on the grease) ➤78| 9 and ➤78| 3.

9
Load correction factor K_p

K_p = load correction factor
C_0/P = ratio between basic static load rating and equivalent dynamic bearing load

①, ②, ③, ④ ➤78|3



3
Correction factor for load K_P

Curve ➤78|9	Bearing type
①	Axial angular contact ball bearings, double row
	Axial deep groove ball bearings
	Axial needle roller bearings, axial cylindrical roller bearings
	Crossed roller bearings
②	Spherical roller bearings with central rib
	Needle roller and cage assemblies, needle roller bearings
	Drawn cup needle roller bearings
	Cylindrical roller bearings, double row (excluding NN30)
	Yoke type track rollers PWTR, stud type track rollers PWKR
	Yoke and stud type track rollers with cage, full complement cylindrical roller set
	Yoke and stud type track rollers, full complement needle roller set
③	Four point contact bearings
	Cylindrical roller bearings LSL, ZSL
	Cylindrical roller bearings, full complement
	Cylindrical roller bearings, single row (constant or alternating load)
	Tapered roller bearings
	Barrel roller bearings
	Spherical roller bearings without central rib (E1)
	Toroidal roller bearings
④	Deep groove ball bearings (single or double row)
	Angular contact ball bearings (single or double row)
	Self-aligning ball bearings
	Ball bearing track rollers (single or double row)
	Radial insert ball bearings, housing units.

Oscillation factor K_R

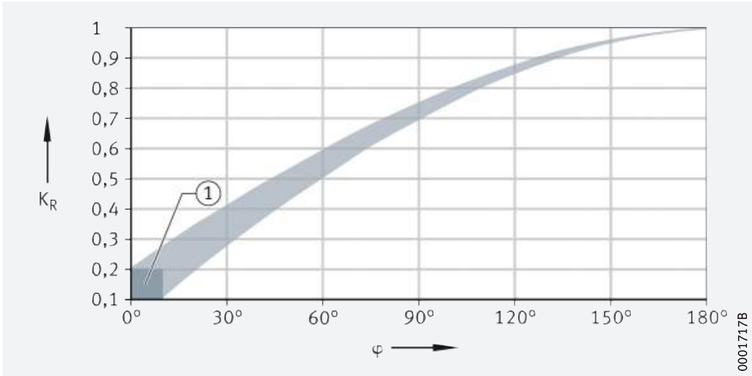
The factor K_R applies for an angle of oscillation $\varphi < 180°$ ➤79|10. Oscillating motion places a greater strain on the grease than does rotating motion.

In order to reduce fretting corrosion, the lubrication interval should be reduced.

If the rolling elements do not undergo complete rotation, please consult Schaeffler.

Figure 10
Correction factor for oscillation K_R

K_R = correction factor for oscillation
φ = angle of oscillation
(1) Angle of oscillation $\varphi < 5°$ requires special lubricants



Environmental factor K_U

The factor K_U takes account of the influences of moisture, shaking forces, slight vibration (leading to fretting corrosion) and shocks ➤79 | Table 4.
It does not take account of extreme environmental influences such as water, aggressive media, contamination, radiation and extreme vibrations such as those occurring in vibratory machines.
In relation to contamination, the influence of contamination on rating life calculation must also be noted.

Table 4
Environment factor K_U

Environmental influence	Factor K_U
Slight (e.g. test rig)	1
Moderate (standard)	0,8
Heavy (e.g. outdoor application)	0,5

Relubrication intervals

Observe lubrication intervals

Where rolling bearings are relubricated, attention must be paid to the lubrication interval in order to ensure reliable function of the bearings.

!

The precise lubrication interval should be determined by tests conducted under application conditions. To do this:

- sufficiently long observation periods must be used
- the condition of the grease must be checked at regular intervals.

For reasons of operational reliability, relubrication intervals of > 1 year are not recommended.

Lubrication interval guide value

Experience shows that the guide value for most applications is ➤79 | Formula 2.

Formula 2
Guide value for relubrication interval

$$t_{fR} = 0{,}5 \cdot t_{fG}$$

Legend

t_{fR}	h	Guide value for relubrication interval
t_{fG}	h	Guide value for grease operating life ➤75.

Relubrication conditions

The grease used for relubrication must be the same as that used in initial greasing. If other greases are used, the miscibility and compatibility of the greases must be checked ➤80.

Relubrication quantity

Due to the compact construction of the bearings, relubrication should be carried out using 50% to 80% of the initial greasing quantity (recommendation).
If feed lines filled with air are present, the filling volume of the feed lines should be included in calculation of the relubrication quantity.

Relubrication

Relubrication should always be carried out as follows:

- with the bearing still warm from operation and rotating if safe to do so
- before the bearing comes to rest if safe to do so
- before extended breaks in operation.

Relubrication should continue until a fresh collar of grease appears at the seal gaps. Old grease must be allowed to leave the bearing unhindered.

Grease reservoir

The initial greasing quantity is between 30% and 100% of the available volume in the bearing, dependent on the bearing type and operating conditions.

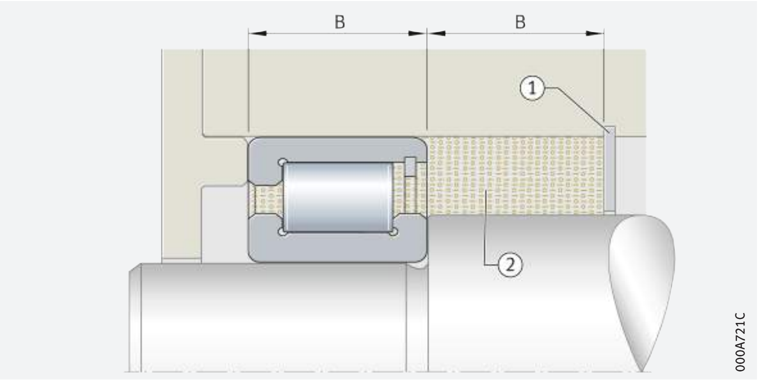
A grease reservoir can extend the grease operating life. The grease in the reservoir must be in constant contact with the grease on the raceway. The grease operating life does not increase proportionally with the size of the grease reservoir.

The volume of the grease reservoir should correspond to the volume in the bearing between the inner and outer ring (not taking account of the cage and rolling elements) ➤80| 11 and ➤80| 12.

Evaporation of the base oil should be prevented by design measures, for example by sealing shields ➤80| 11 and ➤80| 12.

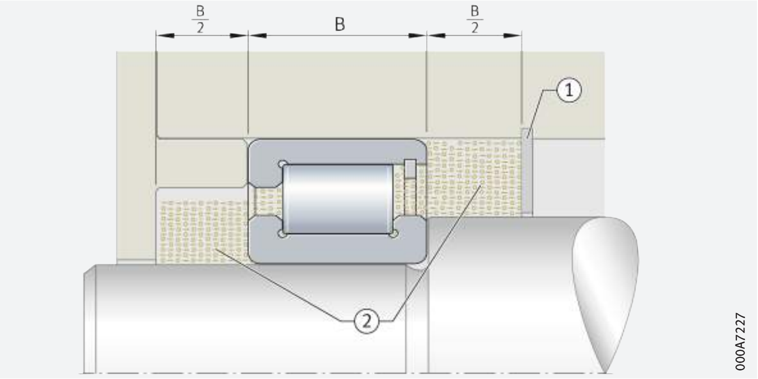
11
Grease reservoir on one side

① *Sealing washer*
② *Grease reservoir*



12
Grease reservoir on both sides

① *Sealing washer*
② *Grease reservoir*



Miscibility

Preconditions

Mixtures of greases should be avoided if at all possible.
If they are unavoidable, the following preconditions must be fulfilled:

- The base oil must be the same
- The thickener types must match
- The base oil viscosities must be similar (they must not differ by more than one ISO VG class)
- The consistency must be identical (NLGI class).

! Miscibility of greases must always be agreed in consultation with the lubricant manufacturer.

Even when these preconditions are fulfilled, impairment of the performance capability of the mixed grease cannot be ruled out.

If a decision is taken to change to a different grease grade, the grease should be rinsed out if this is possible. Further relubrication should be carried out after a shortened period.

If incompatible greases are mixed, this can lead to considerable structural changes. Substantial softening of the grease mixture may also occur. Definite statements on miscibility can only be obtained by means of suitable tests.

Storage life

In general, the greases can be stored for 3 years.

✎ Preconditions

The preconditions are:

- a closed room or store
- temperatures between 0 °C and +40 °C
- relative humidity no more than 65%
- no influence of chemical agents (vapours, gases, fluids)
- the rolling bearings are sealed.

Lubricants age due to environmental influences. The information provided by lubricant manufacturers must always be observed.

After long periods of storage, the start-up frictional torque of greased bearings can be temporarily higher than normal. The lubricity of the grease may also have deteriorated.

Since the lubrication characteristics of greases vary and different raw materials may be used for greases of the same name, Schaeffler cannot offer any guarantees either for the lubricants used by customers for relubrication or for their characteristics.

6.3 Oil lubrication

✎ Mineral oils or synthetic oils are suitable

For the lubrication of rolling bearings, mineral oils and synthetic oils are essentially suitable. Oils with a mineral oil base are used most frequently. They must, as a minimum, fulfil the requirements in accordance with DIN 51517 or DIN 51524.

Special oils, often synthetic oils, are used under extreme operating conditions or where there are special requirements relating to oil resistance. In these cases, please consult the lubricant manufacturers or Schaeffler.

Operating temperatures

The information provided by the lubricant manufacturer should be taken as authoritative.

Selection of suitable oil

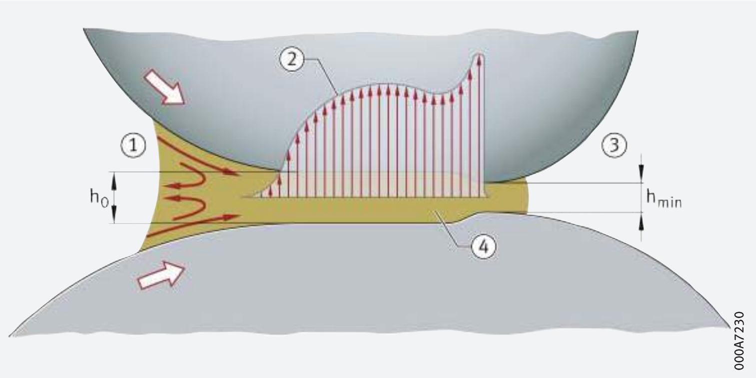
The achievable bearing life and security against wear are higher with better separation of the contact surfaces by a lubricant film ➤81 | 13.

13

Lubricant film in the contact zones

h_{min} = *minimum lubricant film thickness*

1. *Entry zone*
2. *Pressure curve according to EHD theory*
3. *Exit zone*
4. *Lubricant*



Reference viscosity for mineral oils

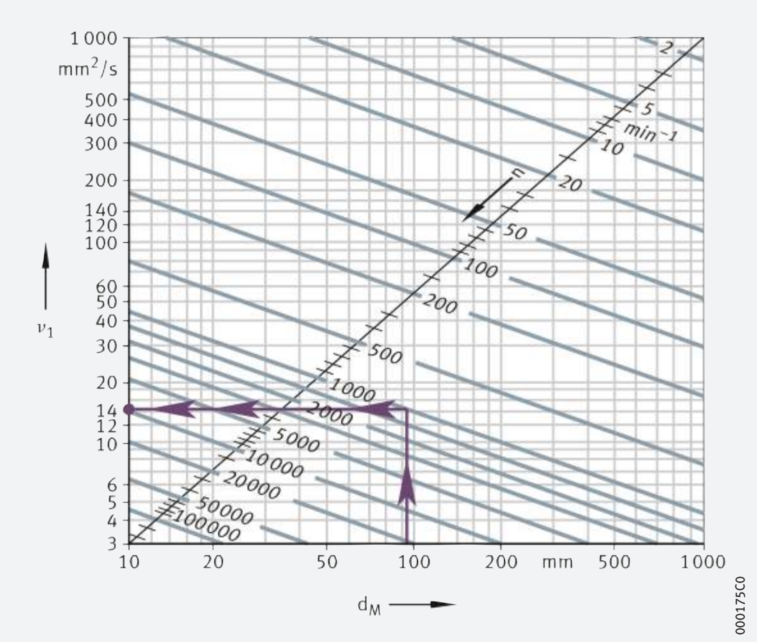
Guide value for ν_1

The guide value for ν_1 is dependent on the mean bearing diameter d_M and the speed n. It takes account of the EHD theory of lubricant film formation and practical experience.

Depending on the operating speed, the oil at operating temperature must have at least the reference viscosity ν_1 ➤82|14 and ➤82|15.

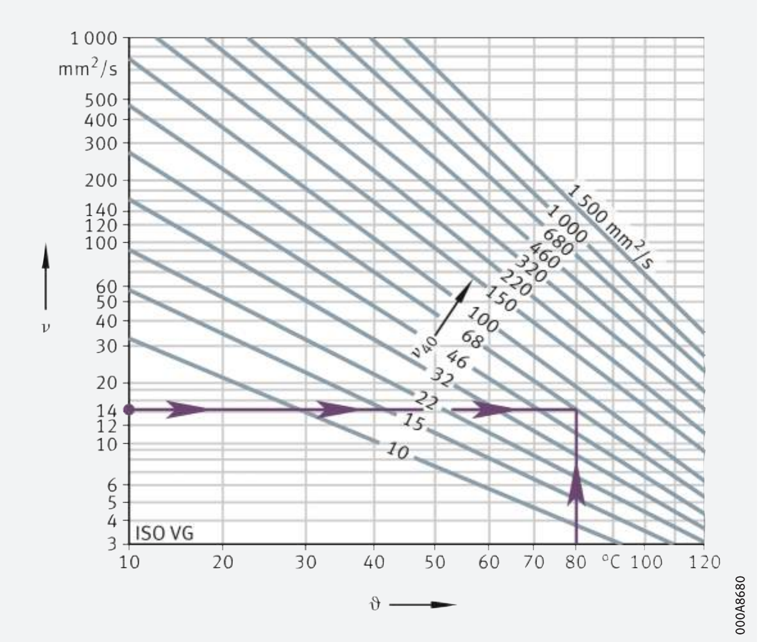
14
Calculating the reference viscosity ν_1

ν_1 = reference viscosity
d_M = mean bearing diameter
n = speed



15
ν/ϑ diagram for mineral oils

ν = operating viscosity
ϑ = operating temperature
ν_{40} = viscosity at +40 °C



Calculation of reference viscosity

✎ Determine ν_1

The reference viscosity ν_1 is calculated as follows:

- Allocate ν_1 to a nominal viscosity between ISO VG 10 and ISO VG 1500 (mid-point viscosity in accordance with ISO 3448)
- Round intermediate values to the nearest ISO VG (due to the steps between groups).

! This method cannot be used for synthetic oils, since these have different V/P (viscosity/pressure) and V/T (viscosity/temperature) characteristics. In these cases, please consult Schaeffler.

Influence of temperature on viscosity

✎ Aim for VI of 95

As the temperature increases, the viscosity of the oil decreases. This temperature-dependent change in the viscosity is described using the viscosity index VI. For mineral oils, the viscosity index should be at least 95.

When selecting the viscosity, the lower operating temperature must be taken into consideration, since the increasing viscosity will reduce the flowability of the lubricant. As a result, the level of power losses may increase.

✎ Viscosity ratio κ

A very long life can be achieved with a viscosity ratio $\kappa = \nu/\nu_1 = 3$ to 4 (ν = operating viscosity). Highly viscous oils do not, however, bring only advantages. In addition to the power losses arising from lubricant friction, there may be problems with the feed and removal of oil at low or even at normal temperatures.

✎ Aim for long fatigue life

The oil selected must be sufficiently viscous that it gives the highest possible fatigue life. It must also be ensured that the bearings are always supplied with adequate quantities of oil.

Pressure properties and anti-wear additives

✎ Oils with wear additives

If the bearings are subjected to high loads or if the operating viscosity ν is less than the reference viscosity ν_1, oils with anti-wear additives (type P in accordance with DIN 51502) should be used. Such oils are also necessary for rolling bearings with a substantial proportion of sliding contact (for example, bearings with line contact). These additives form boundary layers to reduce the harmful effects of metallic contact occurring at various points (wear).

! The suitability of these additives varies and is normally heavily dependent on temperature. Their effectiveness can only be assessed by means of testing in the rolling bearing (for example on our test rig FE8 to DIN 51819).

Silicone oils should only be used for low loads ($P \leqq 0{,}03 \cdot C$).

Compatibility

✎ Check compatibility prior to use

Before an oil is used, its behaviour must be checked in relation to plastics, seal materials (elastomers) and light and non-ferrous metals. This must always be checked under dynamic loading and at operating temperature.

Synthetic oils must always be checked for their compatibility. The lubricant manufacturer must be consulted on this at the same time.

Miscibility

✎ Avoid mixing different oils

The mixing of different oils should be avoided wherever possible. In particular, the presence of different additive packages may lead to undesirable interactions.

In general, oils with a mineral oil base and the same classification are miscible, for example type HLP with type HLP. The viscosities should vary by no more than one ISO VG class.

! Synthetic oils must always be checked for their compatibility. The lubricant manufacturer must be consulted on this at the same time.

Miscibility must be checked in advance for each individual case.

Cleanliness

An oil filter should be used

The cleanliness of the oil has a considerable influence on the rating life of the bearings ➤*34*. Schaeffler therefore recommends that an oil filter should be provided; attention must be paid to the filtration rate. The filter mesh should be $< 25\ \mu m$.

Lubrication methods

Proven methods

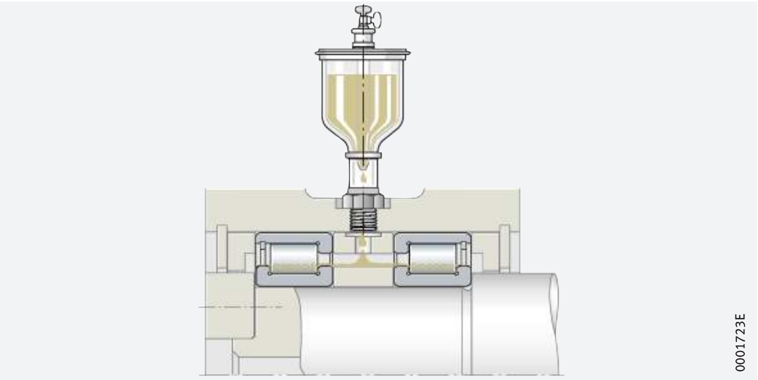
The essential lubrication methods are:
- drip feed oil lubrication
- pneumatic oil lubrication (to protect the environment, this should be used as a substitute for oil mist lubrication)
- oil bath lubrication (immersion or sump lubrication)
- recirculating oil lubrication.

Drip feed oil lubrication

This is suitable for bearings running at high speeds ➤*84* | *16*. The oil quantity required is dependent on the type and size of bearing, the operating speed and the load. The guide value is between 3 drops/min and 50 drops/min for each rolling element raceway (one drop weighs approx. 0,025 g).

Excess oil must be allowed to flow out of the bearing arrangement.

16
Drip feed oil lubrication



Pneumatic oil lubrication

This method is particularly suitable for radial bearings running at high speeds and under low loads ($n \cdot d_M = 800\,000$ to $3\,000\,000\ min^{-1} \cdot mm$) ➤*85* | *17*. Clean compressed air free from moisture feeds oil to the bearing. This generates an excess pressure, which prevents contaminants from entering the bearing.

With a pneumatic oil lubrication system designed for minimal quantity lubrication, low frictional torque and a low operating temperature can be achieved.

Parameters

Parameters for design of the lubrication system should be requested from the equipment manufacturers.

! Pneumatic oil lubrication of axial bearings should be avoided if possible.

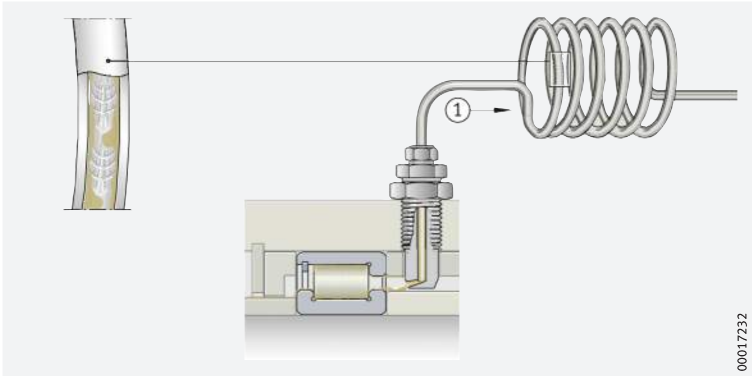
The oil quantity required for adequate supply is dependent on the bearing type.

Pneumatic oil lubrication has little cooling effect.

Follow the instructions provided by the manufacturers of the lubrication systems.

17
Pneumatic oil lubrication

① *To the pneumatic oil unit*



Oil bath lubrication

The oil level should reach the centre line of the lowest rolling element ➤85|18. If the oil level is higher than this, the bearing temperature may increase at high circumferential velocities (with losses due to splashing). Furthermore, foaming of the oil may occur.

$n \cdot d_M$ values

In general, it is suitable for speeds up to $n \cdot d_M = 300\,000\ \text{min}^{-1} \cdot \text{mm}$. At $n \cdot d_M < 150\,000\ \text{min}^{-1} \cdot \text{mm}$, the bearing may be completely immersed.

In bearings with an asymmetrical cross-section, oil return ducts must be provided due to the pumping effect so that recirculation can be achieved.

Axial bearings

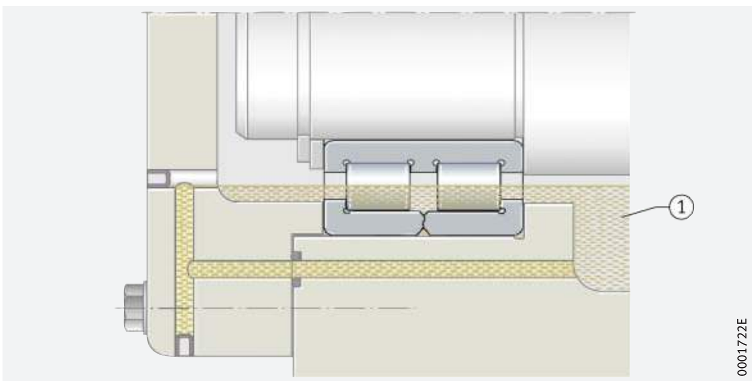
In axial bearings, the oil level must cover the inside diameter of the axial cage.

Proportion oil quantity adequately

The oil quantity in the housing must be adequately proportioned, as otherwise very short oil change intervals will be necessary.

18
Oil bath lubrication

① *Oil sump*

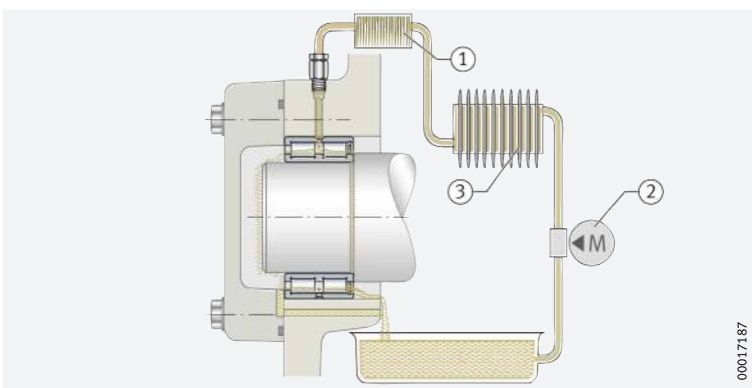


Recirculating oil lubrication

In recirculating oil lubrication, the oil is subjected to additional cooling ➤85|19. The oil can therefore dissipate heat from the bearing. The quantity of oil required for heat dissipation is dependent on the cooling conditions.

19
Recirculating oil lubrication

① *Filter*
② *Pump*
③ *Cooling system*



Oil quantity

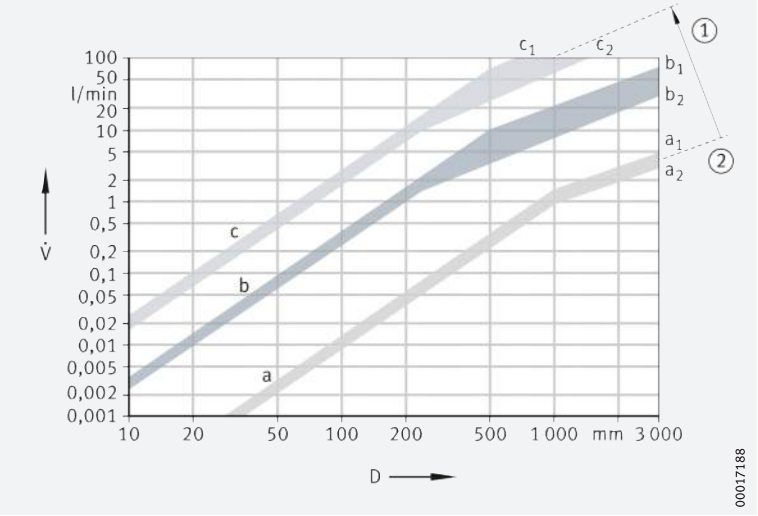
The oil quantities are matched to the operating conditions ➤86 | 20. The diagram indicates oil quantities that can be fed through the bearing without pressure with a side feed arrangement and banking up to the lower edge of the shaft.

Bearings with asymmetrical cross-section

For bearings with an asymmetrical cross-section (such as angular contact ball bearings, tapered roller bearings, axial spherical roller bearings), larger throughput quantities are permissible due to the pumping effect than for bearings with a symmetrical cross-section. Large quantities can be used to dissipate wear debris or heat.

20
Oil quantities

$\dot{V}$ = *oil quantity*
D = *outside bearing diameter*
a = *oil quantity sufficient for lubrication*
b = *upper limit for bearings of symmetrical design*
c = *upper limit for bearings of asymmetrical design*
a_1; b_1; c_1: D/d > 1,5
a_2; b_2; c_2: D/d ≦ 1,5
① *Increasing oil quantity required for heat dissipation*
② *No heat dissipation required*



Design of adjacent construction for oil lubrication

The lubrication holes in the housing and shaft must align with those in the rolling bearings. Adequate cross-sections must be provided for annular slots, pockets, etc. The oil must be able to flow out without pressure (this prevents oil build-up and additional heating of the oil).

Axial bearings

In axial bearings, the oil must always be fed from the inside to the outside.

Guide values

The cross-section of the oil outlet hole should be significantly larger than that of the inlet ➤86 | 21.

The cross-section A_{rab} is dependent on the oil quantity and the viscosity ➤86 | 3.

3
Outlet cross section

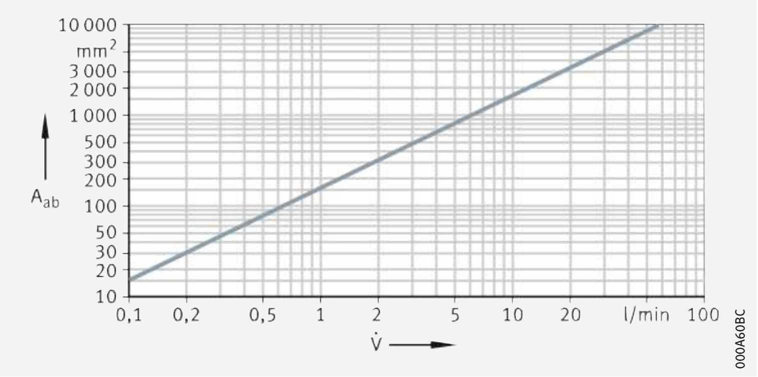
$$A_{rab} = K_{ab} \cdot A_{ab}$$

Legend

A_{rab}	mm^2	Outlet cross-section taking account of viscosity
K_{ab}	–	Correction factor for viscosity ➤87	5
A_{ab}	mm^2	Outlet cross-section ➤86	21.

21
Outlet cross-section (guide values)

A_{ab} = *cross-section for pressure-free oil runout*
$\dot{V}$ = *oil quantity*



5
Correction factor K_{ab}

Viscosity ν mm²/s		Factor K_{ab}	
from	to	from	to
–	30	1	–
30	60	1,2	1,6
60	90	1,8	2,2
90	120	2,4	2,8
120	150	3	3,4

Oil injection lubrication

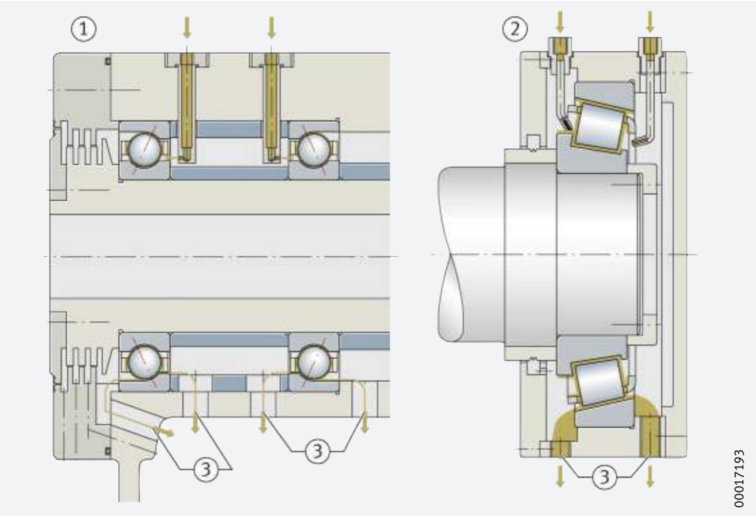
Advantages and disadvantages

In bearings running at high speeds, the oil is injected into the gap between the cage and bearing ring ➤87| 22. Injection lubrication using large recirculation quantities is associated with high power loss.

Heating of the bearings can only be held within limits with a considerable amount of effort. The appropriate upper limit for the speed parameter $n \cdot d_M = 1\,000\,000\ min^{-1} \cdot mm$ for recirculating lubrication with suitable bearings (for example spindle bearings) can be exceeded to a considerable degree when using injection lubrication.

22
Oil injection lubrication

① *Angular contact ball bearing*
② *Tapered roller bearing*
③ *Oil outlet holes*



Heat dissipation by the lubricant

Values $\dot{Q}_L$ and $\dot{V}_L$ can be calculated

Oil can dissipate frictional heat from the bearing. It is possible to calculate the heat flow $\dot{Q}_L$ that is dissipated with the lubricant and the necessary lubricant volume flow $\dot{V}_L$.

Heat flow

The total dissipated heat flow due to possible heating by an external source can be calculated using ➤87| 4, while the heat flow dissipated by the lubricant can be calculated using ➤87| 5.

4
Total dissipated heat flow

$$\dot{Q} = 10^{-6} \cdot \frac{\pi}{30} \cdot n \cdot \left(M_0 + M_1\right) + \dot{Q}_E$$

5
Heat flow dissipated by the lubricant

$$\dot{Q}_L = \dot{Q} - \dot{Q}_S$$

Legend

$\dot{Q}$	kW	Total dissipated heat flow
n	min^{-1}	Operating speed or equivalent speed
M_0	Nmm	Frictional torque as a function of speed
M_1	Nmm	Frictional torque as a function of load
$\dot{Q}_E$	kW	Heat flow due to heating by external source
$\dot{Q}_L$	kW	Heat flow dissipated by the lubricant
$\dot{Q}_S$	kW	Heat flow dissipated via the bearing seating surfaces.

Lubricant volume flow

The lubricant volume flow can be calculated approximately ➤88| f 6.

f 6
Lubricant volume flow

$$\dot{V}_L = \frac{\dot{Q}_L}{0{,}0286 \cdot \Delta\vartheta_L}$$

Legend

$\dot{V}_L$	l/min	Lubricant volume flow
$\dot{Q}_L$	kW	Heat flow dissipated by the lubricant
$\Delta\vartheta_L$	K	Difference between oil inlet temperature and oil outlet temperature.

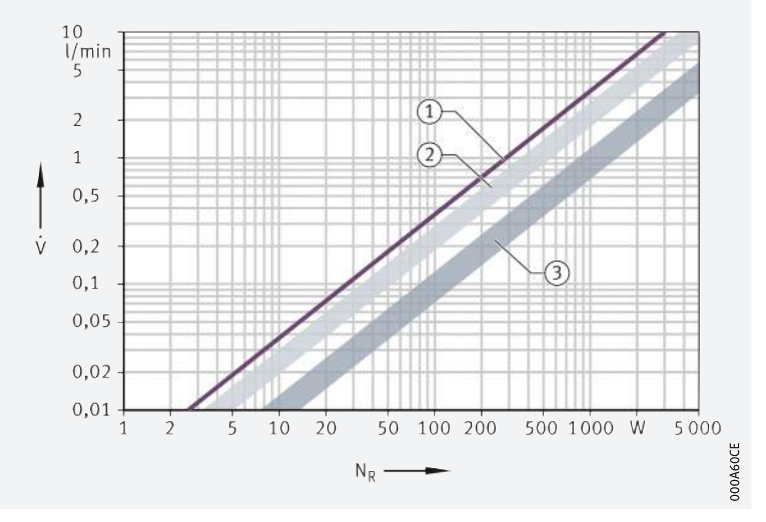
Guide values

If these values cannot be calculated, the guide values according to ➤88| 23 apply for the temperature difference of $\Delta\vartheta_L$ = 10 K.

23
Guide values for the oil quantity in cooling and lubrication

N_R = *frictional power*
$\dot{V}$ = *oil quantity*

① *No account is taken of thermal conduction, radiation or convection*
② *Empirical values for normal cooling conditions*
③ *Empirical values for very good cooling conditions*



Oil changes

One oil change per year is usually sufficient

At temperatures in the bearing of less than +50 °C and with only slight contamination, an oil change once per year is generally sufficient. Guide values for oil change intervals are given in ➤88| 24. The precise oil change intervals should be agreed in consultation with the oil manufacturer.

Severe operating conditions

Under severe conditions, the oil should be changed more frequently. This applies, for example, in the case of higher temperatures and low oil quantities with a high circulation index. The circulation index indicates how often the entire oil volume available is recirculated or pumped per hour ➤88| f 7.

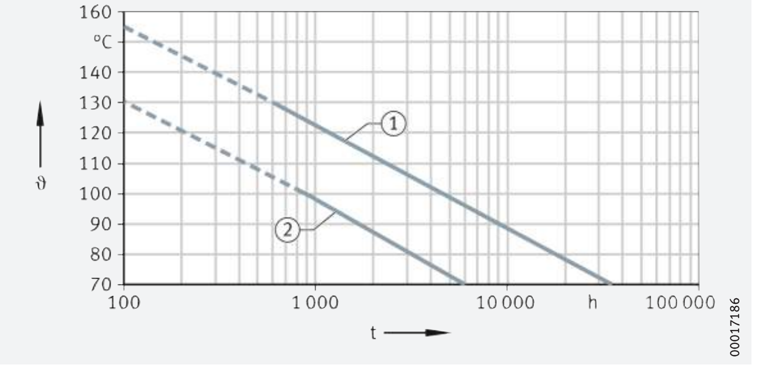
f 7
Circulation index

$$\text{Circulation index} = \frac{\text{Pump displacement m}^3/\text{h}}{\text{Container volume m}^3}$$

24
Oil change intervals

ϑ = *oil sump temperature*
t = *oil change interval*

① *Synthetic gearbox oils*
② *Mineral gearbox oils*



6.4 Lubricating grease groups

Table 6
Greases

Designation[3)]	Classification	Type of grease
GA01	Ball bearing grease for $\vartheta < +180$ °C	Polycarbamide Ester oil
GA02	Ball bearing grease for $\vartheta < +160$ °C	Polycarbamide SHC
GA13	Standard ball bearing and insert bearing grease for $D > 62$ mm	Lithium soap Mineral oil
GA14	Low-noise ball bearing grease for $D \leqq 62$ mm	Lithium soap Mineral oil
GA15	Low-noise ball bearing grease for high speeds	Lithium soap Ester oil/SHC
GA22	Free-running grease with low frictional torque	Lithium soap Ester oil, mineral oil
L069	Radial insert ball bearing grease for wide temperature range	Polycarbamide Ester oil
GA08	Grease for line contact	Lithium complex soap Mineral oil
GA26	Standard grease for drawn cup roller clutches	Calcium/ lithium soap Mineral oil
GA28	Screw drive bearing grease	Lithium soap Synthetic oil/mineral oil
GA11	Rolling bearing grease resistant to media for temperatures up to +250 °C	PTFE Alkoxyfluoroether
GA47	Rolling bearing grease resistant to media for temperatures up to +140 °C	Barium complex soap Mineral oil

1) *The upper continuous limit temperature $\vartheta_{upperlimit}$ must not be exceeded if a reduction in the grease operating life due to temperature is to be avoided.*

2) *Dependent on bearing type.*

3) ***GA..** Stands for **G**rease **A**pplication Group.., based on Grease Spec 00.*

Operating temperature range °C		Upper continuous limit temperature $\vartheta_{upper\ limit}$[1] °C	NLGI class		Speed parameter $n \cdot d_M$	ISO VG class (base oil)[2]		Designation[3]	Recommended Arcanol grease for relubrication
from	to		from	to	$min^{-1} \cdot mm$	from	to		
–30	+180	+125	2	3	600 000	68	220	**GA01**	–
–40	+160	+90	2	3	500 000	68	220	**GA02**	–
–20	+120	+75	3	–	500 000	68	150	**GA13**	**MULTI3**
–30	+120	+75	2	–	500 000	68	150	**GA14**	**MULTI2**
–40	+120	+75	2	3	1 000 000	22	32	**GA15**	–
–50	+120	+70	2	–	1 500 000	10	22	**GA22**	–
–40	+180	+120	2	–	700 000	68	220	**L069**	–
–20	+140	+95	2	3	500 000	150	320	**GA08**	**LOAD150**
–20	+80	+60	2	–	500 000	10	22	**GA26**	–
–30	+140	+80	2	–	800 000	15	100	**GA28**	**MULTITOP**
–30	+260	+200	2	–	300 000	460	680	**GA11**	**TEMP200**
–20	+130	+70	1	2	350 000	150	320	**GA47**	–

6.5 Arcanol rolling bearing greases

7 Arcanol rolling bearing greases

+++ = extremely suitable
++ = highly suitable
+ = suitable
– = less suitable
–– = not suitable

Available containers ➤96 | 8

	Grease	Characteristic applications	Operating temperature °C		Continuous limit temperature °C
			from	to	
Multi-purpose greases	MULTITOP	■ Ball and roller bearings in rolling mills ■ Construction machinery ■ Spinning and grinding spindles ■ Automotive engineering	–50[1]	+140	+80
Multi-purpose greases	MULTI2	■ Ball bearings up to D ≦ 62 mm in electric motors ■ Agricultural and construction machinery ■ Household appliances	–30	+120	+75
Multi-purpose greases	MULTI3	■ Ball bearings from D > 62 mm in electric motors ■ Agricultural and construction machinery ■ Fans	–30	+120	+75
High loads	LOAD150	■ Ball, roller and needle roller bearings ■ Linear guidance systems in machine tools	–20	+140	+95
High loads	LOAD220	■ Ball and roller bearings in rolling mill plant ■ Paper machinery ■ Rail vehicles	–20	+140	+80
High loads	LOAD400	■ Ball/roller bearings in mining machinery ■ Construction machinery ■ Wind turbine main bearings	–40[1]	+130	+80
High loads	LOAD460	■ Ball/roller bearings ■ Wind turbines ■ Bearings with pin cage	–40[1]	+130	+80
High loads	LOAD1000	■ Ball/roller bearings in mining machinery ■ Construction machinery ■ Cement plant	–30[1]	+130	+80

[1] *Measurement values according to Schaeffler FE8 low temperature test.*

Thickener	Base oil	Consistency NLGI	Base oil viscosity at +40 °C mm^2/s	Temperatures Low	 High	Low friction, high speed	High load, low speed	Vibrations	Support for seals	Relubrication facility
Lithium soap	Partially synthetic oil	2	82	+++	++	++	+++	++	+	+++
Lithium soap	Mineral oil	2	110	++	+	+	+	+	+	+++
Lithium soap	Mineral oil	3	80	++	+	+	+	++	++	++
Lithium complex soap	Mineral oil	2	160	+	++	–	+++	++	++	++
Lithium/ calcium soap	Mineral oil	2	245	+	+	–	+++	++	++	++
Lithium/ calcium soap	Mineral oil	2	400	+	+	–	+++	++	++	++
Lithium/ calcium soap	Mineral oil	1	400	++	+	–	+++	++	–	++
Lithium/ calcium soap	Mineral oil	2	1 000	+	+	––	+++	++	++	++

continued ▼

7
Arcanol rolling bearing greases

+++ = extremely suitable
++ = highly suitable
+ = suitable
– = less suitable
–– = not suitable

Available containers ➤96 | 8

	Grease	Characteristic applications	Operating temperature °C from	Operating temperature °C to	Continuous limit temperature °C
High temperatures	TEMP90	■ Ball and roller bearings in couplings ■ Electric motors ■ Automotive engineering	–40	+160	+90
High temperatures	TEMP110	■ Ball and roller bearings in electric motors ■ Automotive engineering	–35	+160	+110
High temperatures	TEMP120	■ Ball and roller bearings in continuous casting plant ■ Paper machinery	–30	+180	+120
High temperatures	TEMP200	■ Ball and roller bearings in guide rollers for baking machinery ■ Kiln trucks and chemical plant ■ Piston pins in compressors	–30	+260	+200
Special requirements	SPEED2,6	■ Ball bearings in machine tools ■ Spindle bearings ■ Rotary table bearings ■ Instrument bearings	–40	+120	+80
Special requirements	VIB3	■ Ball and roller bearings in rotors for wind turbines (blade adjustment) ■ Packaging machinery ■ Rail vehicles	–30	+150	+90
Special requirements	FOOD2	■ Ball and roller bearings in applications with food contact (NSF-H1 registration, kosher and halal certification)	–30	+120	+70
Special requirements	CLEAN-M	■ Ball, roller and needle roller bearings as well as linear guidance systems in clean room applications	–30	+180	+90
Special requirements	MOTION2	■ Ball and roller bearings in oscillating operation ■ Slewing rings in wind turbines	–40	+130	+75

Thickener	Base oil	Consistency NLGI	Base oil viscosity at +40 °C mm²/s	Temperatures		Low friction, high speed	High load, low speed	Vibrations	Support for seals	Relubrication facility
				Low	High					
Polycarbamide	Partially synthetic oil	3	148	+++	++	+	+	+	++	++
Lithium complex soap	Partially synthetic oil	2	130	+++	+++	++	+	+	+	+
Polycarbamide	Alkoxyfluoro oil	2	400	++	+++	–	+++	+	++	+
PTFE	Fluoridated polyether oil	2	550	++	+++	– –	++	+	+	+
Lithium complex soap	Synthetic oil	2 – 3	25	+++	+	+++	– –	–	+	+
Lithium complex soap	Mineral oil	3	170	++	++	–	++	+++	++	–
Aluminium complex soap	Synthetic oil	2	150	++	–	+	+	+	+	+++
Polycarbamide	Ester	2	103	+++	+++	+	+	+	+	++
Lithium soap	Synthetic oil	2	50	+++	+	–	++	+++	++	+

continued ▲

Available containers

8 *Grease container sizes*

Arcanol grease[1]	Tube		Car-tridge	Can	Bucket		Hobbock		Drum
	70 g	250 g	400 g	1 kg	5 kg	12,5 kg	25 kg	50 kg	180 kg
Multitop	–	●	●	●	●	●	●	–	●
Multi2	–	●	●	●	●	●	●	–	●
Multi3	–	●	●	●	●	●	–	–	●
Load150	–	–	●	●	–	●	–	●	–
Load220	–	–	●	●	–	●	●	–	●
Load400	–	–	●	●	●	●	●	●	●
Load460	–	–	●	●	●	●	–	●	●
Load1000	–	–	–	–	●	–	●	●	●
Temp90	–	–	●	●	●	–	●	–	●
Temp110	–	–	●	●	–	–	–	●	–
Temp120	–	–	●	●	●	–	●	–	–
Temp200	●	–	–	●	–	–	–	–	–
Speed2,6	–	●	●	●	–	–	●	–	–
Vib3	–	–	●	●	●	–	●	●	–
Food2	–	–	●	●	–	●	●	–	–
Clean-M	–	●	●	●	–	–	–	–	–
Motion2	–	●	●	●	●	●	●	●	–

[1] *Other containers are available by agreement.*

7 Bearing data

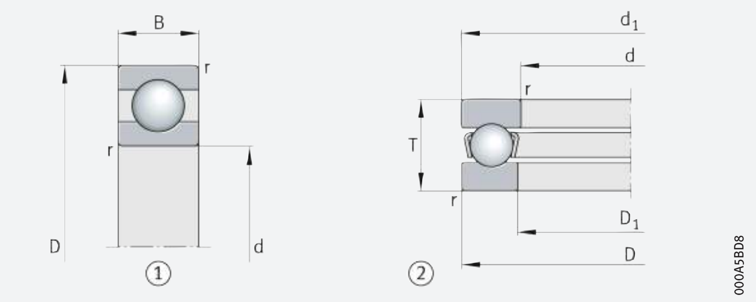
7.1 Main dimensions

The main dimensions are the key dimensions of a rolling bearing. They include ➤97|1:

- the bore diameter (d)
- the outside diameter (D)
- the width or height (B, C, T or H)
- the chamfer dimensions (r).

1
Main dimensions

① Deep groove ball bearing (radial bearing)
② Axial deep groove ball bearing (axial bearing)



Standardised and non-standardised dimensions

External dimensions are standardised

The dimensions which determine the installation space are standardised. Standardisation is not, however, applied to the internal dimensions, such as the size and quantity of the rolling elements for example. The main dimensions of metric rolling bearings are defined in the following ISO dimension plans:

- ISO 15:2017 for radial rolling bearings, excluding single row needle roller bearings, insert bearings and tapered roller bearings
- ISO 355:2007 for tapered roller bearings
- ISO 104:2015 for axial bearings.

DIN ISO

DIN 616 describes dimension plans for radial and axial bearings. An overview of ISO and DIN rolling bearing standards is given in DIN 611:2010-05.

ISO dimension plans

Standard dimensions

Experience has shown that the predominant proportion of all bearing arrangement tasks can be fulfilled using bearings with standard dimensions, which are contained in ISO dimension plans.

Advantages of dimension plans

The dimension plans are valid for different bearing types. Standard rolling bearings of different types can thus be manufactured to the same external dimensions. As a result, a designer working on the same design envelope can make a selection between bearings of several types with the same external dimensions.

Several outside diameters/ width dimensions are assigned to one bearing bore

In the dimension plans, one bearing bore is allocated several outside diameters and width dimensions ➤102|10. In this way, it is possible to design several bearings of the same type that, for the same bore, exhibit different load carrying capacities. The development of new bearing series and individual new rolling bearings in accordance with the dimension plans has considerable advantages for users and manufacturers.

Width and diameter series

✎ Bearing series are described using numbers

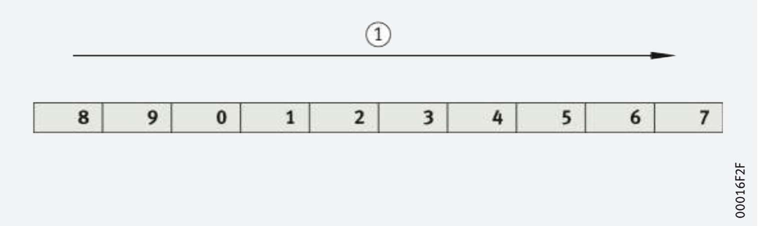
Width and diameter series are described using numbers. In the case of radial bearings in accordance with DIN 616 and ISO 15, these are as follows:

- for width series, the numbers 8, 9, 0, 1, 2, 3, 4, 5, 6, 7 ➤*98*|*2*
- for the identification of diameter series, the numbers 7, 8, 9, 0, 1, 2, 3, 4, 5 ➤*98*|*3*.

2
Identification of width series

For radial bearings to DIN 616 and ISO 15

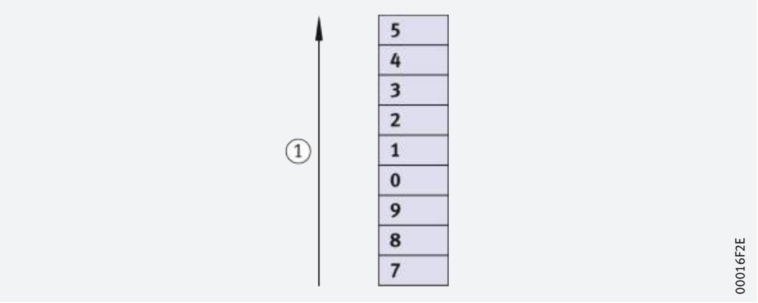
① Width series



3
Identification of diameter series

For radial bearings to DIN 616 and ISO 15

① Diameter series



Dimension series

✎ The dimension series is created from the width series and the diameter series

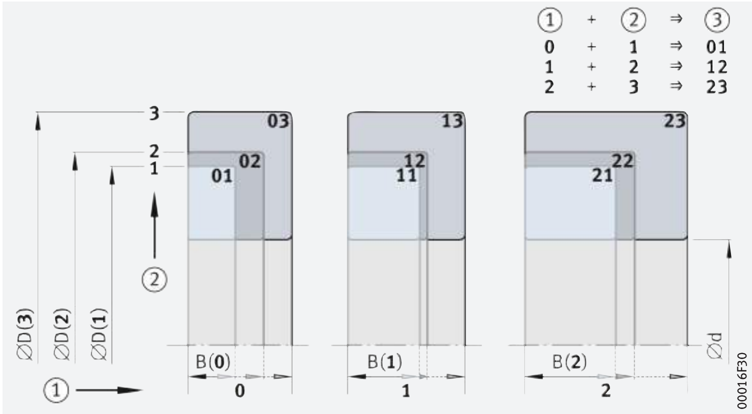
The specific number of the width and diameter series, when combined, identifies the dimension series ➤*98*|*1*. When this table is used, for example, for a radial bearing of the width series 2 and the diameter series 3, this gives the dimension series 23 ➤*98*|*1* and ➤*99*|*4*. If the bearing bore code is then added, ➤*103*|*7.3*, the bearing size is completely defined.

1
Dimension series for radial bearings (excluding tapered roller and needle roller bearings)

Width series – increase in cross-sectional width											
		8	**9**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Diameter series – increase in cross-sectional height	**5**	–	–	–	–	–	–	–	–	–	–
	4	–	–	04	–	24	–	–	–	–	–
	3	83	–	03	12	23	33	–	–	–	–
	2	82	–	02	12	22	32	42	52	62	–
	1	–	–	01	11	21	31	41	51	61	–
	0	–	–	00	10	20	30	40	50	60	–
	9	–	–	09	19	29	39	49	59	69	–
	8	–	–	08	18	28	38	48	58	68	–
	7	–	–	–	17	27	37	47	–	–	–

4
Generation of the dimension series

① *Width series*
② *Diameter series*
③ *Dimension series*

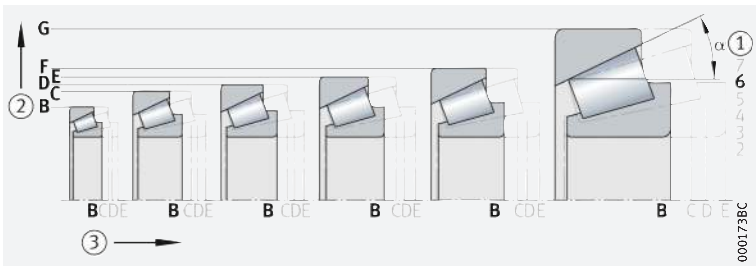


Dimension plan for metric tapered roller bearings to ISO 355

Tapered roller bearings can generally also be classified in the dimension plans to ISO 355 ➤*99*|*5*. The dimension series are designated in these by a combination of three symbols, e. g. 3FE ➤*99*|*5*.

5
Dimension plan for tapered roller bearings (excerpt) to ISO 355

① *Contact angle series (range of contact angles)*
② *Diameter series*
③ *Width series*



7.2 Designation system

Clear designation

Each rolling bearing has a designation that clearly indicates the type, dimensions, tolerances and internal clearance, if necessary with other important features.

Interchangeability

Bearings that have the same standardised designation are interchangeable with each other. In the case of separable bearings, it cannot always be ensured that individual parts with the same origin can be interchanged with each other.

In Germany, the bearing designations are standardised in DIN 623-1. These designations are also used in many other countries.

Designation

The designation is a code comprising numbers and letters

The designation for the bearing series comprises numbers and letters or letters and numbers. It indicates the type of bearing, the diameter series and, in many cases, the width series too ➤*100*|*6*, ➤*100*|*7* and ➤*102*|*10*. The diameter and width series are described in ➤*97*|*7.1*.

Basic designation, prefix and suffix

Basic designation

The basic designation contains the symbols for the bearing series and the bearing bore ➤*100*|*6*, ➤*100*|*7* and ➤*102*|*10*.

Prefix

The prefix normally identifies individual bearing parts of complete bearings (in certain cases, this may also be part of the basic designation) ➤*100*|*6* and ➤*100*|*7*.

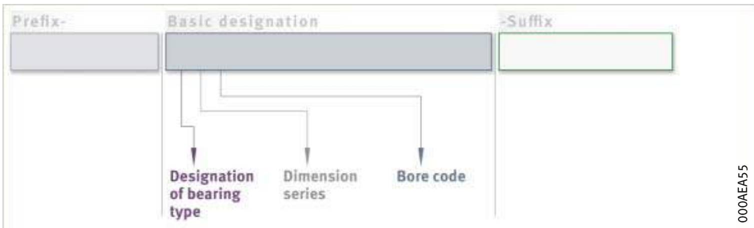
Suffix

The suffix defines special designs and features ➤*100*|*6* and ➤*100*|*7*. The prefix and suffix describe other features of the bearing but are not standardised in all cases and may vary in use depending on the manufacturer.

Designations – examples

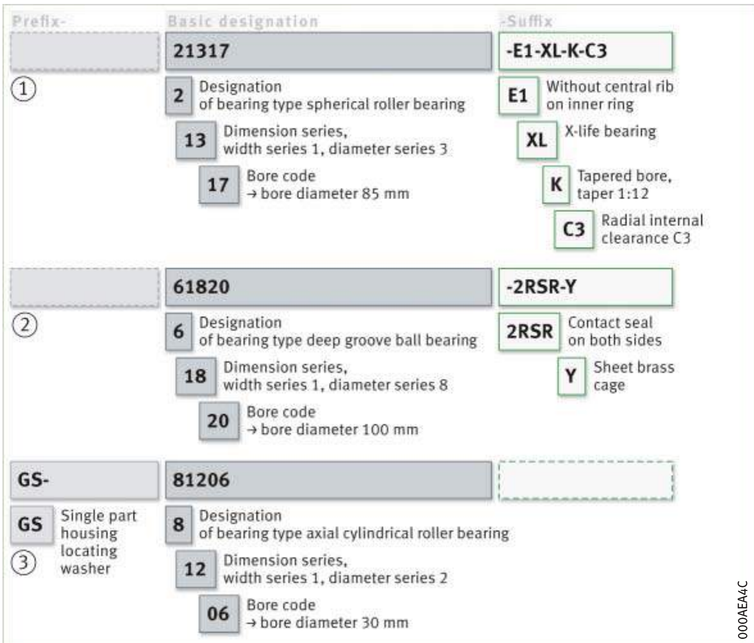
Examples of the composition of designations on the basis of their definition in accordance with ➤100|6 are shown on ➤100|7.

6
Composition of designations



7
Examples of bearing designations, constructed in accordance with ➤6

① *Spherical roller bearing*
② *Deep groove ball bearing*
③ *Axial cylindrical roller bearing*



Designations of metric tapered roller bearings according to ISO 355 and ISO 10317

Structure of bearing designation for metric tapered roller bearings

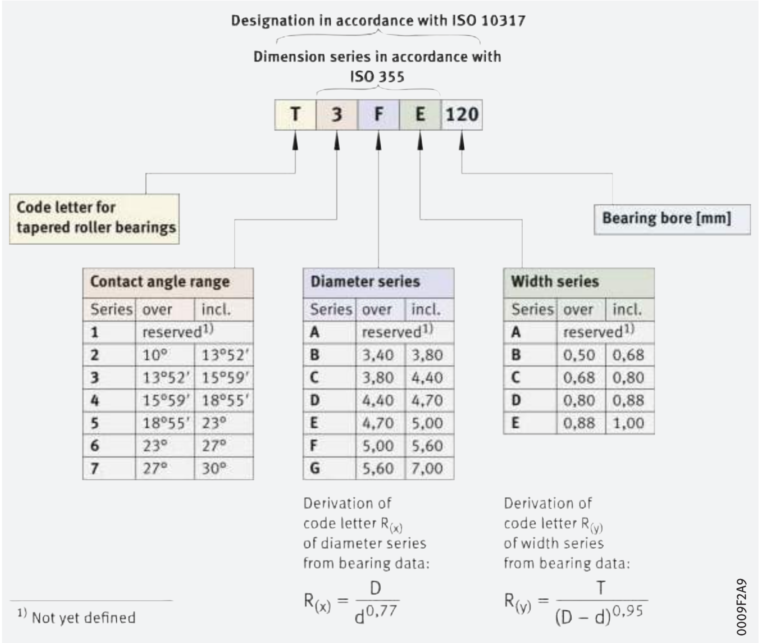
➤101|8 describes as an example the structure of the designation for a metric tapered roller bearing (dimension series to ISO 355, designation to ISO 10317). The 3 indicates the contact angle range. The first letter (F in this case) indicates a diameter series. Each diameter series has a certain ratio D/d (outside diameter to bore diameter). The second letter (E in this case) indicates a width series. Each width series has a certain ratio of bearing width T to the height of the bearing cross-section. The addition of the letter T (for tapered roller bearing) at the start and a three-digit number at the end for the bearing bore diameter in mm (in this case 120) gives the complete designation of a tapered roller bearing (e.g. T3FE 120 ➤101|8).

DIN ISO

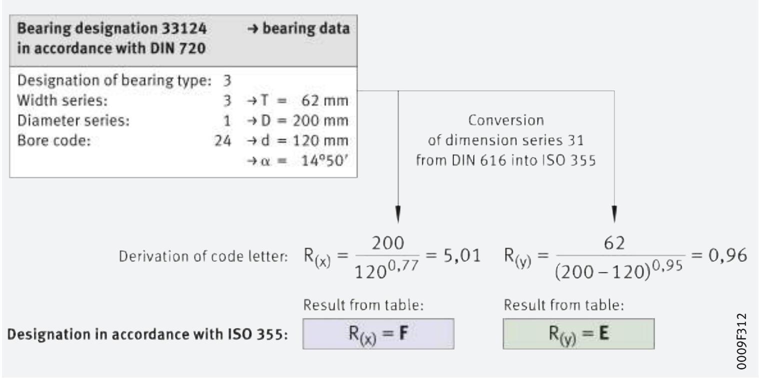
DIN 720 Appendix 1 gives an interchange table for DIN and ISO designations.

8
Composition of designation for metric tapered roller bearings to ISO 10317

Dimension series to ISO 355, designation to ISO 10317



9
Example designation for metric tapered roller bearings to DIN 720



10 *Bearing designations in accordance with DIN 623-1:1993 – basic designation structure*

Basic designation

The bore code is derived from the diameter d of the bearing bore: with a factor of 5 or the addition of an oblique

d ≦ 9 mm — */+d = bore code*

Bore code	/0,6	1	/1,5	2	/2,5	3	4	5	6	7	8	9
Bearing bore d	0,6	1	1,5	2	2,5	3	4	5	6	7	8	9

10 mm ≦ d ≦ 32 mm — *d calculated by different means*

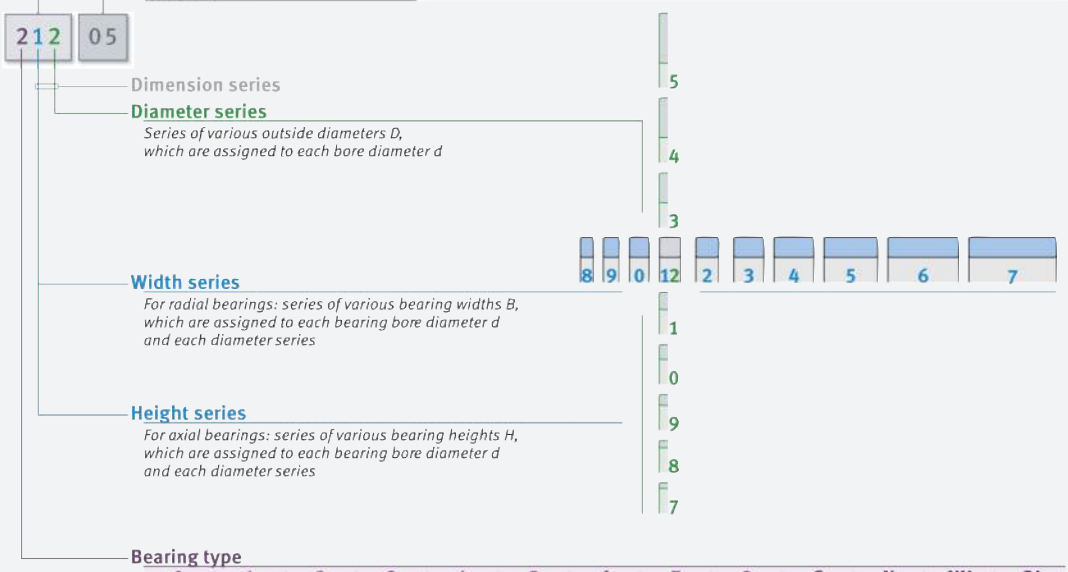
Bore code	00	01	02	03	04	/22	05	/28	06	/32
Bearing bore d	10	12	15	17	20	22	25	28	30	32

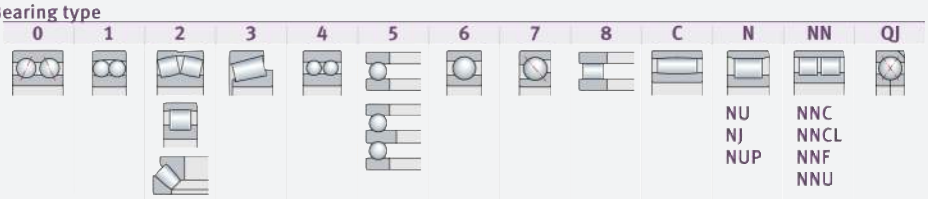
35 mm ≦ d < 500 mm — *d = 5 · bore code*

Bore code	07	08	09	10	11	12	...	80	84	88	92	96
Bearing bore d	35	40	45	50	55	60	...	400	420	440	460	480

d ≧ 500 mm — */+d = bore code*

Bore code	/500	/530	/560	/600	/630	/670	/710	/750	/800	/850	/900	...
Bearing bore d	500	530	560	600	630	670	710	750	800	850	900	...





Bearing series

0	1	2	3	4	5	6	7	8	C	N	NN	QJ
(0)38	1(0)0	238	329	4(2)2	511	6(0)8	718	893	C39	..19	..48	QJ10
(0)30	1(0)2	248	320	4(2)3	512	618	7(1)0	894	C30	..10	..49	QJ(0)2
(0)32	112	239	330		513	6(0)9	7(0)2	811	C40	..(0)2	..30	QJ(0)3
(0)33	(1)22	249	331		514	619	7(0)3	812	C31	..22	..41	
	1(0)3	230	302		532	16(0)0	7(0)4		C41	..(0)3		
	(1)23	240	322		533	6(1)0			C22	..23		
		231	332			6(0)2			C32	..(0)4		
		241	303		522	622			C23			
		222	313		523	6(0)3						
		232	323		542	623						
		213			543	6(0)4						
		223										
		202										
		203										
		292										
		293										
		294										
Double row angular contact ball bearing	Self-aligning ball bearing	Spherical roller bearing, barrel roller bearing, axial spherical roller bearing	Tapered roller bearing	Double row deep groove ball bearing	Axial deep groove ball bearing	Single row deep groove ball bearing	Single row angular contact ball bearing	Axial cylindrical roller bearing	Toroidal roller bearing	Single row cylindrical roller bearing	Double row cylindrical roller bearing	Four point contact bearing
0	1	2	3	4	5	6	7	8	C	N	NN	QJ

000AEA3A

7.3 Determining the bearing bore

✎ For d < 10 mm, the bore diameter is stated in the basic designation

For certain bearing types, the bearing bores are stated directly or in an encoded form in accordance with DIN 623-1. Up to d < 10 mm, the bearing bore diameter is specified in the dimension-specific part of the designation (basic designation) directly as a number indicating the diameter ➤ *102* | Figure *10*.

✎ Example

Deep groove ball bearing 623, bore diameter = 3 mm.

Bore code

✎ The bore code describes the bearing bore from d ≧ 10 mm

For nominal dimensions d ≧ 10 mm to d < 500 mm, the diameter is described by means of a bore code ➤ *102* | Figure *10*.

For bores from 10 mm to 17 mm, the following applies:

d = 10 mm, bore code 00
d = 12 mm, bore code 01
d = 15 mm, bore code 02
d = 17 mm, bore code 03.

! For all rolling bearings in the range from d = 20 mm to d = 480 mm (excluding double direction axial bearings), the bore code is formed by dividing the dimension of the bearing bore by 5.

✎ Example

Bearing bore d = 360 mm divided by 5 (360 : 5), bore code = 72.

✎ From d > 480 mm

From d > 480 mm, the unencoded bore diameter is given with an oblique after the bearing series, e.g. 618/500 with bore diameter d = 500 mm.

✎ Intermediate sizes

The intermediate sizes, such as bore diameter d = 22, 28 and d = 32 mm for example, are also given with an oblique as /22, /28 and /32.

✎ Magneto bearings

In the case of magneto bearings, the unencoded nominal bore dimension is given.

7.4 Radial internal clearance

✎ The radial internal clearance is determined on the dismounted bearing

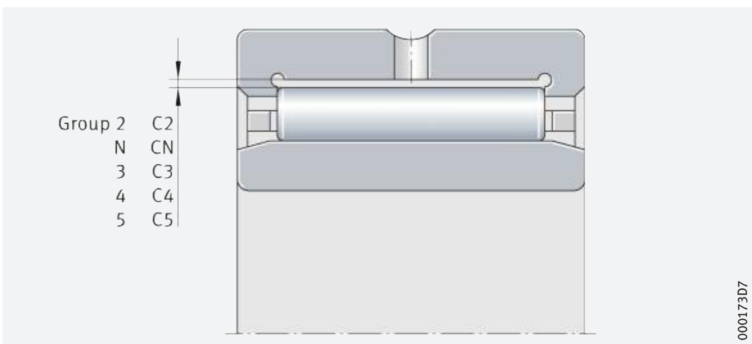
The radial internal clearance applies to bearings with an inner ring and is determined on the unmounted bearing. It is defined as the amount by which the inner ring can be moved in a radial direction from one extreme position to the other in relation to the outer ring ➤ *103* | Figure *11*.

DIN ISO

The radial internal clearance groups are defined in DIN 620-4 and ISO 5753-1 and are described in DIN 620-4 by means of codes that comprise the capital letter C and a number. ISO 5753-1 designates the groups by the word "Group" and a number ➤ *103* | Figure *11* and ➤ *104* | Table *2*.

Figure **11**
Internal clearance groups

C2, CN, C3, C4, C5 = *radial internal clearance groups according to DIN 620-4*
Group 2, N, 3, 4, 5 = *radial internal clearance groups according to ISO 5753-1*



2
Radial internal clearance groups

Internal clearance group		Description	Application
DIN 620-4	ISO 5753-1		
C2	Group 2	Internal clearance < CN	For heavy alternating loads combined with swivel motion
CN	Group N	Normal internal clearance, CN is not included in bearing designations	For normal operating conditions with shaft and housing tolerances
C3	Group 3	Internal clearance > CN	For bearing rings with press fits and large temperature differential between the inner and outer ring
C4	Group 4	Internal clearance > C3	
C5	Group 5	Internal clearance > C4	

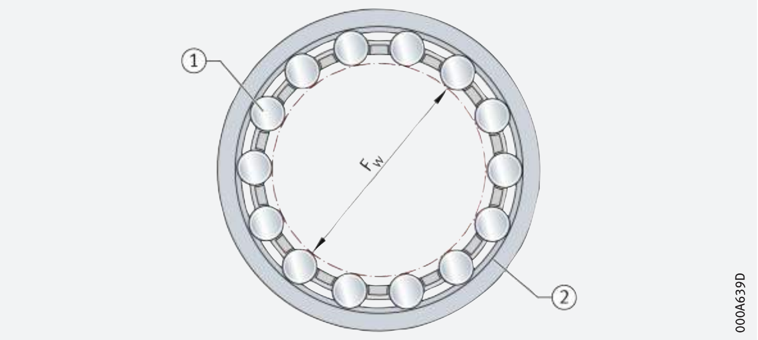
Enveloping circle

For bearings without an inner ring, the enveloping circle F_w is used. This is the inner inscribed circle of the rolling elements in clearance-free contact with the outer raceway ➤ 104 | 12.

12
Enveloping circle

F_w = *enveloping circle diameter*

① *Rolling element*
② *Outer raceway*



7.5 Operating clearance

The operating clearance is determined on a bearing still warm from operation

The operating clearance is determined on a mounted bearing still warm from operation. It is defined as the amount by which the shaft can be moved in a radial direction from one extreme position to the other.

The operating clearance is derived from the radial internal clearance and the change in the radial internal clearance as a result of interference fit and thermal influences in the mounted condition.

A normal operating clearance is usually achieved with internal bearing clearance CN

The operating clearance value is dependent on the operating and installation conditions of the bearing. A larger operating clearance is, for example, necessary if heat is transferred via the shaft, the shaft undergoes deflection or if misalignment occurs. An operating clearance smaller than CN should only be used in special cases, for example in high precision bearing arrangements. Normal operating clearance is achieved with an internal clearance of CN or, for larger bearings, more usually C3 if the recommended shaft and housing tolerances are maintained.

Calculation of operating clearance

The operating clearance is determined in accordance with ➤ 104 | 1.

1
Operating clearance

$$s = s_r - \Delta s_P - \Delta s_T$$

Legend

s	µm	Radial operating clearance of mounted bearing warm from operation
s_r	µm	Radial internal clearance
Δs_P	µm	Reduction in radial internal clearance due to fit
Δs_T	µm	Reduction in radial internal clearance due to temperature.

Reduction in radial internal clearance due to fit

The radial internal clearance is reduced due to the fit as a result of expansion of the inner ring and contraction of the outer ring ➤105|ƒ 2.

ƒ **2**
Reduction in radial internal clearance

$$\Delta s_P = \Delta d + \Delta D$$

Legend

Δs_P	µm	Reduction in radial internal clearance due to fit
Δd	µm	Expansion of the inner ring
ΔD	µm	Contraction of the outer ring.

The expansion of the inner ring is calculated in accordance with ➤105|ƒ 3.

ƒ **3**
Expansion of the inner ring

$$\Delta d \approx 0{,}9 \cdot U \cdot d/F \approx 0{,}8 \cdot U$$

Legend

d	mm	Bore diameter of the inner ring
U	µm	Theoretical interference of the fitted parts with firm seating. The theoretical oversize of the fitted parts with a firm seating is determined from the mean deviations and the upper and lower deviations of the tolerance zones of the fitted parts reduced by $^1/_3$ of their acceptable value. The amount of surface smoothing during assembly must be subtracted from this.
F	mm	Raceway diameter of the inner ring.

! For very thin-walled housings and light metal housings, the reduction in the radial internal clearance must be determined by mounting trials.

The contraction of the outer ring is calculated in accordance with ➤105|ƒ 4.

ƒ **4**
Contraction of the outer ring

$$\Delta D \approx 0{,}8 \cdot U \cdot E/D \approx 0{,}7 \cdot U$$

Legend

ΔD	µm	Contraction of the outer ring
E	mm	Raceway diameter of the outer ring
D	mm	Outside diameter of the outer ring.

Reduction in radial internal clearance due to temperature

The radial internal clearance can alter considerably if there is a substantial temperature differential between the inner and outer ring ➤105|ƒ 5.

ƒ **5**
Reduction in radial internal clearance due to temperature

$$\Delta s_T = \alpha \cdot d_M \cdot 1\,000 \cdot \left(\vartheta_{IR} - \vartheta_{AR}\right)$$

Legend

Δs_T	µm	Reduction in radial internal clearance due to temperature
α	K^{-1}	Coefficient of thermal expansion of steel: $\alpha = 0{,}000011\ K^{-1}$
d_M	mm	Mean bearing diameter (d + D)/2
ϑ_{IR}	°C, K	Temperature of the inner ring
ϑ_{AR}	°C, K	Temperature of the outer ring (usual temperature difference between inner and outer ring: 5 K to 10 K).

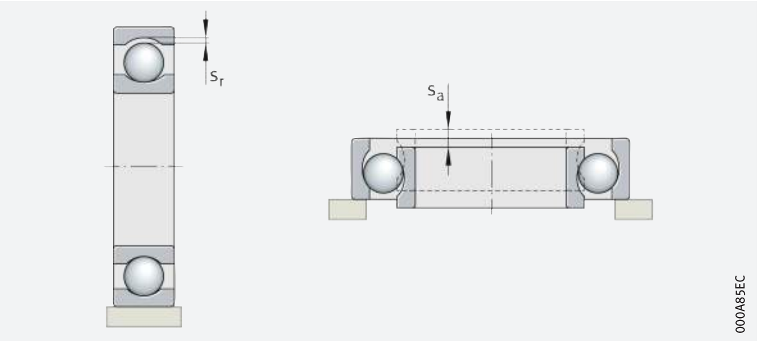
! A larger radial internal clearance should be used for shafts running at high speeds, since adequate thermal compensation between the bearing, shaft and housing does not occur in this situation. Δs_T can, in this case, be significantly higher in this case than for continuous operation.

7.6 Axial internal clearance

The axial internal clearance s_a is defined as the amount by which one bearing ring can be moved relative to the other, without load, along the bearing axis ➤106|13.

13
Axial internal clearance in comparison with radial internal clearance

s_a = *axial internal clearance*
s_r = *radial internal clearance*



Relationship between radial and axial internal clearance

With various bearing types, the radial internal clearance s_r and the axial internal clearance s_a are dependent on each other. Guide values for the correlation between radial and axial internal clearance are shown for some bearing types ➤106|3.

3
Correlation between axial internal clearance and radial internal clearance

Bearing type		Ratio between axial and radial internal clearance s_a/s_r
Self-aligning ball bearings		$2,3 \cdot Y_0$ [1]
Spherical roller bearings		$2,3 \cdot Y_0$ [1]
Tapered roller bearings	Single row, arranged in pairs	$4,6 \cdot Y_0$ [1]
	Matched pairs (N11CA)	$2,3 \cdot Y_0$ [1]
Angular contact ball bearings	Double row, series 32 and 33	1,4
	Double row, series 32..-B and 33..-B	2
Four point contact bearings		1,4

1) *Y_0 = axial load factor in accordance with product table.*

If the operating clearance is an important design criterion, please consult Schaeffler.

The calculation module BEARINX-online Shaft Calculation, which is available from Schaeffler free of charge, can be used to calculate and analyse the operating clearance.

Calculation example

Example: deep groove ball bearing 6008-C3

For deep groove ball bearings, the calculation of the axial internal clearance is shown in the following example:

Deep groove ball bearing		6008-C3
Bore diameter d		40 mm
Radial internal clearance before fitting		15 μm to 33 μm
Actual radial internal clearance		24 μm
Mounting tolerance	Shaft	k5
	Housing	J6
Reduction in radial internal clearance during fitting		14 μm
Radial internal clearance after fitting		24 μm – 14 μm = 10 μm
Ratio s_a/s_r ➤107|14		13

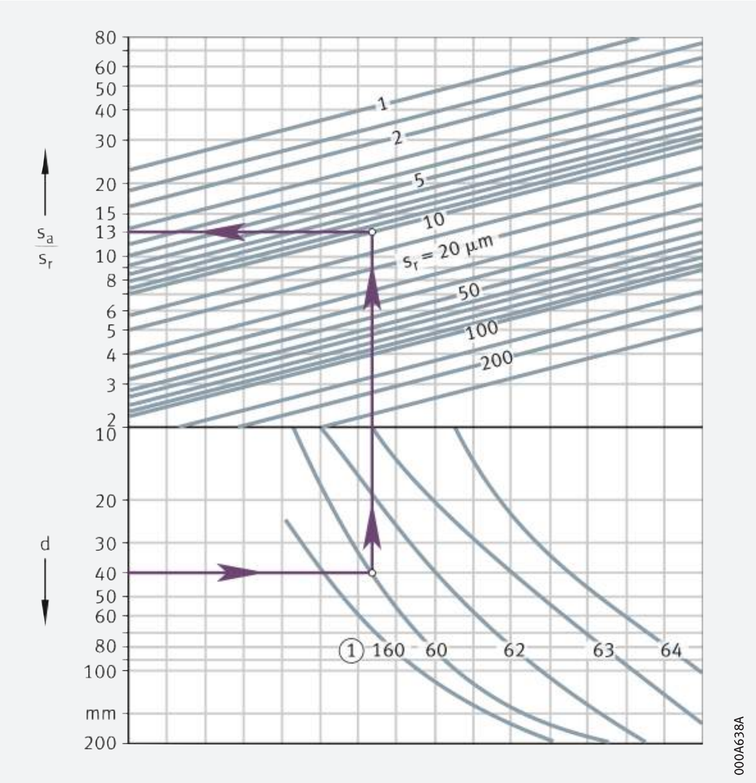
Axial internal clearance

$s_a = 13 \cdot 10\ \mu m = 130\ \mu m$.

14
Approximate calculation of the ratio of radial to axial internal clearance for deep groove ball bearings

s_a = *axial internal clearance*
s_r = *radial internal clearance*
d = *bearing bore diameter*

① *Bearing series*



7.7 Bearing materials

Standard steels

Schaeffler rolling bearings fulfil the requirements for fatigue strength, wear resistance, hardness, toughness and structural stability.
The material used for the rings and rolling elements is generally a low-alloy, through hardening chromium steel of high purity. For bearings subjected to considerable shock loads and reversed bending stresses, case hardening steel is also used (supplied by agreement). The results of research as well as practical experience confirm that bearings made from the steel currently used as standard can achieve their endurance limit if loads are not excessively high and the lubrication and cleanliness conditions are favourable.

High Nitrogen Steel

For the most challenging conditions

Through the use of special bearings made from HNS (High Nitrogen Steel, supplied by agreement), it is possible to achieve adequate service life even under the most challenging conditions (high temperatures, moisture, contamination).

High performance steels Cronidur and Cronitect

Steels for increased requirements

For increased performance requirements, highly corrosion-resistant, nitrogen-alloyed martensitic HNS steels are available, such as Cronidur and Cronitect.

In contrast to Cronidur, the more economical alternative Cronitect has nitrogen introduced into the structure by means of a surface layer hardening process.

Both steels are clearly superior to conventional corrosion-resistant steels for rolling bearings in terms of corrosion resistance and fatigue strength.

Ceramic materials

Hybrid bearings

Ceramic hybrid spindle bearings contain balls made from silicon nitride. These ceramic balls are substantially lighter than steel balls.
The centrifugal forces and friction are significantly lower.

Hybrid bearings allow very high speeds, even with grease lubrication, as well as long operating life and low operating temperatures.

Materials and bearing components

Suitable materials and their use in rolling bearing technology ➤ 108 | 4.

4 Materials and bearing components

Material	Bearing components (example)
Through hardening chromium steel – rolling bearing steel in accordance with ISO 683-17	Outer and inner ring, axial washer
HNS – High Nitrogen Steel	Outer and inner ring
Corrosion-resistant steel – rolling bearing steel in accordance with ISO 683-17	Outer and inner ring
Case hardening steel	For example, outer ring of yoke type track rollers
Flame or induction hardening steel	Roller stud of stud type track rollers
Steel strip to EN 10139, SAE J403	Outer ring for drawn cup needle roller bearings
Silicon nitride	Ceramic balls
Brass alloy	Cage
Aluminium alloy	Cage
Polyamide (thermoplastic)	Cage
NBR, FKM, TPU	Sealing ring

Corrosion protection by Corrotect

Rolling bearings are not resistant to corrosion by water or agents containing alkalis or acids but are often exposed to these corrosion-inducing agents. In these applications, corrosion protection is therefore a decisive factor in achieving a long operating life of the bearings.

In principle, corrosion-resistant steels to ISO 683-17 can be used. These bearings have the prefix S. For higher requirements, it may be advisable to use the high performance steels Cronidur and Cronitect.

Corrotect coating

✎ Special coatings

An extensive modular coating concept currently offers a wide range of surface improvements aimed at increasing the performance and rating life of bearing components. The "added value in the form of coatings" thus provided, is now established as a standard procedure for a wide variety of Schaeffler components.

✎ Various coating variants and coating thicknesses

Thin anti-corrosion coating systems of 0,5 μm – 3 μm and 2 μm – 5 μm are available for bearing applications. Various Corrotect variants with coating thicknesses > 5 μm also exist, which can be applied as necessary. The Corrotect coatings thus offer corrosion protection times – as a function of the coating variant and coating thickness – of ≧ 720 h against base metal corrosion (in accordance with DIN EN ISO 9227).

✎ Cr(VI)-free coatings

Systems are free from Cr(VI), provide effective protection against corrosion and, as result, extend the useful life of Schaeffler components. In isolated cases, the dimensional changes brought about by the coating must be taken into account in a further processing operation.

Detailed information on the modular coating concept and individual coating systems can be found in Technical Product Information ➤ *TPI 186* "Higher Performance Capacity Through the Use of Coatings". This publication can be requested from Schaeffler.

✎ Advantages of Corrotect thin coating

The advantages of the special coating Corrotect are all-round corrosion protection, including the turned surfaces of chamfers and radi ➤ *109* | *15*. It also gives long-term prevention of rust penetration beneath seals and smaller bright spots are protected against corrosion by the cathodic protection effect. In comparison with uncoated parts, operating life is significantly increased by the corrosion protection. There is no decrease in load carrying capacity (such as occurs in the use of corrosion-resistant steels). It is therefore theoretically possible to replace uncoated bearings by coated bearings of the same dimensions. However, it is advisable to check the suitability for the specific application in advance since, for example, abrasion may occur. During storage, there is no need to use organic preservatives.

Mounting of Corrotect-coated bearings

Before bearings with Corrotect coating are mounted, compatibility with the media should always be checked.

For lower press-in forces, the surface of the parts should be lightly greased, the tolerances are increased by the thickness of the coating.

15
Coated and uncoated part after a salt spray test

Test time 24 h in salt spray

(1) With Corrotect coating
(2) Uncoated

7.8 Cages

The functions of cages

Cage is a retainer with pockets for the rolling elements

Cage pockets, which are separated from each other by bars and are uniformly distributed around the circumference of the cage, maintain the spacing of the rolling elements relative to each other and ensure the distribution of load. In addition, the bars prevent sliding friction between adjacent rolling elements and guide the rolling elements parallel to the bearing axis in the load-free zone. In the case of cylindrical and needle roller bearings, they additionally prevent skewing of the rolling elements by guiding the rolling elements parallel to the bearing axis.

Cages ensure spacing between the rolling elements, even in the load-free zone

In the load-free zone, the rolling elements are no longer driven by the inner or outer ring. As a result, they fall behind relative to the direction of rotation of the rings. Cages ensure that the spacing between the rolling elements is maintained, even in the load-free zone.

Where bearings are separable and can be swivelled, the rolling elements cannot escape from the bearing

In the case of bearings that are separable and can be swivelled, such as tapered roller, spherical roller and some cylindrical roller bearings, cages prevent rolling elements from falling out of the bearing. The rolling element set and cage can thus be mounted and dismounted as a complete unit.

Sheet metal or solid cages

Sheet metal cages

Rolling bearing cages are subdivided into sheet metal and solid cages. The cages are predominantly made from steel and, for some bearings, from brass ➤111|Fig. 16. In comparison with solid cages made from metal, sheet metal cages are of lower mass. Since a sheet metal cage only fills a small proportion of the gap between the inner and outer ring, lubricant can easily reach the interior of the bearing and is held on the cage. In general, a sheet steel cage is only included in the bearing designation if it is not defined as a standard version of the bearing.

Solid cages

These cages are made from metal, laminated fabric or plastic ➤111|Fig. 17. They can be identified from the bearing designation.

Solid cages made from metal or laminated fabric

Solid cages made from metal are used where there are requirements for high cage strength and at high temperatures. Solid cages are also used if the cage must be guided on ribs. Rib-guided cages for bearings running at high speeds are made in many cases from light materials, such as light metal or laminated fabric, in order to achieve low inertia forces.

Solid cages made from polyamide PA66

Solid cages made from polyamide PA66 are produced using the injection moulding process ➤111|Fig. 18. As a result, cage types can generally be realised that allow designs with particularly high load carrying capacity. The elasticity and low mass of polyamide are favourable under shock type bearing loads, high accelerations and decelerations and tilting of the bearing rings in relation to each other. Polyamide cages have very good sliding and emergency running characteristics.

Cages made from glass fibre reinforced polyamide PA66 are suitable for continuous temperatures up to +120 °C. For higher operating temperatures, plastics such as PA46 or PEEK can be used.

! When using oil lubrication, additives in the oil can impair the cage operating life. Aged oil can also impair the cage operating life at high temperatures, so attention must be paid to compliance with the oil change intervals.

Cage designs

Proven cage designs ➤111|16 to ➤111|18.

16
Sheet steel cages

1. *Riveted cage for deep groove ball bearings*
2. *Window cage for needle roller bearings*
3. *Window cage for spherical roller bearings*

17
Solid brass cages

1. *Riveted solid cage for deep groove ball bearings*
2. *Window cage for angular contact ball bearings*
3. *Riveted cage with crosspiece rivets for cylindrical roller bearings*

18
Solid cages made from glass fibre reinforced polyamide

1. *Window cage for single row angular contact ball bearings*
2. *Window cage for cylindrical roller bearings*
3. *Window cage for needle roller bearings*

Guidance of cages

The cages are guided by rolling elements or ribs

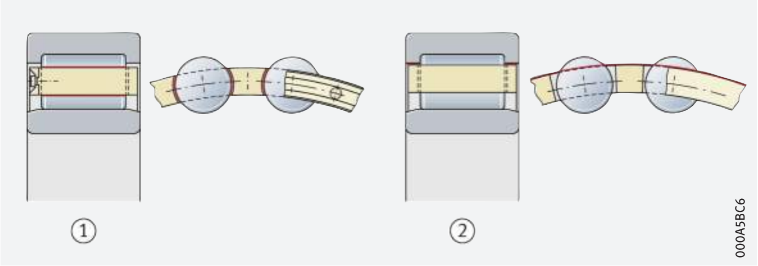
A further means of distinguishing between cages is their guidance method ➤112|19. Most cages are guided by the rolling elements and do not have a suffix for the guidance method. If guidance is by the bearing outer ring, the suffix A is used. Cages that are guided on the inner ring have the suffix B.

Standard cages are suitable under normal operating conditions

Under normal operating conditions, the cage design defined as the standard cage is generally suitable. Standard cages, which may differ within a bearing series according to the bearing size, are described in the product chapters. Under special operating conditions, a cage that is suitable for the specific conditions must be selected.

19
Guidance of cages

① *Guided by rolling elements*
② *Guided by ribs*



7.9 Operating temperature

Standard rolling bearings can be used up to +120 °C

Rolling bearings are heat treated such that, depending on the bearing type, they are generally dimensionally stable up to +120 °C (certain bearings up to +150 °C). Operating temperatures above +150 °C require special heat treatment. Bearings treated in this way are available by agreement and are identified by the suffix S1, S2, S3 or S4 to DIN 623-1 ➤112|5.

!

Above S1, there is a reduction in hardness that must be taken into consideration in the rating life calculation.

5
Operating temperature and suffixes for dimensionally stabilised bearings

Maximum operating temperature °C	Suffix for dimensionally stabilised bearings
+120	SN1) (suffix SN not stated)
+150	S01)
+150	S0B2) (suffix B not stated)
+200	S11)
+250	S21)
+300	S31)
+350	S41)

1) *Inner ring and outer ring stabilised for stated operating temperature*
2) *Inner ring stabilised up to +150 °C*

Track rollers

Normal operating temperature = +70 °C

An operating temperature of +70 °C is regarded as a normal operating temperature. Further temperature data in the product descriptions must be observed.

Sealed bearings

✎ Temperature limits

The permissible temperature for sealed bearings is dependent on the requirements for the operating life of the grease filling and on the action of the contact seals. Sealed bearings are greased with specially tested, high performance, high quality greases. These greases can withstand +120 °C for short periods. At or above continuous temperatures of +70 °C, a reduction in the operating life of standard greases with a lithium soap base must be expected.

✎ Special greases are often required for high temperatures

In many cases, adequate operating life values are only achieved at high temperatures through the use of special greases. In these cases, it must also be checked whether seals made from especially heat-resistant materials must be used. The operating limit of normal contact seals is +100 °C.

! If high temperature synthetic materials are used for seals and greases, it must be noted that the particularly high performance materials containing fluoride may give off harmful gases and vapours when heated to approx. +300 °C and above. This may occur, for example, if a welding torch is used in the dismounting of a bearing.

✎ Observe safety data sheets at high temperatures

High temperatures are critical especially in the case of seals made from fluoro rubber (FKM, FPM, e. g. Viton®) or greases containing fluoride, such as the rolling bearing greases Arcanol TEMP200 and greases to GA11. If high temperatures are unavoidable, attention must be paid to the valid safety data sheet for the specific fluoride-containing material, which can be obtained upon request.

7.10 Dimensional and running tolerances

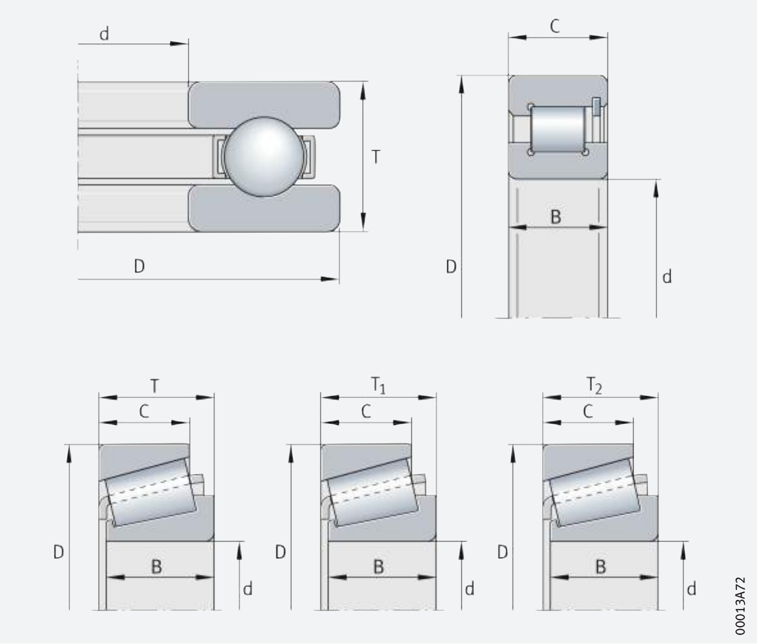
DIN ISO

International standards are usually valid for the main dimensions and running accuracy of rolling bearings. Unless specified otherwise, the tolerances for radial rolling bearings correspond to ISO 492:2014 and, for axial rolling bearings, to ISO 199:2014. Information on which bearings are supplied with which tolerances is provided in the relevant product chapters.

Main dimensions

Main dimensions of bearings ➤ *114* | *20*.

20
Main dimensions of bearings



Accuracy (tolerance classes)

Tolerance class Normal

The dimensional and running accuracy of rolling bearings corresponds to tolerance class Normal. For bearings with increased accuracy, the tolerances are restricted to values in the classes 6, 5, 4 and 2. Tolerance tables for the individual tolerance classes ➤ *122* | *8* to ➤ *135* | *28*.

Super precision bearings

In addition to the standardised tolerance classes, super precision bearings are also produced to the tolerance classes P4S, SP and UP. These tolerances are listed in the relevant product descriptions.

Tolerance symbols, toleranced characteristics, deviations for radial and axial rolling bearings

!

The following restrictions apply to the stated specification modifiers in ➤ *115* | *6* and ➤ *120* | *7*:

- The specification modifier (LP) is not indicated on a drawing if the two-point size is defined as the default specification.
- The specification modifier (GN) is not suitable for cases where there is no material with mating contact, for example the outer ring of a tapered roller bearing with significant edge rounding on the back face and small front face. Solutions must be developed within the framework of the GPS system and taken into consideration in the future.

Table 6

Symbols for nominal dimensions, characteristics and specification modifiers for radial rolling bearings in accordance with ISO 492:2014

Symbol for nominal dimension[1)2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for radial bearings In accordance with ISO 492:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1: 2000
		Width	
B	–	Nominal inner ring width	Nominal inner ring width
$t_{\Delta Bs}$	(LP)	**Symmetrical rings** Deviation of a two-point size of inner ring width from its nominal size ΔBs = Bs – B Bs = single two-point size of inner ring width	Deviation of a single inner ring width
	(GN) ALS ⟨═⟩ (LP)	**Asymmetrical rings, upper limit** Deviation of a minimum circumscribed size of inner ring width, between two opposite lines, in any longitudinal section which includes the inner ring bore axis, from its nominal size	
		Asymmetrical rings, lower limit Deviation of a two-point size of inner ring width from its nominal size	
t_{VBs}	(LP)(SR)	**Symmetrical rings** Range of two-point sizes of inner ring width VBs = Bs max – Bs min	Variation of inner ring width
	(GN) ALS (SR) ⟨═⟩	**Asymmetrical rings** Range of minimum circumscribed sizes of inner ring width, between two opposite lines, obtained from any longitudinal section which includes the inner ring bore axis	
C	–	Nominal outer ring width	Nominal outer ring width
$t_{\Delta Cs}$	(LP)	**Symmetrical rings** Deviation of a two-point size of outer ring width from its nominal size ΔCs = Cs – C Cs = single two-point size of inner ring width	Deviation of a single outer ring width
	(GN) ALS ⟨═⟩ (LP)	**Asymmetrical rings, upper limit** Deviation of a minimum circumscribed size of outer ring width, between two opposite lines, in any longitudinal section which includes the outer ring outside surface axis, from its nominal size	
		Asymmetrical rings, lower limit Deviation of a two-point size of outer ring width from its nominal size	

continued ▼

1) Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.

2) Symbols in accordance with ISO 15241 (exception: font).

6

Symbols for nominal dimensions, characteristics and specification modifiers for radial rolling bearings in accordance with ISO 492:2014

Symbol for nominal dimension[1) 2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for radial bearings In accordance with ISO 492:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1: 2000
t_{VCs}	(LP)(SR)	**Symmetrical rings** Range of two-point sizes of outer ring width VCs = Cs max – Cs min	Variation of outer ring width
	(GN) ALS (SR)	**Asymmetrical rings** Range of minimum circumscribed sizes of outer ring width, between two opposite lines, obtained from any longitudinal section which includes the outer ring outside surface axis	
C_1	–	Nominal outer ring flange width	Nominal outer ring flange width
$t_{\Delta C1s}$	(LP)	Deviation of a two-point size of outer ring flange width from its nominal size	Deviation of a single outer ring flange width
t_{VC1s}	(LP)(SR)	Range of two-point sizes of outer ring flange width VC1s = C1s max – C1s min	Variation of outer ring flange width
		Diameter	
d	–	Nominal bore diameter of a cylindrical bore or at the theoretical small end of a tapered bore	Nominal bore diameter
$t_{\Delta ds}$	(LP)	Deviation of a two-point size of bore diameter from its nominal size Δds = ds – d	Deviation of a single bore diameter
t_{Vdsp}	(LP)(SR) ACS	Range of two-point sizes of bore diameter in any cross-section of a cylindrical or tapered bore Vdsp = ds max – ds min	Variation of bore diameter in a single plane
$t_{\Delta dmp}$	(LP)(SD) ACS	**Cylindrical bore** Deviation of a mid-range size (out of two-point sizes) of bore diameter in any cross-section from its nominal size dmp = (d max + d min)/2 Δdmp = dmp – d	Deviation of mean bore diameter in a single plane
	(LP)(SD) SCS	**Tapered bore** Deviation of a mid-range size (out of two-point sizes) of bore diameter at the theoretical small end of a tapered bore from its nominal size	

continued ▲▼

1) *Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.*

2) *Symbols in accordance with ISO 15241 (exception: font).*

6 Symbols for nominal dimensions, characteristics and specification modifiers for radial rolling bearings in accordance with ISO 492:2014

Symbol for nominal dimension[1) 2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for radial bearings In accordance with ISO 492:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1: 2000
t_{Vdmp}	(LP)(SD)ACS(SR)	Range of mid-range sizes (out of two-point sizes) of bore diameter obtained from any cross-section of a cylindrical bore Vdmp = dmp max – dmp min	Variation of mean bore diameter
d_1	–	Nominal diameter at the theoretical large end of a tapered bore	–
$t_{\Delta d1mp}$	(LP)(SD)SCS	Deviation of a mid-range size (out of two-point sizes) of bore diameter at the theoretical large end of a tapered bore from its nominal size	–
D	–	Nominal outside diameter	Nominal outside diameter
$t_{\Delta Ds}$	(LP)	Deviation of a two-point size of outside diameter from its nominal size	Deviation of a single outside diameter
t_{VDsp}	(LP)(SR)ACS	Range of two-point sizes of outside diameter in any cross-section	Variation of outside diameter in a single plane
$t_{\Delta Dmp}$	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of outside diameter in any cross-section from its nominal size Dmp = (D max + D min)/2 ΔDmp = Dmp – D	Deviation of mean outside diameter in a single plane
t_{VDmp}	(LP)(SD)ACS(SR)	Range of mid-range sizes (out of two-point sizes) of outside diameter obtained from any cross-section VDmp = Dmp max – Dmp min	Variation of mean outside diameter
D_1	–	Nominal outside diameter of outer ring flange	–
$t_{\Delta D1s}$	(LP)	Deviation of a two-point size of outside diameter of outer ring flange from its nominal size	–

continued ▲▼

1) Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.

2) Symbols in accordance with ISO 15241 (exception: font).

Table 6

Symbols for nominal dimensions, characteristics and specification modifiers for radial rolling bearings in accordance with ISO 492:2014

Symbol for nominal dimension[1) 2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for radial bearings In accordance with ISO 492:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1:2000
		Running accuracy	
t_{Kea}	↗ [3)]	Circular radial run-out of outer ring outside surface of assembled bearing with respect to datum, i. e. axis, established from the inner ring bore surface	Radial run-out of outer ring of assembled bearing
t_{Kia}	↗ [3)]	Circular radial run-out of inner ring bore surface of assembled bearing with respect to datum, i. e. axis, established from the outer ring outside surface	Radial run-out of inner ring of assembled bearing
t_{Sd}	↗ [3)]	Circular axial run-out of inner ring face with respect to datum, i. e. axis, established from the inner ring bore surface	Perpendicularity of inner ring face with respect to the bore
t_{SD}	⊥	Perpendicularity of outer ring outside surface axis with respect to datum established from the outer ring face	Perpendicularity of outer ring outside surface with respect to the face
t_{SD1}	⊥	Perpendicularity of outer ring outside surface axis with respect to datum established from the outer ring flange back face	Perpendicularity of outer ring outside surface with respect to the flange back face
t_{Sea}	↗ [3)]	Circular axial run-out of outer ring face of assembled bearing with respect to datum, i. e. axis, established from the inner ring bore surface	Axial run-out of outer ring of assembled bearing
t_{Sea1}	↗ [3)]	Circular axial run-out of outer ring flange back face of assembled bearing with respect to datum, i. e. axis, established from the inner ring bore surface	Axial run-out of outer ring flange back face of assembled bearing
t_{Sia}	↗ [3)]	Circular axial run-out of inner ring face of assembled bearing with respect to datum, i. e. axis, established from the outer ring outside surface	Axial run-out of inner ring of assembled bearing
		Tapered bore	
SL	–	Taper slope: Taper slope is the difference between nominal diameters at the theoretical large end and small end of a tapered bore $SL = d_1 - d$ SL = spacing	–
$t_{\Delta SL}$	–	Deviation of taper slope of a tapered inner ring bore from its nominal size (description based on DIN EN ISO 1119) $\Delta SL = \Delta d1mp - \Delta dmp$	–
α	–	Frustum angle of tapered inner ring bore	–

continued ▲▼

1) *Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.*

2) *Symbols in accordance with ISO 15241 (exception: font).*

3) *Specification modifiers for the direction of action of the mass, as well as fixed and movable parts necessary in accordance with ISO/TS 17863.*

6
Symbols for nominal dimensions, characteristics and specification modifiers for radial rolling bearings in accordance with ISO 492:2014

Symbol for nominal dimension[1) 2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for radial bearings In accordance with ISO 492:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1:2000
		Width of assembled bearing	
T	–	Nominal assembled bearing width	Nominal bearing width
$t_{\Delta Ts}$	(GN) [3)]	Deviation of minimum circumscribed size of assembled bearing width from its nominal size	Deviation of the actual bearing width
$\mathbf{T_1}$	–	Nominal effective width of inner subunit assembled with a master outer ring	Nominal effective width of inner subunit
$t_{\Delta T1s}$	(GN) [3)]	Deviation of minimum circumscribed size of effective width (inner subunit assembled with a master outer ring) from its nominal size	Deviation of the actual effective width of inner subunit
$\mathbf{T_2}$	–	Nominal effective width of outer ring assembled with a master inner subunit	Nominal effective width of outer ring
$t_{\Delta T2s}$	(GN) [3)]	Deviation of minimum circumscribed size of effective width (outer ring assembled with a master inner subunit) from its nominal size	Deviation of the actual effective width of outer ring
$\mathbf{T_F}$	–	Nominal assembled flanged bearing width	–
$t_{\Delta TFs}$	(GN) [3)]	Deviation of minimum circumscribed size of assembled flange bearing width from its nominal size	–
$\mathbf{T_{F2}}$	–	Nominal effective width of flanged outer ring assembled with a master inner subunit	–
$t_{\Delta TF2s}$	(GN) [3)]	Deviation of minimum circumscribed size of effective width (flanged outer ring assembled with a master inner subunit) from its nominal size	–

continued ▲

1) Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.
2) Symbols in accordance with ISO 15241 (exception: font).
3) Specification modifiers for the direction of action of the mass, as well as fixed and movable parts necessary in accordance with ISO/TS 17863.

7

Symbols for nominal dimensions, characteristics and specification modifiers for axial rolling bearings in accordance with ISO 199:2014

Symbol for nominal dimension[1) 2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for axial bearings In accordance with ISO 199:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1:2000
		Diameter	
d	–	Nominal bore diameter of shaft washer, single-direction bearing	Nominal bore diameter of shaft washer
$t_{\Delta dmp}$	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of shaft washer bore diameter in any cross-section from its nominal size dmp = (d max + d min)/2 Δdmp = dmp – d	Deviation of mean bore diameter in a single plane
t_{Vdsp}	(LP)(SR)ACS	Range of two-point sizes of shaft washer bore diameter in any cross-section Vdsp = ds max – ds min	Variation of bore diameter in a single plane
$\mathbf{d_2}$	–	Nominal bore diameter of central shaft washer, double-direction bearing	–
$t_{\Delta d2mp}$	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of central shaft washer bore diameter in any cross-section from its nominal size d2mp = (d2 max + d2 min)/2	–
t_{Vd2sp}	(LP)(SR)ACS	Range of two-point sizes of central shaft washer bore diameter in any cross-section	Variation of bore diameter in a single plane
D	–	Nominal outside diameter of housing washer	Nominal outside diameter of bore (housing washer)
$t_{\Delta Dmp}$	(LP)(SD)ACS	Deviation of a mid-range size (out of two-point sizes) of housing washer outside diameter in any cross-section from its nominal size Dmp = (D max + D min)/2 ΔDmp = Dmp – D	Deviation of mean outside diameter in a single plane
t_{VDsp}	(LP)(SR)ACS	Range of two-point sizes of housing washer outside diameter in any cross-section VDsp = Ds max – Ds min	Variation of outside diameter in a single plane

continued ▼

1) *Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.*

2) *Symbols in accordance with ISO 1101 and ISO 14405-1.*

7

Symbols for nominal dimensions, characteristics and specification modifiers for axial rolling bearings in accordance with ISO 199:2014

Symbol for nominal dimension[1)2)] Tolerance symbol for characteristic[2)]	GPS symbol and specification modifier Symbols in accordance with ISO 1101 and ISO 14405-1	Description for axial bearings In accordance with ISO 199:2014 (based on ISO 1101, ISO 5459 and ISO 14405-1)	Old term In accordance with ISO 1132-1: 2000
		Height	
T	–	Nominal assembled bearing height, single-direction bearing	Nominal bearing height
$t_{\Delta Ts}$	(GN) [3)]	Deviation of minimum circumscribed size of assembled bearing height from its nominal size, single-direction bearing	Deviation of the actual bearing height
$\mathbf{T_1}$	–	Nominal assembled bearing height, double-direction bearing	–
$t_{\Delta T1s}$	(GN) [3)]	Deviation of minimum circumscribed size of assembled bearing height from its nominal size, double-direction bearing	–
t_{Se}[4)]	(LP)(SR)	**Axial cylindrical roller bearings** Range of two-point sizes of thickness between housing washer raceway and the back face	Variation in thickness between housing washer raceway and back face
	(LS)(SN)ALS(SR)	**Axial ball bearings** Range of minimum spherical sizes between the raceway and the opposite back face of the housing washer, obtained from any longitudinal section which includes the housing washer outside surface axis	
t_{Si}[4)]	(LP)(SR)	**Axial cylindrical roller bearings** Range of two-point sizes of thickness between shaft washer raceway and the back face	Variation in thickness between shaft washer raceway and back face
	(LS)(SN)ALS(SR)	**Axial ball bearings** Range of minimum spherical sizes between the raceway and the opposite back face of the shaft washer, obtained from any longitudinal section which includes the shaft washer bore axis	

continued ▲

1) Symbols for the nominal dimension are printed in bold; they indicate size dimensions and spacings.

2) Symbols in accordance with ISO 1101 and ISO 14405-1.

3) Specification modifiers for the direction of action of the mass in accordance with ISO/TS 17863.

4) Valid only for axial ball bearings and axial cylindrical roller bearings with a 90° contact angle.

Radial bearings, excluding tapered roller bearings

Table 8
Tolerance class Normal, inner ring

Tolerance symbols in accordance with ISO 492 ➤115 | Table 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} µm max. Diameter series			t_{Vdmp} µm	Radial runout t_{Kia} µm
over	incl.	U	L	9	0, 1	2, 3, 4	max.	max.
–	2,5	0	–8	10	8	6	6	10
2,5	10	0	–8	10	8	6	6	10
10	18	0	–8	10	8	6	6	10
18	30	0	–10	13	10	8	8	13
30	50	0	–12	15	12	9	9	15
50	80	0	–15	19	19	11	11	20
80	120	0	–20	25	25	15	15	25
120	180	0	–25	31	31	19	19	30
180	250	0	–30	38	38	23	23	40
250	315	0	–35	44	44	26	26	50
315	400	0	–40	50	50	30	30	60
400	500	0	–45	56	56	34	34	65
500	630	0	–50	63	63	38	38	70
630	800	0	–75	–	–	–	–	80
800	1 000	0	–100	–	–	–	–	90
1 000	1 250	0	–125	–	–	–	–	100
1 250	1 600	0	–160	–	–	–	–	120
1 600	2 000	0	–200	–	–	–	–	140

Table 9
Tolerance class Normal, inner ring width tolerances

Tolerance symbols in accordance with ISO 492 ➤115 | Table 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Deviation of inner ring width $t_{\Delta Bs}$ µm			Variation of inner ring width t_{VBs} µm
		All	Normal	Modified[1)]	
over	incl.	U	L	L	max.
–	2,5	0	–40	–	12
2,5	10	0	–120	–250	15
10	18	0	–120	–250	20
18	30	0	–120	–250	20
30	50	0	–120	–250	20
50	80	0	–150	–380	25
80	120	0	–200	–380	25
120	180	0	–250	–500	30
180	250	0	–300	–500	30
250	315	0	–350	–500	35
315	400	0	–400	–630	40
400	500	0	–450	–	50
500	630	0	–500	–	60
630	800	0	–750	–	70
800	1 000	0	–1 000	–	80
1 000	1 250	0	–1 250	–	100
1 250	1 600	0	–1 600	–	120
1 600	2 000	0	–2 000	–	140

1) *Only for bearings manufactured specifically for use as matched pairs, with the exception of deep groove ball bearings.*

10
Tolerance class Normal, outer ring[1)]

Tolerance symbols in accordance with ISO 492 ➤115 | 6

U = *upper limit deviation*

L = *lower limit deviation*

Nominal size of outside diameter		Deviation of outside diameter		Variation					Radial runout
D		$t_{\Delta Dmp}$		t_{VDsp} µm max.				t_{VDmp}[2)]	t_{Kea}
				Open bearings			Bearings with sealing shields or sealing washers		
mm		µm		Diameter series				µm	µm
over	incl.	U	L	9	0, 1	2, 3, 4		max.	max.
–	6	0	−8	10	8	6	10	6	15
6	18	0	−8	10	8	6	10	6	15
18	30	0	−9	12	9	7	12	7	15
30	50	0	−11	14	11	8	16	8	20
50	80	0	−13	16	13	10	20	10	25
80	120	0	−15	19	19	11	26	11	35
120	150	0	−18	23	23	14	30	14	40
150	180	0	−25	31	31	19	38	19	45
180	250	0	−30	38	38	23	–	23	50
250	315	0	−35	44	44	26	–	26	60
315	400	0	−40	50	50	30	–	30	70
400	500	0	−45	56	56	34	–	34	80
500	630	0	−50	63	63	38	–	38	100
630	800	0	−75	94	94	55	–	55	120
800	1 000	0	−100	125	125	75	–	75	140
1 000	1 250	0	−125	–	–	–	–	–	160
1 250	1 600	0	−160	–	–	–	–	–	190
1 600	2 000	0	−200	–	–	–	–	–	220
2 000	2 500	0	−250	–	–	–	–	–	250

1) *$t_{\Delta Cs}$, $t_{\Delta C1s}$, t_{VCs} and t_{VC1s} are identical to $t_{\Delta Bs}$ and t_{VBs} for the inner ring of the corresponding bearing* ➤122 | 9

2) *Applies before assembly of the bearing and after removal of internal and/or external snap rings.*

Radial bearings, excluding tapered roller bearings

Table 11
Tolerance class 6, inner ring

Tolerance symbols in accordance with ISO 492 ➤ 115 | Table 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} µm max. Diameter series			t_{Vdmp} µm	Radial runout t_{Kia} µm
over	incl.	U	L	9	0, 1	2, 3, 4	max.	max.
–	2,5	0	–7	9	7	5	5	5
2,5	10	0	–7	9	7	5	5	6
10	18	0	–7	9	7	5	5	7
18	30	0	–8	10	8	6	6	8
30	50	0	–10	13	10	8	8	10
50	80	0	–12	15	15	9	9	10
80	120	0	–15	19	19	11	11	13
120	180	0	–18	23	23	14	14	18
180	250	0	–22	28	28	17	17	20
250	315	0	–25	31	31	19	19	25
315	400	0	–30	38	38	23	23	30
400	500	0	–35	44	44	26	26	35
500	630	0	–40	50	50	30	30	40

Table 12
Tolerance class 6, inner ring width tolerances

Tolerance symbols in accordance with ISO 492 ➤ 115 | Table 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Deviation of inner ring width $t_{\Delta Bs}$ µm All	Normal	Modified[1]	Variation of inner ring width t_{VBs} µm
over	incl.	U	L	L	max.
–	2,5	0	–40	–	12
2,5	10	0	–120	–250	15
10	18	0	–120	–250	20
18	30	0	–120	–250	20
30	50	0	–120	–250	20
50	80	0	–150	–380	25
80	120	0	–200	–380	25
120	180	0	–250	–550	30
180	250	0	–300	–500	30
250	315	0	–350	–500	35
315	400	0	–400	–630	40
400	500	0	–450	–	45
500	630	0	–500	–	50

[1] *Only for bearings manufactured specifically for use as matched pairs, with the exception of deep groove ball bearings.*

13
Tolerance class 6, outer ring[1)]

Tolerance symbols in accordance with ISO 492 ➤115 | 6

U = *upper limit deviation*

L = *lower limit deviation*

Nominal size of outside diameter		Deviation of outside diameter		Variation					Radial runout
D		$t_{\Delta Dmp}$		t_{VDsp} µm max.				t_{VDmp} [2)]	t_{Kea}
				Open bearings			Bearings with sealing shields or sealing washers		
mm		µm		Diameter series				µm	µm
over	incl.	U	L	9	0, 1	2, 3, 4		max.	max.
–	6	0	−7	9	7	5	9	5	8
6	18	0	−7	9	7	5	9	5	8
18	30	0	−8	10	8	6	10	6	9
30	50	0	−9	11	9	7	13	7	10
50	80	0	−11	14	11	8	16	8	13
80	120	0	−13	16	16	10	20	10	18
120	150	0	−15	19	19	11	25	11	20
150	180	0	−18	23	23	14	30	14	23
180	250	0	−20	25	25	15	–	15	25
250	315	0	−25	31	31	19	–	19	30
315	400	0	−28	35	35	21	–	21	35
400	500	0	−33	41	41	25	–	25	40
500	630	0	−38	48	48	29	–	29	50
630	800	0	−45	56	56	34	–	34	60
800	1 000	0	−60	75	75	45	–	45	75

1) *$t_{\Delta Cs}$, $t_{\Delta C1s}$, t_{VCs} and t_{VC1s} are identical to $t_{\Delta Bs}$ and t_{VBs} for the inner ring of the corresponding bearing* ➤124 | 12

2) *Applies before assembly of the bearing and after removal of internal and/or external snap rings.*

Radial bearings, excluding tapered roller bearings

14
Tolerance class 5, inner ring

Tolerance symbols in accordance with ISO 492 ➤ 115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Variation			Radial runout t_{Kia} µm	Axial runout t_{Sd} µm
				t_{Vdsp} µm max. Diameter series		t_{Vdmp} µm		
over	incl.	U	L	9	0, 1, 2, 3, 4	max.	max.	max.
–	2,5	0	–5	5	4	3	4	7
2,5	10	0	–5	5	4	3	4	7
10	18	0	–5	5	4	3	4	7
18	30	0	–6	6	5	3	4	8
30	50	0	–8	8	6	4	5	8
50	80	0	–9	9	7	5	5	8
80	120	0	–10	10	8	5	6	9
120	180	0	–13	13	10	7	8	10
180	250	0	–15	15	12	8	10	11
250	315	0	–18	18	14	9	13	13
315	400	0	–23	23	18	12	15	15

15
Tolerance class 5, width tolerances, inner ring

Tolerance symbols in accordance with ISO 492 ➤ 115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Deviation of inner ring width $t_{\Delta Bs}$ µm			Variation of inner ring width t_{VBs} µm	Axial runout of lateral inner ring face t_{Sia} 1) µm
		All	Normal	Modified 2)		
over	incl.	U	L	L	max.	max.
–	2,5	0	–40	–250	5	7
2,5	10	0	–40	–250	5	7
10	18	0	–80	–250	5	7
18	30	0	–120	–250	5	8
30	50	0	–120	–250	5	8
50	80	0	–150	–250	6	8
80	120	0	–200	–380	7	9
120	180	0	–250	–380	8	10
180	250	0	–300	–500	10	13
250	315	0	–350	–500	13	15
315	400	0	–400	–630	15	20

1) *Only for deep groove and angular contact ball bearings.*
2) *Only for bearings manufactured specifically for use as matched pairs, with the exception of deep groove ball bearings.*

16
Tolerance class 5, outer ring[1)]

Tolerance symbols in accordance with ISO 492 ➤115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal size of outside diameter		Deviation of outside diameter		Variation				Radial runout	Perpen-dicular-ity	Axial runout
D		$t_{\Delta Dmp}$		t_{VDsp} [2)] µm max.		t_{VDmp} [3)]	t_{VCs}	t_{Kea}	t_{SD}	t_{Sea} [4)]
mm		µm		Diameter series		µm	µm	µm	µm	µm
over	incl.	U	L	9	0, 1, 2, 3, 4	max.	max.	max.	max.	max.
–	6	0	–5	5	4	3	5	5	4	8
6	18	0	–5	5	4	3	5	5	4	8
18	30	0	–6	6	5	3	5	6	4	8
30	50	0	–7	7	5	4	5	7	4	8
50	80	0	–9	9	7	5	6	8	4	10
80	120	0	–10	10	8	5	8	10	4,5	11
120	150	0	–11	11	8	6	8	11	5	13
150	180	0	–13	13	10	7	8	13	5	14
180	250	0	–15	15	11	8	10	15	5,5	15
250	315	0	–18	18	14	9	11	18	6,5	18
315	400	0	–20	20	15	10	13	20	6,5	20
400	500	0	–23	23	17	12	15	23	7,5	23
500	630	0	–28	28	21	14	18	25	9	25
630	800	0	–35	35	26	18	20	30	10	30

1) *$t_{\Delta Cs}$ is identical to $t_{\Delta Bs}$ for the inner ring of the corresponding bearing ➤126 | 15*
2) *No values are given for radial ball bearings with sealing shields or sealing washers.*
3) *Applies before assembly of the bearing and after removal of internal and/or external snap rings.*
4) *Only for deep groove and angular contact ball bearings.*

Radial bearings, excluding tapered roller bearings

17
Tolerance class 4, inner ring

Tolerance symbols in accordance with ISO 492 ➤115|6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d		Bore deviation $t_{\Delta dmp}$ µm		Deviation of a single bore diameter $t_{\Delta ds}$ µm		Variation t_{Vdsp} µm		Variation t_{Vdmp}	Radial runout t_{Kia}
		Diameter series							
mm		9		0, 1, 2, 3, 4		9	0, 1, 2, 3, 4	µm	µm
over	incl.	U	L	U	L	max.	max.	max.	max.
–	2,5	0	–4	0	–4	4	3	2	2,5
2,5	10	0	–4	0	–4	4	3	2	2,5
10	18	0	–4	0	–4	4	3	2	2,5
18	30	0	–5	0	–5	5	4	2,5	3
30	50	0	–6	0	–6	6	5	3	4
50	80	0	–7	0	–7	7	5	3,5	4
80	120	0	–8	0	–8	8	6	4	5
120	180	0	–10	0	–10	10	8	5	6
180	250	0	–12	0	–12	12	9	6	8

18
Tolerance class 4, width tolerances, inner ring

Tolerance symbols in accordance with ISO 492 ➤115|6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d		Deviation of inner ring width $t_{\Delta Bs}$ µm			Variation of inner ring width t_{VBs}	Axial runout t_{Sia} [1]	Axial runout t_{Sd}
mm		All	Normal	Modified[2]	µm	µm	µm
over	incl.	U	L	L	max.	max.	max.
–	2,5	0	–40	–250	2,5	3	3
2,5	10	0	–40	–250	2,5	3	3
10	18	0	–80	–250	2,5	3	3
18	30	0	–120	–250	2,5	4	4
30	50	0	–120	–250	3	4	4
50	80	0	–150	–250	4	5	5
80	120	0	–200	–380	4	5	5
120	180	0	–250	–380	5	7	6
180	250	0	–300	–500	6	8	7

[1] *Only for deep groove and angular contact ball bearings.*
[2] *Only for bearings manufactured specifically for use as matched pairs, with the exception of deep groove ball bearings.*

19 Tolerance class 4, outer ring

Tolerance symbols in accordance with ISO 492 ➤115 | 6

U = upper limit deviation

L = lower limit deviation

Nominal size of outside diameter		Deviation of outside diameter		Deviation of a single outside diameter		Variation			Radial runout
D		$t_{\Delta Dmp}$ µm		$t_{\Delta Ds}$ µm		t_{VDsp}[1)] µm max.		t_{VDmp}	t_{Kea}
		Diameter series							
mm		9		0, 1, 2, 3, 4		9	0, 1, 2, 3, 4	µm	µm
over	incl.	U	L	U	L			max.	max.
–	6	0	–4	0	–4	4	3	2	3
6	18	0	–4	0	–4	4	3	2	3
18	30	0	–5	0	–5	5	4	2,5	4
30	50	0	–6	0	–6	6	5	3	5
50	80	0	–7	0	–7	7	5	3,5	5
80	120	0	–8	0	–8	8	6	4	6
120	150	0	–9	0	–9	9	7	5	7
150	180	0	–10	0	–10	10	8	5	8
180	250	0	–11	0	–11	11	8	6	10
250	315	0	–13	0	–13	13	10	7	11
315	400	0	–15	0	–15	15	11	8	13

continued ▼

1) *No values are given for bearings with sealing shields or sealing washers.*

19 Tolerance class 4, outer ring

Nominal size of outside diameter		Perpendicularity	Axial runout	Deviation of a single outer ring width	Variation of outer ring width
D		t_{SD} t_{SD1}	t_{Sea}[1)]	$t_{\Delta Cs}$	t_{VCs}
mm		µm	µm	µm	µm
over	incl.	max.	max.		max.
–	6	2	5	$t_{\Delta Cs}$ is identical to $t_{\Delta Bs}$ for the inner ring of the corresponding bearing ➤128 | 18	2,5
6	18	2	5		2,5
18	30	2	5		2,5
30	50	2	5		2,5
50	80	2	5		3
80	120	2,5	6		4
120	150	2,5	7		5
150	180	2,5	8		5
180	250	3,5	10		7
250	315	4	10		7
315	400	5	13		8

continued ▲

1) *Only for deep groove and angular contact ball bearings.*

Radial bearings, excluding tapered roller bearings

20
Tolerance class 2, inner ring

Tolerance symbols in accordance with ISO 492 ➤115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Deviation of a single bore diameter $t_{\Delta ds}$ µm		Variation		Radial runout
		Diameter series				t_{Vdsp}	t_{Vdmp}	t_{Kia}
		9		0, 1, 2, 3, 4		µm	µm	µm
over	incl.	U	L	U	L	max.	max.	max.
–	2,5	0	–2,5	0	–2,5	2,5	1,5	1,5
2,5	10	0	–2,5	0	–2,5	2,5	1,5	1,5
10	18	0	–2,5	0	–2,5	2,5	1,5	1,5
18	30	0	–2,5	0	–2,5	2,5	1,5	2,5
30	50	0	–2,5	0	–2,5	2,5	1,5	2,5
50	80	0	–4	0	–4	4	2	2,5
80	120	0	–5	0	–5	5	2,5	2,5
120	150	0	–7	0	–7	7	3,5	2,5
150	180	0	–7	0	–7	7	3,5	5
180	250	0	–8	0	–8	8	4	5

21
Tolerance class 2, width tolerances, inner ring

Tolerance symbols in accordance with ISO 492 ➤115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Deviation of inner ring width $t_{\Delta Bs}$ µm			Axial runout		Variation of inner ring width
					t_{Sd}	t_{Sia} [1)]	t_{VBs}
		All	Normal	Modified[2)]	µm	µm	µm
over	incl.	U	L	L	max.	max.	max.
–	2,5	0	–40	–250	1,5	1,5	1,5
2,5	10	0	–40	–250	1,5	1,5	1,5
10	18	0	–80	–250	1,5	1,5	1,5
18	30	0	–120	–250	1,5	2,5	1,5
30	50	0	–120	–250	1,5	2,5	1,5
50	80	0	–150	–250	1,5	2,5	1,5
80	120	0	–200	–380	2,5	2,5	2,5
120	150	0	–250	–380	2,5	2,5	2,5
150	180	0	–250	–380	4	5	4
180	250	0	–300	–500	5	5	5

1) *Only for deep groove and angular contact ball bearings.*
2) *Only for bearings manufactured specifically for use as matched pairs, with the exception of deep groove ball bearings.*

22 Tolerance class 2, outer ring

Tolerance symbols in accordance with ISO 492 ➤115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal outside diameter D mm		Deviation of outside diameter $t_{\Delta Dmp}$ µm		$t_{\Delta Ds}$ µm		Variation t_{VDsp} 1) µm	t_{VDmp} µm	Radial runout t_{Kea} µm
		Diameter series 9		Diameter series 0, 1, 2, 3, 4				
over	incl.	U	L	U	L	max.	max.	max.
–	6	0	–2,5	0	–2,5	2,5	1,5	1,5
6	18	0	–2,5	0	–2,5	2,5	1,5	1,5
18	30	0	–4	0	–4	4	2	2,5
30	50	0	–4	0	–4	4	2	2,5
50	80	0	–4	0	–4	4	2	4
80	120	0	–5	0	–5	5	2,5	5
120	150	0	–5	0	–5	5	2,5	5
150	180	0	–7	0	–7	7	3,5	5
180	250	0	–8	0	–8	8	4	7
250	315	0	–8	0	–8	8	4	7
315	400	0	–10	0	–10	10	5	8

continued ▼

1) *No values are given for bearings with sealing shields or sealing washers.*

22 Tolerance class 2, outer ring

Tolerance symbols in accordance with ISO 492 ➤115 | 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal outside diameter D mm		Perpendicularity t_{SD} t_{SD1} µm	Axial runout t_{Sea} 1) µm	Deviation of a single outer ring width $t_{\Delta Cs}$ µm	Variation of outer ring width t_{VCs} µm
over	incl.	max.	max.	max.	max.
–	6	0,75	1,5	$t_{\Delta Cs}$ is identical to $t_{\Delta Bs}$ for the inner ring of the corresponding bearing ➤130 | 21	1,5
6	18	0,75	1,5		1,5
18	30	0,75	2,5		1,5
30	50	0,75	2,5		1,5
50	80	0,75	4		1,5
80	120	1,25	5		2,5
120	150	1,25	5		2,5
150	180	1,25	5		2,5
180	250	2	7		4
250	315	2,5	7		5
315	400	3,5	8		7

continued ▲

1) *Only for deep groove and angular contact ball bearings.*

Bearings with tapered bore

23
Tolerances for tapered bores in accordance with ISO 492, taper 1:12, tolerance class Normal

Tolerance symbols in accordance with ISO 492 ➤ 130 | 21
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} 1) µm	Deviation of taper slope $t_{\Delta SL}$ µm	
over	incl.	U	L	max.	U	L
18	30	+33	0	13	+21	0
30	50	+39	0	16	+25	0
50	80	+46	0	19	+30	0
80	120	+54	0	22	+35	0
120	180	+63	0	40	+40	0
180	250	+72	0	46	+46	0
250	315	+81	0	52	+52	0
315	400	+89	0	57	+57	0
400	500	+97	0	63	+63	0
500	630	+110	0	70	+70	0
630	800	+125	0	–	+80	0
800	1 000	+140	0	–	+90	0

1) *Valid in any radial cross-section of the bore.*

24
Tolerances for tapered bores, taper 1:30, tolerance class Normal

Tolerance symbols in accordance with ISO 492 ➤ 130 | 21
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} 1) µm	Deviation of taper slope $t_{\Delta SL}$ µm	
over	incl.	U	L	max.	U	L
–	80	+15	0	19	+35	0
80	120	+20	0	25	+40	0
120	180	+25	0	31	+50	0
180	250	+30	0	38	+55	0
250	315	+35	0	44	+60	0
315	400	+40	0	50	+65	0
400	500	+45	0	56	+75	0
500	630	+50	0	63	+85	0
630	800	+75	0	–	+100	0
800	1 000	+100	0	–	+100	0

1) *Valid in any radial cross-section of the bore.*

Taper 1:12

Taper 1:12 is standardised

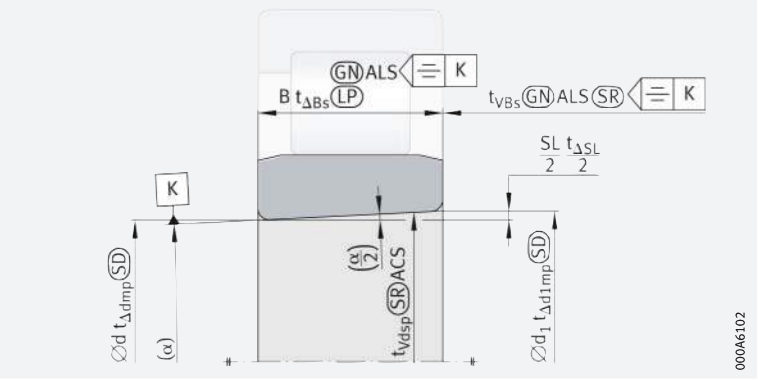
For rolling bearings with a tapered bore, the standardised taper is 1:12. This corresponds to a half taper angle ($\alpha/2 = 2°23'9{,}4''$); basic taper angle $\alpha = 4°46'18{,}8''$. An exception is spherical roller bearings of the dimension series 40, 41 and 42 (the taper in this case is 1:30).

DIN ISO

For the dimensions and tolerances defined in ISO 492:2014 for a tapered bore ➤ 132 | 21.

21
Tolerances for tapered bores

Taper 1:12
Half of taper angle
$\alpha/2 = 2°23'9{,}4''$;
theoretical large end diameter
$d_1 = d + 1/12 \cdot B$
$SL = d_1 - d = 2B \cdot \tan(\alpha/2)$
$\Delta SL = \Delta d1mp - \Delta dmp$



Axial bearings

25
Bore diameter tolerances for shaft locating washers to ISO 199:2014

Tolerance symbols in accordance with ISO 199 ➤120 | 7
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Tolerance class Normal, 6 and 5 Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} µm	Tolerance class 4 Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} µm
over	incl.	U	L	max.	U	L	max.
–	18	0	−8	6	0	−7	5
18	30	0	−10	8	0	−8	6
30	50	0	−12	9	0	−10	8
50	80	0	−15	11	0	−12	9
80	120	0	−20	15	0	−15	11
120	180	0	−25	19	0	−18	14
180	250	0	−30	23	0	−22	17
250	315	0	−35	26	0	−25	19
315	400	0	−40	30	0	−30	23
400	500	0	−45	34	0	−35	26
500	630	0	−50	38	0	−40	30
630	800	0	−75	55	0	−50	40
800	1 000	0	−100	75	0	–	–
1 000	1 250	0	−125	95	0	–	–

26
Outside diameter tolerances for housing locating washers to ISO 199:2014

Tolerance symbols in accordance with ISO 199 ➤120 | 7
U = *upper limit deviation*
L = *lower limit deviation*

Nominal outside diameter D mm		Tolerance class Normal, 6 and 5 Deviation of outside diameter $t_{\Delta Dmp}$ µm		Variation t_{VDsp} µm	Tolerance class 4 Deviation of outside diameter $t_{\Delta Dmp}$ µm		Variation t_{VDsp} µm
over	incl.	U	L	max.	U	L	max.
10	18	0	−11	8	0	−7	5
18	30	0	−13	10	0	−8	6
30	50	0	−16	12	0	−9	7
50	80	0	−19	14	0	−11	8
80	120	0	−22	17	0	−13	10
120	180	0	−25	19	0	−15	11
180	250	0	−30	23	0	−20	15
250	315	0	−35	26	0	−25	19
315	400	0	−40	30	0	−28	21
400	500	0	−45	34	0	−33	25
500	630	0	−50	38	0	−38	29
630	800	0	−75	55	0	−45	34
800	1 000	0	−100	75	0	−60	45
1 000	1 250	0	−125	95	–	–	–
1 250	1 600	0	−160	120	–	–	–

27
Variation in washer thickness for shaft and housing locating washers to ISO 199:2014

Tolerance symbols in accordance with ISO 199 *➤120| 7*

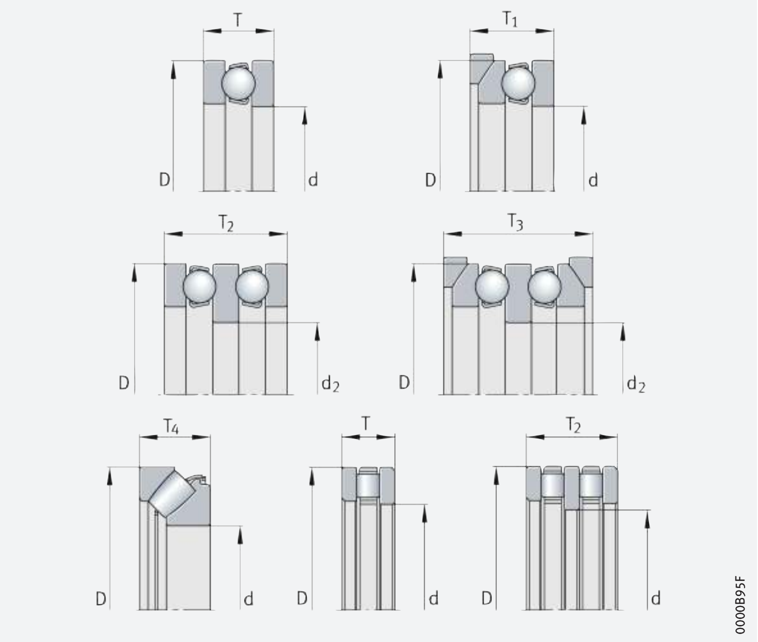
Nominal bore diameter d		Tolerance class				Tolerance class Normal, 6, 5, 4
		Normal	6	5	4	
		Variation in thickness between shaft washer raceway and back face t_{Si}				Variation in thickness between housing washer raceway and back face t_{Se}
mm		μm				μm
over	incl.	max.				max.
–	18	10	5	3	2	Identical to t_{Si} for the shaft locating washer of the corresponding bearing
18	30	10	5	3	2	
30	50	10	6	3	2	
50	80	10	7	4	3	
80	120	15	8	4	3	
120	180	15	9	5	4	
180	250	20	10	5	4	
250	315	25	13	7	5	
315	400	30	15	7	5	
400	500	30	18	9	6	
500	630	35	21	11	7	
630	800	40	25	13	8	
800	1 000	45	30	15	–	
1 000	1 250	50	35	18	–	

Tolerances for nominal bearing height

Tolerances and symbols for nominal size

The tolerances for nominal height are given in ➤135| 28.
The corresponding symbols for nominal size are shown in ➤134| 22.

22
Nominal size symbols for nominal bearing height



28
Tolerances for nominal bearing height

Tolerance symbols in accordance with ISO 199 ➤120| 7
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		t_{Ts} µm		t_{T1s} µm		t_{T2s} µm	
over	incl.	U	L	U	L	U	L
–	30	20	–250	100	–250	150	–400
30	50	20	–250	100	–250	150	–400
50	80	20	–300	100	–300	150	–500
80	120	25	–300	150	–300	200	–500
120	180	25	–400	150	–400	200	–600
180	250	30	–400	150	–400	250	–600
250	315	40	–400	200	–400	350	–700
315	400	40	–500	200	–500	350	–700
400	500	50	–500	300	–500	400	–900
500	630	60	–600	350	–600	500	–1 100
630	800	70	–750	400	–750	600	–1 300
800	1 000	80	–1 000	450	–1 000	700	–1 500
1 000	1 250	100	–1 400	500	–1 400	900	–1 800

continued ▼

28
Tolerances for nominal bearing height

Tolerance symbols in accordance with ISO 199 ➤120| 7
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		t_{T3s} µm		t_{T4s} µm	
over	incl.	U	L	U	L
–	30	300	–400	20	–300
30	50	300	–400	20	–300
50	80	300	–500	20	–400
80	120	400	–500	25	–400
120	180	400	–600	25	–500
180	250	500	–600	30	–500
250	315	600	–700	40	–700
315	400	600	–700	40	–700
400	500	750	–900	50	–900
500	630	900	–1 100	60	–1 200
630	800	1 100	–1 300	70	–1 400
800	1 000	1 300	–1 500	80	–1 800
1 000	1 250	1 600	–1 800	100	–2 400

continued ▲

7.11 Chamfer dimensions

Radial bearings, excluding tapered roller bearings

Minimum and maximum values

The minimum and maximum values for the bearings are given in the table Limit values for chamfer dimensions to DIN 620-6 ➤*136*| *29*, ➤*136*| *23*.

!

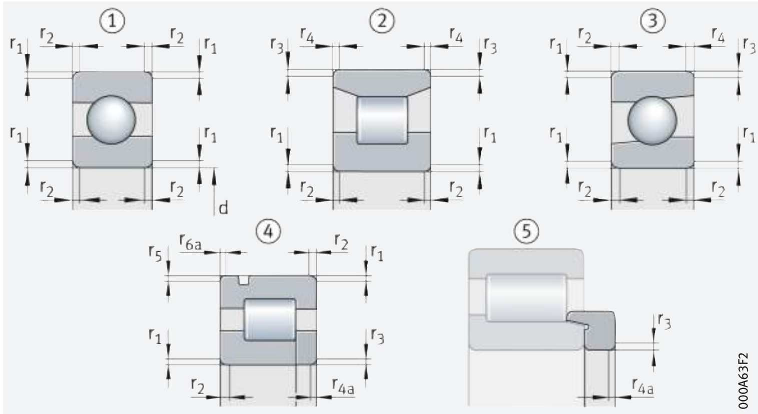
For drawn cup needle roller bearings with open ends HK, drawn cup needle roller bearings with closed end BK and aligning needle roller bearings PNA and RPNA, the chamfer dimensions deviate from DIN 620-6. The lower limit values for r are given in the product tables.

Tapered roller bearings

Chamfer dimensions for tapered roller bearings ➤*137*| *24* and ➤*137*| *30*, for axial bearings ➤*138*| *25* and ➤*138*| *31*.

23
Chamfer dimensions for radial bearings (not including tapered roller bearings)

1. *Symmetrical ring cross-section with identical chamfers on both rings*
2. *Symmetrical ring cross-section with different chamfers on both rings*
3. *Asymmetrical ring cross-section*
4. *Annular slot on outer ring, bearing with rib washer*
5. *L-section ring*



29
Limit values for chamfer dimensions to DIN 620-6

r[1)] mm	d mm over	d mm incl.	r_1 to r_{6a} mm min.	r_1, r_3, r_5 mm max.	r_2, r_4, r_6[2)] mm max.	r_{4a}, r_{6a} mm max.
0,05	–	–	0,05	0,1	0,2	0,1
0,08	–	–	0,08	0,16	0,3	0,16
0,1	–	–	0,1	0,2	0,4	0,2
0,15	–	–	0,15	0,3	0,6	0,3
0,2	–	–	0,2	0,5	0,8	0,5
0,3	–	40	0,3	0,6	1	0,8
	40	–	0,3	0,8	1	0,8
0,5	–	40	0,5	1	2	1,5
	40	–	0,5	1,3	2	1,5
0,6	–	40	0,6	1	2	1,5
	40	–	0,6	1,3	2	1,5
1	–	50	1	1,5	3	2,2
	50	–	1	1,9	3	2,2
1,1	–	120	1,1	2	3,5	2,7
	120	–	1,1	2,5	4	2,7
1,5	–	120	1,5	2,3	4	3,5
	120	–	1,5	3	5	3,5
2	–	80	2	3	4,5	4
	80	220	2	3,5	5	4
	220	–	2	3,8	6	4
2,1	–	280	2,1	4	6,5	4,5
	280	–	2,1	4,5	7	4,5
2,5	–	100	2,5	3,8	6	5
	100	280	2,5	4,5	6	5
	280	–	2,5	5	7	5
3	–	280	3	5	8	5,5
	280	–	3	5,5	8	5,5
4	–	–	4	6,5	9	6,5
5	–	–	5	8	10	8
6	–	–	6	10	13	10
7,5	–	–	7,5	12,5	17	12,5
9,5	–	–	9,5	15	19	15
12	–	–	12	18	24	18
15	–	–	15	21	30	21
19	–	–	19	25	38	25

1) *The nominal chamfer dimension r is identical to the smallest permissible chamfer dimension r_{min}.*

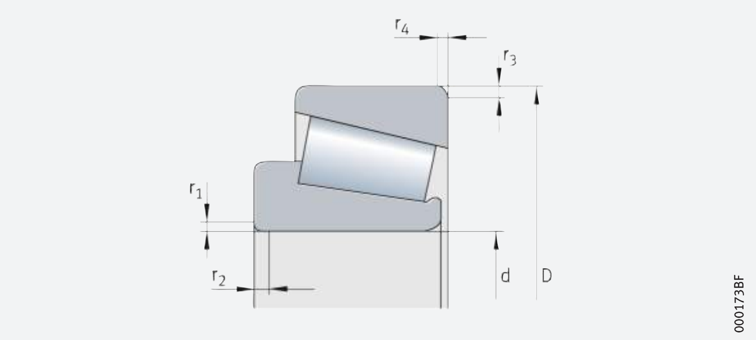
2) *For bearings with a width of 2 mm or less, the values for r_1 apply.*

Tapered roller bearings

Minimum and maximum values

Minimum and maximum values for metric tapered roller bearings
➤137|24 and ➤137|30.

24
Chamfer dimensions for metric tapered roller bearings



30
Limit values for chamfer dimensions

r[1)] mm	d, D mm		r_1 to r_4 mm	r_1, r_3 mm	r_2, r_4 mm
	over	incl.	min.	max.	max.
0,3	–	40	0,3	0,7	1,4
	40	–	0,3	0,9	1,6
0,6	–	40	0,6	1,1	1,7
	40	–	0,6	1,3	2
1	–	50	1	1,6	2,5
	50	–	1	1,9	3
1,5	–	120	1,5	2,3	3
	120	250	1,5	2,8	3,5
	250	–	1,5	3,5	4
2	–	120	2	2,8	4
	120	250	2	3,5	4,5
	250	–	2	4	5
2,5	–	120	2,5	3,5	5
	120	250	2,5	4	5,5
	250	–	2,5	4,5	6
3	–	120	3	4	5,5
	120	250	3	4,5	6,5
	250	400	3	5	7
	400	–	3	5,5	7,5
4	–	120	4	5	7
	120	250	4	5,5	7,5
	250	400	4	6	8
	400	–	4	6,5	8,5
5	–	180	5	6,5	8
	180	–	5	7,5	9
6	–	180	6	7,5	10
	180	–	6	9	11

1) *The nominal chamfer dimension r is identical to the smallest permissible chamfer dimension r_{min}.*

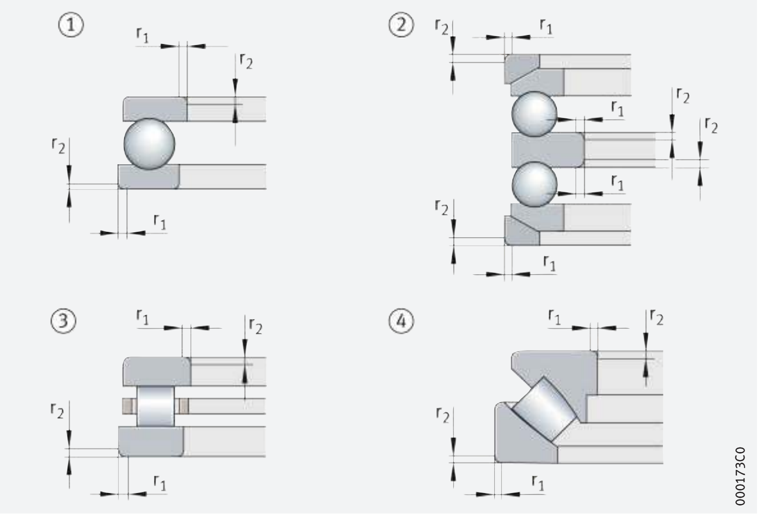
Axial bearings

Minimum and maximum values

Minimum and maximum values for the bearings ➤138|25 and ➤138|31. The values in the table correspond to DIN 620-6.
In the case of axial deep groove ball bearings, the tolerances for the chamfer dimensions are identical in both axial and radial directions.

25
Chamfer dimensions for axial bearings

① *Single direction axial deep groove ball bearing with flat housing locating washer*
② *Double direction axial deep groove ball bearing with spherical housing locating washers and seating washers*
③ *Single direction axial cylindrical roller bearing*
④ *Single direction axial spherical roller bearing*



31
Limit values for chamfer dimensions

r[1)]	r_1, r_2	
mm	mm	mm
	min.	max.
0,05	0,05	0,1
0,08	0,08	0,16
0,1	0,1	0,2
0,15	0,15	0,3
0,2	0,2	0,5
0,3	0,3	0,8
0,6	0,6	1,5
1	1	2,2
1,1	1,1	2,7
1,5	1,5	3,5
2	2	4
2,1	2,1	4,5
3	3	5,5
4	4	6,5
5	5	8
6	6	10
7,5	7,5	12,5
9,5	9,5	15
12	12	18
15	15	21
19	19	25

1) *The nominal chamfer dimension r is identical to the smallest permissible chamfer dimension* r_{min}.

8 Design of bearing arrangements

8.1 Arrangement of bearings

✎ Support of a shaft normally requires two bearings

The guidance and support of a rotating machine part generally requires at least two bearings arranged at a certain distance from each other (exceptions: four point contact, crossed roller and slewing bearings). Depending on the application, a decision is made between a locating/non-locating bearing arrangement, an adjusted bearing arrangement and a floating bearing arrangement.

Locating/non-locating bearing arrangement

✎ The non-locating bearing compensates for differences in distance

On a shaft supported by two radial bearings, the distances between the bearing seats on the shaft and in the housing frequently do not coincide as a result of manufacturing tolerances. The distances may also change as a result of temperature increases during operation. These differences in distance are compensated in the non-locating bearing. Examples of locating/non-locating bearing arrangements ➤140 | 1.

Non-locating bearings

✎ Suitable non-locating bearings

Ideal non-locating bearings are cylindrical roller bearings with cage of series N and NU or needle roller bearings. In these bearings, the roller and cage assembly can be displaced on the raceway of the bearing ring without ribs. All other bearing types, for example deep groove ball bearings and spherical roller bearings, can only act as non-locating bearings if one bearing ring has a fit that allows displacement. The bearing ring subjected to point load therefore has a loose fit; this is normally the outer ring.

Locating bearings

The locating bearing guides the shaft in an axial direction and supports external axial forces. In order to prevent axial bracing, shafts with more than two bearings have only one locating bearing. The type of bearing selected as a locating bearing depends on the magnitude of the axial forces and the accuracy with which the shafts must be axially guided.

✎ Suitable locating bearings

A double row angular contact ball bearing, for example, will give closer axial guidance than a deep groove ball bearing or a spherical roller bearing. A pair of symmetrically arranged angular contact ball bearings or tapered roller bearings used as locating bearings will also provide extremely close axial guidance.

There are particular advantages in using angular contact ball bearings of the universal design. The bearings can be fitted in pairs in any O or X arrangement without shims. Angular contact ball bearings of the universal design are matched so that, in an X or O arrangement, they have a low axial internal clearance (design UA), zero clearance (UO) or slight preload (UL).

In gearboxes, a four point contact bearing is sometimes fitted directly adjacent to a cylindrical roller bearing to give a locating bearing arrangement. The four point contact bearing, without radial support of the outer ring, can only support axial forces. The radial force is supported by the cylindrical roller bearing.

If a lower axial force is present, a cylindrical roller bearing with cage of series NUP can also be used as a locating bearing.

No adjustment or setting work with matched pairs of tapered roller bearings

Fitting is also made easier when using matched pairs of tapered roller bearings as locating bearings (313..-N11CA). They are matched with appropriate axial internal clearance so that no adjustment or setting work is required.

1

Locating/non-locating bearing arrangements

⇔ = non-locating bearing

① Locating bearing: deep groove ball bearing Non-locating bearing: deep groove ball bearing

② Locating bearing: spherical roller bearing Non-locating bearing: spherical roller bearing

③ Locating bearing: deep groove ball bearing Non-locating bearing: cylindrical roller bearing NU

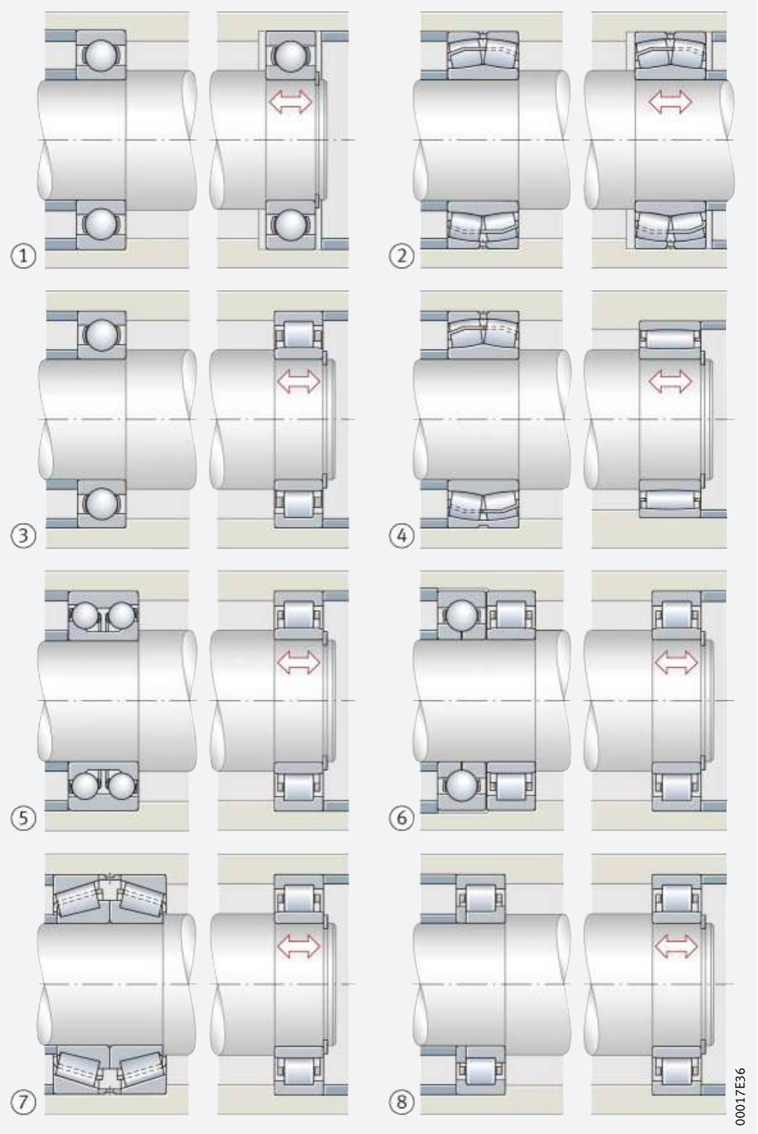
④ Locating bearing: spherical roller bearing Non-locating bearing: toroidal roller bearing

⑤ Locating bearing: double row angular contact ball bearing Locating bearing: cylindrical roller bearing NU

⑥ Locating bearing: four point contact bearing and cylindrical roller bearing NU (outer ring of four point contact bearing not radially retained) Non-locating bearing: cylindrical roller bearing NU

⑦ Locating bearing: tapered roller bearing Non-locating bearing: cylindrical roller bearing NU

⑧ Locating bearing: cylindrical roller bearing NUP Non-locating bearing: cylindrical roller bearing NU



Adjusted bearing arrangement

The “adjustment” process

An adjusted bearing arrangement is generally constructed from two angular contact bearings (angular contact ball bearings, tapered roller bearings) in a mirror image arrangement ➤141|2 and ➤141|3. The inner and outer rings of the bearings are displaced relative to each other until the required clearance or the required preload is achieved. This process is known as “adjustment”.

Angular contact bearings and deep groove ball bearings suitable for adjusted bearing arrangements

Angular contact bearings support radial and axial forces

Angular contact bearings support forces comprising a radial and an axial component. These are thus a combination of a radial and an axial bearing. Depending on the size of the nominal contact angle α, angular contact bearings are classified as radial or axial bearings.

Deep groove ball bearings are also suitable

Deep groove ball bearings can also be used for an adjusted bearing arrangement; these are then angular contact ball bearings with a small nominal contact angle.

Due to the possibility of regulating the clearance, adjusted bearing arrangements are particularly suitable if close guidance is necessary.

O or X arrangement

Two arrangements

In an adjusted bearing arrangement, an O or X arrangement of the bearings is essentially possible.

The contact cone apexes point outwards or inwards

In the O arrangement, the cones and their apexes formed by the contact lines (the contact cone apexes S) point outwards, in the X arrangement, the cones point inwards ➤141|2.

In angular contact ball bearings and tapered roller bearings, the contact lines of the rolling element forces coincide at the contact cone apexes S ➤141|2 and ➤141|3. In adjusted bearing arrangements, the bearing spacing is therefore defined as the spacing of the contact cone apexes.

The support spacing is larger in an O arrangement

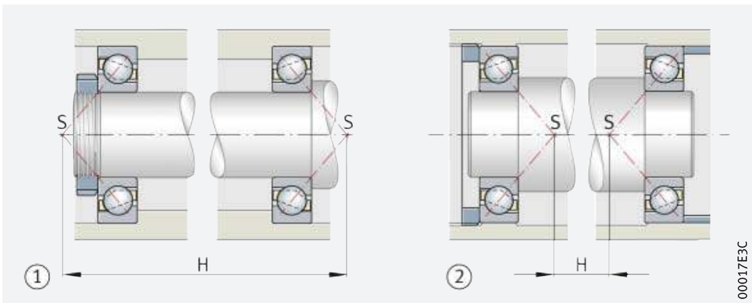
The resulting support spacing H is larger in an O arrangement than in an X arrangement. An O arrangement should be used in preference if the component with small bearing spacing must be guided with the smallest possible tilting clearance or tilting forces must be supported.

2

Adjusted bearing arrangement with angular contact ball bearings

S = *contact cone apex*
H = *support spacing*

① *O arrangement*
② *X arrangement*



Influence of thermal expansion in O and X arrangements

When deciding between an O and X arrangement, attention must also be paid to the temperature conditions and thermal expansions. This is based on the position of the roller cone apexes R. The roller cone apex R represents the intersection point of the extended, inclined outer ring raceway with the bearing axis ➤141|3.

X arrangement

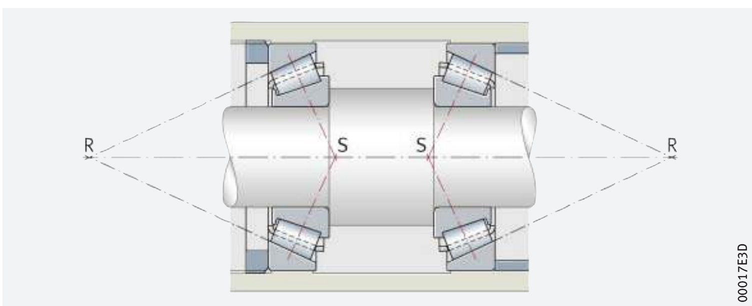
If the shaft is warmer than the housing ($T_W > T_G$), the shaft expands more than the housing in an axial and radial direction. As a result, the clearance set in an X arrangement decreases in every case (assuming the following precondition: shaft and housing of same material).

3

Adjusted bearing arrangement with tapered roller bearings

X arrangement

R = *roller cone apex*
S = *contact cone apex*



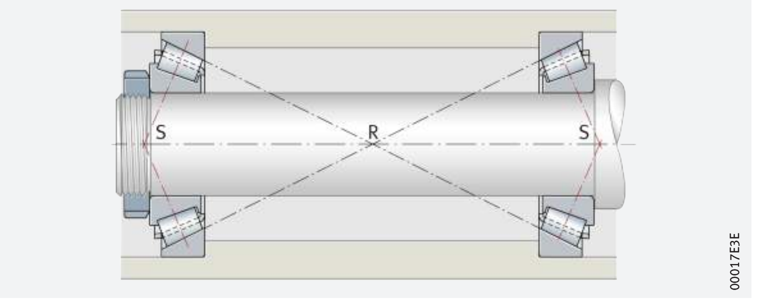
✎ Temperature behaviour and thermal expansion in an O arrangement

The behaviour is different in an O arrangement. A distinction must be drawn between three cases here:

- If the roller cone apexes R coincide at a point, the axial and radial thermal expansion cancel each other out and the clearance set is maintained ➤142 | 4
- If the roller cones overlap with a small bearing spacing, the radial expansion has a stronger effect than the axial expansion on the bearing clearance ➤142 | 5: the axial clearance is reduced. This must be taken into consideration in the adjustment of bearings
- In the third case, the roller cones do not overlap with a large bearing spacing ➤142 | 6. The radial expansion then has a weaker effect than the axial expansion on the bearing clearance: the axial clearance is increased.

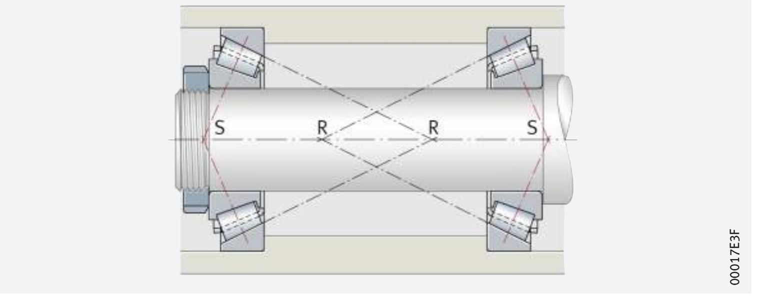
4
Adjusted bearings in an O arrangement, the roller cone apexes coincide

R = *roller cone apex*
S = *contact cone apex*



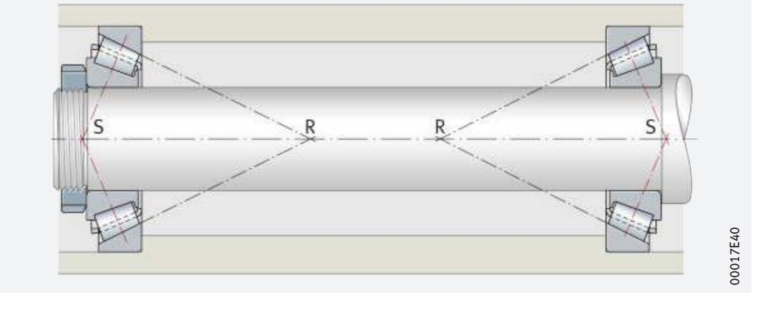
5
Adjusted bearings in an O arrangement, the roller cone apexes overlap

R = *roller cone apex*
S = *contact cone apex*



6
Adjusted bearings in an O arrangement, the roller cone apexes do not overlap

R = *roller cone apex*
S = *contact cone apex*



Sliding seat in the bearing ring to be adjusted

✎ Sliding seat only permissible on the bearing ring with point load

Whether the inner ring or outer ring is adjusted depends on the degree of accessibility of the adjustment elements, such as nuts and covers. Since the bearing ring to be adjusted must be easily displaced, attention must also be paid in these considerations to the fits of the bearing rings.

! A sliding seat should fundamentally only be permitted on the ring that is subject to point load.

Elastic adjustment

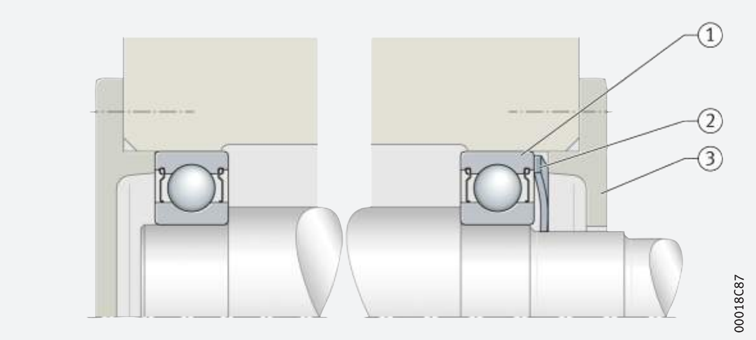
✎ Preloading using springs

Adjusted bearing arrangements can also be achieved by preloading using springs ➤143|7. This elastic adjustment method compensates for thermal expansion. It can also be used where bearing arrangements are at risk of vibration while stationary.

7

Bearing arrangement adjusted by means of spring washer

① *Deep groove ball bearing*
② *Spring washer (spring preload)*
③ *Cover*



Floating bearing arrangement

✎ Difference from the adjusted bearing arrangement: this does not give close axial guidance

The floating bearing arrangement is essentially similar in its arrangement to the adjusted bearing arrangement. While freedom from clearance or even preload is desirable when warm from operation in the latter case, floating bearing arrangements always have an axial clearance s of several tenths of a millimetre depending on the bearing size ➤143|8.
The value s is defined as a function of the required guidance accuracy such that the bearings are not axially stressed even under unfavourable thermal conditions.

Suitable bearing types

✎ A floating bearing arrangement is suitable for bearings that must not be adjusted

For a floating bearing arrangement, almost all bearing types can be considered that must not be adjusted; examples ➤143|8. Floating arrangements are thus possible with, for example, deep groove ball bearings, self-aligning ball bearings and spherical roller bearings; one ring of each of the two bearings (usually the outer ring) then has a sliding seat.
In the floating bearing arrangement with cylindrical roller bearings NJ, length compensation is possible within the bearing.

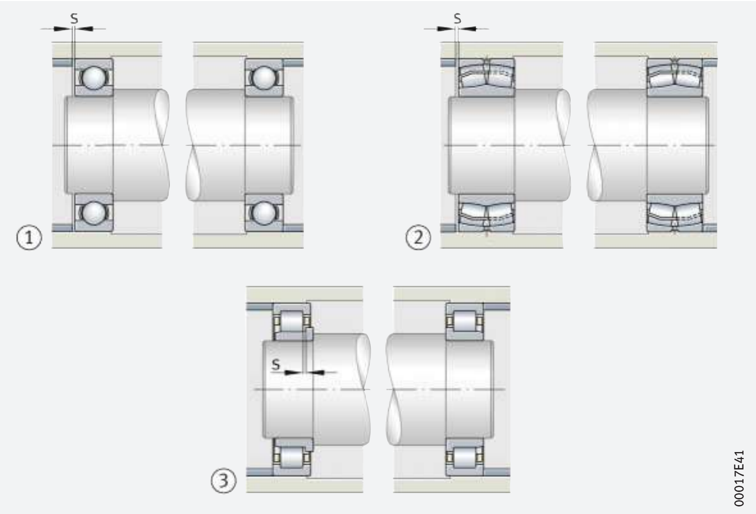
! Tapered roller bearings and angular contact ball bearings are not suitable for a floating bearing arrangement, since these bearings must be adjusted in order to run correctly.

8

Floating bearing arrangements

s *= axial displacement distance (axial clearance)*

① *Deep groove ball bearing*
② *Spherical roller bearing*
③ *Cylindrical roller bearing NJ*



8.2 Radial location of bearings

✎ Location of the bearing rings in a radial and tangential direction by fit, in an axial direction by form fit

Rolling bearings must be located on the shaft and in the housing in a radial, axial and tangential direction in accordance with their function. In a radial and tangential direction, this occurs by means of a tight fit. However, this is only possible under certain conditions in an axial direction, therefore rolling bearings are generally axially located by means of form fit.

Criteria for selection of fits

✎ Points to be observed in the selection of fits

The following must be taken into consideration in determining the fit:

- The rolling bearing rings must be well supported over their entire circumference in order to allow full utilisation of the load carrying capacity of the bearing
- The rings must not creep on their mating parts, otherwise the seating surfaces will be damaged
- The non-locating bearing must compensate changes in the length of the shaft and housing and one ring must therefore be axially adjustable
- Mounting and dismounting of the bearings should be possible without a large amount of work.

✎ Interference fits

Interference fits lead to expansion of the inner ring raceway and contraction of the outer ring raceway. The resulting stresses occurring in the rings and the reduction in the radial internal clearance must be taken into consideration in the selection of the fit; see ➤*146* and ➤*149*.

✎ Tight fit necessary

Good support of the bearing rings on their circumference requires rigid seating. The requirement that rings must not creep on their mating parts also requires firm seating. If non-separable bearings must be mounted and dismounted, a tight fit can only be achieved for one bearing ring.
In the case of cylindrical roller bearings N, NU and needle roller bearings, both rings can have tight fits, since the length compensation takes place within the bearing and since the rings can be mounted separately.
With tight fits and a temperature differential between the inner and outer ring, the radial internal clearance of the bearing is reduced. This must be taken into consideration when selecting the radial internal clearance.

✎ Materials other than cast iron or steel

If materials other than cast iron or steel are used for the adjacent construction, the modulus of elasticity and the differing coefficients of thermal expansion of the materials must also be be taken into consideration to achieve rigid seating. For aluminium housings, thin-walled housings and hollow shafts, a closer fit should be selected if necessary in order to achieve the same force locking as with cast iron, steel or solid shafts.

✎ Higher loads

Higher loads, especially shocks, require a fit with larger interference and narrower geometrical tolerances.

Bearing seat for axial bearings

!

Axial bearings, which support axial loads only, must not be guided radially (with the exception of axial cylindrical roller bearings which have a degree of freedom in the radial direction due to flat raceways). In the case of groove-shaped raceways this is not present and must be achieved by a loose seat for the stationary washer. A rigid seat is normally selected for the rotating washer.

Where axial bearings also support radial forces, such as in axial spherical roller bearings, fits should be selected in the same way as for radial bearings.

✎ Contact surfaces of the mating parts

The contact surfaces of the mating parts must be perpendicular to the axis of rotation (total axial runout tolerance to IT5 or better), in order to ensure uniform load distribution over all the rolling elements.

Conditions of rotation

✎ Point or circumferential load

The conditions of rotation indicate the motion of one bearing ring with respect to the load direction and are expressed as either circumferential load or point load ➤145|▦1.

✎ For point load, a loose fit is also possible

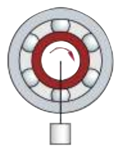
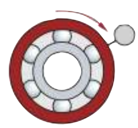
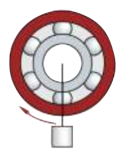
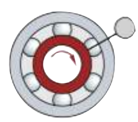
If the bearing ring is stationary relative to the load direction (point load on the ring), no forces occur that could cause creep of the ring. A tight fit would be desirable here in order to give better support, but a loose fit is also possible since there is no risk that the ring will undergo creep. There is essentially a risk, however, that fretting corrosion will occur.

✎ For circumferential load, a firm bearing seat is necessary

A bearing ring that rotates relative to the load direction (circumferential load on the ring) will roll on its seat if a loose fit is present and will thus creep in a circumferential direction. If shock type load is present, the ring will slip. In both cases, there is a risk that the seats of the ring and mating part will be damaged by fretting corrosion and wear.

! The possible creep or slippage of a bearing ring can only be effectively prevented by a firm bearing seat.

▦ **1**
Differentiation between point load and circumferential load

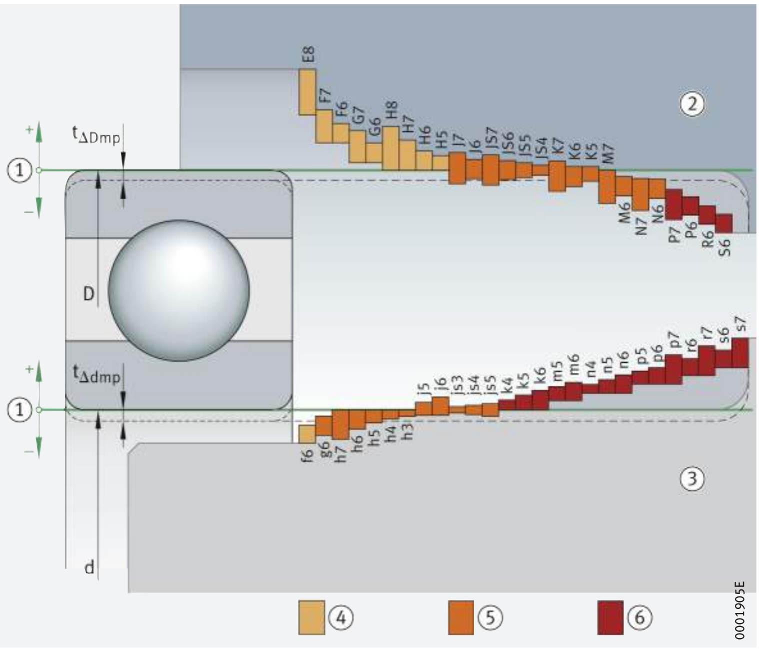
Condition of rotation	Example	Schematic	Load case	Fit
Rotating inner ring, stationary outer ring Constant load direction	Shaft with weight load		Circumferential load on inner ring and point load on outer ring	Inner ring: tight fit necessary Outer ring: loose fit permissible
Stationary inner ring, rotating outer ring Load direction rotates with outer ring	Hub bearing arrangement with significant imbalance			
Stationary inner ring, rotating outer ring Constant load direction	Passenger car front wheel track roller (hub bearing arrangement)		Point load on inner ring and circumferential load on outer ring	Inner ring: loose fit permissible Outer ring: tight fit necessary
Rotating inner ring, stationary outer ring Load direction rotates with inner ring	Centrifuge, vibrating screen			

8.3 Recommended fits

Shaft and housing tolerances

✎ ISO tolerance classes

The tolerances are defined in the form of ISO tolerance classes to ISO 286-1 and ISO 286-2. The designation of the tolerance classes, e.g. “E8”, comprises one or two upper case letters for housings or lower case letters for shafts (= fundamental deviation identifier, which defines the tolerance position relative to the zero line, e.g. “E”) and the grade number of the standard tolerance grade (this defines the tolerance quality, e.g. “8”). A schematic illustration of the most common rolling bearing fits is shown in ➤146|9.



9
Shaft and housing fits for rolling bearings

D = *nominal bearing outside diameter*
d = *nominal bearing bore diameter*
$t_{\Delta Dmp}$ = *deviation of mean bearing outside diameter (in accordance with ISO 492)*
$t_{\Delta dmp}$ = *deviation of mean bearing bore diameter (in accordance with ISO 492)*

① *Zero line*
② *Housing*
③ *Shaft*
④ *Clearance fit*
⑤ *Transition fit*
⑥ *Interference fit*

✎ Recommendations for shaft and housing tolerances

The tables ➤147|2 to ➤148|5 contain recommendations for the selection of shaft and housing tolerances that are valid for normal mounting and operating conditions. Deviations are possible if particular requirements apply, for example in relation to running accuracy, smooth running or operating temperature. Increased running accuracies thus require closer tolerances such as standard tolerance grade 5 instead of 6. If the inner ring is warmer than the shaft during operation, the seating may loosen to an impermissible extent. A tighter fit must then be selected, for example m6 instead of k6.

✎ Objective: the best overall solution

In some applications, the question of fits can only be resolved by a compromise. The individual requirements must be weighed against each other and those selected that give the best overall solution.

Table 2
Tolerance classes for cylindrical shaft seats (radial bearings)

Condition of rotation[1]	Bearing type	Shaft diameter mm over	incl.	Displacement facility Load	Tolerance class[2] of shaft
Point load on inner ring	Ball bearings, roller bearings	All sizes		Inner ring easily displaced	g6 (g5)
				Inner ring not easily displaced, angular contact ball bearings and tapered roller bearings with adjusted inner ring	h6 (j6)
	Needle roller bearings			Non-locating bearing	h6 (g6)[3]
Circumferential load on inner ring or indeterminate load direction	Ball bearings	–	50	Normal loads[4]	j6 (j5)
		50	100	Low loads[5]	j6 (j5)
				Normal and high loads[6]	k6 (k5)
		100	200	Low loads[4]	k6 (m6)
				Normal and high loads[7]	m6 (m5)
		200	–	Low loads	m6 (m5)
				Normal and high loads	n6 (n5)
	Roller bearings	–	60	Low loads	j6 (j5)
				Normal and high loads	k6 (k5)
		60	200	Low loads	k6 (k5)
				Normal loads	m6 (m5)
				High loads	n6 (n5)
		200	500	Normal loads	m6 (n6)
				High loads, shocks	p6
		500	–	Normal loads	n6 (p6)
				High loads	p6
	Needle roller bearings	–	50	Low loads	k6
				Normal and high loads	m6
		50	120	Low loads	m6
				Normal and high loads	n6
		120	250	Low loads	n6
				Normal and high loads	p6
		250	400	Low loads	p6
				Normal and high loads	r6
		400	500	Low loads	r6
				Normal and high loads	s6
		500	–	Low loads	r6
				Normal and high loads	s6

1) *Condition of rotation* *➤145 | Table 1.*
2) *The envelope requirement Ⓔ* *➤168 | 11* *applies.*
3) *For easy fitting.*
4) *$C_0/P_0 > 10$.*
5) *$C_0/P_0 > 12$.*
6) *$C_0/P_0 < 12$.*
7) *$C_0/P_0 < 10$.*

Table 3
Tolerance classes for cylindrical shaft seats (axial bearings)

Load	Bearing type	Shaft diameter mm over	incl.	Operating conditions	Tolerance class[1] of shaft
Axial load	Axial deep groove ball bearings	All sizes		–	j6
	Axial deep groove ball bearings, double direction			–	k6
	Axial cylindrical roller bearings with shaft locating washer			–	h8
	Axial cylindrical roller and cage assemblies			–	h8
Combined load	Axial spherical roller bearings	All sizes		Point load on shaft locating washer	j6
		–	200	Circumferential load on shaft locating washer	j6 (k6)
		200	–		k6 (m6)

1) *The envelope requirement Ⓔ* *➤168 | 11* *applies.*

4
Tolerance classes for bearing seats in housings (radial bearings)

Condition of rotation[1]	Displacement facility Load	Operating conditions	Tolerance class[2] of bore
Point load on outer ring	Outer ring easily displaced, housing unsplit	The tolerance grade is determined by the running accuracy required	H7 (H6)[3]
	Outer ring easily displaced, housing split		H8 (H7)
	Outer ring not easily displaced, housing unsplit	High running accuracy required	H6 (J6)
	Outer ring not easily displaced, angular contact ball bearings and tapered roller bearings with adjusted outer ring, housing split	Normal running accuracy	H7 (J7)
	Outer ring easily displaced	Heat input via shaft	G7[4]
Circumferential load on outer ring or indeterminate load direction	Low loads, outer ring cannot be displaced	High requirements for running accuracy: K6, M6, N6 and P6	K7 (K6)
	Normal loads, shocks, outer ring cannot be displaced		M7 (M6)
	High loads, shocks ($C_0/P_0 < 6$), outer ring cannot be displaced		N7 (N6)
	High loads, severe shocks, thin-walled housing, outer ring cannot be displaced		P7 (P6)

1) *Condition of rotation* *➤145|▦1.*
2) *The envelope requirement Ⓔ* *➤168|11 applies.*
3) *G7 for housings made from flake graphite cast iron, with bearing outside diameter D > 250 mm and temperature differential between outer ring and housing > 10 K.*
4) *F7 for housings made from flake graphite cast iron, with bearing outside diameter D > 250 mm and temperature differential between outer ring and housing > 10 K.*

5
Tolerance classes for bearing seats in housings (axial bearings)

Load	Bearing type	Operating conditions	Tolerance class[1] of bore
Axial load	Axial deep groove ball bearings	Normal running accuracy	E8
		High running accuracy	H6
	Axial cylindrical roller bearings with housing locating washer	–	H9
	Axial cylindrical roller and cage assemblies	–	H10
	Axial spherical roller bearings	Normal loads	E8
		High loads	G7
Combined loads, point load on housing locating washer		–	H7
Combined loads, circumferential load on housing locating washer		–	K7

1) *The envelope requirement Ⓔ* *➤168|11 applies.*

8.4 Tables of fits

✎ Clearance, transition and interference fits for shafts and housing bores

Machining tolerances for shafts and housing bores are shown in ➤*146*|*9*, ➤*150*|*6* and ➤*158*|*7*. The values are valid for solid steel shafts and flake graphite cast iron housings. In the table header, below the nominal diameters, are the normal tolerances for the bore or outside diameter of radial bearings (excluding tapered roller bearings). Below these are the deviations for the most important tolerance classes for mounting of rolling bearings.

✎ Example for shaft fit, tolerance class j5

For the shaft ∅ 40 j5 Ⓔ, ➤*150*|*6* gives an example of how to read the numerical values.

✎ Example for housing fit, tolerance class K6

For the housing bore ∅ 100 K6 Ⓔ, ➤*158*|*7* gives an example explaining the group of numbers.

6 *Shaft fits*

		Nominal shaft diameter in mm											
	over incl.	**3** **6**		**6** **10**		**10** **18**		**18** **30**		**30** **50**		**50** **65**	
	Deviations of bearing bore diameter in µm (tolerance class Normal)												
	$t_{\Delta dmp}$	0 −8		0 −8		0 −8		0 −10		0 −12		0 −15	
	Shaft deviation, fit interference or fit clearance in µm												
Clearance fit	**f6**	−10 −18	2 7 18	−13 −22	5 11 22	−16 −27	8 15 27	−20 −33	10 17 33	−25 −41	13 22 41	−30 −49	15 26 49
Transition fit	**g5**	−4 −9	**4** **0** 9	−5 −11	**3** 2 11	−6 −14	**2** 3 14	−7 −16	**3** 3 16	−9 −20	**3** 5 20	−10 −23	**5** 4 23
	g6	−4 −12	**4** 1 12	−5 −14	**3** 3 14	−6 −17	**2** 4 17	−7 −20	**3** 5 20	−9 −25	**3** 6 25	−10 −29	**5** 6 29
	h5	0 −5	**8** **4** 5	0 −6	**8** **3** 6	0 −8	**8** **3** 8	0 −9	**10** **4** 9	0 −11	**12** **4** 11	0 −13	**15** **6** 13
	h6	0 −8	**8** **3** 8	0 −9	**8** **2** 9	0 −11	**8** **2** 11	0 −13	**10** **2** 13	0 −16	**12** **3** 16	0 −19	**15** **4** 19
	j5	+3 −2	**11** **7** 2	+4 −2	**12** **7** 2	+5 −3	**13** **8** 3	+5 −4	**15** **9** 4	+6 −5	**18** **10** 5	+6 −7	**21** **12** 7
	j6	+6 −2	**14** **8** 2	+7 −2	**15** **9** 2	+8 −3	**16** **10** 3	+9 −4	**19** **11** 4	+11 −5	**23** **14** 5	+12 −7	**27** **16** 7
	js5	+2,5 −2,5	**11** **6** 3	+3 −3	**11** **6** 3	+4 −4	**12** **6** 4	+4,5 −4,5	**15** **9** 5	+5,5 −5,5	**18** **10** 6	+6,5 −6,5	**22** **13** 7
	js6	+4 −4	**12** **7** 4	+4,5 −4,5	**13** **7** 5	+5,5 −5,5	**14** **8** 6	+6,5 −6,5	**17** **9** 7	+8 −8	**20** **11** 8	+9,5 −9,5	**25** **13** 10
Interference fit	**k5**	+6 +1	**14** **9** **1**	+7 +1	**15** **10** **1**	+9 +1	**17** **12** **1**	+11 +2	**21** **15** **2**	+13 +2	**25** **17** **2**	+15 +2	**30** **21** **2**
	k6	+9 +1	**17** **11** **1**	+10 +1	**18** **12** **1**	+12 +1	**20** **14** **1**	+15 +2	**25** **17** **2**	+18 +2	**30** **21** **2**	+21 +2	**36** **25** **2**
	m5	+9 +4	**17** **13** **4**	+12 +6	**20** **15** **6**	+15 +7	**23** **18** **7**	+17 +8	**27** **21** **8**	+20 +9	**32** **24** **9**	+24 +11	**39** **30** **11**
	m6	+12 +4	**20** **15** **4**	+15 +6	**23** **17** **6**	+18 +7	**26** **20** **7**	+21 +8	**31** **23** **8**	+25 +9	**37** **27** **9**	+30 +11	**45** **34** **11**

Example: shaft ∅ 40 j5 Ⓔ

Maximum material value	+6	**18**	Interference or fit clearance if the maximum material values are combined.
		10	Probable interference or fit clearance.
Minimum material value	−5	5	Interference or fit clearance if the minimum material values are combined.

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

65 80		80 100		100 120		120 140		140 160		160 180		180 200		200 220		220 250	
0 −15		0 −20		0 −20		0 −25		0 −25		0 −25		0 −30		0 −30		0 −30	
−30 −49	15 26 49	−36 −58	16 30 58	−36 −58	16 30 58	−43 −68	18 34 68	−43 −68	18 34 68	−43 −68	18 34 68	−50 −79	20 40 79	−50 −79	20 40 79	−50 −79	20 40 79
−10 −23	**5** 4 23	−12 −27	**8** 4 27	−12 −27	**8** 4 27	−14 −32	**11** 3 32	−14 −32	**11** 3 32	−14 −32	**11** 3 32	−15 −35	**15** 2 35	−15 −35	**15** 2 35	−15 −35	**15** 2 35
−10 −29	**5** 6 29	−12 −34	**8** 6 34	−12 −34	**8** 6 34	−14 −39	**11** 6 39	−14 −39	**11** 6 39	−14 −39	**11** 6 39	−15 −44	**15** 5 44	−15 −44	**15** 5 44	−15 −44	**15** 5 44
0 −13	**15** **6** 13	0 −15	**20** **8** 15	0 −15	**20** **8** 15	0 −18	**25** **11** 18	0 −18	**25** **11** 18	0 −18	**25** **11** 18	0 −20	**30** **13** 20	0 −20	**30** **13** 20	0 −20	**30** **13** 20
0 −19	**15** **4** 19	0 −22	**20** **6** 22	0 −22	**20** **6** 22	0 −25	**25** **8** 25	0 −25	**25** **8** 25	0 −25	**25** **8** 25	0 −29	**30** **10** 29	0 −29	**30** **10** 29	0 −29	**30** **10** 29
+6 −7	**21** **12** 7	+6 −9	**26** **14** 9	+6 −9	**26** **14** 9	+7 −11	**32** **18** 11	+7 −11	**32** **18** 11	+7 −11	**32** **18** 11	+7 −13	**37** **20** 13	+7 −13	**37** **20** 13	+7 −13	**37** **20** 13
+12 −7	**27** **16** 7	+13 −9	**33** **19** 9	+13 −9	**33** **19** 9	+14 −11	**39** **22** 11	+14 −11	**39** **22** 11	+14 −11	**39** **22** 11	+16 −13	**46** **26** 13	+16 −13	**46** **26** 13	+16 −13	**46** **26** 13
+6,5 −6,5	**22** **13** 7	+7,5 −7,5	**28** **16** 8	+7,5 −7,5	**28** **16** 8	+9 −9	**34** **20** 9	+9 −9	**34** **20** 9	+9 −9	**34** **20** 9	+10 −10	**40** **23** 10	+10 −10	**40** **23** 10	+10 −10	**40** **23** 10
+9,5 −9,5	**25** **13** 10	+11 −11	**31** **17** 11	+11 −11	**31** **17** 11	+12,5 −12,5	**38** **21** 13	+12,5 −12,5	**38** **21** 13	+12,5 −12,5	**38** **21** 13	+14,5 −14,5	**45** **25** 15	+14,5 −14,5	**45** **25** 15	+14,5 −14,5	**45** **25** 15
+15 +2	**30** **21** **2**	+18 +3	**38** **26** **3**	+18 +3	**38** **26** **3**	+21 +3	**46** **32** **3**	+21 +3	**46** **32** **3**	+21 +3	**46** **32** **3**	+24 +4	**54** **37** **4**	+24 +4	**54** **37** **4**	+24 +4	**54** **37** **4**
+21 +2	**36** **25** **2**	+25 +3	**45** **31** **3**	+25 +3	**45** **31** **3**	+28 +3	**53** **36** **3**	+28 +3	**53** **36** **3**	+28 +3	**53** **36** **3**	+33 +4	**63** **43** **4**	+33 +4	**63** **43** **4**	+33 +4	**63** **43** **4**
+24 +11	**39** **30** **11**	+28 +13	**48** **36** **13**	+28 +13	**48** **36** **13**	+33 +15	**58** **44** **15**	+33 +15	**58** **44** **15**	+33 +15	**58** **44** **15**	+37 +17	**67** **50** **17**	+37 +17	**67** **50** **17**	+37 +17	**67** **50** **17**
+30 +11	**45** **34** **11**	+35 +13	**55** **42** **13**	+35 +13	**55** **42** **13**	+40 +15	**65** **48** **15**	+40 +15	**65** **48** **15**	+40 +15	**65** **48** **15**	+46 +17	**76** **56** **17**	+46 +17	**76** **56** **17**	+46 +17	**76** **56** **17**

6 Shaft fits

	Nominal shaft diameter in mm										
	over incl.	**250** **280**		**280** **315**		**315** **355**		**355** **400**		**400** **450**	
	Deviations of bearing bore diameter in µm (tolerance class Normal)										
	$t_{\Delta dmp}$	0 −35		0 −35		0 −40		0 −40		0 −45	
	Shaft deviation, fit interference or fit clearance in µm										
Clearance fit	**f6**	−56 −88	21 44 88	−56 −88	21 44 88	−62 −98	22 47 98	−62 −98	22 47 98	−68 −108	23 51 108
Transition fit	**g5**	−17 −40	**18** 1 40	−17 −40	**18** 1 40	−18 −43	**22** **0** 43	−18 −43	**22** **0** 43	−20 −47	**25** 1 47
	g6	−17 −49	**18** 4 49	−17 −49	**18** 4 49	−18 −54	**22** 3 54	−18 −54	**22** 3 54	−20 −60	**25** 3 60
	h5	0 −23	**35** **16** 23	0 −23	**35** **16** 23	0 −25	**40** **18** 25	0 −25	**40** **18** 25	0 −27	**45** **21** 27
	h6	0 −32	**35** **13** 32	0 −32	**35** **13** 32	0 −36	**40** **15** 36	0 −36	**40** **15** 36	0 −40	**45** **17** 40
	j5	+7 −16	**42** **23** 16	+7 −16	**42** **23** 16	+7 −18	**47** **25** 18	+7 −18	**47** **25** 18	+7 −20	**52** **28** 20
	j6	+16 −16	**51** **29** 16	+16 −16	**51** **29** 16	+18 −18	**58** **33** 18	+18 −18	**58** **33** 18	+20 −20	**65** **37** 20
	js5	+11,5 −11,5	**47** **27** 12	+11,5 −11,5	**47** **27** 12	+12,5 −12,5	**53** **32** 13	+12,5 −12,5	**53** **32** 13	+13,5 −13,5	**59** **35** 14
	js6	+16 −16	**51** **29** 16	+16 −16	**51** **29** 16	+18 −18	**58** **33** 18	+18 −18	**58** **33** 18	+20 −20	**65** **37** 20
Interference fit	**k5**	+27 +4	**62** **43** **4**	+27 +4	**62** **43** **4**	+29 +4	**69** **47** **4**	+29 +4	**69** **47** **4**	+32 +5	**77** **53** **5**
	k6	+36 +4	**71** **49** **4**	+36 +4	**71** **49** **4**	+40 +4	**80** **55** **4**	+40 +4	**80** **55** **4**	+45 +5	**90** **62** **5**
	m5	+43 +20	**78** **59** **20**	+43 +20	**78** **59** **20**	+46 +21	**86** **64** **21**	+46 +21	**86** **64** **21**	+50 +23	**95** **71** **23**
	m6	+52 +20	**87** **65** **20**	+52 +20	**87** **65** **20**	+57 +21	**97** **72** **21**	+57 +21	**97** **72** **21**	+63 +23	**108** **80** **23**

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

450 500		500 560		560 630		630 710		710 800		800 900	
0 −45		0 −50		0 −50		0 −75		0 −75		0 −100	
−68 −108	23 51 108	−76 −120	26 58 120	−76 −120	26 58 120	−80 −130	5 47 130	−80 −130	5 47 130	−86 −146	**14** 39 146
−20 −47	**25** **1** 47	–	–	–	–	–	–	–	–	–	–
−20 −60	**25** 3 60	−22 −66	**28** 4 66	−22 −66	**28** 4 66	−24 −74	**51** **9** 74	−24 −74	**51** **9** 74	−26 −82	**74** **24** 82
0 −27	**45** **21** 27	0 −32	**50** **23** 32	0 −32	**50** **23** 32	0 −36	**75** **38** 36	0 −36	**75** **38** 36	0 −40	**100** **53** 40
0 −40	**45** **17** 40	0 −44	**50** **18** 44	0 −44	**50** **18** 44	0 −50	**75** **33** 50	0 −50	**75** **33** 50	0 −56	**100** **48** 56
+7 −20	**52** **28** 20	–	–	–	–	–	–	–	–	–	–
+20 −20	**65** **37** 20	–	–	–	–	–	–	–	–	–	–
+13,5 −13,5	**59** **35** 14	+16 −16	**65** **38** 16	+16 −16	**65** **38** 16	+18 −18	**91** **55** 18	+18 −18	**91** **55** 18	+20 −20	**118** **72** 20
+20 −20	**65** **37** 20	+22 −22	**72** **40** 22	+22 −22	**72** **40** 22	+25 −25	**100** **58** 25	+25 −25	**100** **58** 25	+28 −28	**128** **76** 28
+32 +5	**77** **53** **5**	–	–	–	–	–	–	–	–	–	–
+45 +5	**90** **62** **5**	+44 0	**94** **62** **0**	+44 0	**94** **62** **0**	+50 0	**125** **83** **0**	+50 0	**125** **83** **0**	+56 0	**156** **104** **0**
+50 +23	**95** **71** **23**	–	–	–	–	–	–	–	–	–	–
+63 +23	**108** **80** **23**	+70 +26	**120** **88** **26**	+70 +26	**120** **88** **26**	+80 +30	**155** **113** **30**	+80 +30	**155** **113** **30**	+90 +34	**190** **138** **34**

6
Shaft fits

Nominal shaft diameter in mm													
	over incl.	**3** **6**		**6** **10**		**10** **18**		**18** **30**		**30** **50**		**50** **65**	
Deviations of bearing bore diameter in µm (tolerance class Normal)													
	$t_{\Delta dmp}$	0 –8		0 –8		0 –8		0 –10		0 –12		0 –15	
Shaft deviation, fit interference or fit clearance in µm													
Interference fit	**n5**	+13 +8	**21** **17** **8**	+16 +10	**24** **19** **10**	+20 +12	**28** **23** **12**	+24 +15	**34** **28** **15**	+28 +17	**40** **32** **17**	+33 +20	**48** **39** **20**
Interference fit	**n6**	+16 +8	**24** **19** **8**	+19 +10	**27** **21** **10**	+23 +12	**31** **25** **12**	+28 +15	**38** **30** **15**	+33 +17	**45** **36** **17**	+39 +20	**54** **43** **20**
Interference fit	**p6**	+20 +12	**28** **23** **12**	+24 +15	**32** **26** **15**	+29 +18	**37** **31** **18**	+35 +22	**45** **37** **22**	+42 +26	**54** **45** **26**	+51 +32	**66** **55** **32**
Interference fit	**p7**	+24 +12	**32** **25** **12**	+30 +15	**38** **30** **15**	+36 +18	**44** **35** **18**	+43 +22	**53** **43** **22**	+51 +26	**63** **51** **26**	+62 +32	**77** **62** **32**
Interference fit	**r6**	+23 +15	**31** **25** **15**	+28 +19	**36** **30** **19**	+34 +23	**42** **35** **23**	+41 +28	**51** **44** **28**	+50 +34	**62** **53** **34**	+60 +41	**75** **64** **41**
Interference fit	**r7**	+27 +15	**35** **28** **15**	+34 +19	**42** **34** **19**	+41 +23	**49** **40** **23**	+49 +28	**59** **49** **28**	+59 +34	**71** **59** **34**	+71 +41	**86** **71** **41**
Interference fit	**s6**	+27 +19	**35** **30** **19**	+32 +23	**40** **34** **23**	+39 +28	**47** **41** **28**	+48 +35	**58** **50** **35**	+59 +43	**71** **62** **43**	+72 +53	**87** **76** **53**

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

65 80		80 100		100 120		120 140		140 160		160 180		180 200		200 220		220 250	
0 –15		0 –20		0 –20		0 –25		0 –25		0 –25		0 –30		0 –30		0 –30	
+33 +20	**48 39 20**	+38 +23	**58 46 23**	+38 +23	**58 46 23**	+45 +27	**70 56 27**	+45 +27	**70 56 27**	+45 +27	**70 56 27**	+51 +31	**81 64 31**	+51 +31	**81 64 31**	+51 +31	**81 64 31**
+39 +20	**54 43 20**	+45 +23	**65 51 23**	+45 +23	**65 51 23**	+52 +27	**77 60 27**	+52 +27	**77 60 27**	+52 +27	**77 60 27**	+60 +31	**90 70 31**	+60 +31	**90 70 31**	+60 +31	**90 70 31**
+51 +32	**66 55 32**	+59 +37	**79 65 37**	+59 +37	**79 65 37**	+68 +43	**93 76 43**	+68 +43	**93 76 43**	+68 +43	**93 76 43**	+79 +50	**109 89 50**	+79 +50	**109 89 50**	+79 +50	**109 89 50**
+62 +32	**77 62 32**	+72 +37	**92 73 37**	+72 +37	**92 73 37**	+83 +43	**108 87 43**	+83 +43	**108 87 43**	+83 +43	**108 87 43**	+96 +50	**126 101 50**	+96 +50	**126 101 50**	+96 +50	**126 101 50**
+62 +43	**77 66 43**	+73 +51	**93 79 51**	+76 +54	**96 82 54**	+88 +63	**113 97 63**	+90 +65	**115 99 65**	+93 +68	**118 102 68**	+106 +77	**136 116 77**	+109 +80	**139 119 80**	+113 +84	**143 123 84**
+73 +43	**88 73 43**	+86 +51	**106 87 51**	+89 +54	**109 90 54**	+103 +63	**128 107 63**	+105 +65	**130 109 65**	+108 +68	**133 112 68**	+123 +77	**153 128 77**	+126 +80	**156 131 80**	+130 +84	**160 135 84**
+78 +59	**93 82 59**	+93 +71	**113 99 71**	+101 +79	**121 107 79**	+117 +92	**142 125 92**	+125 +100	**150 133 100**	+133 +108	**158 141 108**	+151 +122	**181 161 122**	+159 +130	**189 169 130**	+169 +140	**199 179 140**

6
Shaft fits

Nominal shaft diameter in mm											
	over incl.	250 280		280 315		315 355		355 400		400 450	
Deviations of bearing bore diameter in µm (tolerance class Normal)											
	$t_{\Delta dmp}$	0 −35		0 −35		0 −40		0 −40		0 −45	
Shaft deviation, fit interference or fit clearance in µm											
Interference fit	**n5**	+57 +34	**92 73 34**	+57 +34	**92 73 34**	+62 +37	**102 80 37**	+62 +37	**102 80 37**	+67 +40	**112 88 40**
Interference fit	**n6**	+66 +34	**101 79 34**	+66 +34	**101 79 34**	+73 +37	**113 88 37**	+73 +37	**113 88 37**	+80 +40	**125 97 40**
Interference fit	**p6**	+88 +56	**123 101 56**	+88 +56	**123 101 56**	+98 +62	**138 113 62**	+98 +62	**138 113 62**	+108 +68	**153 125 68**
Interference fit	**p7**	+108 +56	**143 114 56**	+108 +56	**143 114 56**	+119 +62	**159 127 62**	+119 +62	**159 127 62**	+131 +68	**176 139 68**
Interference fit	**r6**	+126 +94	**161 138 94**	+130 +98	**165 142 98**	+144 +108	**184 159 108**	+150 +114	**190 165 114**	+166 +126	**211 183 126**
Interference fit	**r7**	+146 +94	**181 152 94**	+150 +98	**185 156 98**	+165 +108	**205 173 108**	+171 +114	**211 179 114**	+189 +126	**234 198 126**
Interference fit	**s6**	+190 +158	**225 203 158**	+202 +170	**237 215 170**	+226 +190	**266 241 190**	+244 +208	**284 259 208**	+272 +232	**317 289 232**

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

450 500		**500 560**		**560 630**		**630 710**		**710 800**		**800 900**	
0 −45		0 −50		0 −50		0 −75		0 −75		0 −100	
+67 +40	**112 88 40**	–	–	–	–	–	–	–	–	–	–
+80 +40	**125 97 40**	+88 +44	**138 106 44**	+88 +44	**138 106 44**	+100 +50	**175 133 50**	+100 +50	**175 133 50**	+112 +56	**212 160 56**
+108 +68	**153 125 68**	+122 +78	**172 140 78**	+122 +78	**172 140 78**	+138 +88	**213 171 88**	+138 +88	**213 171 88**	+156 +100	**256 204 100**
+131 +68	**176 139 68**	+148 +78	**198 158 78**	+148 +78	**198 158 78**	+168 +88	**243 199 88**	+168 +88	**243 199 88**	+190 +100	**290 227 100**
+172 +132	**217 189 132**	+194 +150	**244 212 150**	+199 +155	**249 217 155**	+225 +175	**300 258 175**	+235 +185	**310 268 185**	+266 +210	**366 314 210**
+195 +132	**240 204 132**	+220 +150	**270 230 150**	+225 +155	**275 235 155**	+255 +175	**330 278 175**	+265 +185	**340 288 185**	+300 +210	**400 337 210**
+292 +252	**337 309 252**	+324 +280	**374 343 280**	+354 +310	**404 373 310**	+390 +340	**465 423 340**	+430 +380	**505 463 380**	+486 +430	**586 534 430**

7 *Housing fits*

Nominal housing bore diameter in mm							
	over incl.	**6** **10**		**10** **18**		**18** **30**	
Deviations of bearing outside diameter in µm (tolerance class Normal)							
	$t_{\Delta Dmp}$	0 −8		0 −8		0 −9	
Housing deviation, fit interference or fit clearance in µm							
Clearance fit	**E8**	+47 +25	25 35 55	+59 +32	32 44 67	+73 +40	40 54 82
Clearance fit	**F7**	+28 +13	13 21 36	+34 +16	16 25 42	+41 +20	20 30 50
Clearance fit	**G6**	+14 +5	5 11 22	+17 +6	6 12 25	+20 +7	7 14 29
Clearance fit	**G7**	+20 +5	5 13 28	+24 +6	6 15 32	+28 +7	7 17 37
Clearance fit	**H6**	+9 0	**0** 6 17	+11 0	**0** 6 19	+13 0	**0** 7 22
Clearance fit	**H7**	+15 0	**0** 8 23	+18 0	**0** 9 26	+21 0	**0** 10 30
Clearance fit	**H8**	+22 0	**0** 10 30	+27 0	**0** 12 35	+33 0	**0** 14 42
Transition fit	**J6**	+5 −4	**4** 2 13	+6 −5	**5** 1 14	+8 −5	**5** 2 17
Transition fit	**J7**	+8 −7	**7** 1 16	+10 −8	**8** 1 18	+12 −9	**9** 1 21
Transition fit	**JS6**	+4,5 −4,5	**4,5** 2 12,5	+5,5 −5,5	**5,5** 1 13,5	+6,5 −6,5	**6,5** **0** 15,5
Transition fit	**JS7**	+7,5 −7,5	**7,5** 1 15,5	+9 −9	**9** **0** 17	+10,5 −10,5	**10,5** **1** 19,5
Transition fit	**K6**	+2 −7	**7** **1** 10	+2 −9	**9** **3** 10	+2 −11	**11** **4** 11
Transition fit	**K7**	+5 −10	**10** **2** 13	+6 −12	**12** **3** 14	+6 −15	**15** **5** 15

Example: housing ∅ 100 K6 Ⓔ

Minimum material value	+4	**18**	Interference or fit clearance if the maximum material values are combined.
		6	Probable interference or fit clearance.
Maximum material value	−18	19	Interference or fit clearance if the minimum material values are combined.

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

30 50		50 80		80 120		120 150		150 180	
0 −11		0 −13		0 −15		0 −18		0 −25	
+89 +50	50 67 100	+106 +60	60 79 119	+126 +72	72 85 141	+148 +85	85 112 166	+148 +85	85 114 173
+50 +25	25 37 61	+60 +30	30 44 73	+71 +36	36 53 86	+83 +43	43 62 101	+83 +43	43 64 108
+25 +9	9 18 36	+29 +10	10 21 42	+34 +12	12 24 49	+39 +14	14 28 57	+39 +14	14 31 64
+34 +9	9 21 45	+40 +10	10 24 53	+47 +12	12 29 62	+54 +14	14 33 72	+54 +14	14 36 79
+16 0	**0** 9 27	+19 0	**0** 11 32	+22 0	**0** 12 37	+25 0	**0** 14 43	+25 0	**0** 17 50
+25 0	**0** 12 36	+30 0	**0** 14 43	+35 0	**0** 17 50	+40 0	**0** 19 58	+40 0	**0** 22 65
+39 0	**0** 17 50	+46 0	**0** 20 59	+54 0	**0** 23 69	+63 0	**0** 27 81	+63 0	**0** 29 88
+10 −6	**6** 3 21	+13 −6	**6** 5 26	+16 −6	**6** 6 31	+18 −7	**7** 7 36	+18 −7	**7** 10 43
+14 −11	**11** 1 25	+18 −12	**12** 2 31	+22 −13	**13** 4 37	+26 −14	**14** 5 44	+26 −14	**14** 8 51
+8 −8	**8** 1 19	+9,5 −9,5	**9,5** **0** 22,5	+11 −11	**11** 1 26	+12,5 −12,5	**12,5** 1 30,5	+12,5 −12,5	**12,5** 3 37,5
+12,5 −12,5	**12,5** **1** 23,5	+15 −15	**15** **1** 28	+17,5 −17,5	**17,5** **1** 32,5	+20 −20	**20** 1 38	+20 −20	**20** 1 45
+3 −13	**13** **4** 14	+4 −15	**15** **4** 17	+4 −18	**18** **6** 19	+4 −21	**21** **7** 22	+4 −21	**21** **4** 29
+7 −18	**18** **6** 18	+9 −21	**21** **7** 22	+10 −25	**25** **8** 25	+12 −28	**28** **9** 30	+12 −28	**28** **6** 37

7
Housing fits

	Nominal housing bore diameter in mm						
	over incl.	**180** **250**		**250** **315**		**315** **400**	
	Deviations of bearing outside diameter in μm (tolerance class Normal)						
	$t_{\Delta Dmp}$	0 −30		0 −35		0 −40	
	Housing deviation, fit interference or fit clearance in μm						
Clearance fit	**E8**	+172 +100	100 134 202	+191 +110	110 149 226	+214 +125	125 168 254
	F7	+96 +50	50 75 126	+108 +56	56 85 143	+119 +62	62 94 159
	G6	+44 +15	15 35 74	+49 +17	17 39 84	+54 +18	18 43 94
	G7	+61 +15	15 40 91	+69 +17	17 46 104	+75 +18	18 50 115
	H6	+29 0	**0** 20 59	+32 0	**0** 22 67	+36 0	**0** 25 76
	H7	+46 0	**0** 25 76	+52 0	**0** 29 87	+57 0	**0** 32 97
	H8	+72 0	**0** 34 102	+81 0	**0** 39 116	+89 0	**0** 43 129
Transition fit	**J6**	+22 −7	**7** 13 52	+25 −7	**7** 15 60	+29 −7	**7** 18 69
	J7	+30 −16	**16** 9 60	+36 −16	**16** 13 71	+39 −18	**18** 14 79
	JS6	+14,5 −14,5	**14,5** 5 44,5	+16 −16	**16** 7 51	+18 −18	**18** 6 58
	JS7	+23 −23	**23** 2 53	+26 −26	**26** 3 61	+28,5 −28,5	**28,5** 3 68,5
	K6	+5 −24	**24** **4** 35	+5 −27	**27** **5** 40	+7 −29	**29** **4** 47
	K7	+13 −33	**33** **8** 43	+16 −36	**36** **7** 51	+17 −40	**40** **8** 57

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

400 **500**		**500** **630**		**630** **800**		**800** **1000**		**1000** **1250**	
0 −45		0 −50		0 −75		0 −100		0 −125	
+232 +135	135 182 277	+255 +145	145 199 305	+285 +160	160 227 360	+310 +170	170 250 410	+360 +195	195 292 485
+131 +68	68 104 176	+146 +76	76 116 196	+160 +80	80 132 235	+176 +86	86 149 276	+203 +98	98 175 328
+60 +20	20 48 105	+66 +22	22 54 116	+74 +24	24 66 149	+82 +26	26 78 182	+94 +28	28 93 219
+83 +20	20 56 128	+92 +22	22 62 142	+104 +24	24 76 179	+116 +26	26 89 216	+133 +28	28 105 258
+40 0	**0** 28 85	+44 0	**0** 32 94	+50 0	**0** 42 125	+56 0	**0** 52 156	+66 0	**0** 64 191
+63 0	**0** 36 108	+70 0	**0** 40 120	+80 0	**0** 52 155	+90 0	**0** 63 190	+105 0	**0** 77 230
+97 0	**0** 47 142	+110 0	**0** 54 160	+125 0	**0** 67 200	+140 0	**0** 80 240	+165 0	**0** 97 290
+33 −7	**7** 21 78	–	–	–	–	–	–	–	–
+43 −20	**20** 16 88	–	–	–	–	–	–	–	–
+20 −20	**20** 8 65	+22 −22	**22** 10 72	+25 −25	**25** 17 100	+28 −28	**28** 24 128	+33 −33	**33** 31 158
+31,5 −31,5	**31,5** 4 76,5	+35 −35	**35** 5 85	+40 −40	**40** 12 115	+45 −45	**45** 18 145	+52,5 −52,5	**52** 24 177
+8 −32	**32** **4** 53	0 −44	**44** **12** 50	0 −50	**50** **8** 75	0 −56	**56** **4** 100	0 −66	**66** **2** 125
+18 −45	**45** **9** 63	0 −70	**70** **30** 50	0 −80	**80** **28** 75	0 −90	**90** **27** 100	0 −105	**105** **28** 125

Table 7 *Housing fits*

		Nominal housing bore diameter in mm					
	over incl.	**6** **10**		**10** **18**		**18** **30**	
	Deviations of bearing outside diameter in μm (tolerance class Normal)						
	$t_{\Delta Dmp}$	0 –8		0 –8		0 –9	
	Housing deviation, fit interference or fit clearance in μm						
Transition fit	**M6**	–3 –12	**12** **6** 5	–4 –15	**15** **9** 4	–4 –17	**17** **10** 5
Transition fit	**M7**	0 –15	**15** **7** 8	0 –18	**18** **9** 8	0 –21	**21** **11** 9
Transition fit	**N6**	–7 –16	**16** **10** 1	–9 –20	**20** **14** 1	–11 –24	**24** **17** 2
Transition fit	**N7**	–4 –19	**19** **11** 4	–5 –23	**23** **14** 3	–7 –28	**28** **18** 2
Interference fit	**P6**	–12 –21	**21** **15** **4**	–15 –26	**26** **20** **7**	–18 –31	**31** **24** **9**
Interference fit	**P7**	–9 –24	**24** **16** **1**	–11 –29	**29** **20** **3**	–14 –35	**35** **25** **5**

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

30 50		50 80		80 120		120 150		150 180	
0 −11		0 −13		0 −15		0 −18		0 −25	
−4 −20	**20** **11** 7	−5 −24	**24** **13** 8	−6 −28	**28** **16** 9	−8 −33	**33** **19** 10	−8 −33	**33** **16** 17
0 −25	**25** **13** 11	0 −30	**30** **16** 13	0 −35	**35** **18** 15	0 −40	**40** **21** 18	0 −40	**40** **18** 25
−12 −28	**28** **19** 1	−14 −33	**33** **22** 1	−16 −38	**38** **26** 1	−20 −45	**45** **31** 2	−20 −45	**45** **28** 5
−8 −33	**33** **21** 3	−9 −39	**39** **25** 4	−10 −45	**45** **28** 5	−12 −52	**52** **33** 3	−12 −52	**52** **30** 13
−21 −37	**37** **28** **10**	−26 −45	**45** **34** **13**	−30 −52	**52** **40** **15**	−36 −61	**61** **47** **18**	−36 −61	**61** **44** **11**
−17 −42	**42** **30** **6**	−21 −51	**51** **37** **8**	−24 −59	**59** **42** **9**	−28 −68	**68** **49** **10**	−28 −68	**68** **46** **3**

7
Housing fits

		Nominal housing bore diameter in mm					
	over incl.	**180** **250**		**250** **315**		**315** **400**	
	Deviations of bearing outside diameter in μm (tolerance class Normal)						
	$t_{\Delta Dmp}$	0 −30		0 −35		0 −40	
	Housing deviation, fit interference or fit clearance in μm						
Transition fit	**M6**	−8 −37	**37** **17** 22	−9 −41	**41** **19** 26	−10 −46	**46** **21** 30
	M7	0 −46	**46** **21** 30	0 −52	**52** **23** 35	0 −57	**57** **25** 40
	N6	−22 −51	**51** **31** 8	−25 −57	**57** **35** 10	−26 −62	**62** **37** 14
	N7	−14 −60	**60** **35** 16	−14 −66	**66** **37** 21	−16 −73	**73** **41** 24
Interference fit	**P6**	−41 −70	**70** **50** **11**	−47 −79	**79** **57** **12**	−51 −87	**87** **62** **11**
	P7	−33 −79	**79** **54** **3**	−36 −88	**88** **59** **1**	−41 −98	**98** **66** **1**

Values **in bold type** in the group of three indicate fit interference, values in normal type indicate fit clearance.

400 **500**		**500** **630**		**630** **800**		**800** **1000**		**1000** **1250**	
0 −45		0 −50		0 −75		0 −100		0 −125	
−10 −50	**50** **22** 35	−26 −70	**70** **38** 24	−30 −80	**80** **38** 45	−34 −90	**90** **38** 66	−40 −106	**106** **45** 85
0 −63	**63** **27** 45	−26 −96	**96** **56** 24	−30 −110	**110** **58** 45	−34 −124	**124** **61** 66	−40 −145	**145** **68** 85
−27 −67	**67** **39** 18	−44 −88	**88** **56** 6	−50 −100	**100** **58** 25	−56 −112	**112** **60** 44	−66 −132	**132** **67** 59
−17 −80	**80** **44** 28	−44 −114	**114** **74** 6	−50 −130	**130** **78** 25	−56 −146	**146** **83** 44	−66 −171	**171** **94** 59
−55 −95	**95** **67** **10**	−78 −122	**122** **90** **28**	−88 −138	**138** **96** **13**	−100 −156	**156** **104** **0**	−120 −186	**186** **121** 5
−45 −108	**108** **72** **0**	−78 −148	**148** **108** **28**	−88 −168	**168** **126** **13**	−100 −190	**190** **127** **0**	−120 −225	**225** **148** 5

Shaft tolerances for adapter sleeves and withdrawal sleeves are shown in ➤166|▦8.

▦8
Shaft tolerances for adapter sleeves and withdrawal sleeves

The numbers printed in italics give guide values for the cylindricity tolerance t_1 (DIN EN ISO 1101) *➤168|11.*

Nominal shaft diameter		Shaft tolerance					
		h7/ $\frac{IT5}{2}$		h8/ $\frac{IT5}{2}$		h9/ $\frac{IT6}{2}$	
mm		µm		µm		µm	
over	incl.						
3	**6**	0 −12	*2,5*	0 −18	*2,5*	0 −30	*4*
6	**10**	0 −15	*3*	0 −22	*3*	0 −36	*4,5*
10	**18**	0 −18	*4*	0 −27	*4*	0 −43	*5,5*
18	**30**	0 −21	*4,5*	0 −33	*4,5*	0 −52	*6,5*
30	**50**	0 −25	*5,5*	0 −39	*5,5*	0 −62	*8*
50	**65**	0 −30	*6,5*	0 −46	*6,5*	0 −74	*9,5*
65	**80**	0 −30	*6,5*	0 −46	*6,5*	0 −74	*9,5*
80	**100**	0 −35	*7,5*	0 −54	*7,5*	0 −87	*11*
100	**120**	0 −35	*7,5*	0 −54	*7,5*	0 −87	*11*
120	**140**	0 −40	*9*	0 −63	*9*	0 −100	*12,5*
140	**160**	0 −40	*9*	0 −63	*9*	0 −100	*12,5*
160	**180**	0 −40	*9*	0 −63	*9*	0 −100	*12,5*
180	**200**	0 −46	*10*	0 −72	*10*	0 −115	*14,5*
200	**220**	0 −46	*10*	0 −72	*10*	0 −115	*14,5*
220	**250**	0 −46	*10*	0 −72	*10*	0 −115	*14,5*
250	**280**	0 −52	*11,5*	0 −81	*11,5*	0 −130	*16*
280	**315**	0 −52	*11,5*	0 −81	*11,5*	0 −130	*16*
315	**355**	0 −57	*12,5*	0 −89	*12,5*	0 −140	*18*
355	**400**	0 −57	*12,5*	0 −89	*12,5*	0 −140	*18*
400	**450**	0 −63	*13,5*	0 −97	*13,5*	0 −155	*20*
450	**500**	0 −63	*13,5*	0 −97	*13,5*	0 −155	*20*
500	**560**	0 −70	*16*	0 −110	*16*	0 −175	*22*
560	**630**	0 −70	*16*	0 −110	*16*	0 −175	*22*
630	**710**	0 −80	*18*	0 −125	*18*	0 −200	*25*
710	**800**	0 −80	*18*	0 −125	*18*	0 −200	*25*
800	**900**	0 −90	*20*	0 −140	*20*	0 −230	*28*

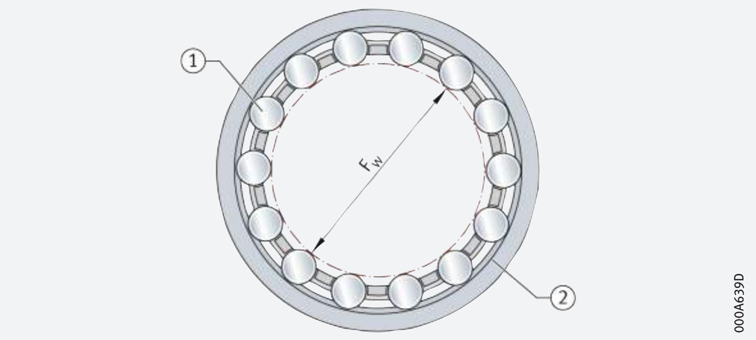
8.5 Enveloping circle

For bearings without an inner ring, the enveloping circle F_w ➤167|10 is used. This is the inner inscribed circle of the rolling elements in clearance-free contact with the outer raceway. The enveloping circle for unfitted machined needle roller bearings is in the tolerance class F6 and for drawn cup needle roller bearings in the tolerance class F8. Deviations for F6 and F8 ➤167|9.

10
Enveloping circle

F_w = *enveloping circle diameter*

① *Rolling element*
② *Outer raceway*



9
Deviations for the enveloping circle diameter

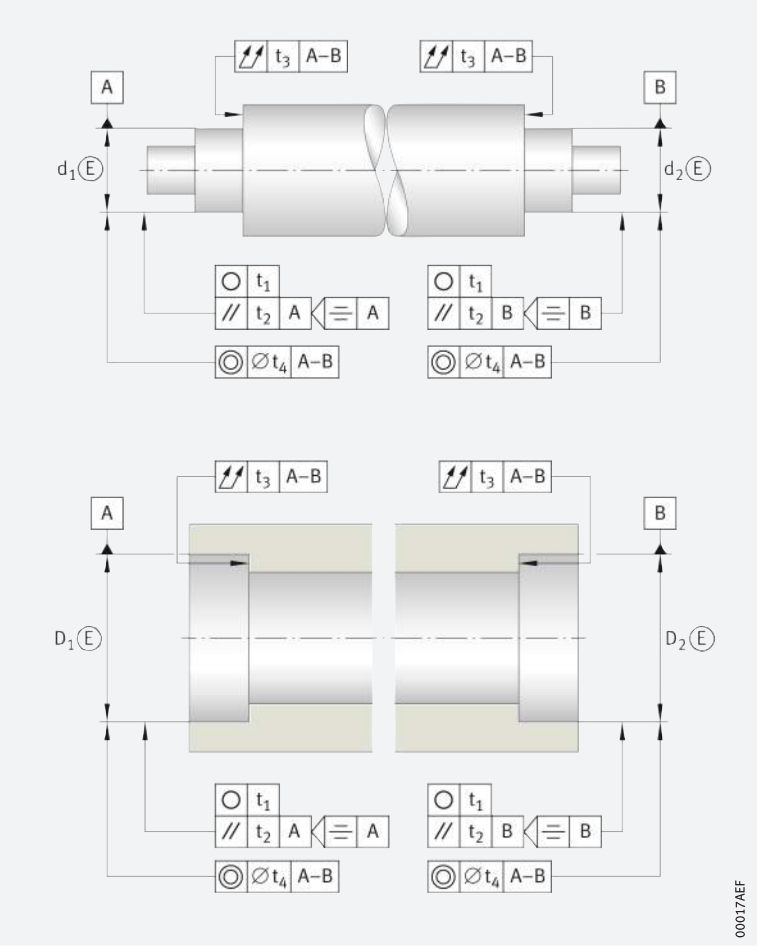
Enveloping circle diameter F_w mm		Tolerance class F6 Tolerance for enveloping circle diameter F_w		Tolerance class F8 Tolerance for enveloping circle diameter F_w	
		Upper deviation	Lower deviation	Upper deviation	Lower deviation
over	incl.	μm	μm	μm	μm
3	6	+18	+10	+28	+10
6	10	+22	+13	+35	+13
10	18	+27	+16	+43	+16
18	30	+33	+20	+53	+20
30	50	+41	+25	+64	+25
50	80	+49	+30	+76	+30
80	120	+58	+36	+90	+36
120	180	+68	+43	+106	+43
180	250	+79	+50	+122	+50
250	315	+88	+56	+137	+56
315	400	+98	+62	+151	+62
400	500	+108	+68	+165	+68

8.6 Dimensional, geometrical and running accuracy of mating parts

In order to achieve the required fit, the bearing seats and fit surfaces of the shaft and housing bore must conform to certain tolerances ➤168|11 and ➤169|10.

11
Guide values for the geometrical and positional tolerances of bearing seating surfaces

t_1 = *roundness tolerance*
t_2 = *parallelism tolerance*
t_3 = *total axial runout tolerance of abutment shoulders*
t_4 = *coaxiality tolerance*



Accuracy of bearing seating surfaces

ISO fundamental tolerances

The degree of accuracy for the bearing seat tolerances on the shaft and in the housing, as well as the ISO fundamental tolerances, are shown in ➤169|10 (DIN ISO 286-1:2010).

Second bearing seat

The positional tolerances t_4 for a second bearing seat on the shaft (d_2) or in the housing (D_2) are dependent on the types of bearings used and the operating conditions. For the values required in the specific application, please consult Schaeffler.

Housings

In split housings, the joints must be free from burrs.
The accuracy of the bearing seats is determined as a function of the accuracy of the bearing selected.

Table 10
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Fundamental tolerance grades[1]			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal 6X	PN (P0) P6X	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	
6	P6	Shaft	IT5	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	
		Housing	IT6	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
5	P5	Shaft	IT5	Circumferential load IT2/2	Circumferential load IT2/2	IT2
				Point load IT3/2	Point load IT3/2	
		Housing	IT6	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	
4	P4 P4S[2] SP[2]	Shaft	IT4	Circumferential load IT1/2	Circumferential load IT1/2	IT1
				Point load IT2/2	Point load IT2/2	
		Housing	IT5	Circumferential load IT2/2	Circumferential load IT2/2	IT2
				Point load IT3/2	Point load IT3/2	
	UP[2]	Shaft	IT3	Circumferential load IT0/2	Circumferential load IT0/2	IT0
				Point load IT1/2	Point load IT1/2	
		Housing	IT4	Circumferential load IT1/2	Circumferential load IT1/2	IT1
				Point load IT2/2	Point load IT2/2	

[1] *ISO fundamental tolerances (IT grades) in accordance with DIN ISO 286. Values for IT grades* *➤170 | Table 12.*

[2] *Not included in DIN 620.*

Roughness of bearing seats

✎ Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. Shafts must be ground, while bores must be precision turned. For further information on this subject ➤*170* | Table *11* and product chapter.

11
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4
500	1 250	3,2[1]	1,6	1,6	0,8

[1] *For the mounting of bearings using the hydraulic method, a value Ra = 1,6 µm must not be exceeded*

Numerical values for IT grades

➤170| 12 shows numerical values for the ISO fundamental tolerances (IT grades) in accordance with DIN ISO 286-1:2010.

12
IT grades and values

IT grade	Nominal dimension in mm							
over	–	3	6	10	18	30	50	80
incl.	3	6	10	18	30	50	80	120
	Values in µm							
IT01	0,3	0,4	0,4	0,5	0,6	0,6	0,8	1
IT0	0,5	0,6	0,6	0,8	1	1	1,2	1,5
IT1	0,8	1	1	1,2	1,5	1,5	2	2,5
IT2	1,2	1,5	1,5	2	2,5	2,5	3	4
IT3	2	2,5	2,5	3	4	4	5	6
IT4	3	4	4	5	6	7	8	10
IT5	4	5	6	8	9	11	13	15
IT6	6	8	9	11	13	16	19	22
IT7	10	12	15	18	21	25	30	35
IT8	14	18	22	27	33	39	46	54
IT9	25	30	36	43	52	62	74	87
IT10	40	48	58	70	84	100	120	140
IT11	60	75	90	110	130	160	190	220
IT12	100	120	150	180	210	250	300	350

continued ▼

12
IT grades and values

IT grade	Nominal dimension in mm							
over	120	180	250	315	400	500	630	800
incl.	180	250	315	400	500	630	800	1 000
	Values in µm							
IT01	1,2	2	2,5	3	4	–	–	–
IT0	2	3	4	5	6	–	–	–
IT1	3,5	4,5	6	7	8	9	10	11
IT2	5	7	8	9	10	11	13	15
IT3	8	10	12	13	15	16	18	21
IT4	12	14	16	18	20	22	25	28
IT5	18	20	23	25	27	32	36	40
IT6	25	29	32	36	40	44	50	56
IT7	40	46	52	57	63	70	80	90
IT8	63	72	81	89	97	110	125	140
IT9	100	115	130	140	155	175	200	230
IT10	160	185	210	230	250	280	320	360
IT11	250	290	320	360	400	440	500	560
IT12	400	460	520	570	630	700	800	900

continued ▲

Seats for adapter sleeves and withdrawal sleeves

Seat diameter tolerances for adapter sleeves and withdrawal sleeves

Adapter and withdrawal sleeves are used if increased requirements are not made on the running accuracy of the bearing. For the seats, diameter tolerances corresponding to the IT grades 7 to 9 are possible, while the geometrical deviation can be 50% of this value.

Tapered bearing seats for radial bearings

Geometrical and positional tolerances of the shaft

Guide values for the machining of tapered bearing seats on shafts are shown in ➤171|12, ➤171|13.

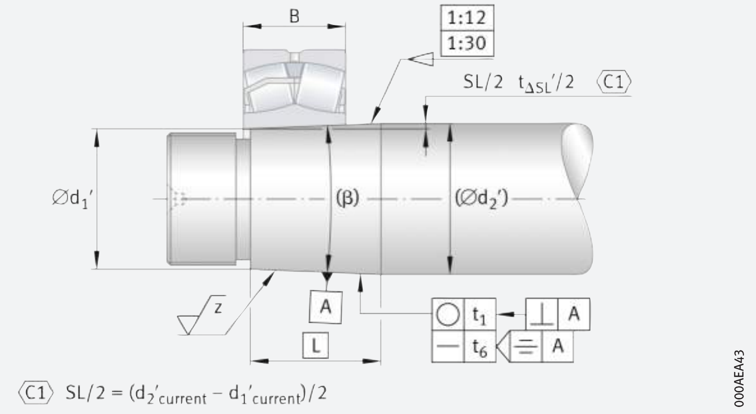
This information does not apply to super precision cylindrical roller bearings in machine tools (spindle bearing arrangement). For information on this subject, see the catalogue Super Precision Bearings ➤ SP 1.

Taper gauges

Schaeffler taper gauges can be used to check for adherence to the recommended tolerances.

12
Guide values for the geometrical and positional tolerances of tapered bearing seats

B = *bearing width*
SL = *L · taper ratio (1:12, 1:30)*
$t_{\Delta SL}'$ = *taper angle tolerance*
t_1 = *roundness tolerance* ➤*169|10*
t_6 = *perpendicularity tolerance = 2/3 · t_2; values for t_2* ➤*169|10*
z = *recommended mean roughness* ➤*170|11*



The tolerances for taper angle $t_{\Delta SL}$ relative to the bearing width B can be found in the table ➤171|13.

13
Taper angle tolerance of tapered bearing seats, relative to bearing width

Bearing width B (nominal dimension)		Taper angle tolerance $t_{\Delta SL}$			
		from		to	
mm		Deviations			
over	incl.	upper µm	lower µm	upper µm	lower µm
16	25	+8	0	+12,5	0
25	40	+10	0	+16	0
40	63	+12,5	0	+20	0
63	100	+16	0	+25	0
100	160	+20	0	+32	0
160	250	+25	0	+40	0
250	400	+32	0	+50	0
400	630	+40	0	+63	0

Determine $t_{\Delta SL}$ by means of interpolation

For bearing widths with nominal dimensions between the values listed in the table, the taper angle tolerance $t_{\Delta SL}$ should be determined by means of interpolation of the upper deviations ➤171|1.

1
Interpolation of the taper angle tolerance

$$t_{\Delta SL} = \frac{\Delta t_{\Delta SL}}{\Delta B} \cdot B$$

For a taper of length L, the taper angle tolerance $t_{\Delta SL}'$ of the entire taper applies ➤171|2.

2
Taper angle tolerance of the entire taper

$$t_{\Delta SL}' = \frac{t_{\Delta SL}}{B} \cdot L = \frac{\Delta t_{\Delta SL}}{\Delta B} \cdot L$$

Example of tolerance calculation

Given:

- bearing width B = 90 mm
- taper ratio 1:12
- taper length L = 100 mm.

$$t_{\Delta SL}' = \frac{25\ \mu m - 16\ \mu m}{100\ mm - 63\ mm} \cdot 100\ mm = \frac{9\ \mu m}{37\ mm} \cdot 100\ mm \cong 24\ \mu m$$

The tolerance $t_{\Delta SL}'/2$ is thus 0 to +12 μm.

In order to calculate the taper slope SL (nominal dimension), the taper length L is multiplied by the taper ratio (1:12) ➤172|ƒ3.

ƒ3
Taper slope

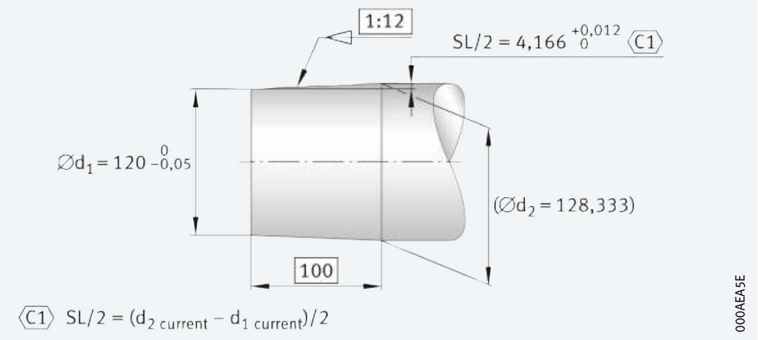
$$SL = L \cdot \frac{1}{12}$$

$$SL = 100\ mm \cdot \frac{1}{12} = 8{,}333\ mm$$

The nominal dimension for SL/2 is thus 4,166 mm; SL/2 = 4,166 +0,012/0.

The data can then be entered in the drawing as follows ➤172|13.

13
Example of drawing entry for dimensional tolerances



Checking of a shaft

Measured values:

- $d_1' = 120$ mm
- $d_2' = 128{,}345$ mm.

The taper slope is calculated from the measured values using ➤172|ƒ4.

ƒ4
Taper slope

$$\frac{SL}{2} = \frac{d_2' - d_1'}{2}$$

$$\frac{SL}{2} = \frac{128{,}345\ mm - 120\ mm}{2} = 4{,}173\ mm$$

The value for SL/2 is thus within tolerance.

8.7 Axial location of bearings

Securing the bearing rings against axial creep by means of form fit

In order to prevent the bearing rings co-rotating, they are radially fixed by means of a tight fit. At the same time, the rings must be axially located in both directions so that they cannot undergo lateral creep. Axial creep cannot be prevented solely by a tight fit, especially not if a radial bearing must support large axial forces. For axial location, the bearing rings must therefore be connected by form fit to the shaft or the housing.

Examples

Solutions proven in practice for individual bearing arrangements (locating bearing arrangement, non-locating bearing arrangement, adjusted/floating bearing arrangement) and the axial location of bearing rings in certain bearing types are described below. Specific features of the individual bearing types are covered in the product chapters.

Guidelines for axial location of bearing rings

Locating bearing arrangement

Locating bearings can support axial forces in both directions

Locating bearings must in general also support axial forces. For the axial location of bearing rings, form fit elements such as shoulders, snap rings, covers, caps, nuts etc. have proved effective.

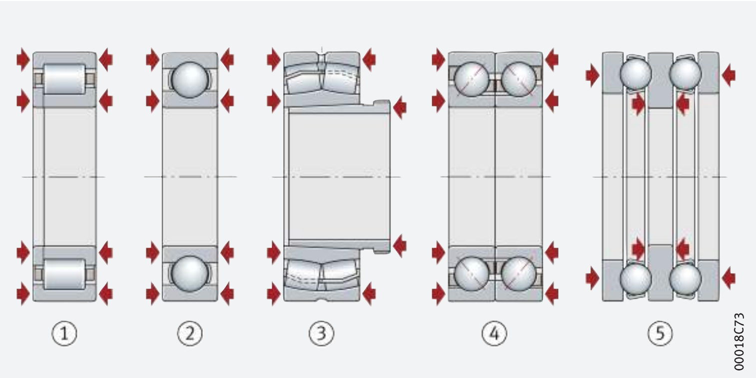
➤173| 14 shows bearing types that can be used as locating bearings and can support axial forces in both directions. The arrows in ➤173| 14 to ➤175| 16 indicate what task the axial location methods perform in the various types of mounting and types of bearing, such as axial location on both sides of the outer and inner ring of the deep groove ball bearing.

! In locating bearing arrangements, both bearing rings must always be abutted on both sides. The fasteners must be matched to the magnitude of the axial forces present.

14
Axial location of bearing rings in locating bearings

= the means of location must support significant axial forces

1. *Cylindrical roller bearing NUP*
2. *Deep groove ball bearing*
3. *Spherical roller bearing*
4. *Angular contact ball bearing pair*
5. *Double direction axial deep groove ball bearing*



Cylindrical roller bearing, deep groove ball bearing

The cylindrical roller bearing NUP and deep groove ball bearing support alternating axial forces. Both rings must therefore be axially located on both sides.

Spherical roller bearing

The spherical roller bearing must, as a locating bearing, support axial forces from alternating directions. In this example, the inner ring is located by means of a withdrawal sleeve.

Angular contact ball bearings

The pair of angular contact ball bearings forms a locating bearing in which the two single row bearings are adjusted against each other in mounting. For location on the shaft, readjustable fasteners, such as nuts, are suitable.

Double direction axial deep groove ball bearing

The double direction axial deep groove ball bearing should be seen as a closed bearing group. The shaft locating washer is axially located on both sides, while the housing locating washers are each located on one side. In order that the ball and cage assemblies are guided correctly in the raceway grooves, the bearing is mounted clearance-free by adjustment of the housing locating washers.

Non-locating bearing arrangement

✎ The means of axial location only needs to prevent lateral creep of the bearing rings

Non-locating bearings must only support slight axial forces. The axial location method only needs to prevent lateral creep of the rings. The simplest way of achieving this is by a tight fit. In the case of non-separable bearings, the rotating bearing ring has a tight fit. The other ring is axially retained by the rolling elements. ➤174 | *15* shows rolling bearings that can be used as non-locating bearings.

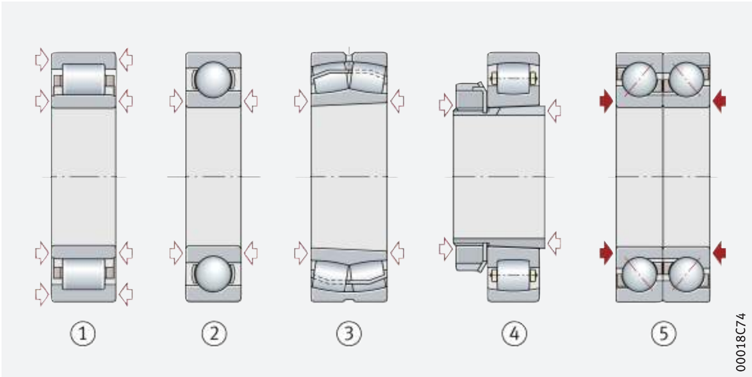
15

Axial location of bearing rings in non-locating bearings

= the means of location must prevent axial creep of the ring

= the means of location must support significant axial forces

① Cylindrical roller bearing NU
② Deep groove ball bearing
③ Spherical roller bearing
④ Barrel roller bearing
⑤ Two single row angular contact ball bearings, adjusted in a pair



✎ Cylindrical roller bearing NU

The cylindrical roller bearing NU is designed such that the inner ring can be displaced relative to the roller and cage assembly. For this reason, both bearing rings must also be secured against axial creep on both sides.

✎ Deep groove ball bearing

In the deep groove ball bearing, only the inner ring is located, while the outer ring is axially retained by the rolling elements.

✎ Spherical roller bearing, barrel roller bearing, angular contact ball bearings

In the spherical roller bearing and barrel roller bearing, as well as in the angular contact ball bearing pair, the outer ring is guided axially by the rolling elements. The inner ring of the barrel roller bearing is located on the shaft with or without an adapter sleeve. Location by means of an adapter sleeve secures the bearing against lateral creep.

✎ Adjusted single row angular contact ball bearings

In the adjusted pair of single row angular contact ball bearings, the inner rings are clamped against each other so that they are not forced apart by the axial component of the radial force.

Adjusted or floating bearing arrangement

✎ The bearings can support axial loads in one direction only

Bearings mounted in an adjusted and floating arrangement can support axial load in one direction only; this also applies to single direction axial bearings. The axial forces are supported by shaft or housing shoulders, snap rings, covers etc.

✎ Angular contact ball bearing, cylindrical roller bearing

The angular contact ball bearing in ➤175 | *16* supports axial forces in one direction only. The bearing rings therefore only require abutment on one side each in accordance with the force pattern.
The axial force component is supported by an additional bearing in a mirror image arrangement. Similar conditions are present in the cylindrical roller bearing NJ.

✎ Axial deep groove ball bearing

The balls in the axial deep groove ball bearing in ➤175 | *16* only roll correctly if the bearing runs clearance-free and with adequate minimum load.

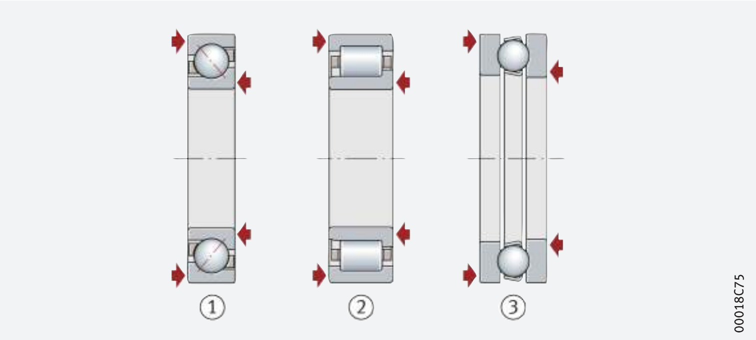
!

If the shaft is horizontal, a further adjustable bearing must be provided. This is particularly important in the case of high speeds. If the shaft is vertical, the opposing bearing can be omitted if the bearing is adjusted clearance-free by the load in all operating states.

16
Axial location of the bearing rings in bearings in an adjusted or floating bearing arrangement

= the means of location must support significant axial forces

① *Angular contact ball bearing*
② *Cylindrical roller bearing NJ*
③ *Axial deep groove ball bearing*



Examples of the axial fixing of bearing rings

Axial location of bearing rings

➤*175*| *17* to ➤*179*| *24* show possibilities for the location of bearing rings depending on the design of the bearing arrangement and the application.

Locating/non-locating bearing arrangement

Deep groove ball bearing and cylindrical roller bearing

➤*175*| *17* shows the bearing arrangement of the shaft in an electric motor of medium power rating.

Locating bearing A

The locating bearing A is subjected not only to radial forces but also to axial forces of alternating direction. The axial forces are not very high and do not act in a shock type manner. For location of the deep groove ball bearing, rigid shoulders, covers, snap rings or other form fit elements are therefore normally used. The adjacent parts should require little production work and mounting and dismounting should be easy to perform.

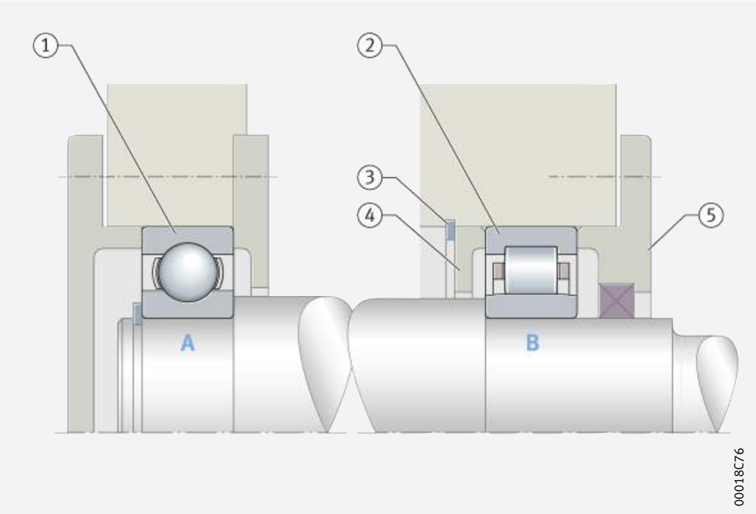
Non-locating bearing B

The non-locating bearing B must support radial forces only. The outer ring is clamped between the snap ring and cover, while the inner ring has a tight fit on the shaft.

17
Axial location of deep groove ball bearing and cylindrical roller bearing

A = *locating bearing*
B = *non-locating bearing*

① *Deep groove ball bearing*
② *Cylindrical roller bearing NU*
③ *Snap ring*
④ *Spacer ring*
⑤ *Cover*



Locating/non-locating bearing arrangement

Tapered roller bearing pair and cylindrical roller bearing

The bearing arrangement of a pinion shaft shown in ➤176|Figure 18 is subjected to high, occasionally shock type radial and axial forces. Due to the hypoid tooth set, precise axial adjustment of the pinion against the crown gear and rigid guidance are necessary.

Locating bearing A

The locating bearing A is formed by the tapered roller bearing pair clamped from within. Since spacer rings are arranged between the inner rings, the shaft nut can be tightened to a certain torque without leading to bracing of the bearing arrangement. The axial position of the pinion relative to the crown gear is set by means of shims at the time of mounting.

Non-locating bearing B

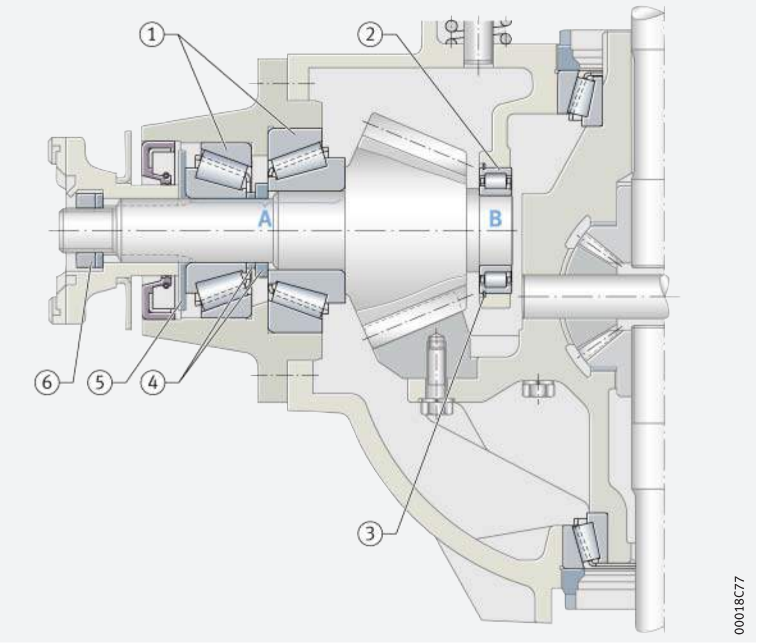
The non-locating bearing B must support radial forces only. Due to the magnitude of the forces, both rings have tight fits. A snap ring in one annular slot of the outer ring securely prevents creep of the bearing to the left. The ribs of the bearing rings represent additional security against creep to the right. In order to prevent jamming of the bearing arrangement, the non-locating bearing must have axial clearance between the inner ring rib and the rollers.

18

Axial location of tapered roller bearing pair and cylindrical roller bearing

A = locating bearing
B = non-locating bearing

① Pair of tapered roller bearings
② Cylindrical roller bearing
③ Snap ring
④ Spacer ring
⑤ Shims
⑥ Shaft nut



Locating bearing arrangement

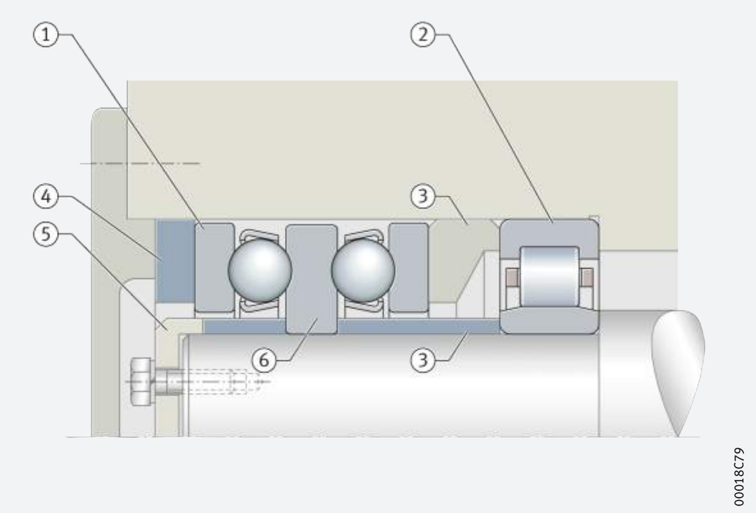
✎ Cylindrical roller bearing and axial deep groove ball bearing

The locating bearing in ➤177|⌧19 is subjected to high axial forces in both directions and the shaft must be guided axially clearance-free.

The shaft locating washer of the double direction axial deep groove ball bearing and the inner ring of the cylindrical roller bearing are axially clamped by means of an end washer. The axial deep groove ball bearing is adjusted clearance-free by means of the intermediate ring inserted with a fit.

⌧19
Axial location of axial deep groove ball bearing and cylindrical roller bearing

1. *Housing locating washer of axial deep groove ball bearing, double direction*
2. *Cylindrical roller bearing NU*
3. *Spacer ring*
4. *Intermediate ring inserted with fit*
5. *End washer*
6. *Shaft locating washer of axial deep groove ball bearing*



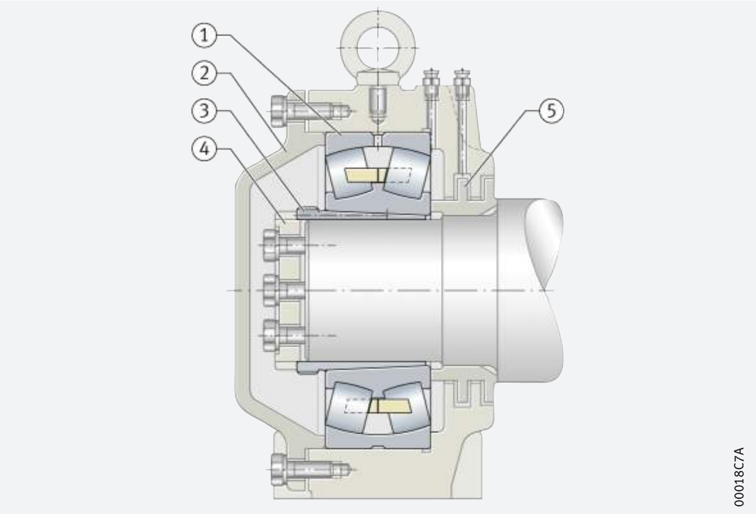
Locating bearing arrangement

✎ Spherical roller bearing

➤177|⌧20 shows the locating bearing for a conveyor sheave. In order that the bearing can be mounted and dismounted with ease, a withdrawal sleeve is used to locate the inner ring, which is pressed in using a hydraulic mounting method. The taper on the withdrawal sleeve is self-retaining. The end cap serves as a retainer only.

⌧20
Axial location of spherical roller bearing with withdrawal sleeve

1. *Spherical roller bearing*
2. *Cover*
3. *Withdrawal sleeve*
4. *End cap*
5. *Spacer bush with labyrinth passages*



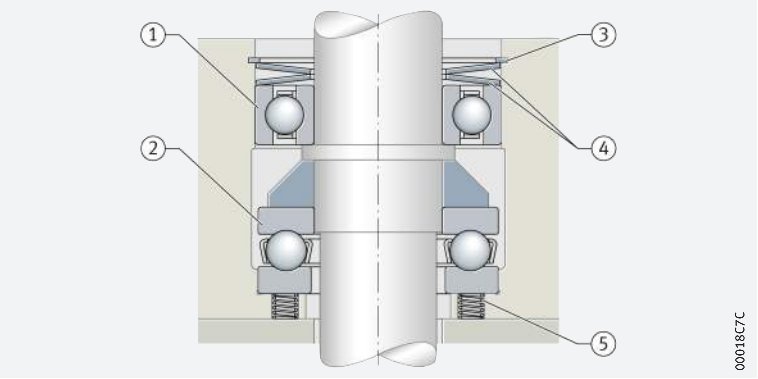
Locating bearing arrangement for vertical shaft

✎ Radial deep groove ball bearing and axial deep groove ball bearing

The vertical shaft in ➤178|🗔21 is radially guided by a radial deep groove ball bearing and axially supported by an axial deep groove ball bearing. Disc springs fixed by means of a snap ring give axial preload of the bearing, thus ensuring the minimum load for the guidance bearing. There is some axial clearance between the disc spring when pressed flat and the snap ring. This gives easier mounting of the snap ring. In order to ensure a minimum load for the axial bearing in the event of thrust reversal, biasing springs are attached to the housing locating washer.

🗔21
Axial location of an axial and radial deep groove ball bearing with a vertical shaft

1. *Radial deep groove ball bearing*
2. *Axial deep groove ball bearing*
3. *Snap ring*
4. *Disc spring*
5. *Helical compression spring*



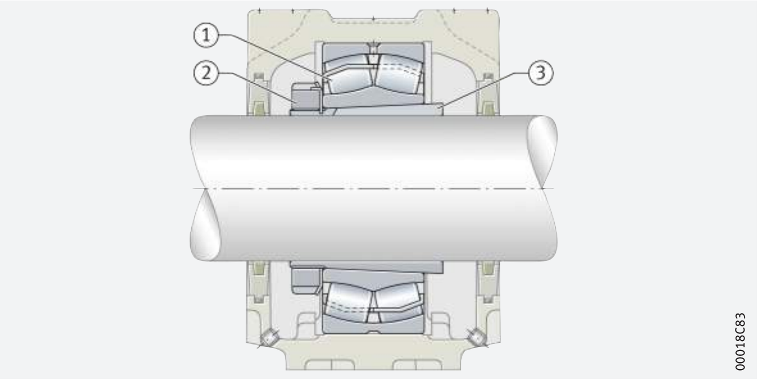
Non-locating bearing arrangement

✎ Spherical roller bearing, location by adapter sleeve

The locating bearing in ➤178|🗔22 must support high radial loads. When the adapter sleeve is tightened, this gives the bearing on the smooth shaft a tight fit, which prevents axial creep.

🗔22
Axial location of spherical roller bearing with adapter sleeve

1. *Spherical roller bearing*
2. *Locknut with tab washer*
3. *Adapter sleeve*



Adjusted bearing arrangement

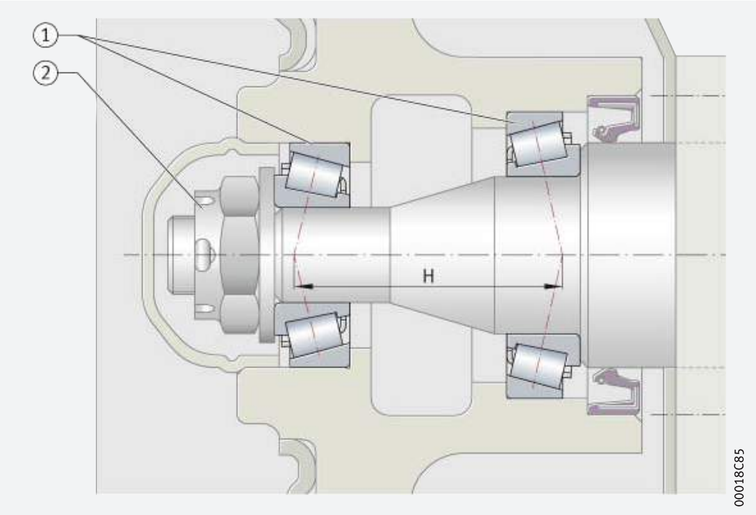
✎ Tapered roller bearing pair, bearings in O arrangement, outer rings with tight fit

In wheel bearing arrangements with a rotating outer ring in accordance with ➤179|🗔23, not only are high radial and axial forces present but tilting moments also occur. The outer rings have a tight fit. In these sorts of hub bearing arrangements, this is important due to the circumferential load acting on the outer rings. The axial clearance of the bearing group is set by means of the fixing nut, where the loosely fitted inner ring of the outer bearing undergoes displacement.

23
Axial location of tapered roller bearing pair

H = support spacing

① Tapered roller bearing pair, O arrangement
② Fixing nut



Adjusted bearing arrangement with spring washer

Deep groove ball bearings

The example in ➤143|7 shows a bearing arrangement that is commonly used in small electric motors. The bearings are not subjected to high loads, the speed is in the moderate range. The radial load is small and only guidance forces must be supported in an axial direction.

Inner rings with tight fit, outer rings with sliding seat, bearings adjusted by means of spring preload

The inner rings of the deep groove ball bearings have a tight fit on the journal and are abutted on the shaft shoulders. The outer rings have a sliding seat. A spring washer is fitted between the outer ring of the right hand bearing and the cover collar. The bearings are axially adjusted by the tensioned springs. This achieves particularly smooth running.

Floating bearing arrangement

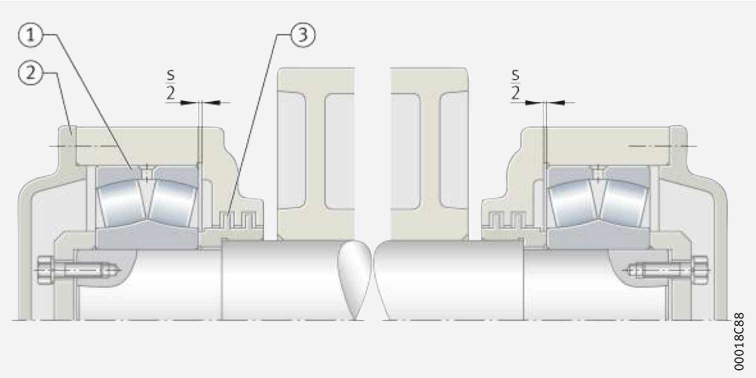
Spherical roller bearings

➤179|24 shows the bearing arrangement of a heavy support roller. The bearings are subjected to high radial loads. In addition, a frictional force acts axially on the outside surface of the support roller. Close axial guidance is not required and, as a result, a floating bearing arrangement can be selected. In the course of this, the lateral movement of the outer rings is restricted by the contact in the housing. Both housings are split. The axial displacement distance s can be measured with the upper section removed.

24
Axial location of two spherical roller bearings

s = axial displacement distance

① Spherical roller bearing
② Cover
③ Spacer bush with labyrinth passages



8.8 Raceways with direct bearing arrangement

✎ The raceways must be produced as a rolling bearing raceway

In rolling bearings without an inner ring, the rolling elements run directly on the shaft, while in bearings without an outer ring they run directly in the housing bore. The shaft and/or housing bore must therefore be produced as a rolling bearing raceway; steels, surface hardness and hardening depth ➤*180*.

!

The raceways must be free of waviness and precision machined (grinding and honing); for design of raceways see product chapter.

✎ The fits have a major influence on the bearing clearance

The shaft and housing fits have a considerable influence on the bearing and operating clearance of the rolling bearing; this must be taken into consideration in determining the tolerances.

Steels for the raceways

Through hardening steels

DIN ISO

Through hardening steels in accordance with ISO 683-17 (e.g. 100Cr6) are suitable as materials for rolling bearing raceways in direct bearing arrangements. These can also be surface layer hardened.

Case hardening steels

DIN ISO

Case hardening steels must conform to DIN EN ISO 683-17 (e.g. 17MnCr5, 18CrNiMo7-6) or EN 10084 (e.g. 16MnCr5).

Steels for induction surface layer hardening

DIN ISO

For flame and induction hardening, steels to DIN EN ISO 683-17 must be used (e.g. C56E2, 43CrMo4) or DIN 17212 (e.g. Cf53).

Surface hardness and hardening depth of raceways

✎ Nominal surface hardness: ≧ 670 HV

The hardness values apply to raceways, axial washers and shaft shoulders. Steels hardened by means of case, flame or induction hardening must have a surface hardness of 670 HV to 840 HV and an adequate hardening depth CHD or SHD.

✎ Determining CHD and SHD

The requisite case hardening depth CHD for case hardening steels is determined in accordance with ➤*180*| *ƒ 5*, while the requisite surface hardening depth SHD for steels for induction surface layer hardening is determined in accordance with ➤*181*| *ƒ 6*.

✎ Nominal hardening depth ≧ 0,3 mm

In accordance with DIN EN ISO 15787:2010, the hardening depth is the depth of the hardened surface zone at which there is still a hardness of 550 HV1. It is measured on the finish ground shaft and must correspond to the stated values, but must in any case be ≧ 0,3 mm.

Determining the case hardening depth

✎ Approximation value for case hardening depth

An approximation value for determining the minimum hardness depth can be found in ➤*180*| *ƒ 5*. The reference value for the load present is the equivalent stress in accordance with the distortion energy hypothesis (DEH) as a function of the rolling element diameter D_W and the magnitude of the load.

ƒ 5
Case hardening depth

$$CHD \geqq 0{,}052 \cdot D_W$$

Legend

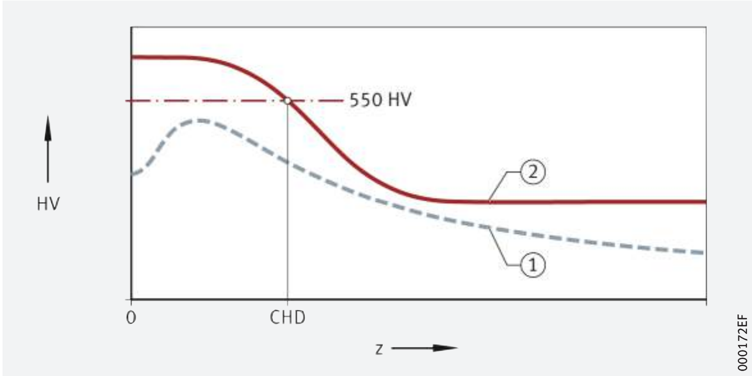
CHD	mm	Case hardening depth
D_W	mm	Rolling element diameter.

The local hardness must always be above the local requisite hardness, which can be calculated from the equivalent stress.

25
Case hardening depth and hardness profile

HV = *hardness according to Vickers*
z = *depth under the contact surface*

① *Requisite hardness (equivalent stress profile)*
② *Actual hardness profile*



Determining the surface hardening depth

For the calculation of the surface hardening depth SHD ➤181 | 6 applies.

6
Surface hardening depth

$$SHD \geqq 140 \cdot D_w / R_{p0,2}$$

Legend

SHD	mm	Surface hardening depth
D_w	mm	Rolling element diameter
$R_{p0,2}$	N/mm^2	Yield point of base material.

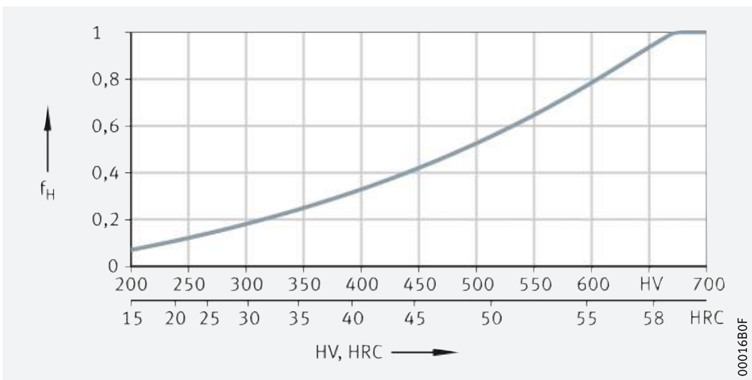
Raceway hardness less than 670 HV

!

If the raceway fulfils the requirements for rolling bearing materials but its hardness value is less than 670 HV (58 HRC), the static and dynamic load carrying capacity of the bearing will be reduced. In order to determine the load carrying capacity, the basic dynamic load rating C of the bearings must be multiplied by the reduction factor f_H and the basic static load rating C_{0r} by the reduction factor f_{H0} ➤181 | 26 and ➤181 | 27.

26
Dynamic hardness factor at reduced hardness of raceways

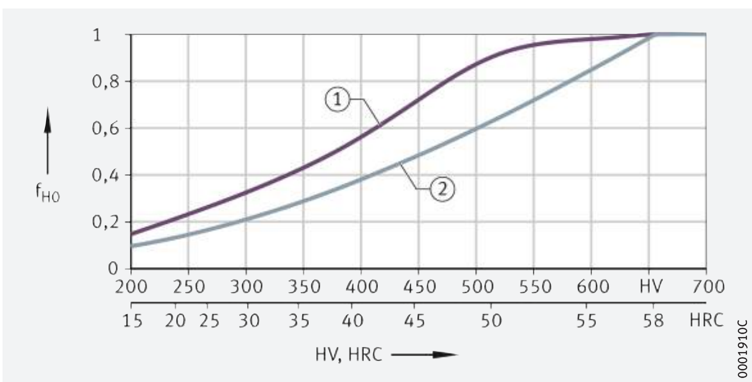
f_H = *dynamic hardness factor*
HV, HRC = *surface hardness*



27
Static hardness factor at reduced hardness of raceways

f_{H0} = *static hardness factor*
HV, HRC = *surface hardness*

① *Roller*
② *Ball*



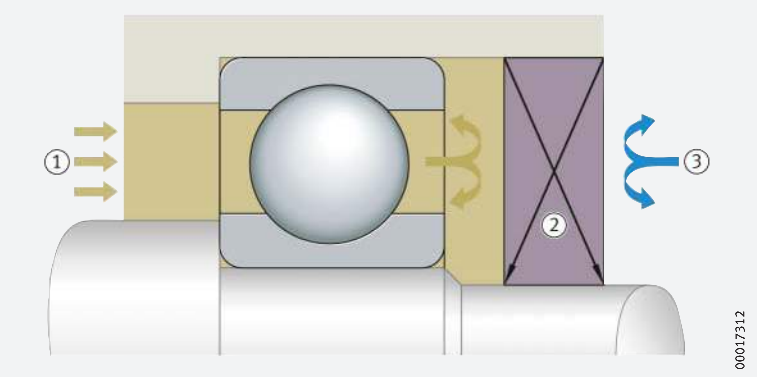
9 Sealing of bearing positions

✎ Sealing has a decisive influence on the function and operating life of a bearing

In order to make optimum use of the potential life of a rolling bearing, the egress of lubricant (grease, oil) must be reliably prevented and the bearing must be securely protected against the ingress of solid and liquid contaminants (e.g. dust, sludge, water, cleaning liquid) ➤182|⧉1.

⧉ **1**
Principle of a sealing position

① *Lubricant*
② *Seal*
③ *Contaminants*



✎ Contaminant particles can damage the bearing

If contaminant particles enter the bearing, overrolling of the particles at the rolling contact forms indentations that cause running noise and may constitute initial points for rapidly propagating material fatigue.

✎ Contaminants with an abrasive action

Where contaminants that have an abrasive action are present in the bearing, the rolling contact surface partners undergo wear and there is a progressive increase in the bearing clearance. With an increasing operating duration, the running accuracy of the bearing in particular is reduced until it fails.

✎ Liquid and vaporous media

If liquid or vaporous media enter the bearing, the lubrication conditions at the rolling contacts are disrupted. If corrosive media are present, oxidative damage of the surfaces will also occur. Both of these situations lead to a considerable reduction in the operating life of bearings.

! Effective sealing of the bearing position is thus decisive for the long operating life of a rolling bearing.

✎ Non-contact or contact seals

A basic distinction is made between contact and non-contact seals in the adjacent construction and the bearing.

9.1 Non-contact seals

✎ Non-contact seals are free from friction

Non-contact seals are particularly suitable for applications with high speeds and high requirements for freedom from friction and low heat generation. They are free from friction, except for a small amount of lubricant friction in the sealing gap. In general, non-contact seals are free from wear and have an almost unlimited operating life.

✎ Measures which prevent the ingress of liquids into the bearing while stationary

In order to prevent the ingress of liquids while stationary, additional sealing measures are necessary, such as the supply of barrier media. Where higher requirements for sealing integrity are present, a relatively large design envelope is required for labyrinth designs.

Grease sealing by means of baffle plates and sealing shields

✎ Stationary baffle plates prevent the egress of grease

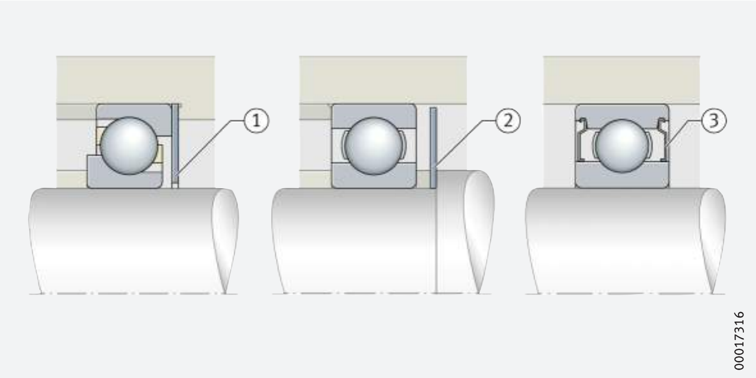
In the case of grease-lubricated bearings, the egress of grease can be prevented in many cases on the stationary bearing ring by the use of simple baffle plates. Depending on the mounting and operating situation, the plates are braced on either their outer or inner edge ➤183|Fig. 2. The grease collar that forms at the sealing gap gives protection against slight contamination impact from outside.

✎ Compact solutions in the form of bearings with sealing shields integrated on one or both sides

For designs in which there is no space adjacent to the bearing for a seal, there are rolling bearings with sealing shields integrated on both sides ➤183|Fig. 2; see product chapter. These bearings are supplied with a grease charge. Bearings with only one sealing shield on one side are also commercially available.

Fig. 2
Baffle plates and integrated sealing shields

1. *Baffle plate braced on outer edge*
2. *Baffle plate braced on inner edge*
3. *Sealing shields integrated on both sides*



Gap seals

✎ Narrow gap between shaft and housing

A narrow gap between the shaft and housing is a simple and, in many cases, adequate means of sealing against the egress of grease and slight contamination impact from outside ➤183|Fig. 3. The sealing gap can be held to a relatively narrow size.

✎ Grooves in the housing increase the sealing action if grease lubrication is used

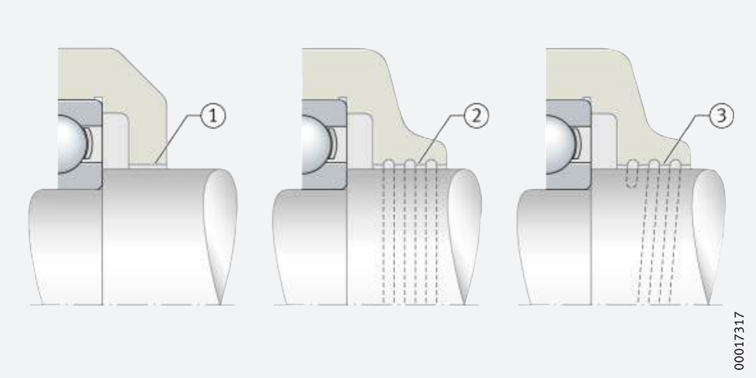
If grease lubrication is used, the sealing action of the gap can be increased by several grooves in the through bore of the housing ➤183|Fig. 3. The grooves act as storage chambers and hinder the ingress of contaminants as well as the egress of lubricant.

✎ Helical grooves are used for oil return

Where oil lubrication is used and the shaft is horizontal, the through bore in some housings has a helical groove ➤183|Fig. 3. Depending on the spiral direction relative to the rotational direction of the shaft, oil creeping along the shaft is returned to the housing or contaminants are transported from the gap to the outside. A similar sealing action is achieved if the helical groove is located on the shaft.

Fig. 3
Gap seals

1. *Gap seal*
2. *Gap seal, grooves in the bore*
3. *Gap seal, helical grooves in the bore*



Splash rings and flinger shields

✎ The sealing action is achieved by means of rotation and centrifugal force displacement

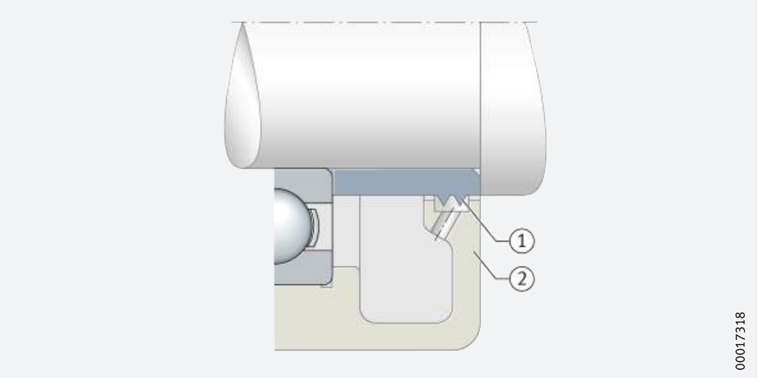
In the case of splash rings and flinger shields, sealing action is achieved by means of rotation and centrifugal force displacement ➤184|▭4 and ➤184|▭5. Splash rings can give effective sealing, for example, where oil lubrication is used and the shaft is horizontal ➤184|▭4. The oil creeping along the bush is propelled away by the splash rings and flows back into the housing via a drain hole.

✎ The sealing gap is protected by an outer flinger shield

If heavy contamination impact or direct impact by liquids is expected at the sealing position, the sealing gap can be protected on the outside by means of a flinger shield ➤184|▭5. The same purpose is fulfilled by a simple rubber shield that – without additional means of location – is seated under tension on the shaft or shaft bush ➤184|▭5. At higher speeds, however, there is a risk that the rubber shield will become detached from the shaft under the influence of centrifugal force. For this reason, vulcanised flinger shields with sheet metal reinforcement are available that are used very effectively in, for example, passenger car wheel bearing units of the 1st Generation or shaft support bearings ➤184|▭5.

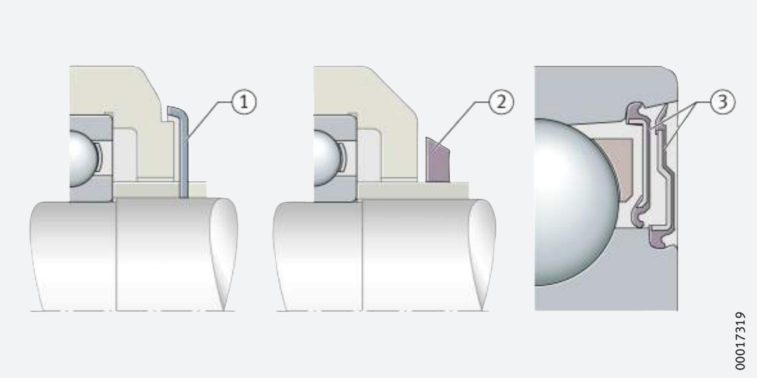
▭ **4**
Splash rings

① *Splash rings*
② *Housing with collector groove and drain hole*



▭ **5**
Flinger shields

① *Sheet metal shield as flinger shield*
② *Simple rubber shield as flinger shield*
③ *Flinger shield with sheet metal reinforcement in bearing unit with sealing washer*



Labyrinth seals

✎ Protective or collector labyrinths provide very good sealing results

A considerably greater sealing action than with gap seals is achieved by labyrinths incorporating gaps filled with grease. A distinction is made between protective labyrinths and collector labyrinths.

✎ Protective labyrinths

Protective labyrinths are centrifugal force seals. They protect sealing positions subjected to little external load due to liquids against the egress of grease and the ingress of contamination.

✎ Collector labyrinths

Collector labyrinths are labyrinths of highly complex design with collector grooves and drain holes in the housing that are also suitable for the sealing of sealing positions subjected to very high impact by liquids.

✎ *Labyrinths are configured with radially or axially aligned crosspieces*

Depending on the contamination load, labyrinths are configured with one crosspiece or several crosspieces ➤*185*|Fig. *6*. Labyrinths with several radially aligned crosspieces are only considered, for reasons of mounting, for split housings ➤*185*|Fig. *6*. Their advantage is that the grease propelled outwards is held in U-shaped housing slots, which thus improves the sealing action.

✎ *In order to improve sealing, labyrinths are frequently filled with grease*

In practice, labyrinths filled with grease are frequently used in order to achieve better sealing against contamination. In a highly contaminated environment, fresh grease is occasionally pressed into the sealing gap, which has the effect of pressing contaminated grease out of the sealing position.

! If significant angular deviations of the shaft are expected in the case of spherical roller bearings, for example, there is a risk that grazing of the crosspieces will occur in labyrinths in accordance with ➤*185*|Fig. *6*. In this case, labyrinths with bevelled crosspieces are used. The bevel is matched to the motion about the centre point of the bearing ➤*185*|Fig. *6*.

Fig. ***6***

Examples of labyrinth seals

① *Labyrinth with axially aligned crosspieces*
② *Labyrinth with radially aligned crosspieces*
③ *Labyrinth with bevelled crosspieces*
④ *Taper type lubrication nipple to DIN 71512-A with integrated protective labyrinth*

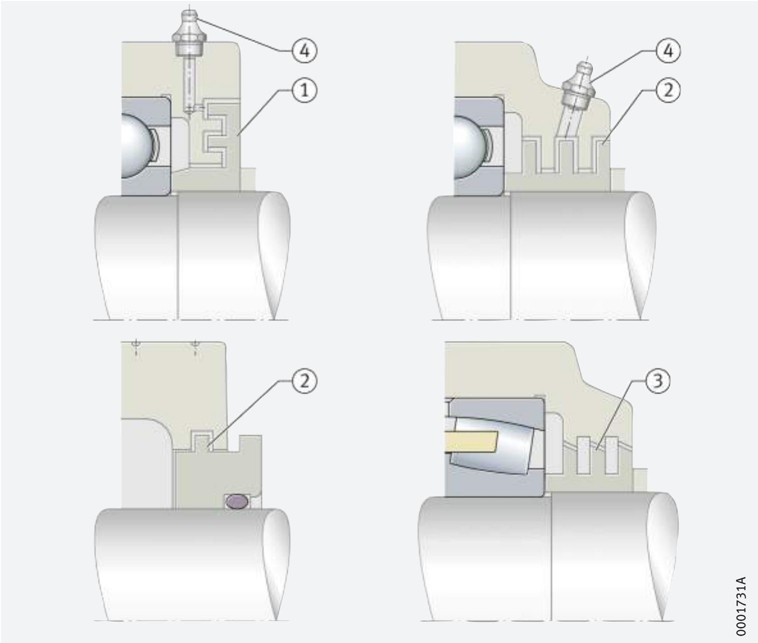
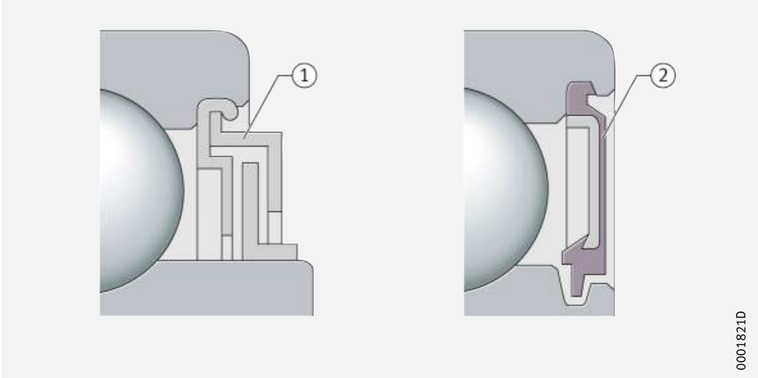


Fig. ***7***

Labyrinth seals integrated in the bearing

① *Bearing with integrated protective labyrinth*
② *Bearing with rubberised sealing shield as protective labyrinth*



✎ *Collector labyrinths*

Where there is heavy liquid impact and sealing positions are inundated by surge flows, so-called collector labyrinths are used. These seals effectively repel liquids if the sealing position is not subjected to prolonged inundation while stationary.

9.2 Contact seals

✎ The contact pressure at sliding contact causes friction in contact seals at the sliding surface

Contact seals are in contact at their sliding surface under a certain contact pressure. In many cases, they represent the most favourable solution in terms of design envelope and costs. The general disadvantage, however, is the loss of energy due to friction at the sealing contact.

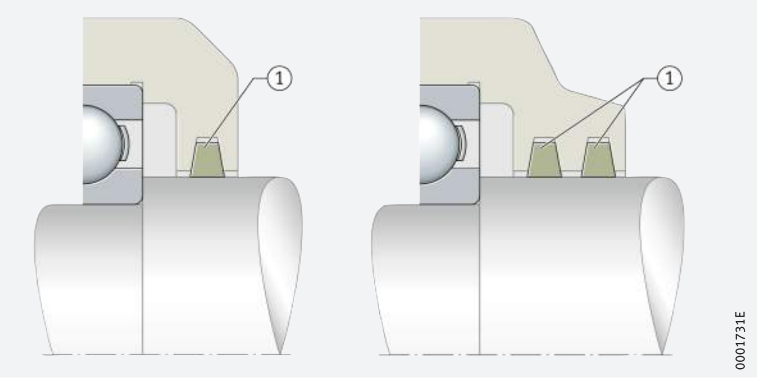
Felt ring seals

✎ Felt rings are simple sealing elements used with grease lubrication

Felt rings are simple sealing elements that have proved effective primarily with grease lubrication ➤186|8. After a short running-in time, the felt forms a sealing surface in preload-free contact with excellent sealing action against dust. Before mounting, the rings are soaked with oil.

8
Felt ring seals

① Felt rings, arranged individually or adjacent to each other



✎ Several felt rings can also be arranged adjacent to each other

A felt ring is sufficient if the level of contamination is not too high. If the environmental conditions are less favourable, several felt rings can be arranged adjacent to each other.

Operating temperatures up to +100 °C are possible. At higher temperatures, sealing rings made from wound yarns are required that comprise PTFE, graphite or aramide and glass fibres, and are impregnated with PTFE or graphite.

DIN ISO

The dimensions of felt rings and annular slots are standardised and stated in DIN 5419.

Metallic sealing washers

✎ Sealing washers made from thin sheet metal provide good sealing for grease lubrication

When using grease lubrication, effective sealing can also be achieved by axially sprung metallic sealing washers ➤187|9. These thin sheet metal seals are braced in the end face of the inner ring or outer ring and are in spring contact with the other bearing ring. In order to prevent fretting of the seal tongues during running-in, these washers are greased before mounting.

✎ Metallic sealing washers are suitable if no static or pressure-resistant sealing is required

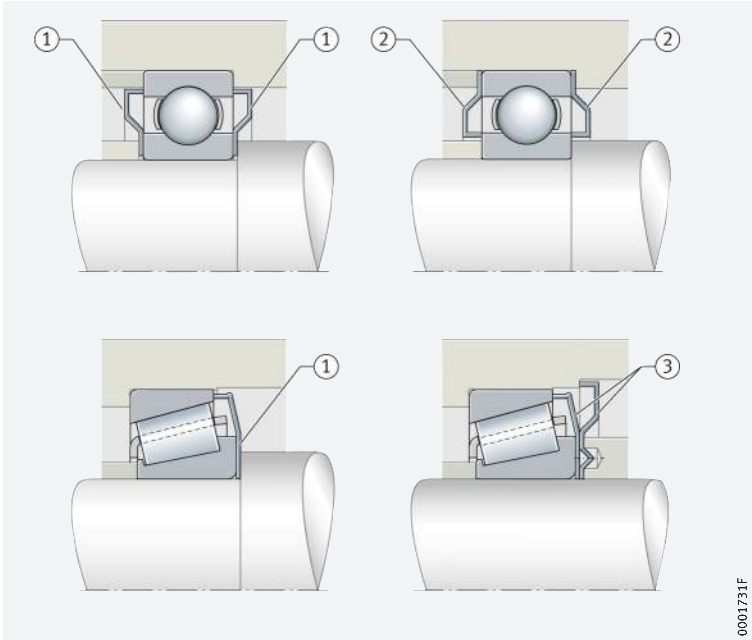
At the sealing contact, the sprung sealing washer beds into the bearing ring during the running-in process and the preload decreases. A groove is formed in the bearing ring that, together with the seal edge, forms a small "microlabyrinth" under light contact. Due to this principle, these seals are suitable for bearing positions that require no static or pressure-resistant sealing of the bearing.

✎ In washers in double arrangements, the intermediate space is filled with grease

In addition to simple sprung sealing washers, there are also washers in double arrangements. The intermediate space is additionally filled with grease at the mounting stage. Due to their small section width, these seals can normally be fitted retrospectively and without design modifications to the adjacent construction.

9
Metal sealing washers

① *Sealing washers braced on inner ring*
② *Sealing washers braced on outer ring*
③ *Sealing washers in double arrangement*



Sealing washers with elastomer seal lip

✎ Sealing washers integrated in the bearing are used for small design envelopes

Where the design envelope is small, rolling bearings (e.g. ball bearings, roller bearings, spherical roller bearings, toroidal roller bearings) with integrated sealing washers are frequently used; see product chapter. These sealing washers comprise a sheet metal washer for reinforcement and have a vulcanised elastomer seal lip.

✎ Various elastomers are available for selection

Various elastomers can be selected in accordance with the chemical and thermal requirements. In general, nitrile butadiene rubbers NBR are used. For applications with higher temperatures or speeds, sealing washers with lips made from fluoroelastomers FKM are frequently used.

✎ The seal lip can be in radial or axial contact

Sealing washers are available with seal lips for radial or axial contact ➤ *188* | *10*. They are suitable for sealing against loss of grease and ingress of contamination at low pressure differentials.

Sealing washers with one or more radial seal lips are also suitable for the sealing of rolling bearings with axial relative motion between the inner ring and outer ring (e.g. in spherical roller bearings or toroidal roller bearings).

Sealing washers with seal lips in axial running contact are used primarily in bearings with lower axial operating clearance (e.g. in deep groove ball bearings).

✎ Sealing washer RSD with radial sealing action

Sealing washers RSD have a seal lip with radial sealing action and are characterised by low seal friction ➤ *188* | *10*. The seal lip is initially in very light contact with the shaft (little or no contact pressure). After running-in, a minimal sealing gap is created.

✎ Sealing washer RSR with radial contact

Seals RSR with radial contact are equipped with a seal lip geometry that is similar to a rotary shaft seal ➤ *188* | *10*. The angles of the seal edge are selected such that the pumping action at the sealing contact repels liquids outwards and a small amount of grease is conveyed under the seal edge in order to lubricate the seal lip.

✎ Sealing washer for axial inward sealing

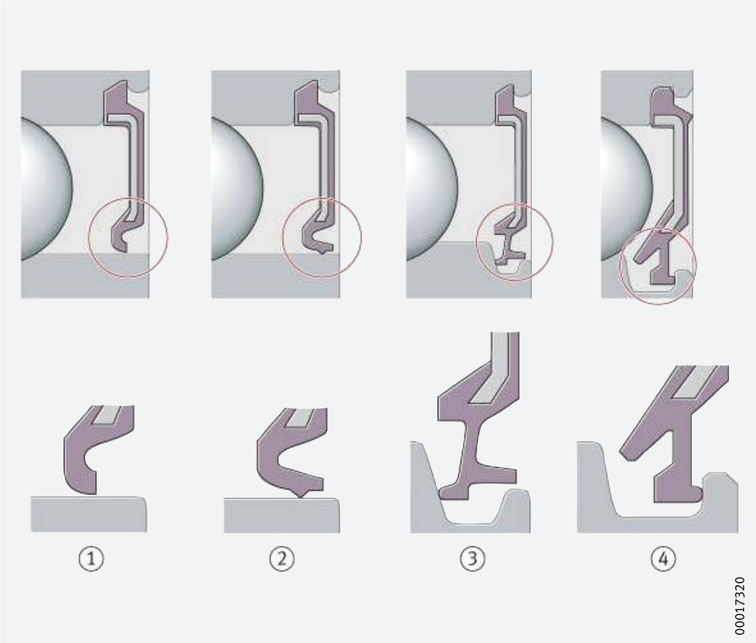
In the case of sealing washers for axial sealing, an additional outer seal lip is often provided ➤ *188* | *10*. The outer seal lip (protective lip) is of a non-contact design and, together with the undercut on the inner ring, forms an additional protective labyrinth against the ingress of contamination.

✎ Sealing washer for axial outward sealing

A seal geometry that is designed in particular for applications with a rotating outer ring and high requirements for retention of the grease is the sealing washer with a seal lip in axial contact in accordance with ➤188|▭10. This seal has increased sealing action against the egress of grease. An additional non-contact lip that repels the grease provides a grease chamber in front of the main seal lip for axial outward sealing.

▭10
Sealing washers with elastomer seal lips

① *Sealing washer RSD*
② *Sealing washer RSR*
③ *Sealing washer for axial inward sealing with additional external seal lip*
④ *Sealing washer for axial outward sealing*



Lip seals

✎ Lip seals provide radial or axial sealing

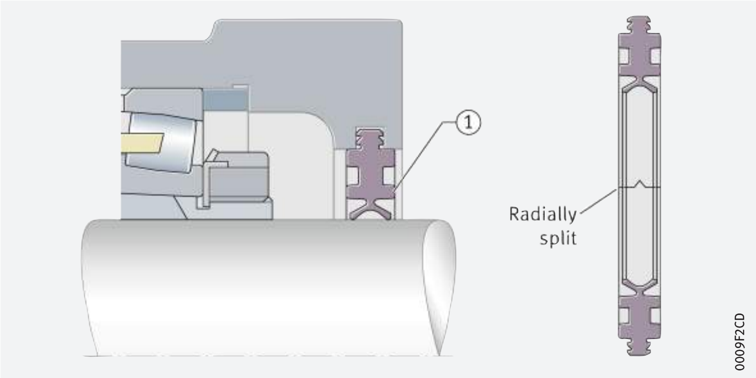
Lip seals are seals with one or more seal lips that give axial or radial sealing. These seals are predominantly elastomer seals. Typical designs are shown in ➤188|▭11 to ➤189|▭13.

✎ Double lip seal: the inner seal lip prevents egress of lubricant, the outer seal lip prevents ingress of contamination

➤188|▭11 shows a double lip seal made from NBR for use in standard plummer block housings. The radially split seal can be easily inserted in the annular slot in the housing. Ingress of contamination is prevented by the outer seal lip, while the inner seal lip prevents the egress of lubricant. The grease between the two seal lips supports the sealing action.

▭11
Double lip seal for plummer block housings

① *Radially split double lip seal*



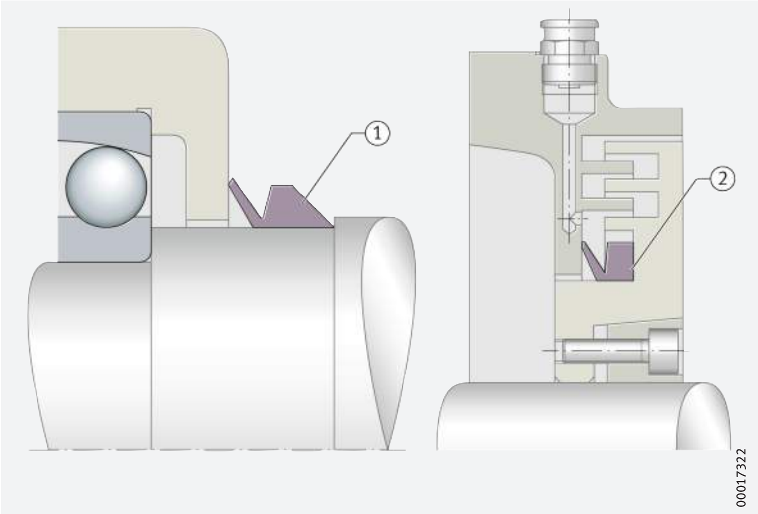
V-ring seals are lip seals with axial sealing action

The V-ring is a lip seal with axial sealing action ➤189|Fig. 12. The ring is made from elastic rubber NBR. During mounting, it is stretched and slid onto the shaft so that the seal lip is in contact with the housing wall.

At circumferential velocities over 12 m/s, experience shows that the V-ring must be radially located so that it does not become detached due to centrifugal force. Precise circumferential velocities for specific applications must always be agreed in consultation with the sealing ring manufacturer.

12
V-ring seal

① *V-ring seal as protective seal*
② *V-ring for grease sealing in labyrinth*



Lip seals of three-part construction

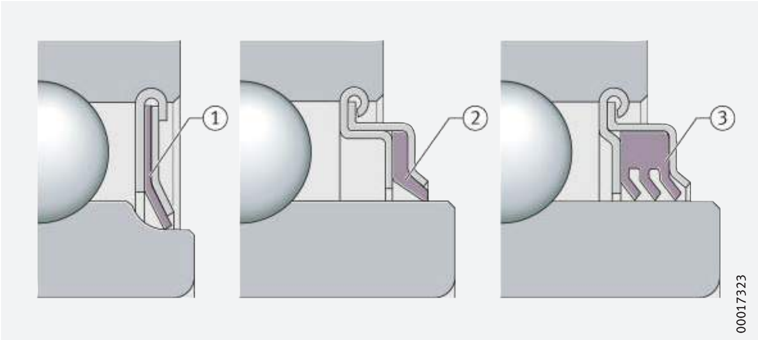
Lip seals of a three-part construction with single or multiple lips (comprising an NBR sealing element between two sheet steel washers) are used, for example, in radial insert ball bearings ➤189|Fig. 13.

The outer sheet steel washer protects the seal lips against damage

During mounting, this sandwich construction allows concentric alignment of the rubber seal lip with the inner ring. The outer washer protects the seal lips effectively against damage caused by coarse contaminants.

13
Lip seals of sandwich construction with seal lip protection

① *Axially preloaded seal lip*
② *Radially preloaded seal lip*
③ *Three radially preloaded seal lips*



Rotary shaft seals

For oil sealing of rotating shafts, rotary shaft seals (RWDR) in accordance with DIN 3760 and DIN 3761 and with spring preload are suitable. Frequently used designs are shown in ➤190|Fig. 14. The sealing rings are designed for applications with slight pressure differentials.

Speed limits for rotary shaft seals are given in DIN 3760.

With oil lubrication

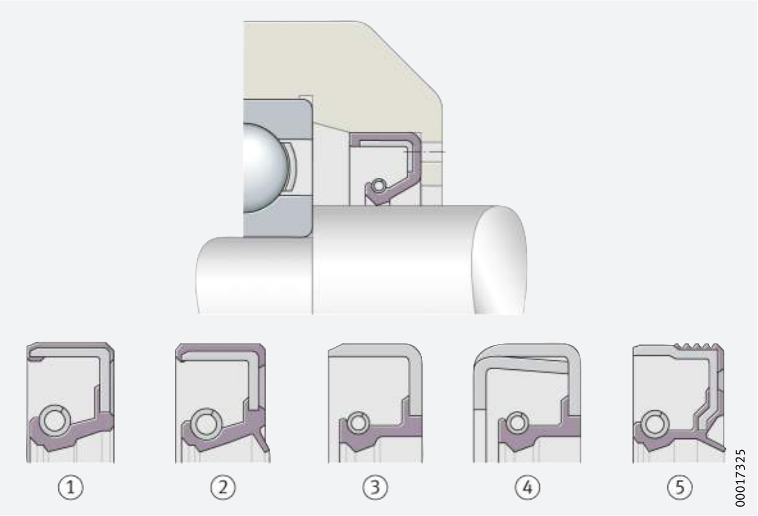
Depending on the seal material and the surface structure of the shaft, the geometry of the seal lips generates a pumping action in the sealing gap towards the steep flank of the seal lip. The sealing ring is therefore mounted with the steep flank facing in the direction of the medium against which sealing is required.

✎ With grease lubrication

In the case of grease lubrication, the steep flank of the RWDR is often placed in the direction of grease egress. As a result, some grease passes under the seal lip for lubrication of the sealing edge. The preload force of seal lips – in relation to their contact length – is normally 80 N/m to 150 N/m.

14
Rotary shaft seals

① *Type A*
② *Type AS*
③ *Type B*
④ *Type C*
⑤ *Type D*



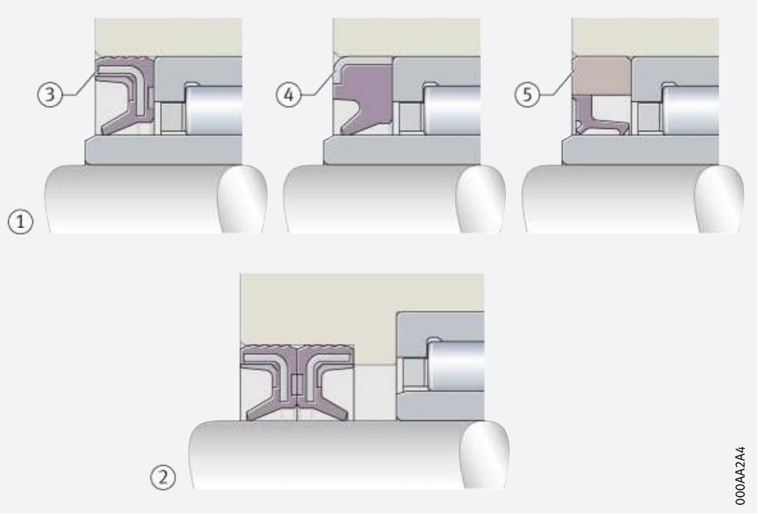
Springless Schaeffler sealing rings G, GR, SD

✎ Schaeffler sealing rings are highly suitable for a small radial design envelope and in combination with needle roller bearings

Low-friction sealing of bearing positions with a small radial design envelope, such as bearing positions with needle roller bearings, can be effectively achieved using sealing rings G, GR and SD; see product chapter. These sealing rings can be used individually or in a double arrangement ➤190 | 15. In the double arrangement, one seal lip faces inwards to seal the lubrication medium, while the second seal lip faces outwards to give protection against contamination. In order to improve the protective function, the space between the seals can be filled with grease. With an extended inner ring, a sealing ring with the same outside diameter as the outer ring can be used, where the seal lip runs on the extended inner ring. Sealing rings give good protection against contamination and spray water as well as against the egress of oil and grease under slight pressure differentials. In order to reduce friction and protect the seal lip against damage, the sealing edge must be lubricated.

15
Schaeffler sealing rings

① *Single arrangement, bearing with extended inner ring*
② *Double arrangement, bearing with inner ring*
③ *G sealing ring*
④ *GR sealing ring*
⑤ *SD sealing ring*



10 Mounting and dismounting

10.1 Handling

Rolling bearings, rolling bearing parts and Arcanol rolling bearing greases are high quality goods and must therefore be handled with care.

Storage of rolling bearings

✎ Even slight deviations in functional areas will impair the performance capability of the bearings

The performance capability of modern rolling bearings lies at the boundaries of what is technically achievable. The materials, dimensional and running tolerances, surface quality and lubrication have been optimised for maximum levels of function, which means that even slight deviations in functional areas, such as those caused by corrosion, can impair the performance capacity. In order to realise the full performance capability of rolling bearings, it is essential to match the corrosion protection, packaging, storage and handling to each other.

✎ Corrosion protection and packaging constitute part of the bearing

Corrosion protection and packaging constitute part of the bearing and are optimised such that they preserve all characteristics of the product at the same time as far as possible. In addition to protecting the surface against corrosion, this includes emergency running lubrication, friction, lubricant compatibility, noise behaviour, resistance to ageing and compatibility with rolling bearing components (cage and seal material).

Storage conditions for rolling bearings

!

As a basic prerequisite, parts must be stored in a closed storage area which cannot be affected by any aggressive media, such as exhaust gases from vehicles or gases, mist or aerosols of acids, lyes or salts. Direct sunlight should be avoided since, apart from the harmful effects of UV radiation, it can lead to wide temperature fluctuations in the packaging.
The temperature should be constant and air humidity should be as low as possible. Extreme shifts in temperature and increased humidity lead to condensation.

✎ Conditions for storing rolling bearings

The following conditions must be fulfilled:

- frost-free storage, i.e. a temperature of $>$ +5 °C
  (this prevents formation of white frost, a maximum of +2 °C is permissible for up to 12 hours per day)
- maximum temperature +40 °C
  (to prevent excessive drainage of anti-corrosion oils)
- relative humidity $\leqq$ 65%
  (with temperature changes, up to 70% permissible for up to 12 hours per day).

!

The temperature and humidity must be continuously monitored. This can be carried out using a datalogger. The measurements must be taken at intervals of no more than 2 hours. At least 2 measurement points must be selected: the highest point and the lowest point in the vicinity of an external wall at which the goods can be stored.

Storage periods for rolling bearings

✎ Maximum storage period of 3 years

Rolling bearings should not be stored for longer than 3 years. This applies both to open and to greased bearings with sealing shields or washers. In particular, specifically greased bearings should not be stored for too long, since the chemical-physical behaviour of greases may change during storage. Even if the minimum performance capacity remains, the safety reserves of the grease may have diminished.

✎ Check the bearings at the end of the storage period

In general, rolling bearings can be used even after their permissible storage period has been exceeded, if the storage conditions during storage and transport were observed. If the conditions are not fulfilled, shorter storage periods must be anticipated. If the periods are exceeded, it is recommended that the bearing be checked for corrosion, as well as for the condition of the anti-corrosion oil and the condition of the grease, before it is used. The aforementioned storage periods are empirical values based purely on practice and do not constitute an extension to the legal or, where applicable, contractually agreed warranty period.

Storage of Arcanol rolling bearing greases

The information on storage of rolling bearings applies as appropriate to Arcanol rolling bearing greases. The precondition is that the grease is stored in closed, completely filled original containers.

Storage periods for Arcanol rolling bearing greases

✎ Rolling bearing greases do not have unlimited stability

Rolling bearing greases are mixtures of oil, thickener and additives. Such mixtures of liquid and solid substances do not have unlimited stability. During storage, their chemical-physical characteristics may change and they should therefore be used up as soon as possible.

✎ The storage period for Arcanol greases is 3 years

If the storage conditions are observed, Arcanol greases can be stored without loss of performance for 3 years. As in the case of rolling bearings, however, the permissible storage period should not be seen as a rigid limit. If storage is carried out as prescribed, most greases can also be used after 3 years, if allowances are made for small changes. If there is any doubt when using older greases, random sample checking of chemical-physical characteristics is recommended in order to determine any changes in the grease. It is therefore not possible to state storage periods for containers that have been opened. If containers are to be stored after opening, the grease surface should always be brushed flat, the container should be sealed airtight and it should be stored such that the empty space is upwards. High temperatures should be avoided in all cases. The aforementioned storage periods are empirical values based purely on practice and do not constitute an extension to the legal or, where applicable, contractually agreed warranty period.

Unpacking of rolling bearings

✎ Observe guidelines on unpacking

Perspiration leads to corrosion. Hands should be kept clean and dry and protective gloves worn if necessary. Bearings should only be removed from their original packaging immediately before assembly. If bearings are removed from multi-item packaging with dry preservation, the package must be closed again immediately, since the protective vapour phase is only effective in closed packaging. Bearings should be oiled or greased immediately after unpacking.

Compatibility, miscibility

✎ Observe guidelines on compatibility and miscibility

The anti-corrosion agents in bearings with an oil-based preservative are compatible and miscible with oils and greases having a mineral oil base. Compatibility should be checked if synthetic lubricants or thickeners other than lithium or lithium complex soaps are used. If there is an incompatibility, the anti-corrosion oil should be washed out before greasing, especially in the case of lubricants with a PTFE/alkoxyfluoroether base and thickeners based on polycarbamide. Bearings should be washed out if the lubricant is changed or the bearings are contaminated.

Cleaning of rolling bearings

Suitable agents for degreasing and washing

The following are suitable for degreasing and washing of rolling bearings:

- aqueous neutral, acidic or alkaline cleaning agents. Check the compatibility of alkaline agents with aluminium components before cleaning
- organic cleaning agents such as paraffin oil free from water and acid, petroleum ether (not petrol), spirit, dewatering fluids, freon 12 substitutes, cleaning agents containing chlorinated hydrocarbons.

Cleaning should be carried out using brushes, paint brushes or lint-free cloths. In the case of resinous oil or grease residues, precleaning by mechanical means followed by treatment with an aqueous, strongly alkaline cleaning agent is recommended. Legal regulations relating to handling, environmental protection and health and safety at work must be observed. The specifications of cleaning agent manufacturers must be observed. Paraffin oil, petroleum ether, spirit and dewatering fluids are flammable, while alkaline agents are corrosive. The use of chlorinated hydrocarbons is associated with the risk of fire, explosion and decomposition as well as with health hazards. These hazards and appropriate protective measures are described comprehensively in Datasheet ZH1/425 of the Hauptverband der gewerblichen Berufsgenossenschaften (German Federation of Institutions for Statutory Accident Insurance and Prevention). Rolling bearings must be dried and preservative applied immediately after cleaning.

10.2 Guidelines for mounting

Comprehensive information on mounting and dismounting is given in the publications Mounting Handbook MH 1 and IS 1, Mounting and Maintenance of Rolling Bearings.

Observe guidelines

The following guidelines must always be taken into account:

- The assembly area must be kept clean and free from dust
- Protect bearings from dust, contaminants and moisture. Contaminants have a detrimental influence on the running and operating life of rolling bearings
- Before mounting work is started, familiarise yourself with the design by means of the final assembly drawing
- Before mounting, check whether the bearing presented for mounting corresponds to the data in the drawing
- Check the housing bore and shaft seat for dimensional, geometrical and positional accuracy and for cleanliness
- Check that the shaft and housing bore have a lead chamfer of 10° to 15°
- Wipe away any anti-corrosion agent from the seating and contact surfaces, wash anti-corrosion agent out of tapered bores
- Lightly oil the bearing ring seating surfaces or rub with solid lubricant
- Do not cool the bearings excessively. Moisture due to condensation can lead to corrosion in the bearings and bearing seats
- After mounting, provide the rolling bearings with lubricant
- Check the correct functioning of the bearing arrangement.

10.3 Accessories for mounting

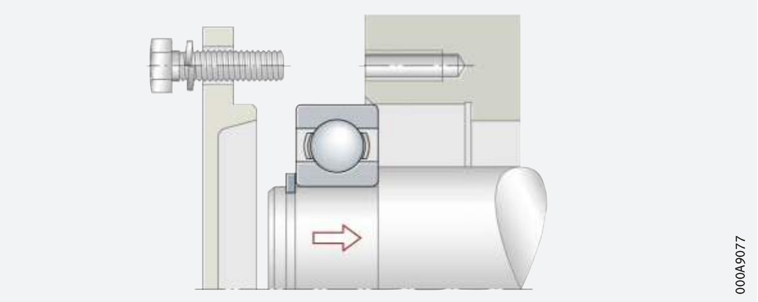
Avoid applying direct blows to the bearing rings with a hammer.

Mounting of non-separable bearings

In the mounting of non-separable bearings, the mounting forces must always be applied to the ring with a tight fit ➤194| 1. This ring is also mounted first. Forces acting on the ring with a loose fit are transmitted by the rolling elements. This can damage the raceways and rolling elements.

1 *Non-separable bearing*

Tight fit of the inner ring, mount this ring first

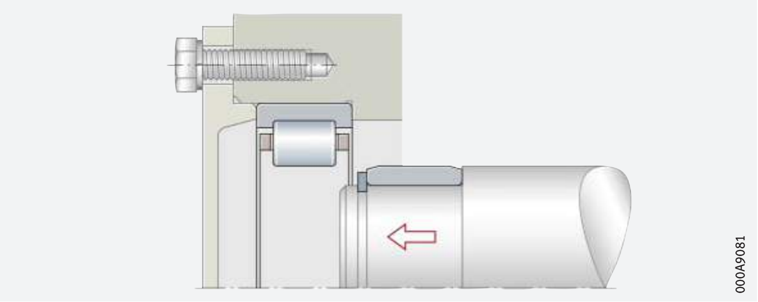


Mounting of separable bearings

Mounting is easier in the case of separable bearings; the two rings can be mounted individually ➤194| 2. Rotating the ring while fitting to give a screwdriver effect will help to avoid scraping marks.

2 *Separable bearing*

Tight fit of the inner ring, individual fitting of rings



Mechanical, hydraulic and thermal accessories

The mounting method is dependent on the bearing type and size

Due to the different bearing types and sizes, rolling bearings cannot all be mounted and dismounted using the same method. An overview of suitable tools and methods for mounting and dismounting is shown in ➤206| 1.

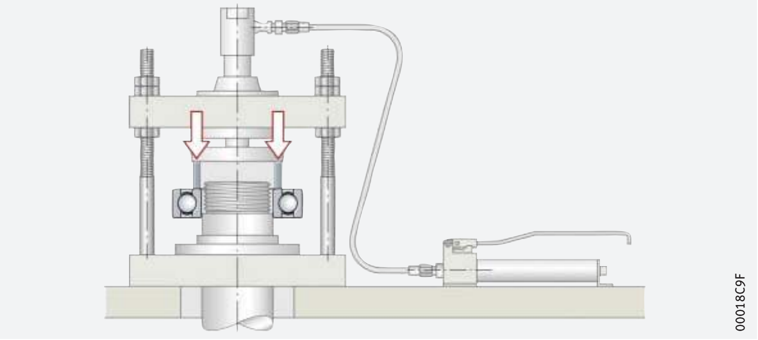
Mechanical or hydraulic mounting

Cold fitting/ driving on of bearings

Where smaller bearings with cylindrical seats must have a tight fit on their mating parts and the interference values are not too large, they can be pressed onto the shaft or into the housing. Mechanical or hydraulic presses can be used for this purpose ➤194| 3.

3 *Hydraulic press for mounting*

Direct pressing-in forces through the inner ring

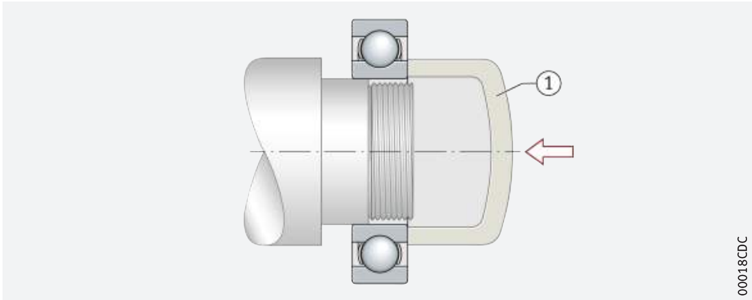


Mounting of small bearings

Small bearings can be driven onto the shaft using a mounting sleeve made from aluminium with a flat end face ➤195|Figure 4. The mounting sleeve must be matched to the bearing ring to be mounted. During mounting, it must be ensured that no other bearing components, such as seals, are damaged.

Figure 4
Sleeve for driving up small bearings

① *Aluminium mounting sleeve*



Thermal methods

Sliding on of warm bearings

Larger bearings, or bearings that must have a large interference fit, are generally mounted by means of thermal methods.

For the interference values normally used with rolling bearing seats, it is sufficient to heat the bearings to approx. +80 °C, with a maximum of +100 °C ➤195|Figure 5.

Induction heating technology and electric ovens

Heating can be carried out using induction heating technology ➤204|Figure 25. A distinction is made here between the low frequency technique (50 Hz to 60 Hz) and medium frequency technique (10 kHz to 25 kHz).

Induction heating devices

The induction heating devices described in ➤201|10.6 can be used to heat rolling bearings quickly, safely and, above all, cleanly to the correct temperature for mounting ➤203|Figure 23 to ➤204|Figure 25. The temperature is measured directly on the inner ring. Since the inner ring heats up more quickly than the outer ring, the bearing can be positioned on the shaft and in the housing at the same time with only slight heating of the outer ring.

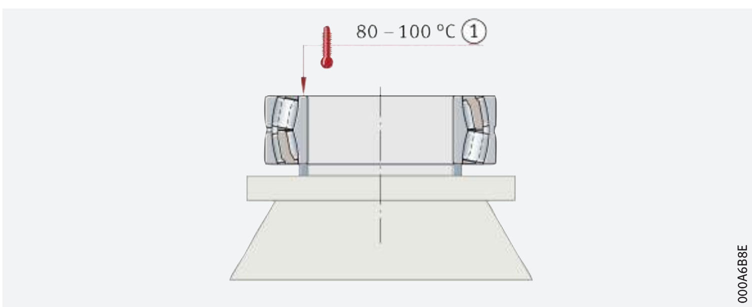
Electric ovens, oil bath, heating plate

Furthermore, an electric oven, a clean oil bath or a thermostatically controlled heating plate, ➤195|Figure 5, can be used. In the case of electric ovens and induction heating devices, the temperature is controlled by means of a temperature sensor or thermostat and is therefore held to very high accuracy. This is important since the hardness of the rings must not decrease due to the tempering effect.

! When bearings are heated on a heating plate, all parts of the bearing must be protected against overheating (e.g. plastic parts, seals, lubricant) ➤195|Figure 5.

Figure 5
Bearings with plastic cage: heating on a heating plate

① *For standard bearings*



Mounting on tapered bearing seats

✎ In order to give a tight fit, the inner ring is pressed on axially

In the case of tapered seats, the tight fit required is achieved by pressing the inner ring on axially. Whether a sufficiently tight fit is achieved can be determined from the expansion of the inner ring and therefore the reduction in the radial internal clearance, or from the axial drive-up distance on the taper; see corresponding product chapters.

Reduction in radial internal clearance

✎ Checking of the clearance is necessary during mounting

The reduction in radial internal clearance is the difference between the radial internal clearance before mounting and the bearing clearance after mounting of the bearing. The radial internal clearance must be measured first. During pressing on, the radial clearance (bearing clearance) must be checked until the necessary reduction in the radial internal clearance and thus the required tight fit is achieved.

✎ Measuring the radial internal clearance of spherical roller bearings using a feeler gauge

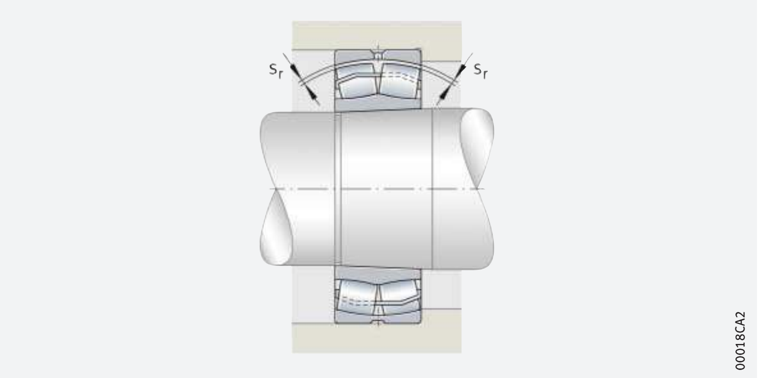
The radial clearance of larger bearings is measured using a feeler gauge. In the case of spherical roller bearings, it must be ensured that both rows of rollers are measured at the same time ➤ 196 | 6.

It can only be ensured that the inner ring is not laterally offset relative to the outer ring when the internal clearance values are identical for both rows of rollers.

6

Radial internal clearance in spherical roller bearings

s_r = *radial internal clearance*



Measuring the axial drive-up distance

✎ Measuring axial drive-up distance as an alternative to measuring radial internal clearance

Instead of reducing the radial internal clearance, the axial drive-up distance on the taper can be measured; see corresponding product chapters. For a shaft seat with a normal taper 1:12, the axial drive-up distance is approx. 15 times the reduction in radial internal clearance.

The mounting of small bearings with a tapered bore requires particular care. Since the radial internal clearance is often smaller than the thinnest measuring sheet, measurement using a feeler gauge is no longer possible. The bearing is therefore slid on, where possible, outside the housing. It may only be pressed on so far that the outer ring can still be rotated easily and, in the case of self-aligning bearings, can be swivelled out by hand under slight resistance. The shaft with the mounted bearing is inserted in the housing.

Mounting of withdrawal sleeves

✎ With large ring cross-sections, high forces are necessary for pressing-in

Withdrawal sleeves are pressed on and secured between the inner ring and shaft by means of a nut seated on the shaft. For bearings with large ring cross-sections, considerable forces are necessary for pressing-in. In such cases, mounting is made easier by means of the nut with pressure screws shown in ➤ 197 | 7.

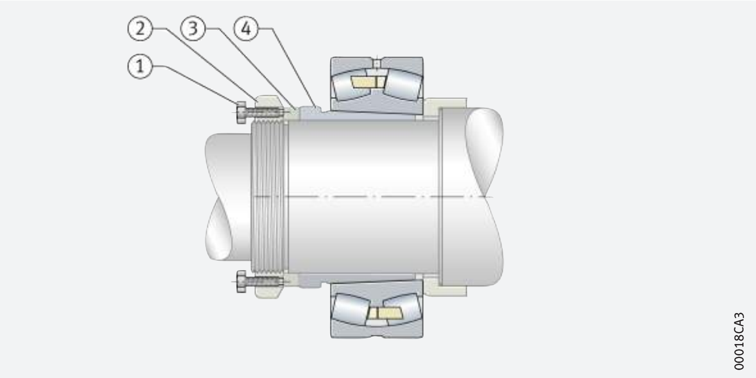
✎ *Pressure screws must always be tightened in a crosswise sequence*

In order that the withdrawal sleeve is not pressed in skewed, the nut is first tightened so far that the pressure ring is fully in contact with the withdrawal sleeve. The pressure screws distributed uniformly around the circumference are then tightened uniformly in a crosswise sequence until the required reduction in radial internal clearance is achieved. Since the taper of the withdrawal sleeve is self-locking, the nut can then be removed; the position of the withdrawal sleeve is secured by the shaft nut.

7

Nut with pressure ring for pressing in large withdrawal sleeves, bearing with tapered bore

① *Pressure screw*
② *Shaft nut*
③ *Pressure ring*
④ *Withdrawal sleeve*



!

In the mounting of bearings with a tapered bore, it must be ensured that the seats of the sleeve connections are rubbed with a very thin layer of oil. Mounting pastes must not be used. While a thicker layer of lubricant would reduce the friction and thus allow easier mounting, the sleeves could however become loose when the nut with the pressure screws is removed after mounting. In operation, the lubricant would be gradually squeezed out of the fit joint and the tight fit of the bearing would be progressively lost.

✎ *Measures to be taken if the bearing is to be mounted again after dismounting*

If the rolling bearing has been dismounted and is to be used again, it is not sufficient to move the retaining nut to its earlier position. After longer periods of operation, the fit loosens again since the thread undergoes settling and the surfaces become smoothed. In this case also, the reduction in radial internal clearance or the axial drive-up distance, or the expansion of the raceways in the case of cylindrical roller bearings, must be measured again.

Mounting of large bearings using hydraulic nuts

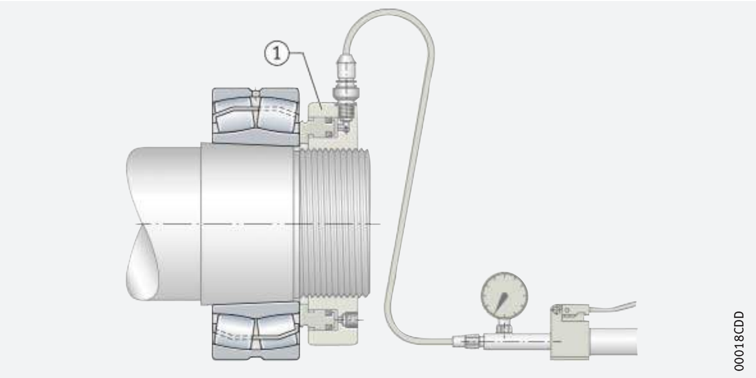
✎ *Hydraulic nuts are available for all common sleeves and shaft threads*

For the mounting of large bearings, it is advisable to use a hydraulic nut in order to slide the bearing into place or press in the sleeve ➤197|8. Hydraulic nuts are available for all common sleeves and shaft threads. The hydraulic method described not only gives easier mounting, but in particular easier dismounting.

8

Hydraulic nut for mounting of bearings with tapered bore

① *Hydraulic nut*



10.4 Regulating the clearance during mounting

✎ The preset internal clearance gives the required bearing clearance after mounting

In some bearing arrangements, a certain radial and axial clearance necessitated by the design and temperature conditions is set during mounting which may also, if required, be zero clearance or light preload. In large volume situations, bearing units are increasingly fitted whose internal clearance has been preset such that the required bearing clearance is achieved when mounted; see product chapter and ➤ 🕮 *MH 1*.

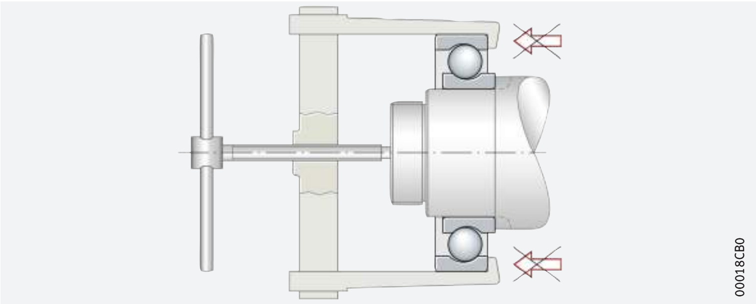
10.5 Accessories for dismounting

✎ Dismounting of bearings with a tight fit is more difficult

The removal of a rolling bearing mounted with a tight fit is not always easy, especially if fretting corrosion has formed. Defective rolling bearings can be dismounted by cutting or splitting of the rings.

! If the bearings are to be reused, the force used in pressing the bearing off must always be applied to the bearing ring with a tight fit ➤*198*|*9*.

9
Incorrect dismounting: the rolling elements must support wthdrawal forces



✎ Dismounting of non-separable bearings: the tool must be applied to the ring with a tight fit

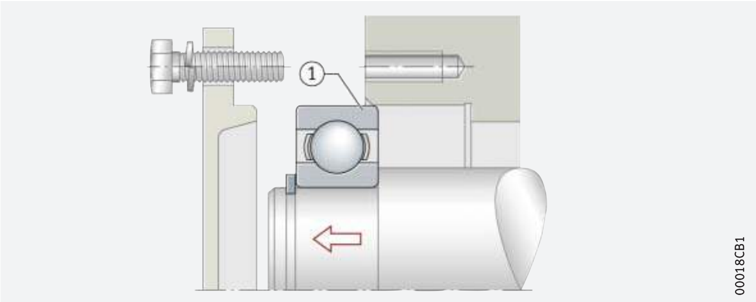
In the case of non-separable bearings, the ring fitted with a sliding seat must first be removed from its seat ➤*198*|*10*. The ring with a tight fit is then pressed off. The tools must be applied to the bearing ring with a tight fit ➤*198*|*11* and ➤*199*|*12*. In order to apply the withdrawal device to the inner ring, extraction slots are provided in the shaft shoulder ➤*199*|*12*.

✎ Simpler dismounting with fixed press

Dismounting of rolling bearings is a simpler operation if a fixed press is used for pressing off ➤*199*|*13*.

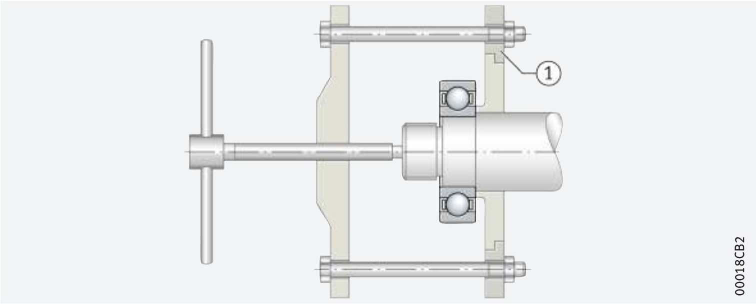
10
Dismounting of non-separable bearings

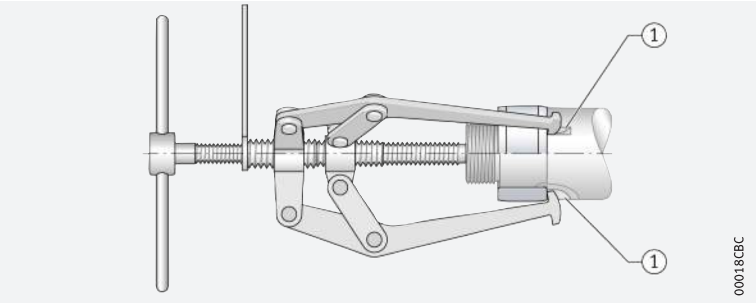
① Bearing outer ring fitted with sliding seat



11
Withdrawal device with tie rods

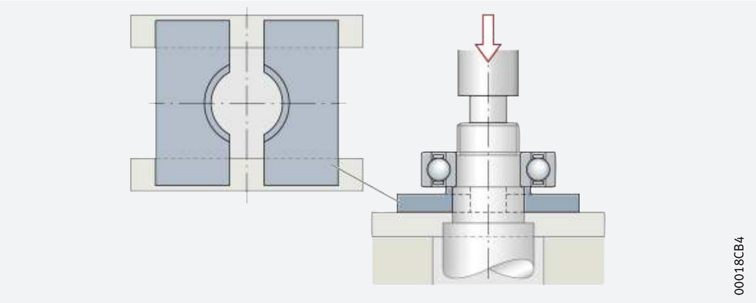
① Tie rod





12
Withdrawal device with adjustable arms

① *Extraction slots in shaft shoulder*



13
Pressing off a ball bearing using a fixed (stationary) press

Ball bearing extractor with clamping tool

In cases where the inner ring is in contact with the shaft shoulder and no extraction slots are present there, it is possible to remove ball bearings, tapered roller bearings and cylindrical roller bearings with the aid of an extractor with a clamping tool. In the case of the ball bearing extractor, the finger-shaped extensions of the clamping tool inserted in the extractor engage between the balls on the raceway edge of the inner ring ➤199| 14.

The clamping tool is part of a collet that is clamped against the inner ring by means of a conical clamping ring. It is extracted by means of a tensioning spindle. The extractor can also be used to remove bearings, that are still mounted in the housing, from the shaft.

14
Ball bearing extractor with clamping tool

Further precautions for the adjacent construction when using dismounting tools

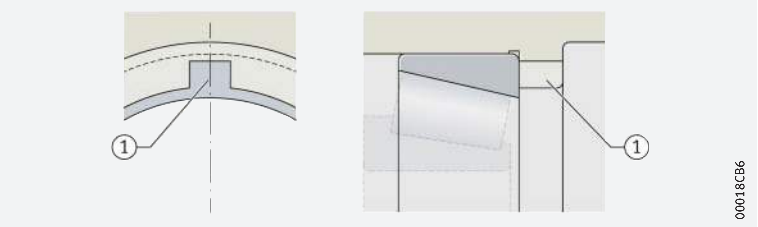
The examples show that consideration must be given in the design of the adjacent parts to the placement of extraction tools. If the inner ring has a tight fit, its end face must be accessible. This can be achieved, for example, by restricting the shaft shoulder diameter or providing slots in the shaft shoulder ➤198| 11 and ➤199| 12. Spacer rings or labyrinth rings must be designed such that they do not disrupt extraction.

✎ Recesses or threaded holes must be provided for extraction screws

The same applies to the design of the housing. Pot type housings with a rigid end wall are preferred for strength reasons, but cause difficulties in dismounting of the bearing outer ring. If rigid shoulders are present, recesses or threaded holes for extraction screws should be provided ➤200| 15 and ➤200| 16.

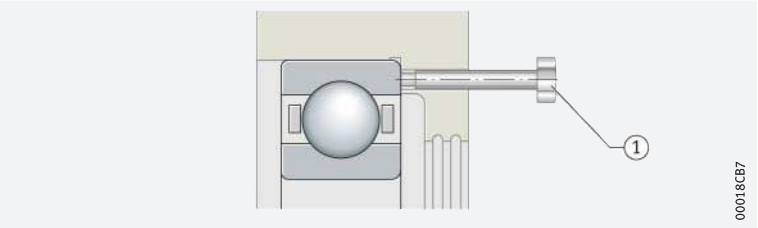
15
Slots in housing wall for placement of extraction tool

① *Slot*



16
Pressure screws in housing wall for extraction of bearing ring

① *Pressure screw*



Separable bearings

✎ Separable bearings allow easier dismounting

The requirement for easy dismounting of bearings also influences bearing selection. Since they are easy to dismount, separable bearings such as magneto bearings, tapered roller bearings, cylindrical roller bearings and needle roller bearings are often used in preference to other bearing types.

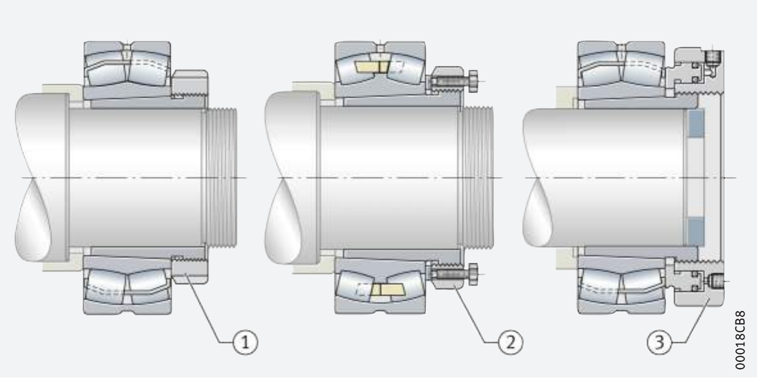
Withdrawal sleeve

✎ Method for dismounting a withdrawal sleeve

The withdrawal sleeve is also an accessory to give easier dismounting. For dismounting of the sleeve, it is possible in difficult cases – principally in the case of large size bearings – to use a nut with quenched and tempered pressure screws or a hydraulic nut in place of the extraction nut that is otherwise normally used ➤200| 17.

17
Dismounting of a withdrawal sleeve

① *Extraction nut*
② *Quenched and tempered pressure screws*
③ *Hydraulic nut*



10.6 Special methods for mounting and dismounting

✎ Hydraulic methods or induction heating are suitable for overcoming high adhesive friction

In practice, the high level of adhesive friction in the seating surfaces of tightly fitted bearings often causes problems in extraction. If fretting corrosion has formed in the fit joint, the fit surfaces often undergo fretting during extraction. This can be combatted by means of induction heating or – in the case of larger bearings – by means of hydraulic mounting methods.

Hydraulic methods

✎ Oil between the seating surfaces causes slight expansion of the bearing ring

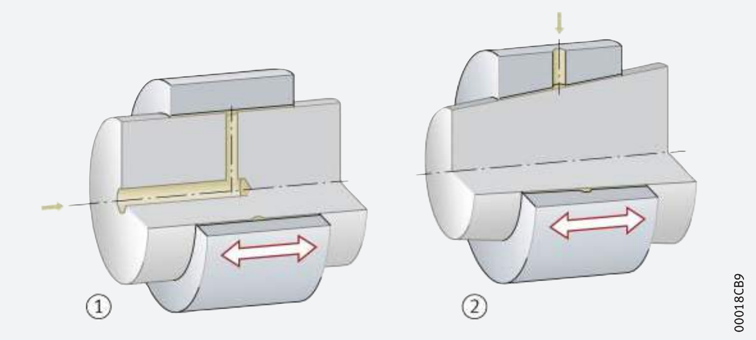
In hydraulic mounting methods, oil is pressed between the seating surfaces of the tight bearing fit, which slightly expands the bearing ring ➤201|18. The fluid film eliminates the contact between the fit parts to the point where these can be displaced with little application of force and without the risk of surface damage.

The hydraulic method is only suitable for dismounting in the case of cylindrical fit parts. Conical fit parts can, however, be mounted and removed using the hydraulic method ➤201|18.

! During dismounting, the inner ring becomes loose abruptly. It must therefore be axially secured.

18
Principle of hydraulic mounting

① *For cylindrical seating surfaces*
② *For tapered seating surfaces*

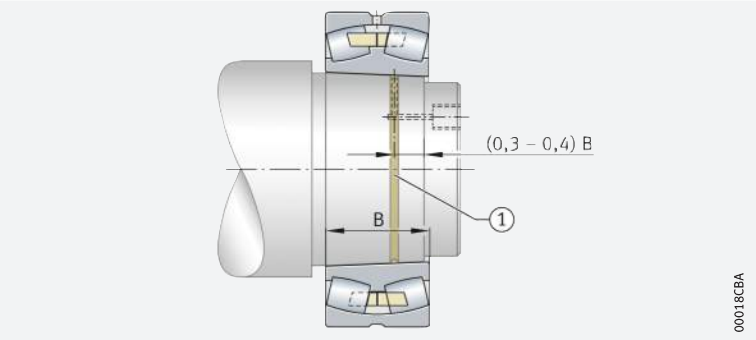


✎ Oil grooves, feed ducts and threaded connectors are necessary

In order to press oil in, oil grooves and feed ducts as well as threaded connectors for the pressure generation devices must be provided ➤201|19. There are designs of adapter and withdrawal sleeves that already have these ducts ➤202|20.

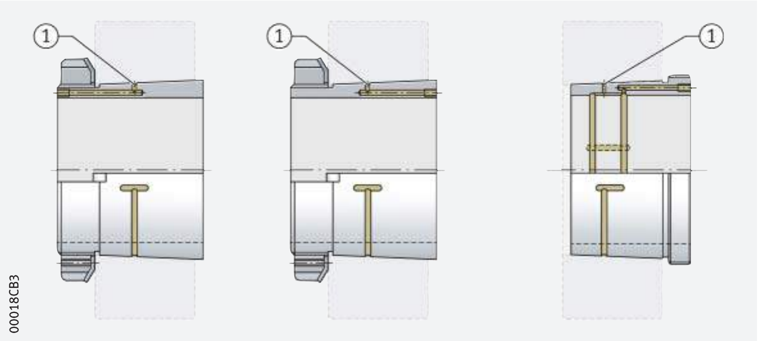
19
Oil ducts and grooves in a tapered shaft

B = *bearing width*
① *Oil groove*



20
Adapter and withdrawal sleeves with oil ducts

① Oil duct



Oil injector for bearings with tapered bore and tapered shaft journal

In the mounting and dismounting of bearings with a tapered bore that are mounted on a tapered shaft journal, a simple oil injector is sufficient ➤202|21. If cylindrical fit surfaces are present and adapter or withdrawal sleeves are used, more oil must be pressed in due to the oil loss that occurs at the edges of the fit surfaces. In this case, a twin-stage hand piston pump with an oil pressure of up to 1 600 bar can be used ➤202|22.

21
Oil injector and valve nipples

22
Twin-stage hand piston pump

Oil pressure of up to 1 600 bar

Induction heating

Expansion of the rings by induction heating

In addition to the hydraulic method, the expansion of bearing rings by means of induction heating has gained considerable importance for the mounting of rolling bearings and is currently the state of the art. ➤203|23 shows a portable device (rigid coil) that is used for the mounting and dismounting of cylindrical roller bearing inner rings. ➤204|24 shows the flexible inductor for medium frequency technology. These inductors give safe and reliable heating of rolling bearings or other ring-shaped steel parts even at locations with poor accessibility. Due to the targeted application of heat and the high energy density, medium frequency technology allows short heating times and environmentally acceptable heating.

As a result of rapid local heating, very little heat enters the shaft

If fixed coils are used, a separate device is necessary for each size of ring. Heating takes place so quickly that very little heat enters the shaft during dismounting and the inner rings that previously had a tight fit can easily be loosened from the shaft.

The method is economical if cylindrical roller bearing inner rings are mounted in large quantities or if large size bearings – such as in the replacement of rolls in a rolling mill – must be dismounted and mounted again frequently.

Induction heating devices for sealed and greased bearings

Two further induction heating devices which can be used to heat complete rolling bearings of any type for mounting are shown in ➤204|25. These devices can also be used to heat sealed and greased bearings.

The devices operate on the transformer principle, where the bearing acts as a short-circuited secondary winding. As long as the primary current is switched on, a short circuit current is induced in the bearing that heats the bearing to +80 °C or a preselectable temperature. Depending on size, the heating time is between a few seconds and a few minutes.
Heating devices are available for the normal mains voltages. Shrink fit and labyrinth rings or other ring-shaped metallic parts can therefore also be heated by this method.

23
Induction heating device with medium frequency technology

24
Induction device with flexible inductor

25
Induction heating devices for the mounting of complete rolling bearings

① *Table top device for bearings of 10 mm bore diameter and above*
② *Standalone device for bearings up to 400 kg mass*

10.7 Tools and methods for the mounting and dismounting of rolling bearings

Whether a rolling bearing is mounted without heating, with heating or using the hydraulic method depends on various factors. The overview in ➤206|▦1 shows which method is suitable in the specific circumstances.

1
Mounting and dismounting methods for rolling bearings

Bearing type		Bearing bore	d mm
Deep groove ball bearings Angular contact ball bearings Spindle bearings Four point contact bearings Self-aligning ball bearings	Tapered roller bearings Barrel roller bearings Spherical roller bearings Toroidal roller bearings	Cylindrical	< 80
			80 – 200
			> 200
Cylindrical roller bearings Needle roller bearings		Cylindrical	< 80
			80 – 200
			> 200
Axial deep groove ball bearings Axial angular contact ball bearings Axial cylindrical roller bearings Axial spherical roller bearings		Cylindrical	< 80
			80 – 200
			> 200
Self-aligning ball bearings Self-aligning ball bearings with adapter sleeve Toroidal roller bearings Barrel roller bearings Barrel roller bearings with adapter sleeve Spherical roller bearings Spherical roller bearings with adapter sleeve Spherical roller bearings with withdrawal sleeve Adapter sleeve	Withdrawal sleeve	Tapered	< 80
			80 – 200
			> 200
Cylindrical roller bearings, double row		Tapered	< 80
			80 – 200
			> 200

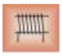
Symbols

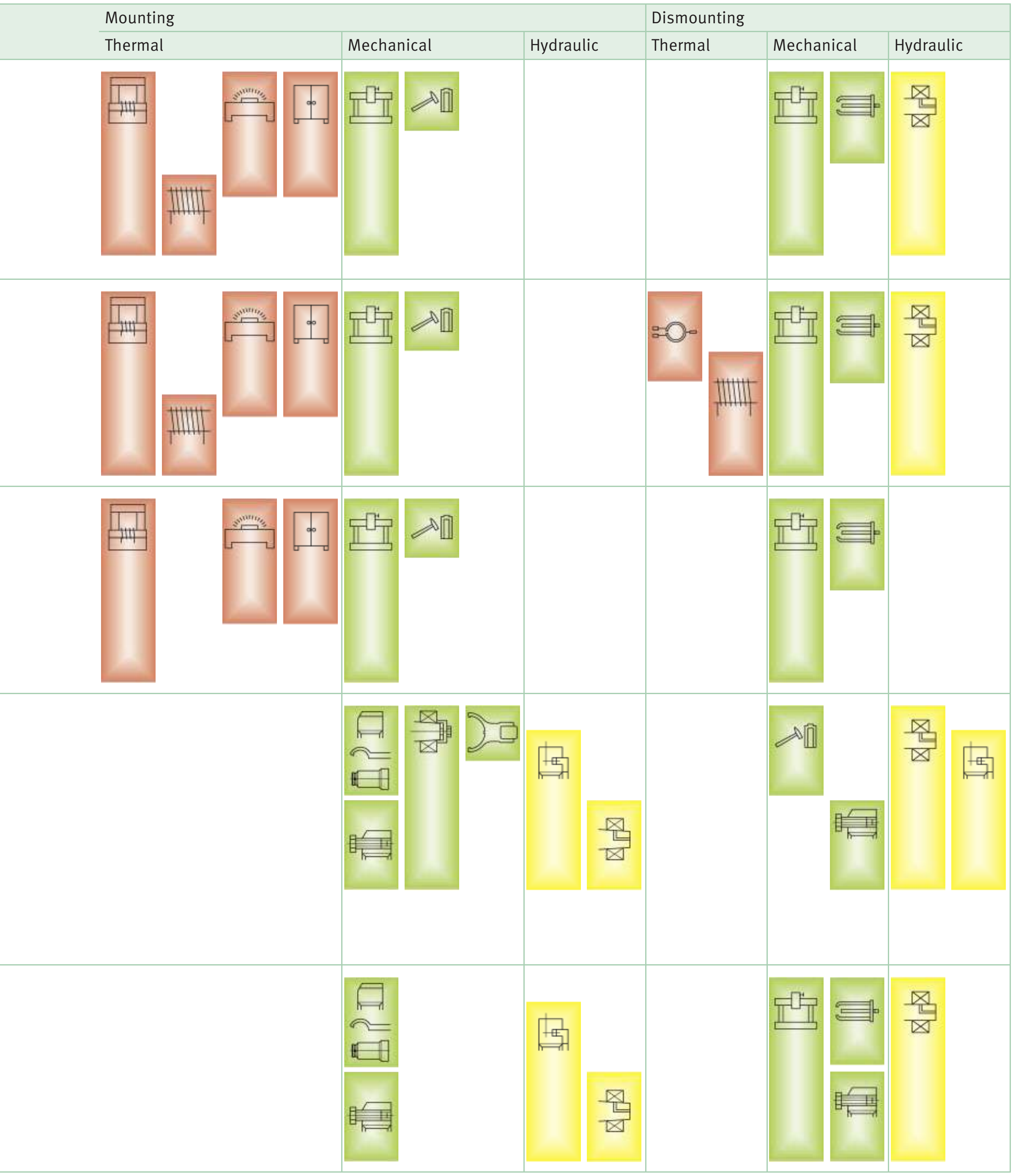
 Induction heating device

 Heating cabinet

 Heating ring

 Heating plate

 Medium frequency technology



- Hammer and mounting sleeve
- Double hook wrench
- Socket wrench
- End cap
- Hydraulic nut
- Mechanical and hydraulic presses
- Nut and hook wrench
- Nut and mounting wrench
- Withdrawal device
- Hydraulic method

Deep groove ball bearings

FAG

Matrix for bearing preselection

The matrix gives an overview of the types and design features of deep groove ball bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter (see column "detailed information") and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

Design features and suitability			Deep groove ball bearings		
+++ extremely suitable ++ highly suitable + suitable (+) suitable with restrictions – not suitable/not applicable ✓ available			single row	double row	detailed information ➤ 212
Load carrying capacity	radial		++	++	➤216|1.2
	axial, one direction		+	++	➤216|1.2
	axial, both directions		+	++	➤216|1.2
	moments		(+)	+	➤216|1.2
Compensation of angular misalignments	static		(+)	–	➤217|1.3
	dynamic		(+)	–	➤217|1.3
Bearing design	cylindrical bore		✓	✓	➤212|1.1
	tapered bore		–	–	
	separable		–	–	➤231|1.17
Lubrication	greased		✓1)	✓	➤217|1.4
Sealing	open		✓	✓	➤218|1.5
	non-contact		✓	–	➤218|1.5
	contact		✓	–	➤218|1.5
Operating temperature in °C		from to	–30 +120 2)	–30 +120	➤221|1.8
Suitability for	high speeds		+++	+	➤220|1.6
	high running accuracy		++	+	➤224|1.11 ➤114
	low-noise running		+++	+++	➤220|1.7 ➤228|1.16
	high rigidity		+	+	➤54
	reduced friction		+++	+++	➤56
	length compensation within bearing		–	–	
	non-locating bearing arrangement		+	+	➤139
	locating bearing arrangement		++	++	➤139
X-life bearings			–	–	
Bearing bore d in mm		from to	2 260 3)	10 90	➤232 ➤276
Product tables		from page ➤	232	276	

1) For sealed bearings only

2) Valid for bearings with sheet steel sealing shields

3) Larger catalogue bearings ➤ 🕮 GL 1

1 Deep groove ball bearings

Deep groove ball bearings are available in single row and double row designs.

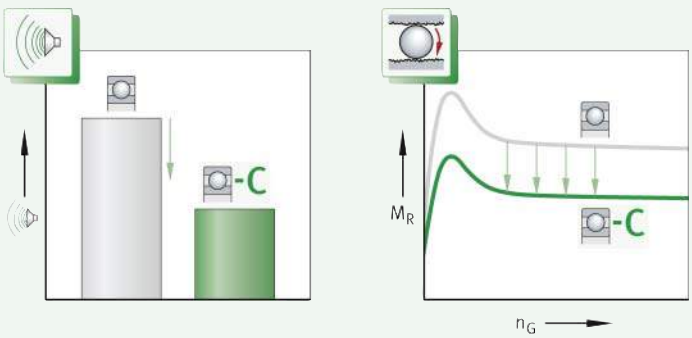
Single row bearings are particularly suitable where:

- high and very high speeds are required
- the bearing arrangement must be operated with very low friction
- very low running noise is required, without reducing the speed, load carrying capacity and operating life of the bearing (Generation C) ➤*213*
- high demands are made on the sealing of the bearing, without increasing heat generation or limiting the speed (Generation C) ➤*218*|*1.5*
- the bearing position is to be designed particularly economically.

Double row bearings can be considered for bearing arrangements where:

- the load carrying capacity of single row deep groove ball bearings is no longer sufficient ➤*216*
- axial loads in both directions and/or tilting moments must be supported in addition to radial loads ➤*216*
- a high load carrying capacity is required and the design envelope available in a radial and axial direction is relatively small.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*211*.



⊡ **1**
Comparison of standard deep groove ball bearings with bearings of Generation C: running noise, frictional torque

C = *bearings of Generation C*
M_R = *frictional torque*
n_G = *limiting speed*

1.1 Bearing design

Design variants

Single row deep groove ball bearings are available as:

- standard bearings ➤*213*|⊡*2*
- bearings of Generation C ➤*214*|⊡*3* and ➤*214*|⊡*4*
- matched bearing sets ➤*215*|⊡*5*
- corrosion-resistant bearings ➤*215*.

Double row deep groove ball bearings are available as:

- standard bearings ➤*215*|⊡*6*.

Single row deep groove ball bearings are also available in many other designs and sizes, as well as for specific applications, by agreement. Corrosion-resistant bearings ➤ TPI 64, larger catalogue bearings ➤ GL 1.

Standard bearings

Proven and versatile bearings with high market shares

Single row deep groove ball bearings are self-retaining units, which are part of the group of radial ball bearings. The solid outer and inner rings have deep raceway grooves, with shoulders which are not generally interrupted by filling slots ➤213|2. Solid cages made from polyamide PA66 or brass, and sheet metal cages made from steel or brass, are used as standard cages ➤222|4. The bearings are open or sealed. Due to the manufacturing processes used, open bearings, which are also available as sealed versions, can have turned recesses in the outer and inner ring for sealing washers or sealing shields.

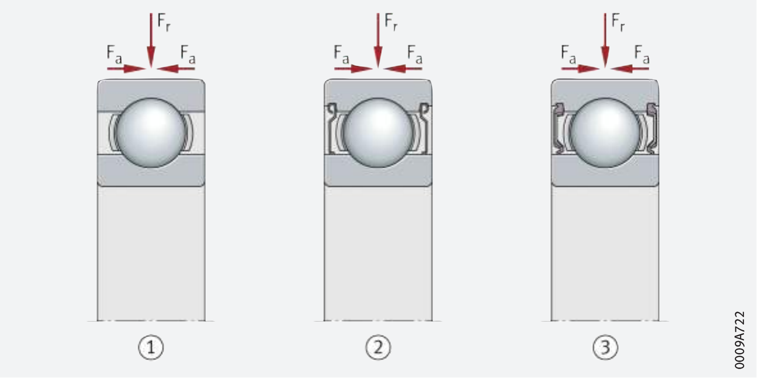
Single row deep groove ball bearings are particularly versatile, robust in operation, easy to maintain and very economical. Due to their significant advantages, they are the most widely used rolling bearings worldwide. As a result, Schaeffler also manufactures these bearings in a large number of sizes and designs.

2

Single row deep groove ball bearings, open or sealed

F_r = *radial load*
F_a = *axial load*

① *Open*
② *Sealing shield on both sides (non-contact)*
③ *Contact seal on both sides*



Deep groove ball bearings of Generation C

Gen. C = optimised design of standard bearings

Deep groove ball bearings of Generation C correspond in their structure to single row standard deep groove ball bearings, but are specially optimised in relation to:

- significantly quieter running
- even more effective sealing
- a further reduction in the already very low frictional torque.

Measures to reduce noise

Schaeffler has analysed the causes of noise generation in deep groove ball bearings using the most advanced methods. On the basis of the findings obtained from these analyses:

- The surface of the raceways has been improved
- The ball quality has been increased
- Osculation has been optimised
- The production tolerances have been reduced
- Deep groove ball bearings have been fitted with new riveted cages made from steel.

The result of this is a noise reduction in Generation C bearings over comparable standard deep groove ball bearings.

✎ Gen. C = particularly high sealing effect due to new and improved seals

The quality of the seal not only has a considerable influence on the rating life, but also on the efficiency of a rolling bearing. As a result, the seal must not only protect the running system reliably against contamination, the ingress of moisture and the loss of grease, but also ensure that the total frictional torque and heat generation in the bearing remain low despite the high sealing action. The new sealing shields, non-contact seals and contact seals of Generation C deep groove ball bearings (suffixes Z, BRS, HRS, ELS) demonstrate the success of Schaeffler in performing this difficult technical step effectively ➤*214*|*3* and ➤*214*|*4*. Description of sealing shields and seals ➤*218*|*1.5*.

✎ Gen. C = technical and economical advantages of very low friction

Electric motors, electrical machinery, washing machines, ventilators and electric tools are the preferred application areas of single row deep groove ball bearings. However, in order to facilitate further increases in the efficiency of these motors, machines and tools, the power loss occurring in the bearing arrangements must be reduced.
The above-mentioned measures for reducing noise also resulted, for example, in an approximate reduction in friction of 35%, giving the designer a range of application-specific advantages:

- lower heat generation
- a longer grease operating life
- higher possible speeds
- a longer bearing operating life
- a reduced energy consumption
- lower energy costs
- lower overall cost of the bearing position.

✎ Gen. C = a leading player among single row deep groove ball bearings

In summary, this means that, in addition to their technical advantages, bearing positions with deep groove ball bearings of Generation C are also considerably more economical than bearing arrangements with single row standard deep groove ball bearings. Generation C is available in series 60, 62 and 63.

3

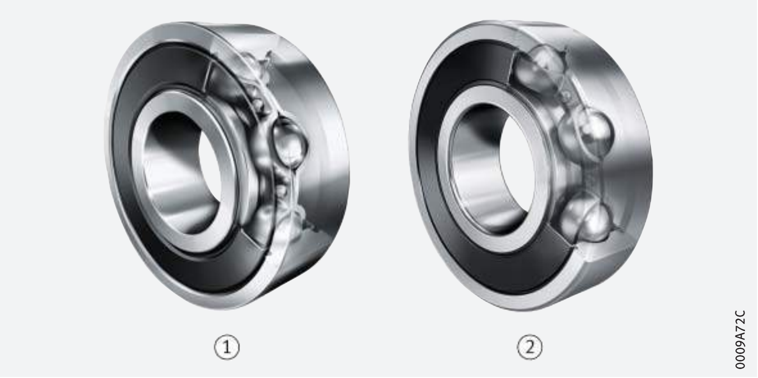
Single row deep groove ball bearings, Generation C, open or with non-contact seals

① *Open*
② *Sealing shield on both sides (suffix 2Z)*
③ *Non-contact seal on both sides (suffix 2BRS)*

4

Single row deep groove ball bearings, Generation C, contact seals

① *Contact seal on both sides (suffix 2HRS)*
② *Contact seal on both sides (suffix 2ELS)*

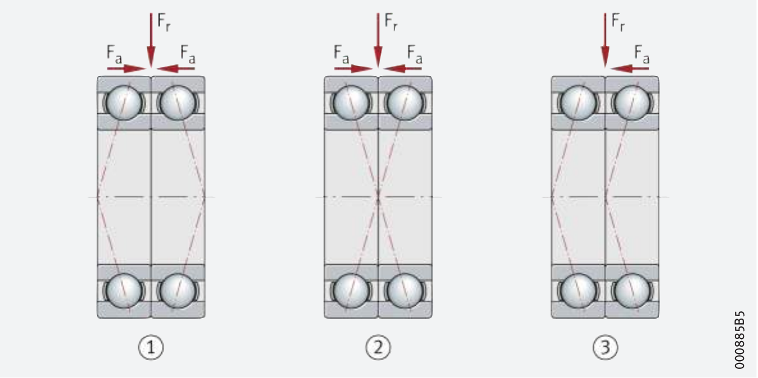


Matched bearing sets

Bearing sets in O, X or tandem arrangements

If the load carrying capacity of a single bearing is not sufficient, or the shaft is to be guided axially in both directions with a defined clearance, single row standard deep groove ball bearings are also available as matched bearing sets ➤215 | 5.

As the arrangement of the bearing pairs is specific to the application, Schaeffler supplies bearing sets by agreement.



5 *Matched bearing sets*

F_r = *radial load*
F_a = *axial load*

① *Set in O arrangement*
② *Set in X arrangement*
③ *Set in tandem arrangement*

Corrosion-resistant bearings

Wide product range

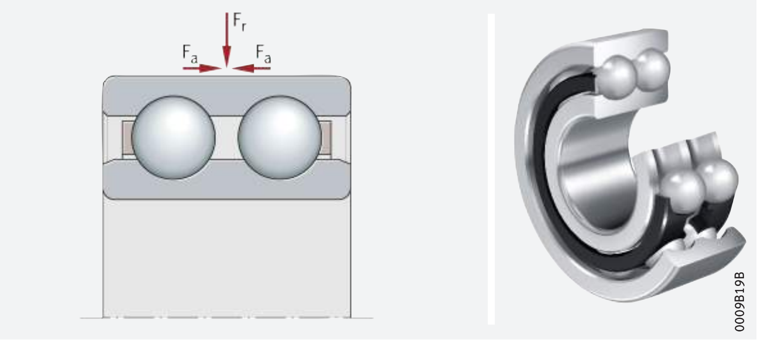
Corrosion-resistant bearings are suitable where particular requirements for corrosion protection are present. Schaeffler supplies deep groove ball bearings of this type in open and sealed designs.

The load carrying capacity for bearings made from corrosion-resistant steel is slightly lower than for bearings made from rolling bearing steel.

The range of these bearings and housings is described in detail in Technical Product Information TPI 64 ➤ *TPI 64*.

Double row deep groove ball bearings

Double row deep groove ball bearings of series 42 and 43 correspond in their structure and function to single row deep groove ball bearings arranged in pairs ➤215 | 6. They have deep raceway grooves in the bearing rings and a narrow osculation between the raceway grooves and balls. However, they are slightly narrower than two single row deep groove ball bearings of the series 62 and 63 with the same bore and outside diameter.



6 *Double row deep groove ball bearing, open*

F_r = *radial load*
F_a = *axial load*

1.2 Load carrying capacity

Single row deep groove ball bearings – radial load carrying capacity

✎ Suitable for predominantly radial loads

The balls are in contact with the raceways at one point only. Under purely radial load, the contact points between the rolling elements and raceways lie at the centre of the raceway. As a result, the connection between the contact points passes through the radial plane, i.e. the optimum load direction is a purely radial load ➤213|⊡ 2.

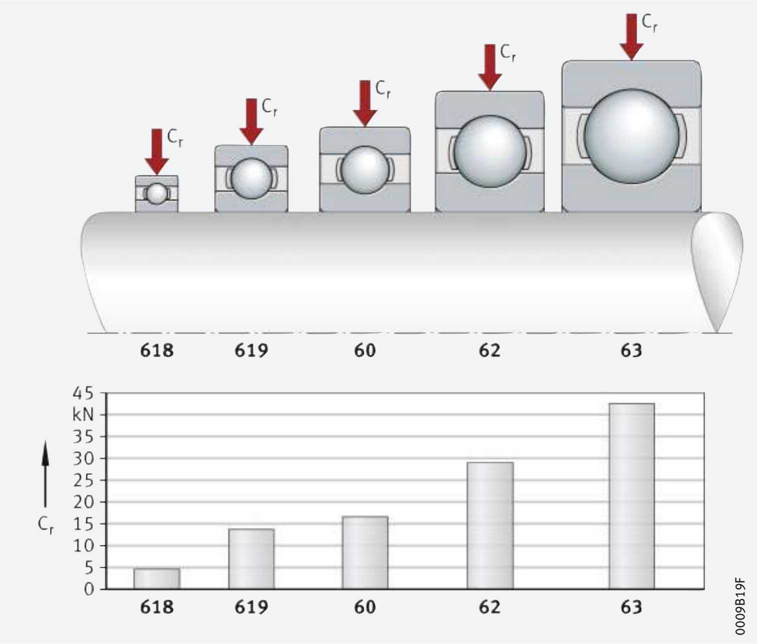
✎ Larger bearing cross-sections permit higher loads

The load carrying capacity is dependent on the bearing series. As a result, deep groove ball bearings of series 618 and 619, with their smaller bearing cross-sections, cannot support loads as high as series 60, 62 and 63 – with identical dimensions relative to bore diameter d – with their larger cross-sections ➤216|⊡ 7.

⊡ 7

Single row deep groove ball bearings, comparison of cross-section and load carrying capacity (radial load carrying capacity C_r) for bearings with d = 40 mm

C_r = basic dynamic load rating



Single row deep groove ball bearings – axial load carrying capacity

✎ Capable of supporting axial loads in both directions

Due to the deep raceway grooves in the bearing rings and the narrow osculation between the raceway grooves and balls, single row deep groove ball bearings can support axial loads in both directions ➤213|⊡ 2.
The axial load carrying capacity is dependent, for example, on the bearing size, the internal construction and the operating clearance.
If the axial load is too high, however, this can increase the running noise and considerably reduce the operating life of the bearings.

If there is any uncertainty regarding the axial load carrying capacity of the bearings, please consult Schaeffler.

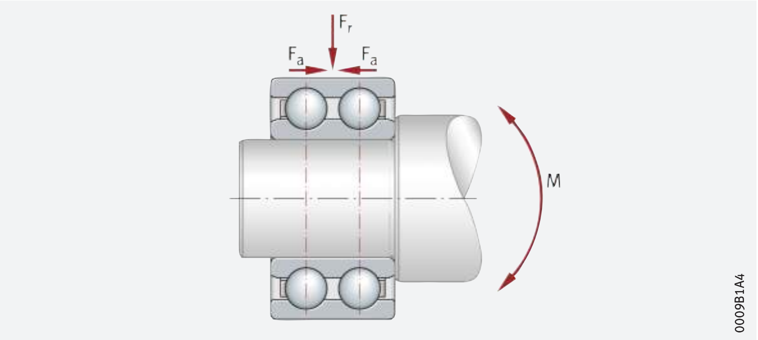
Double row deep groove ball bearings

✎ Considerably higher load carrying capacity than single row bearings

Due to the larger number of rolling elements, double row deep groove ball bearings can be subjected to greater loads than single row deep groove ball bearings with an identical ball set. They can replace two single row deep groove ball bearings if a smaller design envelope width is required.

✎ Also suitable for tilting moment loads

Double row deep groove ball bearings can also support tilting moment loads in addition to radial and axial loads ➤217|⊡ 8. They are therefore suitable for particularly short shafts that are supported by only one bearing.



8
Unilateral bearing arrangement of a shaft with a double row deep groove ball bearing (flying bearing arrangement)

F_r = radial load
F_a = axial load
M = tilting moment load

1.3 Compensation of angular misalignments

Single row deep groove ball bearings – permissible adjustment angle

The adjustment angle is dependent on the magnitude of the load

Single row deep groove ball bearings are only suitable for compensating static angular misalignments to a very limited extent. As a result, the bearing positions must be well aligned. Misalignments shorten the operating life, as they place an additional strain on the bearing. In order to keep these loads at a low level, only small adjustment angles are permissible – dependent on the load – for deep groove ball bearings ➤217|1.

1
Permissible adjustment angles

Series	Adjustment angle for	
	low loads	high loads
62, 622, 63, 623, 64	5′ to 10′	8′ to 16′
618, 619, 160, 60	2′ to 6′	5′ to 10′

Double row deep groove ball bearings

!

Due to their internal construction, double row deep groove ball bearings do not have an angular adjustment facility. When using these bearings, therefore, misalignments are not permissible.

1.4 Lubrication

Single row deep groove ball bearings

Greased bearings are maintenance-free

Deep groove ball bearings sealed on both sides are lubricated with a high quality lithium soap grease with a mineral oil base, which has good anti-corrosion characteristics. The grease filling is measured so that it is sufficient for the entire life of the bearing. As a result, these bearings are generally maintenance-free.

!

Do not wash greased bearings out prior to mounting. If mounting is carried out using thermal tools, the bearings should not be heated to a temperature in excess of +80 °C, taking account of the grease filling and seal material. If higher heating temperatures are required, it must be ensured that the permissible upper temperature limits for grease and seals are not exceeded. Schaeffler recommends the use of induction heating devices for heating purposes ➤231.

Oil or grease lubrication is possible

Open bearings and bearings with seals on one side are not greased as standard. They must be lubricated with oil or grease. Lubrication is carried out via the end faces of the bearings.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

Double row deep groove ball bearings

✎ Open bearings are greased

As standard, the bearings are lubricated with a high quality lithium soap grease with a mineral oil base and are maintenance-free for most applications.

1.5 Sealing

Single row deep groove ball bearings

✎ The bearings are available in open and sealed designs

Single row deep groove ball bearings are available in open designs, as well as with seals on one or both sides ➤213|2. In the case of sealed bearings, either non-contact or contact seals are used.

✎ Provide seals in the adjacent construction

In the case of unsealed bearings, sealing of the bearing position must be carried out by the adjacent construction. The sealing system should reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

Single row bearings with non-contact seals and sealing shields – standard bearings and Generation C

✎ For bearing assemblies with high speeds and lower requirements for sealing

Non-contact seals are particularly suitable for applications with high speeds and high requirements for low inherent heat generation ➤219|2. They are free from friction, except for a small amount of lubricant friction in the sealing gap. As a rule, non-contact seals do not undergo wear and therefore have an unlimited operating life. Deep groove ball bearings with non-contact seals on one or both sides have the suffixes RZ and 2RZ, or BRS and 2BRS; the suffixes Z and 2Z indicate seals on one or both sides with sealing shields.

✎ Z sealing shields for standard bearings and for bearings of Gen. C

Z sealing shields are made from sheet steel. They sit securely in the outer ring and form a narrow, non-contact seal gap relative to the surface of the inner ring ➤219|2. This sealing arrangement is particularly suitable for applications with a rotating inner ring, high to very high speeds and low contamination impact.

✎ RZ seals for standard bearings of series 618 and 619

RZ seals are rubberised sealing washers with a sheet steel reinforcement, which sit securely in the outer ring and form a narrow, non-contact seal gap relative to the surface of the inner ring ➤219|2.

✎ BRS seals for bearings of Gen. C

BRS seals are rubberised sealing washers with a sheet steel reinforcement, which sit securely in the outer ring and form a narrow, non-contact seal gap relative to the surface of the inner ring ➤219|2. The seal is securely anchored in the outer ring. A recess incorporated in the inner ring forms a labyrinth in conjunction with the seal lip, which is filled with grease. The frictional behaviour of this seal is comparable with that of the Z sealing shield, however, the protection against ingress of dust and egress of lubricant is higher.

Single row bearings with non-contact seals – standard bearings and Generation C

✎ For lower speeds and higher requirements for sealing action

As these seals are in contact with a defined contact pressure against their sliding surface, they provide very good sealing action against the egress of lubricant and ingress of moisture and dust. Attention must, however, be paid to the loss of energy resulting from friction at the sealing contact. Furthermore, in bearings with contact seals, the bearing speed is restricted by the permissible sliding velocity at the seal lip, i.e. the speed suitability of these bearings is lower than for open bearings or bearings with non-contact seals.

✎ RSR seals, for standard bearings

RSR seals are elastomer lip seals with a sheet steel reinforcement ➤219|2. One seal lip is in radial contact with the inner ring.

HRS and ELS seals for bearings of Gen. C

HRS and ELS seals are securely anchored in a recess in the outer ring. The sealing material is vulcanised onto a sheet steel reinforcement ➤219|2. The sealing washer, together with the inner ring, forms an axial sealing system. In addition, the outer non-contact lip forms a protective labyrinth with the inner ring. An additional increase in the sealing action is also provided by the film of grease between the two seal lips. With this sealing arrangement, higher speeds can be achieved than with conventional RSR seals, as the frictional torque and thus the heat generation in the bearing is lower.

Generation C deep groove ball bearings with contact seals are supplied with HRS seals as standard. ELS seals are available for these bearings by agreement.

2
Seal characteristics – standard bearings and Generation C

+++ = *excellent*
++ = *very good*
\+ = *good*
o = *satisfactory*
– = *unsatisfactory*

Suffix	Type of seal		Seal characteristic				
			low-friction running	high speeds	sealing integrity against ingress of water	sealing integrity against ingress of dust	sealing integrity against loss of grease
–		open (without seals)	+++	+++	–	–	–
Z, 2Z		non-contact (sheet metal), for standard bearings and Gen. C	++	+++	o	o	o
RZ, 2RZ		non-contact (elastomer), for standard bearings	++	+++	o	o	o
BRS, 2BRS		non-contact (elastomer), for Gen. C	++	+++	o	+	+
HRS, 2HRS		contact (elastomer), for Gen. C	o	+	++	++	++
RSR, 2RSR		contact (elastomer), for standard bearings	o	+	+	++	++
ELS, 2ELS		contact (elastomer), for Gen. C	+	++	++	+++	+++

Double row deep groove ball bearings

✎ The bearings are of an open design

Double row deep groove ball bearings are not sealed. As a result, sealing of the bearing position must be carried out by the adjacent construction ➤218|1.5.

1.6 Speeds

✎ Limiting speeds and reference speeds in the product tables

Two speeds are generally indicated in the product tables ➤232|:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

The values given in the product tables are valid for oil lubrication in the case of bearings without seals or shields and for grease lubrication where bearings are supplied greased and with seals or shields.

✎ Values for grease lubrication

For grease lubrication, 85% of the value stated in the product tables is permissible in each case.

Reference speeds

✎ $n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

✎ Bearings with contact seals

For bearings with contact seals, no reference speeds are defined in accordance with DIN ISO 15312:2004. As a result, only the limiting speed n_G is given in the product tables for these bearings.

Speeds for bearing sets

For matched bearing pairs in an O, X or tandem arrangement, the speed must be limited to approx. 80% of the individual bearings. More accurate speed data for a specific application can be requested from Schaeffler.

1.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

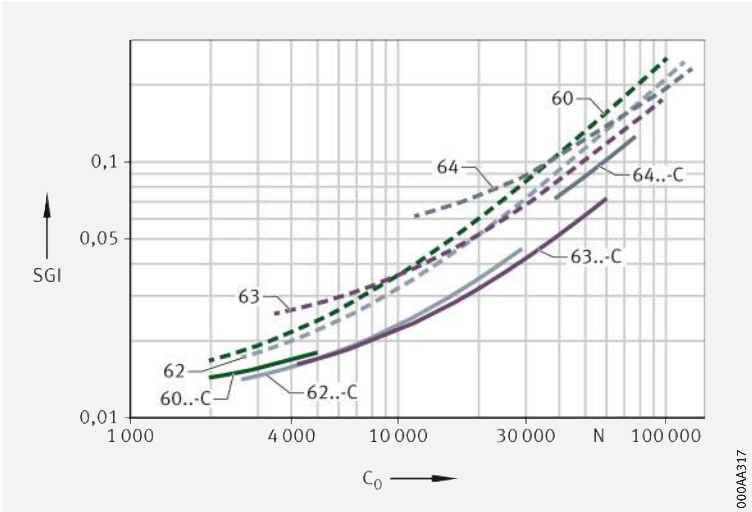
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- **medias** ➤ https://medias.schaeffler.com.

9
Schaeffler Noise Index for deep groove ball bearings

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and rolling elements
- the cage
- the lubricant
- the seals.

Possible operating temperatures of single row deep groove ball bearings ➤221 | 3.

3
Permissible temperature ranges

Operating temperature	Open deep groove ball bearings		Sealed deep groove ball bearings	
	with brass or sheet steel cage	with polyamide cage PA66	with seals BRS, 2BRS ELS, 2ELS HRS, 2HRS RSR, 2RSR RZ, 2RZ	with gap seals Z, 2Z
	$D \leqq 90$ mm, –30 °C to +120 °C[1)	–30 °C to +120 °C	–30 °C to +110 °C, limited by the lubricant, cage material and seal material	–30 °C to +120 °C, limited by the lubricant, cage material and seal material
	$90 \text{ mm} < D \leqq 240$ mm, –30 °C to +150 °C[1)			
	$D > 240$ mm, –30 °C to +200 °C[1)			

1) *By agreement, dimensionally stabilised for higher temperatures.*

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

Single row bearings: sheet steel or solid brass cages are used as standard

Standard cages for single row deep groove ball bearings are made from sheet steel or brass ➤222| 4. Other cage designs are available ➤225| 8. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

4
Cage, cage suffix, bore code for single row deep groove ball bearings

Bearing series	Sheet steel cage	Sheet brass cage Y	Solid brass cage M
	Bore code		
60	up to 34	–	from 36
62	up to 30	–	from 32
63	up to 26, 30	–	28, from 32
64	up to 14	–	from 15
160	up to 52	–	from 56
618	up to 08, 26, 30 to 56	09 to 24, 28	from 60
619	up to 18, 21, 32 to 48	–	26
622	up to 12	–	–
623	up to 10	–	–

Double row bearings

Double row deep groove ball bearings have cages made from glass fibre reinforced polyamide PA66.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass or sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

Cages for bearings of Generation C

Riveted sheet metal cages used as standard

In bearings of Generation C, a noise-optimised, riveted sheet steel cage is used as the standard cage. This cage design does not have a cage suffix in the bearing designation.

The bearings are also available with cages made from glass fibre reinforced polyamide PA66 by agreement.

1.10 Internal clearance

Radial internal clearance

The standard is CN

Deep groove ball bearings of basic design and bearings of Generation C are manufactured as standard with radial internal clearance CN (normal) ➤223 | 5. CN is not stated in the designation.

The bearings are also available with the smaller internal clearance C2 and with the larger internal clearance C3 and C4.

CM also available for smaller bore diameters

Deep groove ball bearings with a bore diameter $10 \leqq d \leqq 50$ are also available with the more closely toleranced bearing internal clearance CM (specifically for use in electric motors) ➤223 | 6.

The values for radial internal clearance (not CM) correspond to DIN 620-4:2004 (ISO 5753-1:2009). They are valid for bearings which are free from load and measurement forces (without elastic deformation).

5
Radial internal clearance of deep groove ball bearings – standard bearings and Gen. C

Nominal bore diameter d mm		Radial internal clearance C2 (Group 2) µm		CN (Group N) µm		C3 (Group 3) µm		C4 (Group 4) µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
1,5	6	0	7	2	13	8	23	–	–
6	10	0	7	2	13	8	23	14	29
10	18	0	9	3	18	11	25	18	33
18	24	0	10	5	20	13	28	20	36
24	30	1	11	5	20	13	28	23	41
30	40	1	11	6	20	15	33	28	46
40	50	1	11	6	23	18	36	30	51
50	65	1	15	8	28	23	43	38	61
65	80	1	15	10	30	25	51	46	71
80	100	1	18	12	36	30	58	53	84
100	120	2	20	15	41	36	66	61	97
120	140	2	23	18	48	41	81	71	114
140	160	2	23	18	53	46	91	81	130
160	180	2	25	20	61	53	102	91	147
180	200	2	30	25	71	63	117	107	163
200	225	2	35	25	85	75	140	125	195
225	250	2	40	30	95	85	160	145	225
250	280	2	45	35	105	90	170	155	245

6
Radial internal clearance CM

Nominal bore diameter d mm		Radial internal clearance CM µm	
over	incl.	min.	max.
10	18	4	11
18	24	5	12
24	30	5	12
30	40	9	17
40	50	9	17

1.11 Dimensions, tolerances

Dimension standards

The main dimensions of single row deep groove ball bearings correspond to DIN 625-1:2011. Nominal dimensions of single row deep groove ball bearings ➤232|.

The main dimensions of double row deep groove ball bearings correspond to DIN 625-3:2011. Nominal dimensions of double row deep groove ball bearings ➤276|.

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤135|7.11. Nominal value of chamfer dimension ➤232|.

Tolerances for standard bearings

The tolerances for the dimensional and running accuracy of single and double row standard bearings correspond to tolerance class Normal in accordance with ISO 492:2014. Bearings with a higher accuracy are available by agreement. Tolerance values in accordance with ISO 492 ➤122| 8.

The width tolerance of matched bearings deviates from the values in the above-mentioned standard ➤224| 7.

7
Width tolerance of bearing rings in matched bearings

Tolerance symbols ➤122|
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Width deviation $t_{\Delta Bs}$ µm	
over	incl.	U	L
–	18	0	–250
18	50	0	–300
50	80	0	–450
80	120	0	–550
120	180	0	–750
180	250	0	–950
250	315	0	–1050

Tolerances for bearings of Generation C

The dimensional and running tolerances correspond to tolerance class 6 in accordance with ISO 492:2014. Bearings with a higher accuracy are available by agreement. Tolerance values in accordance with ISO 492 ➤124| 11.

1.12 Suffixes

For a description of the suffixes used in this chapter ➤225|▦8, ➤225|▦9 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

Further special designs of deep groove ball bearings are available by agreement.

▦**8**

Suffixes and corresponding descriptions, single row deep groove ball bearings

Suffix	Description of suffix	
C	Deep groove ball bearing, Generation C	Standard
M	Solid brass cage, ball-guided	
MA	Solid brass cage, guided on outer ring rib	Available by agreement
MB	Solid brass cage, guided on inner ring rib	
C2	Radial internal clearance C2 (smaller than normal)	Available by agreement
C3	Radial internal clearance C3 (larger than normal)	
C4	Radial internal clearance C4 (larger than C3)	
CM	Radial internal clearance more closely toleranced than normal	
2BRS	Non-contact seal on both sides (labyrinth seal)	Standard for Generation C
2HRS	Contact seal on both sides (lip seal)	Standard for Generation C
2RSR	Contact seal on both sides (lip seal)	Standard
2RZ	Non-contact seal on both sides (rubberised gap seal)	Standard
2Z	Non-contact sealing shield on both sides (sheet metal gap seal)	Standard
BRS	Non-contact seal on one side (labyrinth seal)	Available by agreement
ELS	Contact seal on one side (lip seal)	Available by agreement for Generation C
2ELS	Contact seal on both sides (lip seal)	Available by agreement for Generation C
RSR	Contact seal on one side (lip seal)	Available by agreement
RZ	Non-contact seal on one side (rubberised gap seal)	Available by agreement
TVH	Solid cage made from glass fibre reinforced polyamide PA66	Available by agreement
Y	Sheet brass cage	Available by agreement
Z	Non-contact sealing shield on one side (sheet metal gap seal)	Available by agreement
S0	Dimensionally stabilised bearing for operating temperatures up to +150 °C	Available by agreement
S1	Dimensionally stabilised bearing for operating temperatures up to +200 °C	Available by agreement
S2	Dimensionally stabilised bearing for operating temperatures up to +250 °C	Available by agreement

▦**9**

Suffixes and corresponding descriptions, double row deep groove ball bearings

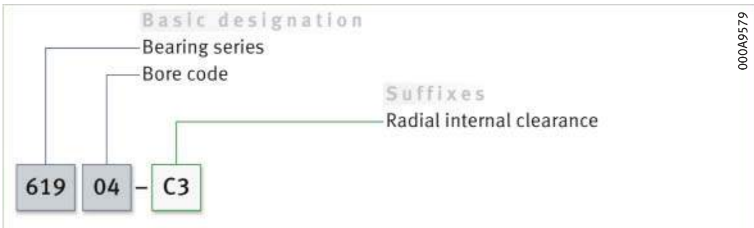
Suffix	Description of suffix	
B	Modified internal construction	Standard
TVH	Solid cage made from glass fibre reinforced polyamide PA66	Standard

1.13 Structure of bearing designation

✎ Examples of composition of bearing designation

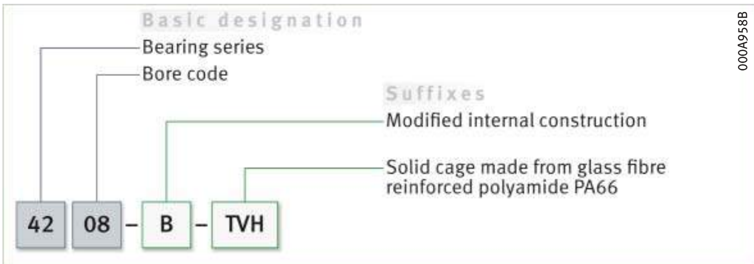
The designation of bearings follows a set model. Examples ➤226| 10, ➤226| 11 and ➤226| 12. The composition of designations is subject to DIN 623-1 ➤102| 10.

10
Single row deep groove ball bearing, open: designation structure



11
Single row deep groove ball bearing, sealed, Generation C: designation structure

12
Double row deep groove ball bearing, open: designation structure



1.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

✎ P is a substitute force for combined load and various load cases

If this condition is not met, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ $F_a/F_r \leq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factor e ➤227| 1 and ➤227| 2.

ƒ 1
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r$$

ƒ 2
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = X \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load
e, X, Y	–	Factors ➤227 | ▦ 10.

! The values in accordance with ➤227 | ▦ 10 are valid for normal fits (shaft manufactured to j5 or k5, housing bore manufactured to J6).
If the calculation values lie between the stated values (e.g. in the case of 0,4), then read off the table values for 0,3 and 0,5 and determine the intermediate values using linear interpolation.

▦ 10
Factors e, X and Y

$\frac{f_0 \cdot F_a}{C_{0r}}$	Factor for radial internal clearance CN		
	e	X	Y
0,3	0,22	0,56	2
0,5	0,24	0,56	1,8
0,9	0,28	0,56	1,58
1,6	0,32	0,56	1,4
3	0,36	0,56	1,2
6	0,43	0,56	1

Legend

C_{0r}	N	Basic static load rating ➤232 | ▦
f_0	–	Factor ➤232 | ▦
F_a	N	Axial load.

Equivalent static bearing load

✎ $F_{0a}/F_{0r} \leqq 0{,}8$ or $F_{0a}/F_{0r} > 0{,}8$

For deep groove ball bearings under static load ➤227 | ƒ 3 and ➤227 | ƒ 4. The calculation of P_0 is dependent on the load ratio F_{0a}/F_{0r} and the factor 0,8.

ƒ 3
Equivalent static load

$$\frac{F_{0a}}{F_{0r}} \leqq 0{,}8 \quad \Rightarrow \quad P_0 = F_{0r}$$

ƒ 4
Equivalent static load

$$\frac{F_{0a}}{F_{0r}} > 0{,}8 \quad \Rightarrow \quad P_0 = 0{,}6 \cdot F_{0r} + 0{,}5 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load).

Static load safety factor

✎ $S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤227 | ƒ 5.

ƒ 5
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

1.15 Minimum load

✎ In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/100$ is required

In order that no slippage occurs between the contact partners, the deep groove ball bearings must be constantly subjected to a sufficiently high load. Based on experience, a minimum radial load of the order of $P > C_{0r}/100$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

1.16 Design of bearing arrangements

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and thus also achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤229|▦11 to ➤230|▦13.

Radial location of bearings – fit recommendations

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158|▦7.

Axial location of bearings – location methods

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings and retaining rings etc., are fundamentally suitable.

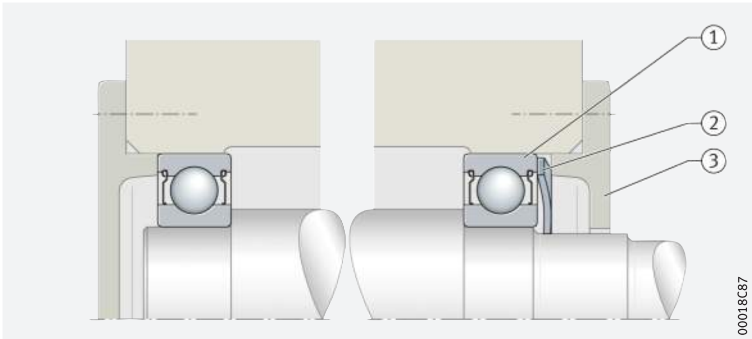
Axial adjustment by means of spring element to reduce noise

✎ Example: single row deep groove ball bearing, bearing arrangement in an electric motor

If the bearing arrangement is to run particularly quietly, this can be achieved economically with commonly available spring elements ➤229|Fig. 13. The bearings in the figure must only support guidance forces in an axial direction. The inner rings have a tight fit on the shaft and are abutted on the shaft shoulders. The outer rings are mounted with a sliding seat. A spring washer is fitted between the outer ring of the right hand bearing and the cover collar. The bearings are thus axially adjusted by the tensioned springs. This achieves particularly smooth running.

Fig. 13
Bearing arrangement axially adjusted with a spring washer

① Deep groove ball bearing
② Spring washer
③ Cover



Dimensional, geometrical and running accuracy of the bearing seats

✎ For bearings with tolerance class Normal, a minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For deep groove ball bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7; with tolerance class 6, the shaft seat should correspond to a minimum of IT5 and the housing seat to a minimum of IT6. Guide values for the geometrical and positional tolerances of bearing seating surfaces ➤229|Table 11, tolerances t_1 to t_3 in accordance with ➤168|Fig. 11. Numerical values for IT grades ➤230|Table 12.

Table 11
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	
6	P6	Shaft	IT5	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	
		Housing	IT6	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	

12 *Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010*

IT grade	Nominal dimension in mm							
	over – incl. 3	over 3 incl. 6	over 6 incl. 10	over 10 incl. 18	over 18 incl. 30	over 30 incl. 50	over 50 incl. 80	over 80 incl. 120
	Values in µm							
IT3	2	2,5	2,5	3	4	4	5	6
IT4	3	4	4	5	6	7	8	10
IT5	4	5	6	8	9	11	13	15
IT6	6	8	9	11	13	16	19	22
IT7	10	12	15	18	21	25	30	35

continued ▼

12 *Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010*

IT grade	Nominal dimension in mm							
	over 120 incl. 180	over 180 incl. 250	over 250 incl. 315	over 315 incl. 400	over 400 incl. 500	over 500 incl. 630	over 630 incl. 800	over 800 incl. 1 000
	Values in µm							
IT3	8	10	12	13	15	16	18	21
IT4	12	14	16	18	20	22	25	28
IT5	18	20	23	25	27	32	36	40
IT6	25	29	32	36	40	44	50	56
IT7	40	46	52	57	63	70	80	90

continued ▲

Roughness of cylindrical bearing seating surfaces

✎ Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤230 | 13.

13 *Roughness values for cylindrical bearing seating surfaces – guide values*

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4
500	1 250	3,2[1]	1,6	1,6	0,8

[1] *For the mounting of bearings using the hydraulic method, a value Ra = 1,6 µm must not be exceeded.*

Mounting dimensions for the contact surfaces of bearing rings

✎ The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of the abutment shoulders are given in the product tables. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

1.17 Mounting and dismounting

The mounting and dismounting options for deep groove ball bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎ Ensure that the bearings are not damaged during mounting.

Deep groove ball bearings are not separable. In the mounting of non-separable bearings, the mounting forces must always be applied to the bearing ring with a tight fit.

Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤ *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

§

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

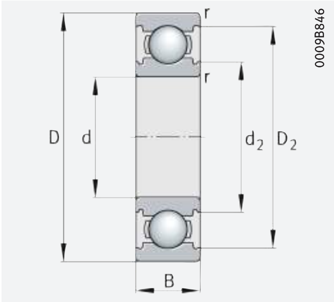
1.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

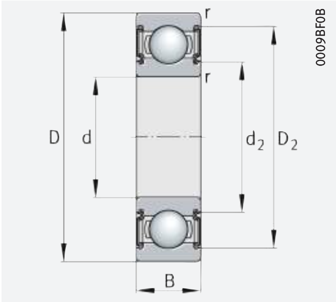
- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Deep groove ball bearings

Single row



Generation C, open



With seal 2BRS, 2HRS, 2Z

d = 2 – 9 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
2	5	2,3	180	49,5	1,26	137 000	114 000	12,9	0,001	**682-2Z**
	6	3	350	99	2,6	112 000	107 000	11,5	0,002	**692-2Z**
	7	3,5	410	128	7,3	102 000	89 000	12,7	0,001	**602-2Z**
3	7	3	330	112	2,9	103 000	79 000	14	0,001	**683-2Z**
	8	4	590	180	4,65	87 000	83 000	11,9	0,001	**693-2Z**
	10	4	670	218	11,1	84 000	80 000	12,3	0,002	**623-2Z**
4	9	4	680	225	5,8	81 000	71 000	12,7	0,002	**684-2Z**
	12	4	1 020	345	19,7	69 000	59 000	12,3	0,002	**604-2Z**
	13	5	1 380	485	24,6	61 000	53 000	12,2	0,003	**624-2Z**
	16	5	1 840	670	40,5	53 000	42 000	12,4	0,006	**634-2Z**
5	11	5	760	280	7,3	71 000	61 000	–	0,002	**685-2Z**
	14	5	1 410	510	29	58 000	49 000	12,9	0,004	**605-2Z**
	16	5	1 560	600	28,5	55 000	43 500	13,2	0,005	**625-2Z**
	19	6	2 600	1 050	53	45 000	34 000	13	0,009	**635-2Z**
6	13	5	1 150	440	11,4	61 000	49 000	13,8	0,003	**686-2Z**
	17	6	2 090	740	42	49 000	43 500	12,2	0,006	**606-2Z**
	19	6	2 600	1 050	53	45 000	35 000	13	0,008	**626-2Z**
7	14	5	1 250	510	13,2	58 000	43 500	14,2	0,003	**687-2Z**
	19	6	2 800	1 060	65	44 500	37 500	12,4	0,008	**607-2Z**
	22	7	3 500	1 360	69	40 500	35 000	12,3	0,014	**627-2Z**
8	16	5	1 330	590	15,2	53 000	37 000	14,8	0,004	**688-2Z**
	22	7	3 500	1 370	69	40 000	34 500	12,4	0,012	**608-2Z**
	24	8	3 550	1 410	89	38 500	34 500	12,8	0,018	**628-2Z**
9	17	5	1 410	660	17,1	51 000	33 500	15	0,005	**689-2Z**
	24	7	3 900	1 640	83	38 000	30 000	13	0,016	**609-2Z**
	26	8	5 000	1 970	133	44 500	29 500	12,4	0,019	**629-C**
	26	8	5 000	1 970	133	38 000	29 500	12,4	0,02	**629-C-2BRS**
	26	8	5 000	1 970	133	30 000	–	12,4	0,02	**629-C-2HRS**
	26	8	5 000	1 970	133	38 000	29 500	12,4	0,02	**629-C-2Z**

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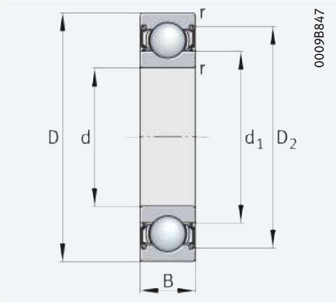
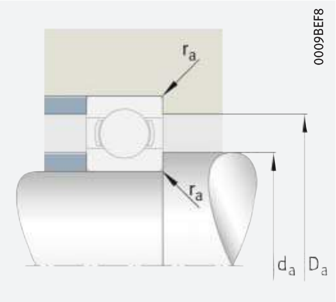


With seal 2Z

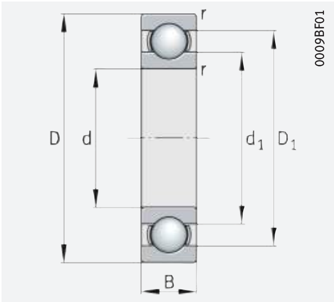


Mounting dimensions

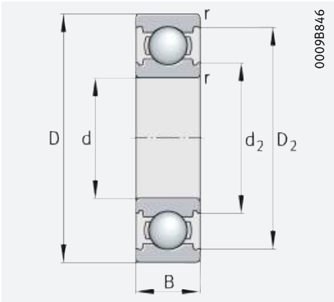
Dimensions						Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2	d_a min.	D_a max.	r_a max.
2	0,08	–	4,4	2,7	–	2,52	4,48	0,08
	0,15	–	5,4	3	–	2,8	5,2	0,15
	0,15	–	6,2	–	3,2	2,8	6,2	0,15
3	0,1	–	6,4	–	3,9	3,6	6,4	0,1
	0,15	–	7,3	4,4	–	3,8	7,2	0,15
	0,15	–	8,3	–	4,7	4,4	8,6	0,2
4	0,1	–	8,1	5,2	–	4,6	8,77	0,1
	0,2	–	9,9	–	5,6	5,4	10,6	0,2
	0,2	–	11,4	–	6,3	5,8	11,2	0,2
	0,3	–	13,5	–	7,5	6,4	13,6	0,3
5	0,15	–	9,9	–	6,2	5,8	10,2	0,15
	0,2	–	12,2	–	6,9	6,4	12,6	0,2
	0,3	–	13,5	–	7,5	7,4	13,6	0,3
	0,3	–	16,7	–	9	7,4	16,6	0,3
6	0,15	–	11,8	7,9	–	6,8	12,2	0,15
	0,3	–	14,7	9	–	8	15	0,3
	0,3	–	16,7	–	9	8,4	16,6	0,3
7	0,15	–	12,7	–	8,5	7,8	13,2	0,15
	0,3	–	16,7	–	9,4	9	17	0,3
	0,3	–	19,3	–	11	9,4	19,6	0,3
8	0,2	–	14,2	–	9,7	9,4	14,6	0,2
	0,3	–	19,3	–	11	10	20	0,3
	0,3	–	20,1	–	12,7	10,4	21,6	0,3
9	0,2	–	15,2	–	10,7	10,4	15,6	0,2
	0,3	–	20,1	–	12,2	11	22	0,3
	0,3	–	23,3	–	13,6	11,4	23,6	0,3
	0,3	–	23,4	–	13,4	11,4	23,6	0,3
	0,3	–	21,4	–	13,6	11,4	23,6	0,3
	0,3	–	21,4	–	13,6	11,4	23,6	0,3

Deep groove ball bearings

Single row



Open



Generation C, open

d = 10 – 10 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
10	19	5	1 820	840	56	54 000	27 500	14,8	0,005	**61800**
	19	5	1 820	840	56	21 100	–	14,8	0,006	**61800-2RSR**
	19	5	1 820	840	56	46 000	27 500	14,8	0,006	**61800-2Z**
	22	6	2 850	1 270	65	48 000	27 000	14	0,01	**61900**
	22	6	2 850	1 270	65	19 200	–	14	0,012	**61900-2RSR**
	22	6	2 850	1 270	65	41 000	27 000	14	0,01	**61900-2Z**
	26	8	5 000	1 970	133	44 500	30 000	12,4	0,017	**6000-C**
	26	8	5 000	1 970	133	38 000	30 000	12,4	0,02	**6000-C-2BRS**
	26	8	5 000	1 970	133	30 000	–	12,4	0,018	**6000-C-2HRS**
	26	8	5 000	1 970	133	38 000	30 000	12,4	0,02	**6000-C-2Z**
	30	9	6 600	2 600	177	40 500	26 000	12	0,03	**6200-C**
	30	9	6 600	2 600	177	34 500	26 000	12	0,033	**6200-C-2BRS**
	30	9	6 600	2 600	177	27 000	–	12	0,032	**6200-C-2HRS**
	30	9	6 600	2 600	177	34 500	26 000	12	0,032	**6200-C-2Z**
	30	14	6 200	2 600	194	16 700	–	12	0,044	**62200-2RSR**
	35	11	8 600	3 450	174	31 000	21 100	11,3	0,055	**6300**
	35	11	8 600	3 450	174	9 500	–	11,3	0,057	**6300-2RSR**
	35	11	8 600	3 450	174	26 500	21 100	11,3	0,057	**6300-2Z**
	35	17	8 500	3 450	265	14 900	–	11,3	0,06	**62300-2RSR**

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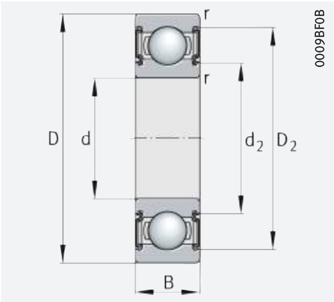
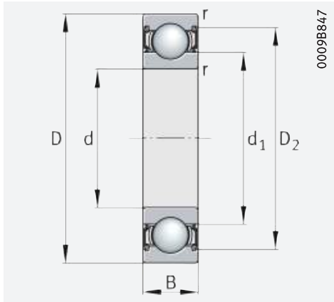
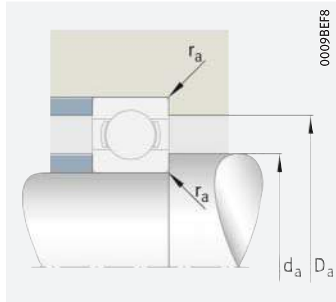


With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR

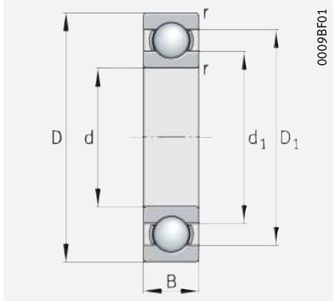


Mounting dimensions

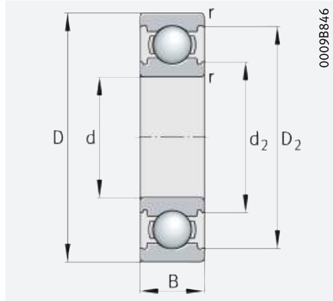
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
10	0,3	16,3	–	12,7	–	12	17	0,3
	0,3	–	17,2	–	11,8	12	17	0,3
	0,3	–	17,2	–	11,8	12	17	0,3
	0,3	18,2	–	13,9	–	12	20	0,3
	0,3	–	19,4	–	13,2	12	20	0,3
	0,3	–	19,4	–	13,2	12	20	0,3
	0,3	–	23,3	–	13,6	12	24	0,3
	0,3	–	23,4	–	13,4	12	24	0,3
	0,3	–	23,4	–	13,4	12	24	0,3
	0,3	–	23,4	–	13,6	12	24	0,3
	0,6	–	25,8	–	14,9	14,2	25,8	0,6
	0,6	–	26	–	14,9	14,2	26	0,6
	0,6	–	25	–	15	14,2	25,8	0,6
	0,6	–	26	–	14,9	14,2	25,8	0,6
	0,6	–	25,8	16	–	14,2	25,8	0,6
	0,6	27	–	18,1	–	14,2	30,8	0,6
	0,6	–	28,6	18,1	–	14,2	30,8	0,6
	0,6	–	28,6	18,1	–	14,2	30,8	0,6
	0,6	–	29,5	–	15,4	14,2	30,8	0,6

Deep groove ball bearings

Single row



Open

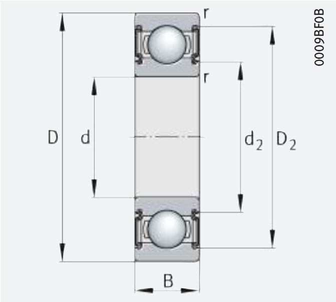


Generation C, open

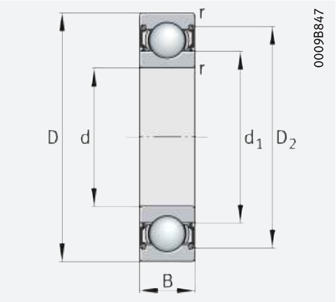
d = 12 – 12 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
12	21	5	1 890	910	46	42 500	23 500	13,4	0,007	**61801**
	21	5	1 890	910	46	18 100	–	13,4	0,007	**61801-2RSR**
	21	5	1 890	910	46	42 500	23 500	13,4	0,006	**61801-2Z**
	24	6	3 050	1 460	75	45 000	23 300	14,5	0,012	**61901**
	24	6	3 050	1 460	75	16 700	–	14,5	0,012	**61901-2RSR**
	24	6	3 050	1 460	75	38 000	23 300	14,5	0,012	**61901-2Z**
	28	8	5 500	2 370	158	42 500	26 000	13,1	0,02	**6001-C**
	28	8	5 500	2 370	158	36 000	26 000	13,1	0,02	**6001-C-2BRS**
	28	8	5 500	2 370	158	26 000	–	13,1	0,02	**6001-C-2HRS**
	28	8	5 500	2 370	158	36 000	26 000	13,1	0,02	**6001-C-2Z**
	32	10	7 600	3 100	208	37 000	24 600	12,3	0,037	**6201-C**
	32	10	7 600	3 100	208	31 500	24 600	12,3	0,039	**6201-C-2BRS**
	32	10	7 600	3 100	208	23 400	–	12,3	0,039	**6201-C-2HRS**
	32	10	7 600	3 100	208	31 500	24 600	12,3	0,039	**6201-C-2Z**
	32	14	7 200	3 100	236	14 600	–	12,3	0,049	**62201-2RSR**
	37	17	10 300	4 200	320	13 900	–	11,1	0,07	**62301-2RSR**
	37	12	10 900	4 200	280	31 000	21 900	11,1	0,062	**6301-C**
	37	12	10 900	4 200	280	26 500	21 900	11,1	0,064	**6301-C-2BRS**
	37	12	10 900	4 200	280	21 700	–	11,1	0,064	**6301-C-2HRS**
	37	12	10 900	4 200	280	26 500	21 900	11,1	0,061	**6301-C-2Z**

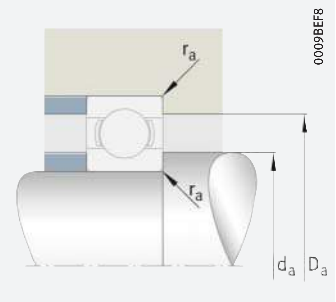
medias ➤ *https://www.schaeffler.de/std/1E2A*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR

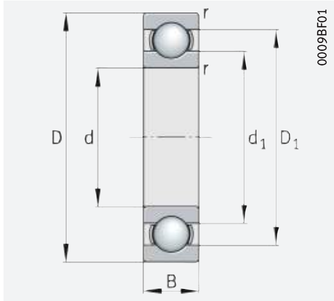


Mounting dimensions

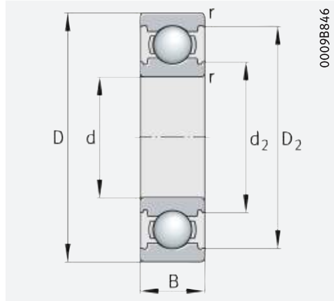
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
12	0,3	18,3	–	14,8	–	14	19	0,3
	0,3	–	19,2	–	13,8	14	19	0,3
	0,3	–	19,2	–	13,8	14	19	0,3
	0,3	20,3	–	16	–	14	22	0,3
	0,3	–	21,4	–	15,4	14	22	0,3
	0,3	–	21,4	–	15,4	14	22	0,3
	0,3	–	25,3	–	15,6	14	26	0,3
	0,3	–	25,4	–	15,4	14	26	0,3
	0,3	–	24,5	–	15,6	14	26	0,3
	0,3	–	25,3	–	15,6	14	26	0,3
	0,6	–	28	–	17,2	16,2	27,8	0,6
	0,6	–	28,2	–	17	16,2	27,8	0,6
	0,6	–	27,4	–	17,2	16,2	27,8	0,6
	0,6	–	28,2	–	17,2	16,2	27,8	0,6
	0,6	–	27,9	18,3	–	16,2	27,8	0,6
	1	–	32,6	19,3	–	18,75	30,55	1
	1	–	32	–	18	17,6	31,4	1
	1	–	32	–	17,9	17,6	31,4	1
	1	–	32	–	18	17,6	31,4	1
	1	–	32	–	18	17,6	31,4	1

Deep groove ball bearings

Single row



Open

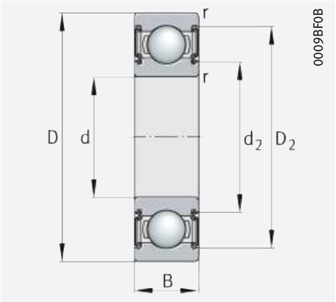


Generation C, open

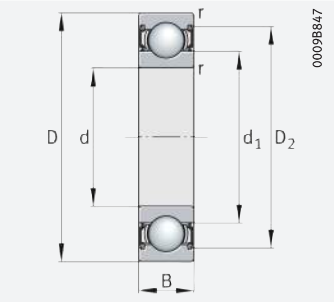
d = 15 – 15 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
15	24	5	2 050	1 100	56	45 000	19 200	13,9	0,008	**61802**
	24	5	2 050	1 100	56	15 000	–	13,9	0,008	**61802-2RSR**
	24	5	2 050	1 100	56	38 000	19 200	13,9	0,008	**61802-2Z**
	28	7	4 600	2 260	128	38 000	20 600	14,3	0,019	**61902**
	28	7	4 600	2 260	128	14 200	–	14,3	0,019	**61902-2RSR**
	28	7	4 600	2 260	128	32 000	20 600	14,3	0,019	**61902-2Z**
	32	8	5 900	2 850	144	33 500	20 000	14	0,025	**16002**
	32	9	6 000	2 850	171	37 000	23 200	14	0,031	**6002-C**
	32	9	6 000	2 850	171	31 500	23 200	14	0,033	**6002-C-2BRS**
	32	9	6 000	2 850	171	21 000	–	14	0,028	**6002-C-2HRS**
	32	9	6 000	2 850	171	31 500	23 200	14	0,033	**6002-C-2Z**
	35	11	8 400	3 750	250	33 000	21 900	13	0,043	**6202-C**
	35	11	8 400	3 750	250	28 000	22 000	13	0,033	**6202-C-2BRS**
	35	11	8 400	3 750	250	20 000	–	13	0,045	**6202-C-2HRS**
	35	11	8 400	3 750	250	28 000	21 900	13	0,045	**6202-C-2Z**
	35	14	8 200	3 750	191	12 700	–	13	0,057	**62202-2RSR**
	42	17	11 900	5 300	410	11 500	–	12	0,106	**62302-2RSR**
	42	13	12 600	5 300	360	27 500	19 200	12	0,08	**6302-C**
	42	13	12 600	5 300	360	23 500	19 200	12	0,083	**6302-C-2BRS**
	42	13	12 600	5 300	360	17 700	–	12	0,083	**6302-C-2HRS**
	42	13	12 600	5 300	360	23 500	19 200	12	0,082	**6302-C-2Z**

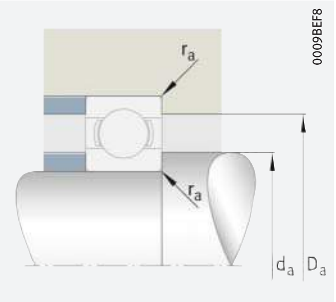
medias ➤ *https://www.schaeffler.de/std/1E2B*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

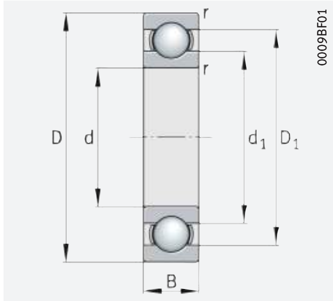


Mounting dimensions

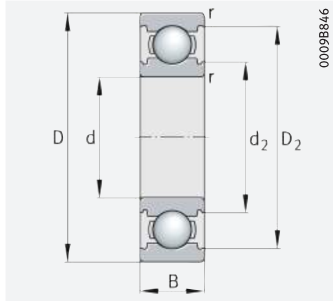
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
15	0,3	21,3	–	17,8	–	17	22	0,3
	0,3	–	22,2	–	16,8	17	22	0,3
	0,3	–	22,2	–	16,8	17	22	0,3
	0,3	24,2	–	18,8	–	17	26	0,3
	0,3	–	25,3	18,8	–	17	26	0,3
	0,3	–	25,3	18,8	–	17	26	0,3
	0,3	26,8	–	20,5	–	17	30	0,3
	0,3	–	28,9	–	19,1	17	30	0,3
	0,3	–	29	–	18,9	17	30	0,3
	0,3	–	28,4	–	19,1	17	30	0,3
	0,3	–	28,4	–	19,1	17	30	0,3
	0,6	–	31,2	–	15,6	19,2	30,8	0,6
	0,6	–	29	–	18,9	19,2	30,8	0,6
	0,6	–	29	–	20	19,2	30,8	0,6
	0,6	–	31,2	–	20	19,2	30,8	0,6
	0,6	–	30,6	21,1	–	19,2	30,8	0,6
	1	–	36,2	23,2	–	20,6	36,4	1
	1	–	34,1	–	22,9	20,6	36,4	1
	1	–	34,1	–	22,9	20,6	36,4	1
	1	–	34,1	–	22,9	20,6	36,4	1
	1	–	34,1	–	22,9	20,6	36,4	1

Deep groove ball bearings

Single row



Open

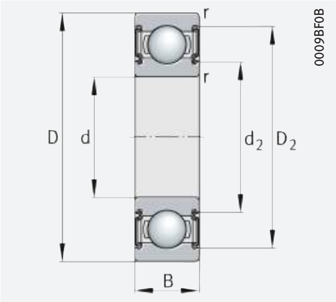


Generation C, open

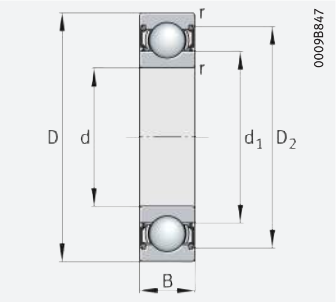
d = 17 – 17 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
17	26	5	2 210	1 280	65	41 500	17 100	14,1	0,008	**61803**
	26	5	2 210	1 280	65	13 500	–	14,1	0,008	**61803-2RSR**
	26	5	2 210	1 280	65	35 000	17 100	14,1	0,008	**61803-2Z**
	30	7	4 900	2 550	146	34 500	17 800	14,7	0,014	**61903**
	30	7	4 900	2 550	146	12 700	–	14,7	0,02	**61903-2RSR**
	30	7	4 900	2 550	146	29 000	17 800	14,7	0,017	**61903-2Z**
	35	10	6 400	3 250	157	31 000	20 300	14,3	0,038	**6003**
	35	8	6 400	3 250	165	31 000	17 700	14,3	0,032	**16003**
	35	10	6 400	3 250	157	11 800	–	14,3	0,04	**6003-2RSR**
	35	10	6 400	3 250	157	26 000	20 300	14,3	0,04	**6003-2Z**
	40	12	10 400	4 750	320	29 000	20 100	13	0,062	**6203-C**
	40	12	10 400	4 750	320	24 600	20 100	13	0,065	**6203-C-2BRS**
	40	12	10 400	4 750	320	17 600	–	13	0,067	**6203-C-2HRS**
	40	12	10 400	4 750	320	24 600	20 100	13	0,067	**6203-C-2Z**
	40	16	10 000	4 750	345	11 100	–	13	0,085	**62203-2RSR**
	47	19	14 300	6 600	510	9 700	–	12,4	0,152	**62303-2RSR**
	47	14	15 000	6 500	440	24 500	17 400	12,2	0,107	**6303-C**
	47	14	15 000	6 500	440	20 800	17 400	12,2	0,111	**6303-C-2BRS**
	47	14	15 000	6 500	440	15 700	–	12,2	0,111	**6303-C-2HRS**
	47	14	15 000	6 500	440	20 800	17 400	12,2	0,067	**6303-C-2Z**
	62	17	23 800	11 500	750	16 200	11 600	12,4	0,269	**6403**

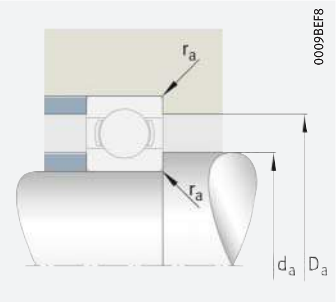
medias ➤ *https://www.schaeffler.de/std/1E2C*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

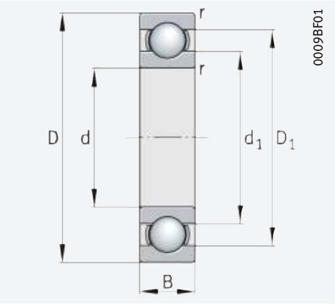


Mounting dimensions

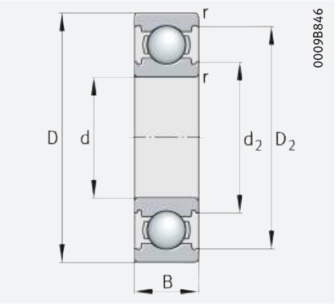
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
17	0,3	23,3	–	19,8	–	19	24	0,3
	0,3	–	24,2	–	18,8	19	24	0,3
	0,3	–	24,2	–	18,8	19	24	0,3
	0,3	26,8	–	21	–	19	28	0,3
	0,3	–	27,8	21	–	19	28	0,3
	0,3	–	27,8	21	–	19	28	0,3
	0,3	29,5	–	22,7	–	19	33	0,3
	0,3	29,5	–	22,8	–	19	33	0,3
	0,3	–	30,8	22,7	–	19	33	0,3
	0,3	–	30,8	22,7	–	19	33	0,3
	0,6	–	35	–	22,8	21,2	35,8	0,6
	0,6	–	35,2	–	22,8	21,2	35,8	0,6
	0,6	–	34,4	–	22,8	21,2	35,8	0,6
	0,6	–	32,9	–	22,8	21,2	35,8	0,6
	0,6	–	35	24,1	–	21,2	35,8	0,6
	1	–	41,1	27,5	–	22,6	41,4	1
	1	–	40,2	–	25,9	22,6	41,4	1
	1	–	40,2	–	25,9	22,6	41,4	1
	1	–	40,2	–	25,9	22,6	41,4	1
	1	–	35,2	–	22,6	22,6	41,4	1
	1,1	50,2	–	36,4	–	26	53	1

Deep groove ball bearings

Single row



Open

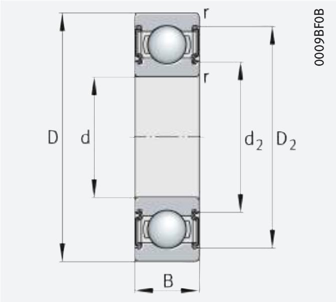


Generation C, open

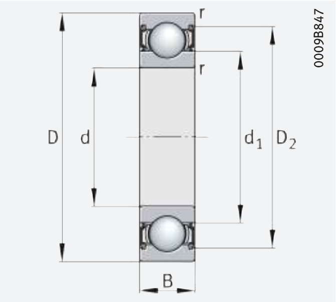
d = 20 – 20 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
20	32	7	3 950	2 130	108	33 500	17 200	13,4	0,018	**61804**
	32	7	3 950	2 130	108	11 500	–	13,4	0,018	**61804-2RSR**
	32	7	3 950	2 130	108	28 500	17 200	13,4	0,018	**61804-2Z**
	37	9	6 800	3 700	226	28 500	17 000	14,8	0,04	**61904**
	37	9	6 800	3 700	226	10 600	–	14,8	0,037	**61904-2RSR**
	37	9	6 800	3 700	226	24 200	17 000	14,8	0,037	**61904-2Z**
	42	8	7 400	4 100	207	26 000	14 300	14,9	0,048	**16004**
	42	12	10 000	5 000	305	27 500	19 700	13,8	0,07	**6004-C**
	42	12	10 000	5 000	305	23 200	19 700	13,8	0,071	**6004-C-2BRS**
	42	12	10 000	5 000	305	15 800	–	13,8	0,069	**6004-C-2HRS**
	42	12	10 000	5 000	305	23 200	19 700	13,8	0,066	**6004-C-2Z**
	47	14	13 900	6 600	445	24 300	18 100	13,1	0,106	**6204-C**
	47	14	13 900	6 600	445	20 600	18 100	13,1	0,104	**6204-C-2BRS**
	47	14	13 900	6 600	445	15 000	–	13,1	0,11	**6204-C-2HRS**
	47	14	13 900	6 600	445	20 600	18 100	13,1	0,104	**6204-C-2Z**
	47	18	13 400	6 600	475	9 400	–	13,1	0,129	**62204-2RSR**
	52	15	16 900	7 900	530	19 800	14 400	12,4	0,151	**6304**
	52	21	16 900	7 900	540	8 900	–	12,4	0,2	**62304-2RSR**
	52	15	16 900	7 900	530	8 800	–	12,4	0,155	**6304-2RSR**
	52	15	16 900	7 900	530	16 800	14 400	12,4	0,155	**6304-2Z**
	72	19	30 500	16 200	820	13 700	9 800	13	0,405	**6404**

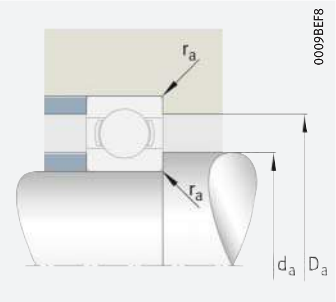
medias ➤ *https://www.schaeffler.de/std/1E2D*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

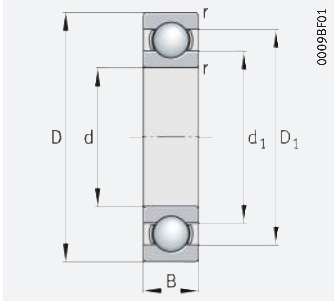


Mounting dimensions

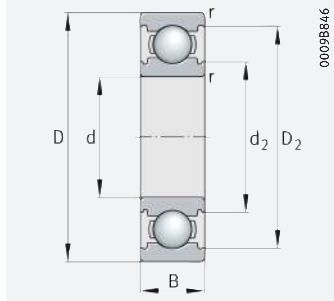
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
20	0,3	28,2	–	23,2	–	22	30	0,3
	0,3	–	29,5	–	22,6	22	30	0,3
	0,3	–	29,5	–	22,6	22	30	0,3
	0,3	32	–	25,2	–	22	35	0,3
	0,3	–	33,5	–	23,7	22	35	0,3
	0,3	–	33,5	–	23,7	22	35	0,3
	0,3	35	–	28,4	–	22	40	0,3
	0,6	–	37,4	–	25,2	23,2	38,8	0,6
	0,6	–	37,7	–	25,1	23,2	38,8	0,6
	0,6	–	37,4	–	25,2	23,2	38,8	0,6
	0,6	–	37,4	–	25,2	23,2	38,8	0,6
	1	–	41,4	–	26,5	25,6	41,4	1
	1	–	41,4	–	26,6	25,6	41,4	1
	1	–	41,4	–	26,6	25,6	41,4	1
	1	–	41,4	–	26,6	25,6	41,4	1
	1	–	41,5	–	25,9	25,6	41,4	1
	1,1	41,9	–	30,3	–	27	45	1
	1,1	–	45,1	30	–	27	45	1
	1,1	–	44,4	30,3	–	27	45	1
	1,1	–	44,4	30,3	–	27	45	1
	1,1	59,6	–	37,5	–	29	63	1

Deep groove ball bearings

Single row



Open

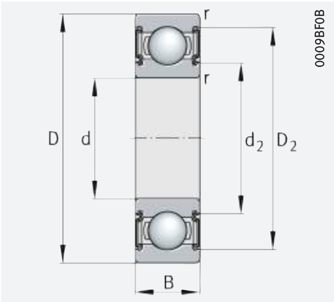


Generation C, open

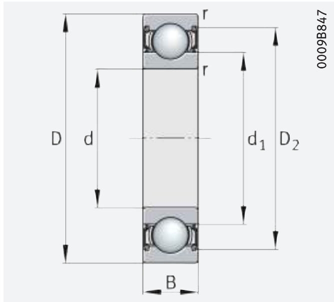
d = 25 – 25 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
25	37	7	4 250	2 550	129	28 000	13 900	13,9	0,023	**61805**
	37	7	4 250	2 550	129	9 500	–	13,9	0,021	**61805-2RSR**
	37	7	4 250	2 550	129	24 000	13 900	13,9	0,02	**61805-2Z**
	42	9	7 400	4 550	280	24 200	13 500	15,4	0,042	**61905**
	42	9	7 400	4 550	280	8 700	–	15,4	0,047	**61905-2RSR**
	42	9	7 400	4 550	280	20 500	13 500	15,4	0,045	**61905-2Z**
	47	12	10 700	5 900	305	21 900	15 200	14,6	0,081	**6005**
	47	8	7 700	4 650	234	22 900	12 000	15,5	0,052	**16005**
	47	12	10 700	5 900	305	8 400	–	14,6	0,085	**6005-2RSR**
	47	12	10 700	5 900	305	18 600	15 200	14,6	0,083	**6005-2Z**
	52	15	15 000	7 800	485	21 600	16 000	13,8	0,129	**6205-C**
	52	15	15 000	7 800	485	18 400	16 000	13,8	0,133	**6205-C-2BRS**
	52	15	15 000	7 800	485	12 700	–	13,8	0,133	**6205-C-2HRS**
	52	15	15 000	7 800	485	18 400	16 000	13,8	0,133	**6205-C-2Z**
	52	18	14 900	7 900	530	7 900	–	13,9	0,155	**62205-2RSR**
	62	24	23 800	11 500	770	7 300	–	12,4	0,316	**62305-2RSR**
	62	17	24 700	11 500	780	17 800	13 500	12,4	0,215	**6305-C**
	62	17	24 700	11 500	780	15 100	13 500	12,4	0,242	**6305-C-2BRS**
	62	17	24 700	11 500	780	11 300	–	12,4	0,224	**6305-C-2HRS**
	62	17	24 700	11 500	780	15 100	13 500	12,4	0,222	**6305-C-2Z**
	80	21	35 500	19 100	1 250	12 300	9 400	13,1	0,549	**6405**

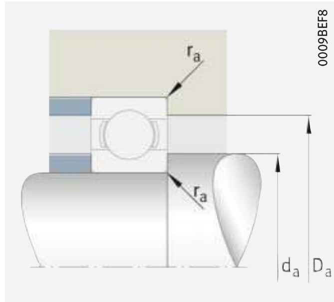
medias ➤ *https://www.schaeffler.de/std/1E2E*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

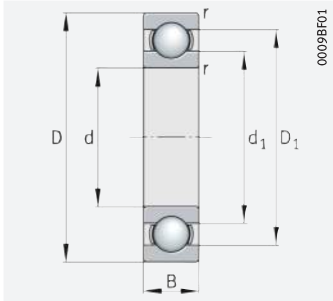


Mounting dimensions

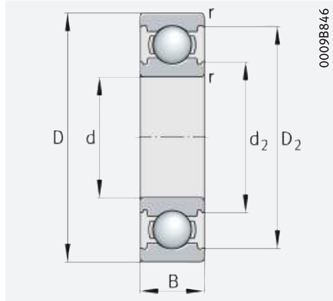
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
25	0,3	33,2	–	28,2	–	27	35	0,3
	0,3	–	34,2	28,2	–	27	35	0,3
	0,3	–	34,2	28,2	–	27	35	0,3
	0,3	37,5	–	30,9	–	27	40	0,3
	0,3	–	39,5	30,9	–	27	40	0,3
	0,3	–	39,5	30,9	–	27	40	0,3
	0,6	40,2	–	32	–	28,2	43,8	0,6
	0,3	40	–	32,5	–	27	45	0,3
	0,6	–	42,5	32	–	28,2	43,8	0,6
	0,6	–	42,5	32	–	28,2	43,8	0,6
	1	–	46,4	–	31,4	30,6	46,4	1
	1	–	46,4	–	31,3	30,6	46,4	1
	1	–	46,4	–	31,4	30,6	46,4	1
	1	–	46,4	–	31,4	30,6	46,4	1
	1	–	46,3	–	31,8	30,6	46,4	1
	1,1	–	52,8	–	33,6	32	55	1
	1,1	–	54	–	34	32	55	1
	1,1	–	54	–	34	32	55	1
	1,1	–	54	–	34	32	55	1
	1,1	–	54	–	34	32	55	1
	1,5	65,6	–	49,3	–	36	69	1,5

Deep groove ball bearings

Single row



Open

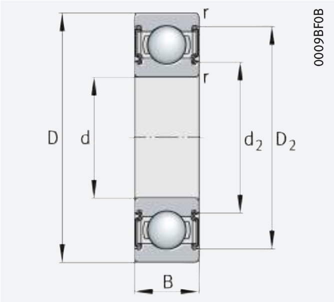


Generation C, open

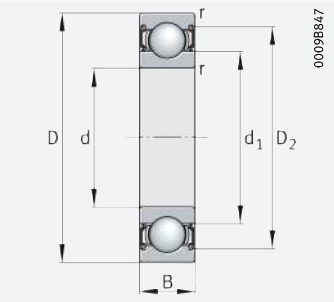
d = 30 – 30 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
30	42	7	4 500	2 950	149	24 500	11 500	14,2	0,027	**61806**
	42	7	4 500	2 950	149	8 100	–	14,2	0,027	**61806-2RSR**
	42	7	4 500	2 950	149	20 800	11 500	14,2	0,027	**61806-2Z**
	47	9	7 700	5 000	310	21 700	11 900	15,7	0,051	**61906**
	47	9	7 700	5 000	310	7 600	–	15,7	0,053	**61906-2RSR**
	47	9	7 700	5 000	310	18 400	11 900	15,7	0,053	**61906-2Z**
	55	13	13 500	8 000	390	18 500	13 100	14,8	0,122	**6006**
	55	9	11 900	7 300	370	18 900	10 500	15,1	0,082	**16006**
	55	13	13 500	8 000	390	7 000	–	14,8	0,126	**6006-2RSR**
	55	13	13 500	8 000	390	15 700	13 100	14,8	0,126	**6006-2Z**
	62	16	20 800	11 300	700	17 800	13 400	13,8	0,195	**6206-C**
	62	16	20 800	11 300	700	15 100	13 400	13,8	0,201	**6206-C-2BRS**
	62	16	20 800	11 300	700	10 600	–	13,8	0,201	**6206-C-2HRS**
	62	16	20 800	11 300	700	15 100	13 400	13,8	0,201	**6206-C-2Z**
	62	20	20 700	11 300	570	6 700	–	13,8	0,243	**62206-2RSR**
	72	27	30 000	15 800	1 060	6 000	–	13	0,486	**62306-2RSR**
	72	19	32 000	16 200	1 090	15 100	11 500	13	0,328	**6306-C**
	72	19	32 000	16 200	1 090	12 800	11 500	13	0,339	**6306-C-2BRS**
	72	19	32 000	16 200	1 090	8 900	–	13	0,34	**6306-C-2HRS**
	72	19	32 000	16 200	1 090	12 800	11 500	13	0,339	**6306-C-2Z**
	90	23	45 500	25 000	1 640	10 800	8 600	13	0,74	**6406**

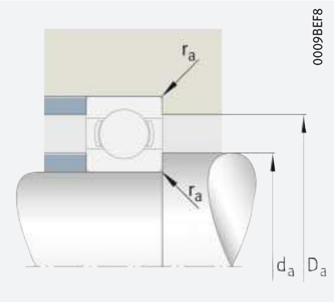
medias ➤ *https://www.schaeffler.de/std/1E2F*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

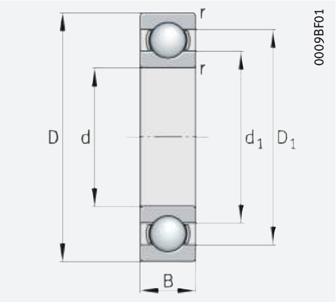


Mounting dimensions

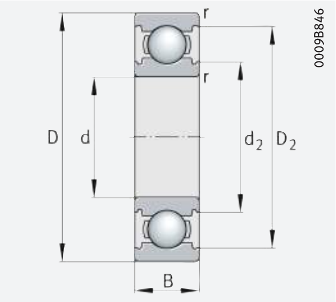
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
30	0,3	38,2	–	33,1	–	32	40	0,3
	0,3	–	39,2	33,1	–	32	40	0,3
	0,3	–	39,2	33,1	–	32	40	0,3
	0,3	42	–	35,1	–	32	45	0,3
	0,3	–	44,1	35,1	–	32	45	0,3
	0,3	–	44,1	35,1	–	32	45	0,3
	1	47,2	–	38,3	–	34,6	50,4	1
	0,3	47,9	–	39,2	–	32	53	0,3
	1	–	49,2	38,3	–	34,6	50,4	1
	1	–	49,2	38,3	–	34,6	50,4	1
	1	–	55,4	–	37,5	35,6	56,4	1
	1	–	55,4	–	37,4	35,6	56,4	1
	1	–	55,4	–	37,5	35,6	56,4	1
	1	–	55,4	–	37,5	35,6	56,4	1
	1	–	55,2	–	38	35,6	56,4	1
	1,1	–	62,5	–	41,7	37	65	1
	1,1	–	63,4	–	41,3	37	65	1
	1,1	–	63,4	–	41,3	37	65	1
	1,1	–	63,4	–	41,3	37	65	1
	1,1	–	63,4	–	41,3	37	65	1
	1,5	74,6	–	55,6	–	41	79	1,5

Deep groove ball bearings

Single row



Open

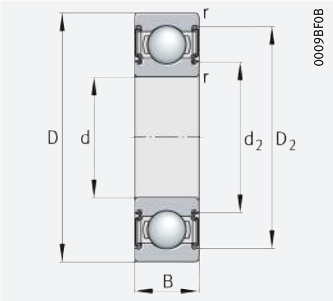


Generation C, open

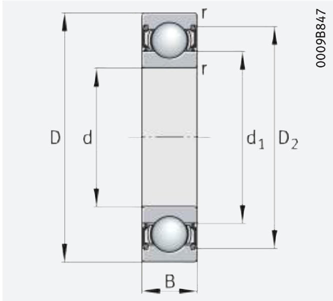
d = 35 – 35 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
35	47	7	4 700	3 350	170	21 600	9 900	14,4	0,032	**61807**
	47	7	4 700	3 350	170	7 000	–	14,4	0,032	**61807-2RSR**
	47	7	4 700	3 350	170	18 300	9 900	14,4	0,032	**61807-2Z**
	55	10	10 100	6 800	410	18 300	10 500	15,7	0,076	**61907**
	55	10	10 100	6 800	345	6 500	–	15,7	0,076	**61907-2RSR**
	55	10	10 100	6 800	410	15 600	10 500	15,7	0,076	**61907-2Z**
	62	14	17 000	10 300	550	16 100	11 600	14,9	0,157	**6007**
	62	9	13 000	8 800	445	16 700	8 900	15,6	0,105	**16007**
	62	14	17 000	10 300	550	6 200	–	14,9	0,163	**6007-2RSR**
	62	14	17 000	10 300	550	13 700	11 700	14,9	0,163	**6007-2Z**
	72	17	28 000	15 400	1 030	15 000	11 300	13,9	0,262	**6207-C**
	72	17	28 000	15 400	1 030	12 700	11 300	13,9	0,274	**6207-C-2BRS**
	72	17	28 000	15 400	1 030	8 800	–	13,9	0,274	**6207-C-2HRS**
	72	17	28 000	15 400	1 030	12 700	11 300	13,9	0,273	**6207-C-2Z**
	72	23	27 500	15 300	770	5 700	–	13,8	0,384	**62207-2RSR**
	80	31	35 500	19 100	1 280	5 300	–	13,1	0,651	**62307-2RSR**
	80	21	37 000	19 100	1 290	13 600	10 900	13,1	0,434	**6307-C**
	80	21	37 000	19 100	1 290	11 500	10 900	13,1	0,447	**6307-C-2BRS**
	80	21	37 000	19 100	1 290	8 300	–	13,1	0,449	**6307-C-2HRS**
	80	21	37 000	19 100	1 290	11 500	10 900	13,1	0,447	**6307-C-2Z**
	100	25	56 000	31 500	2 180	9 500	7 900	12,9	0,971	**6407**

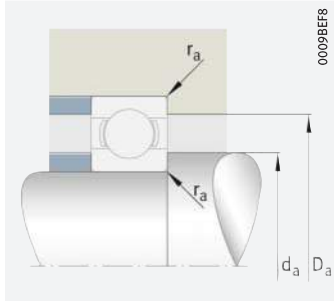
medias ➤ *https://www.schaeffler.de/std/1E30*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

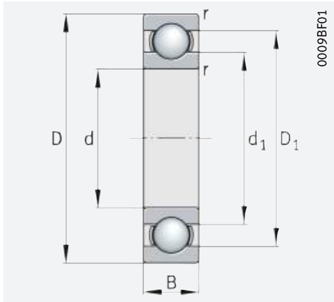


Mounting dimensions

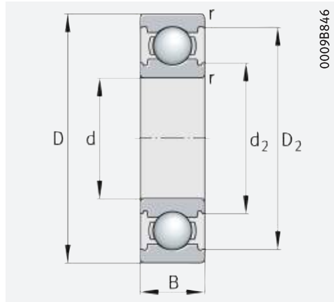
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
35	0,3	42,8	–	38,2	–	37	45	0,3
	0,3	–	44	38,2	–	37	45	0,3
	0,3	–	44	38,2	–	37	45	0,3
	0,6	48,4	–	41,6	–	38,2	51,8	0,6
	0,6	–	50,6	41,1	–	38,2	51,8	0,6
	0,6	–	50,6	41,1	–	38,2	51,8	0,6
	1	53,3	–	43,2	–	39,6	57,4	1
	0,3	52,7	–	44,3	–	37	60	0,3
	1	–	55,4	43,2	–	39,6	57,4	1
	1	–	55,4	43,2	–	39,6	57,4	1
	1,1	–	64,7	–	44,5	42	65	1
	1,1	–	64,7	–	44,5	42	65	1
	1,1	–	64,7	–	44,5	42	65	1
	1,1	–	64,7	–	44,5	42	65	1
	1,1	–	62,9	–	44,1	42	65	1
	1,5	–	70,1	–	46,2	44	71	1,5
	1,5	–	69,8	–	46	44	71	1,5
	1,5	–	69,8	–	46	44	71	1,5
	1,5	–	69,8	–	46	44	71	1,5
	1,5	–	69,8	–	46	44	71	1,5
	1,5	83,8	–	62,3	–	46	89	1,5

Deep groove ball bearings

Single row



Open

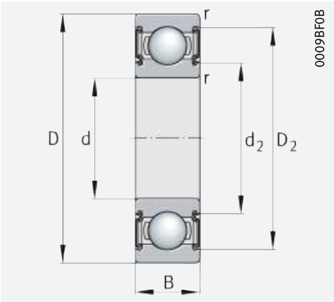


Generation C, open

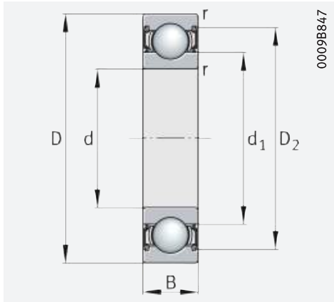
d = 40 – 40 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
40	52	7	4 900	3 750	191	19 300	8 600	14,6	0,035	**61808**
	52	7	4 900	3 750	191	6 200	–	14,6	0,035	**61808-2RSR**
	52	7	4 900	3 750	191	16 400	8 600	14,6	0,034	**61808-2Z**
	62	12	14 500	9 900	580	15 800	10 000	15,5	0,117	**61908**
	62	12	14 500	9 900	580	5 700	–	15,5	0,11	**61908-2RSR**
	62	12	14 500	9 900	580	13 500	10 000	15,5	0,11	**61908-2Z**
	68	15	17 800	11 500	580	14 600	10 700	15,2	0,194	**6008**
	68	9	14 100	10 200	520	15 700	8 400	15,8	0,127	**16008**
	68	15	17 800	11 500	580	5 400	–	15,2	0,202	**6008-2RSR**
	68	15	17 800	11 500	580	12 400	10 600	15,2	0,2	**6008-2Z**
	80	18	31 500	17 800	1 200	13 600	10 500	14	0,345	**6208-C**
	80	18	31 500	17 800	1 200	11 600	10 500	14	0,359	**6208-C-2BRS**
	80	18	31 500	17 800	1 200	8 000	–	14	0,359	**6208-C-2HRS**
	80	18	31 500	17 800	1 200	11 600	10 500	14	0,359	**6208-C-2Z**
	80	23	31 000	17 800	1 200	5 000	–	14	0,462	**62208-2RSR**
	90	33	46 500	26 000	1 730	4 750	–	13	0,882	**62308-2RSR**
	90	23	47 000	25 000	1 690	11 800	9 900	13	0,6	**6308-C**
	90	23	47 000	25 000	1 690	10 100	9 900	13	0,654	**6308-C-2BRS**
	90	23	47 000	25 000	1 690	7 400	–	13	0,622	**6308-C-2HRS**
	90	23	47 000	25 000	1 690	10 100	9 900	13	0,617	**6308-C-2Z**
	110	27	68 000	38 500	2 600	9 500	7 400	13,3	1,23	**6408**

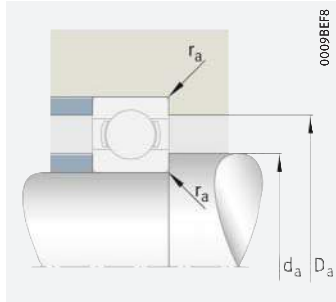
medias ➤ *https://www.schaeffler.de/std/1E31*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2Z

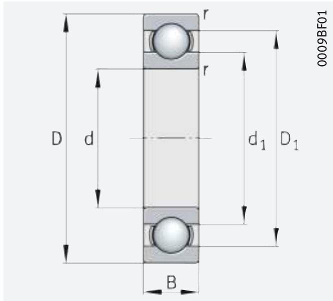


Mounting dimensions

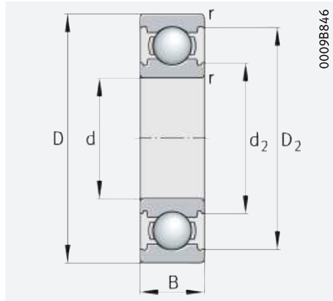
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
40	0,3	48,1	–	43,2	–	42	50	0,3
	0,3	–	48,9	43,2	–	42	50	0,3
	0,3	–	48,9	43,2	–	42	50	0,3
	0,6	55,1	–	46,9	–	43,2	58,8	0,6
	0,6	–	57,3	46,6	–	43,2	58,8	0,6
	0,6	–	56,6	46,6	–	43,2	58,8	0,6
	1	59,1	–	49,3	–	44,6	63,4	1
	0,3	59,7	–	48,9	–	42	66	0,3
	1	–	61,6	49,3	–	44,6	63,4	1
	1	–	61,6	49,3	–	44,6	63,4	1
	1,1	–	70,7	–	49,2	47	73	1
	1,1	–	70,7	–	49,2	47	73	1
	1,1	–	70,7	–	49,2	47	73	1
	1,1	–	70,7	–	49,2	47	73	1
	1,1	–	70,6	–	50,4	47	73	1
	1,5	–	78	–	51	49	81	1,5
	1,5	–	78,8	–	52,1	49	81	1,5
	1,5	–	78,8	–	52,1	49	81	1,5
	1,5	–	78,8	–	52,1	49	81	1,5
	1,5	–	78,8	–	52,1	49	81	1,5
	2	91,8	–	68	–	53	97	2

Deep groove ball bearings

Single row



Open

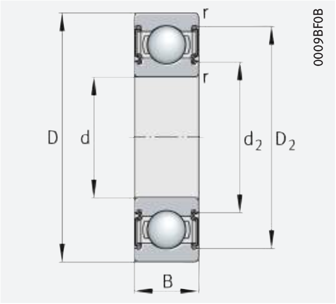


Generation C, open

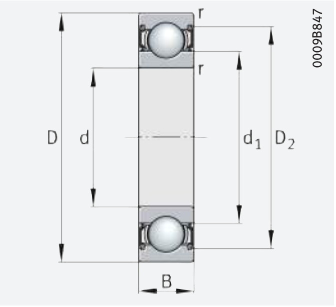
d = 45 – 45 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | *1.12* ➤226 | *1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
45	58	7	7 000	5 900	385	5 400	–	16,3	0,039	**61809-2RSR-Y**
	58	7	7 000	5 900	385	14 300	7 300	16,3	0,039	**61809-2RZ-Y**
	58	7	7 000	5 900	385	21 900	7 300	16,3	0,039	**61809-Y**
	68	12	15 000	10 900	630	14 400	8 800	16	0,135	**61909**
	68	12	15 000	10 900	630	5 100	–	16	0,13	**61909-2RSR**
	68	12	15 000	10 900	630	12 200	8 800	16	0,13	**61909-2RZ**
	75	16	21 200	14 400	730	13 100	9 700	15,3	0,247	**6009**
	75	10	16 500	12 300	700	13 100	6 900	16,1	0,16	**16009**
	75	16	21 200	14 400	730	4 950	–	15,3	0,257	**6009-2RSR**
	75	16	21 200	14 400	730	11 200	9 700	15,3	0,253	**6009-2Z**
	85	19	34 000	20 300	1 370	12 700	9 900	14,3	0,396	**6209-C**
	85	19	34 000	20 300	1 370	10 800	9 900	14,3	0,414	**6209-C-2BRS**
	85	19	34 000	20 300	1 370	7 100	–	14,3	0,413	**6209-C-2HRS**
	85	19	34 000	20 300	1 370	10 800	9 900	14,3	0,411	**6209-C-2Z**
	85	23	34 500	20 300	1 370	4 650	–	14	0,484	**62209-2RSR**
	100	36	56 000	31 500	2 180	4 300	–	12,9	1,2	**62309-2RSR**
	100	25	58 000	31 500	2 140	10 500	9 100	12,9	0,83	**6309-C**
	100	25	58 000	31 500	2 140	8 900	9 100	12,9	0,85	**6309-C-2BRS**
	100	25	58 000	31 500	2 140	6 400	–	12,9	0,85	**6309-C-2HRS**
	100	25	58 000	31 500	2 140	8 900	9 100	12,9	0,84	**6309-C-2Z**
	120	29	83 000	47 500	3 150	8 500	6 800	12,9	1,55	**6409**

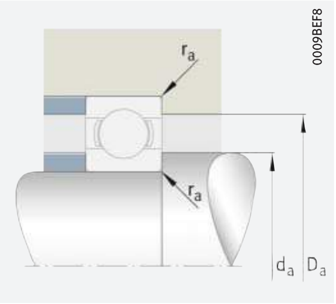
medias ➤ *https://www.schaeffler.de/std/1E32*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2RZ, 2Z

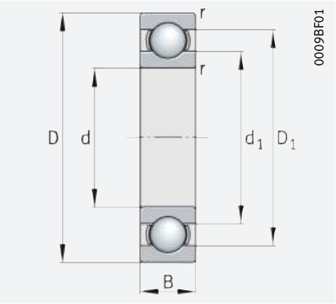


Mounting dimensions

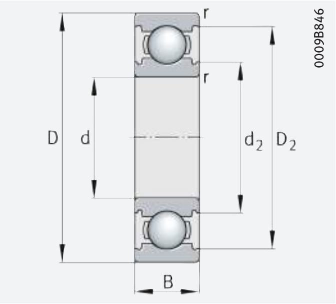
Dimensions						Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a
	min.	≈	≈	≈		min.	max.	max.
45	0,3	–	55,4	49,1	–	47	56	0,3
	0,3	–	55,4	49,1	–	47	56	0,3
	0,3	54,1	–	49,1	–	47	56	0,3
	0,6	60,6	–	52,4	–	48,2	64,8	0,6
	0,6	–	62,1	52,1	–	48,2	64,8	0,6
	0,6	–	62,1	52,1	–	48,2	64,8	0,6
	1	65,5	–	54,2	–	49,6	70,4	1
	0,6	65,7	–	54,2	–	48,2	71,8	0,6
	1	–	68	54,2	–	49,6	70,4	1
	1	–	68	54,2	–	49,6	70,4	1
	1,1	–	75,5	–	53,9	52	78	1
	1,1	–	75,5	–	53,9	52	78	1
	1,1	–	75,5	–	53,9	52	78	1
	1,1	–	75,5	–	53,9	52	78	1
	1,1	–	75,6	–	54,4	52	78	1
	1,5	–	85,6	62	–	54	91	1,5
	1,5	–	86,4	–	60,3	54	91	1,5
	1,5	–	86,4	–	60,3	54	91	1,5
	1,5	–	86,4	–	60,3	54	91	1,5
	1,5	–	86,4	–	60,3	54	91	1,5
	2	101,1	–	75,2	–	58	107	2

Deep groove ball bearings

Single row



Open

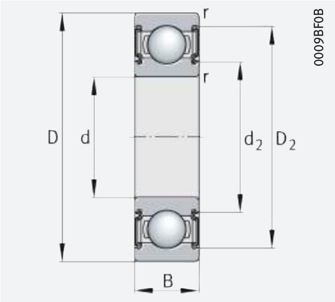


Generation C, open

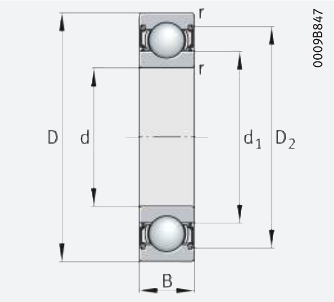
d = 50 – 50 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | *1.12* ➤226 | *1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
50	65	7	7 200	6 300	425	4 850	–	16	0,052	**61810-2RSR-Y**
	65	7	7 200	6 300	425	12 900	6 400	16	0,052	**61810-2RZ-Y**
	65	7	7 200	6 300	425	19 700	6 400	16	0,052	**61810-Y**
	72	12	15 400	11 700	680	13 400	8 100	16,1	0,083	**61910**
	72	12	15 400	11 700	680	4 700	–	16,1	0,13	**61910-2RSR**
	72	12	15 400	11 700	680	11 400	8 100	16,1	0,13	**61910-2RZ**
	80	10	17 100	13 200	670	12 500	6 700	16,2	0,175	**16010**
	80	16	22 000	15 800	770	12 200	8 900	15,6	0,272	**6010**
	80	16	22 000	15 800	770	10 400	8 900	15,6	0,282	**6010-2Z**
	80	16	22 000	15 800	770	4 450	–	15,6	0,283	**6010-2RSR**
	90	20	38 000	23 200	1 540	11 700	9 200	14,4	0,431	**6210-C**
	90	20	38 000	23 200	1 540	9 900	9 200	14,4	0,48	**6210-C-2BRS**
	90	20	38 000	23 200	1 540	6 400	–	14,4	0,451	**6210-C-2HRS**
	90	20	38 000	23 200	1 540	9 900	9 200	14,4	0,448	**6210-C-2Z**
	90	23	37 500	23 200	1 560	4 250	–	14,4	0,53	**62210-2RSR**
	110	40	66 000	38 000	2 600	3 950	–	13,1	1,55	**62310-2RSR**
	110	27	68 000	38 000	2 550	9 500	8 400	13,1	1,1	**6310-C**
	110	27	68 000	38 000	2 550	8 000	8 400	13,1	1,1	**6310-C-2BRS**
	110	27	68 000	38 000	2 550	5 800	–	13,1	1,12	**6310-C-2HRS**
	110	27	68 000	38 000	2 550	8 000	8 400	13,1	1,12	**6310-C-2Z**
	130	31	89 000	52 000	3 500	7 900	6 500	13,2	1,96	**6410**

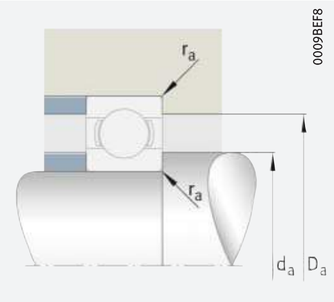
medias ➤ *https://www.schaeffler.de/std/1E33*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2RZ, 2Z

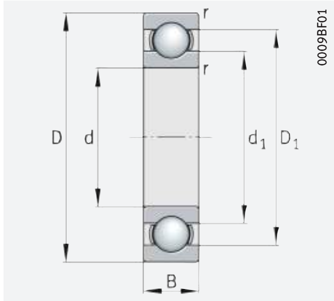


Mounting dimensions

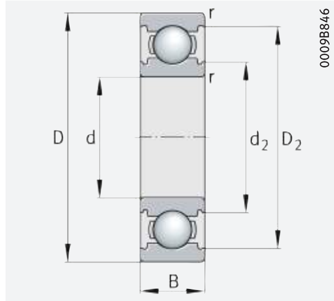
Dimensions						Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2	d_a min.	D_a max.	r_a max.
50	0,3	–	61,8	55,1	–	52	63	0,3
	0,3	–	61,8	55,1	–	52	63	0,3
	0,3	60,1	–	55,1	–	52	63	0,3
	0,6	65,1	–	56,9	–	53,2	68,8	0,6
	0,6	–	68,6	56,6	–	53,2	68,8	0,6
	0,6	–	67,3	56,9	–	53,2	68,8	0,6
	0,6	71,3	–	59,7	–	53,2	76,8	0,6
	1	70,1	–	59,8	–	54,6	75,4	1
	1	–	72,9	59,8	–	54,6	75,4	1
	1	–	72,9	59,8	–	54,6	75,4	1
	1,1	–	81,8	–	59,1	57	83	1
	1,1	–	81,7	–	59,2	57	83	1
	1,1	–	81,8	–	59,1	57	83	1
	1,1	–	81,8	–	59,1	57	83	1
	1,1	–	82,1	–	58,8	57	83	1
	2	–	95,1	68	–	61	99	2
	2	–	95,2	–	66,7	61	99	2
	2	–	95,2	–	66,7	61	99	2
	2	–	95,2	–	66,7	61	99	2
	2	–	95,2	–	66,7	61	99	2
	2,1	108,6	–	81,3	–	64	116	2,1

Deep groove ball bearings

Single row



Open

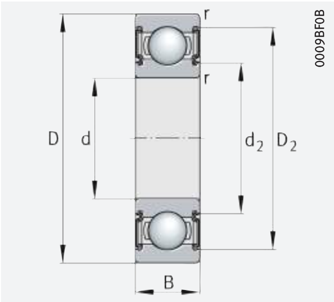


Generation C, open

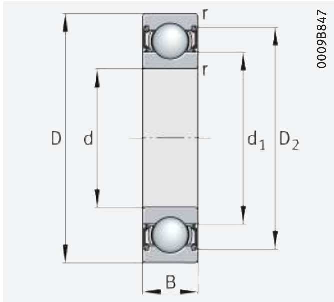
d = 55 – 55 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤*225*|*1.12* ➤*226*|*1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
55	90	18	30 000	21 200	1 120	10 700	8 300	15,3	0,385	**6011**
	90	18	30 000	21 200	1 120	4 100	–	15,3	0,41	**6011-2RSR**
	90	18	30 000	21 200	1 120	9 100	8 300	15,3	0,409	**6011-2Z**
	72	9	9 600	8 500	510	4 400	–	16,3	0,084	**61811-2RSR-Y**
	72	9	9 600	8 500	510	11 500	6 600	16,3	0,084	**61811-2RZ-Y**
	72	9	9 600	8 500	510	17 500	6 600	16,3	0,085	**61811-Y**
	80	13	17 700	14 100	760	12 100	7 500	16,3	0,185	**61911**
	80	13	17 700	14 100	760	4 250	–	16,3	0,18	**61911-2RSR**
	80	13	17 700	14 100	760	10 300	7 500	16,3	0,18	**61911-2RZ**
	90	11	20 600	16 300	910	10 900	6 000	16,2	0,26	**16011**
	100	21	46 000	29 000	1 720	9 500	7 500	14,2	0,618	**6211**
	100	21	46 000	29 000	1 720	3 900	–	14,2	0,632	**6211-2RSR**
	100	21	46 000	29 000	1 720	8 000	7 500	14,2	0,632	**6211-2Z**
	100	25	44 500	29 000	1 720	3 900	–	14,2	0,737	**62211-2RSR**
	120	29	83 000	47 500	3 200	8 500	7 800	12,9	1,33	**6311-C**
	120	29	83 000	47 500	3 200	7 200	7 800	12,9	1,38	**6311-C-2BRS**
	120	29	83 000	47 500	3 200	5 300	–	12,9	1,37	**6311-C-2HRS**
	120	29	83 000	47 500	3 200	7 200	7 800	12,9	1,37	**6311-C-2Z**
	140	33	100 000	60 000	3 900	7 300	6 200	13,2	2,29	**6411**

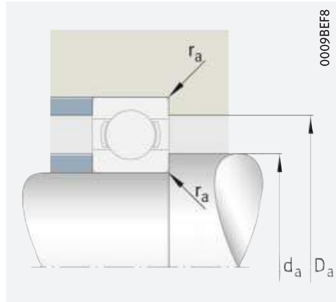
medias ➤ *https://www.schaeffler.de/std/1E34*



With seal 2BRS, 2HRS, 2RSR, 2Z



With seal 2RSR, 2RZ, 2Z

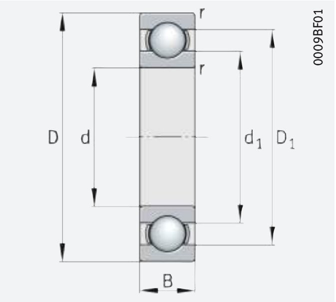


Mounting dimensions

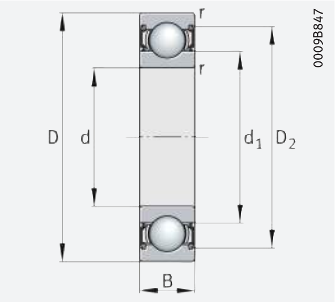
Dimensions						Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2	d_a min.	D_a max.	r_a max.
55	1,1	78,9	–	66,2	–	61	84	1
	1,1	–	81,5	66,2	–	61	84	1
	1,1	–	81,5	66,2	–	61	84	1
	0,3	–	68,6	60,6	–	57	70	0,3
	0,3	–	68,6	60,6	–	57	70	0,3
	0,3	66,5	–	60,6	–	57	70	0,3
	1	71,8	–	63,2	–	59,6	75,4	1
	1	–	74,2	62,6	–	59,6	75,4	1
	1	–	74,2	63,2	–	59,6	75,4	1
	0,6	79	–	65,6	–	58,2	86,8	0,6
	1,5	86,2	–	68,9	–	64	91	1,5
	1,5	–	88,2	68,7	–	64	91	1,5
	1,5	–	88,2	68,7	–	64	91	1,5
	1,5	–	88,2	68,7	–	64	91	1,5
	2	–	105,3	–	72,5	66	109	2
	2	–	105,3	–	72,5	66	109	2
	2	–	105,3	–	72,5	66	109	2
	2	–	105,3	–	72,5	66	109	2
	2,1	117,6	–	88,6	–	69	126	2,1

Deep groove ball bearings

Single row



Open

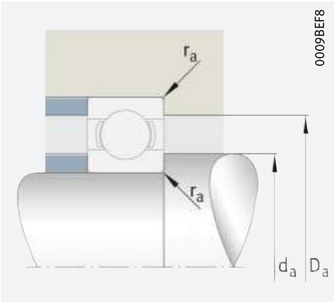


With seal 2RSR, 2RZ, 2Z

d = 60 – 60 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
60	78	10	12 600	11 100	690	4 100	–	16,3	0,105	**61812-2RSR-Y**
	78	10	12 600	11 100	690	10 400	6 300	16,3	0,105	**61812-2RZ-Y**
	78	10	12 600	11 100	690	15 900	6 300	16,3	0,109	**61812-Y**
	85	13	17 400	14 300	770	11 300	6 900	16,5	0,206	**61912**
	85	13	17 400	14 300	770	3 950	–	16,5	0,19	**61912-2RSR**
	95	18	31 500	23 200	1 190	10 100	7 600	15,6	0,419	**6012**
	95	11	21 200	17 500	820	10 500	5 700	16,3	0,283	**16012**
	95	18	31 500	23 200	1 190	3 750	–	15,6	0,432	**6012-2RSR**
	95	18	31 500	23 200	1 190	8 500	7 600	15,6	0,431	**6012-2Z**
	110	22	57 000	36 500	2 470	9 300	6 800	14,5	0,791	**6212**
	110	22	57 000	36 500	2 470	3 550	–	14,5	0,809	**6212-2RSR**
	110	22	57 000	36 500	2 470	7 900	6 800	14,5	0,807	**6212-2Z**
	110	28	56 000	36 000	2 480	3 550	–	14,3	0,998	**62212-2RSR**
	130	31	89 000	52 000	3 500	7 900	7 400	13,2	1,71	**6312-C**
	130	31	89 000	52 000	3 500	6 700	7 400	13,2	1,75	**6312-C-2BRS**
	130	31	89 000	52 000	3 500	4 800	–	13,2	1,75	**6312-C-2HRS**
	130	31	89 000	52 000	3 500	6 700	7 400	13,2	1,74	**6312-C-2Z**
	150	35	115 000	69 000	4 450	6 800	5 900	13,4	2,83	**6412**

medias ➤ *https://www.schaeffler.de/std/1E35*

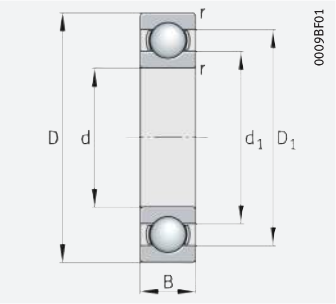


Mounting dimensions

Dimensions						Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2	d_a min.	D_a max.	r_a max.
60	0,3	–	75,3	65,6	–	62	76	0,3
	0,3	–	74,5	65,6	–	62	76	0,3
	0,3	72,6	–	65,6	–	62	76	0,3
	1	76,8	–	68,2	–	64,6	80,4	1
	1	–	79,2	67,6	–	64,6	80,4	1
	1,1	83,9	–	71,3	–	66	89	1
	0,6	83	–	72,1	–	63,2	91,8	0,6
	1,1	–	86	71,3	–	66	89	1
	1,1	–	86	71,3	–	66	89	1
	1,5	95,8	–	75,8	–	69	101	1,5
	1,5	–	97,7	75,8	–	69	101	1,5
	1,5	–	97,7	75,8	–	69	101	1,5
	1,5	–	97,7	75,8	–	69	101	1,5
	2,1	–	112,1	–	79,6	72	118	2,1
	2,1	–	112,1	–	79,6	72	118	2,1
	2,1	–	112,1	–	79,6	72	118	2,1
	2,1	–	112,1	–	79,6	72	118	2,1
	2,1	126,3	–	95,1	–	74	136	2,1

Deep groove ball bearings

Single row



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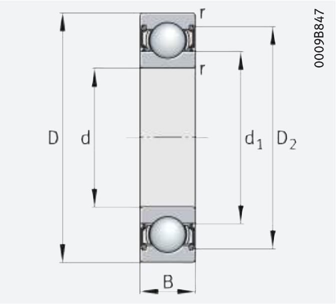
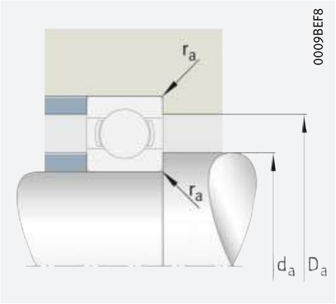


With seal 2RSR, 2RZ, 2Z

d = 65 – 65 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
65	85	10	13 000	12 000	760	3 750	–	16,2	0,13	**61813-2RSR-Y**
	85	10	13 000	12 000	760	9 600	5 700	16,2	0,13	**61813-2RZ-Y**
	85	10	13 000	12 000	760	14 700	5 700	16,2	0,136	**61813-Y**
	90	13	18 500	16 100	870	10 600	6 400	16,6	0,212	**61913**
	90	13	18 500	16 100	870	3 650	–	16,6	0,212	**61913-2RSR**
	90	13	18 500	16 100	810	9 000	6 400	16,6	0,212	**61913-2RZ**
	100	18	32 500	25 000	1 270	9 500	7 100	15,7	0,448	**6013**
	100	11	22 500	19 700	910	9 900	5 300	16,5	0,302	**16013**
	100	18	32 500	25 000	1 270	3 500	–	15,7	0,463	**6013-2RSR**
	100	18	32 500	25 000	1 270	8 100	7 100	15,7	0,464	**6013-2Z**
	120	23	63 000	41 500	2 750	8 600	6 300	14,4	1	**6213**
	120	23	63 000	41 500	2 750	3 250	–	14,4	1,03	**6213-2RSR**
	120	23	63 000	41 500	2 750	7 300	6 300	14,4	1,03	**6213-2Z**
	140	33	101 000	60 000	4 000	7 300	7 000	13,2	2,07	**6313-C**
	140	33	101 000	60 000	4 000	6 200	7 000	13,2	2,13	**6313-C-2BRS**
	140	33	101 000	60 000	4 000	4 500	–	13,2	2,13	**6313-C-2HRS**
	140	33	101 000	60 000	4 000	6 200	7 000	13,2	2,12	**6313-C-2Z**
	160	37	123 000	77 000	4 750	6 300	5 600	13,2	3,49	**6413**

medias ➤ *https://www.schaeffler.de/std/1E36*

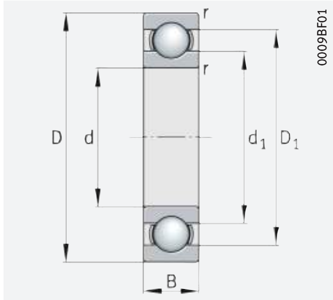


Mounting dimensions

Dimensions						Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2	d_a min.	D_a max.	r_a max.
65	0,6	–	80,5	71,6	–	68,2	81,8	0,6
	0,6	–	80,5	71,6	–	68,2	81,8	0,6
	0,6	78,6	–	71,6	–	68,2	81,8	0,6
	1	82,3	–	72,6	–	69,6	85,4	1
	1	–	84,2	73,2	–	69,6	85,4	1
	1	–	84,2	72,6	–	69,6	85,4	1
	1,1	88,8	–	76,2	–	71	94	1
	0,6	88	–	77,1	–	68,2	96,8	0,6
	1,1	–	91,5	76,2	–	71	94	1
	1,1	–	91,5	76,2	–	71	94	1
	1,5	103,2	–	82,3	–	74	111	1,5
	1,5	–	106,3	82	–	74	111	1,5
	1,5	–	106,3	82	–	74	111	1,5
	2,1	–	121,4	–	85,6	77	128	2,1
	2,1	–	121,4	–	85,6	77	128	2,1
	2,1	–	121,4	–	85,6	77	128	2,1
	2,1	–	121,4	–	85,6	77	128	2,1
	2,1	133,3	–	101,7	–	79	146	2,1

Deep groove ball bearings

Single row



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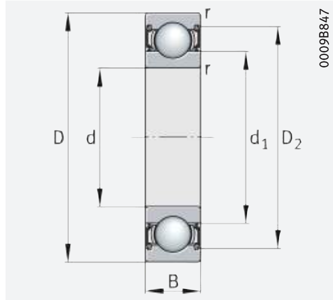
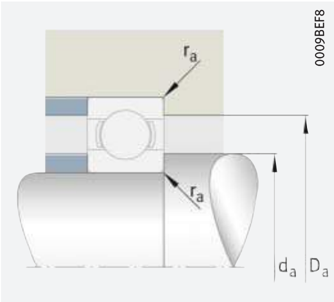


With seal 2RSR, 2RZ, 2Z

d = 70 – 75 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | *1.12* ➤226 | *1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
70	90	10	13 200	12 400	800	3 500	–	16,1	0,14	**61814-2RSR-Y**
	90	10	13 200	12 400	800	9 000	5 300	16,1	0,14	**61814-2RZ-Y**
	90	10	13 200	12 400	800	13 800	5 300	16,1	0,138	**61814-Y**
	100	16	25 000	21 200	1 160	9 500	6 400	16,4	0,34	**61914**
	100	16	25 000	21 200	1 160	3 350	–	16,4	0,34	**61914-2RSR**
	100	16	25 000	21 200	1 160	8 100	6 400	16,4	0,34	**61914-2RZ**
	110	20	40 500	31 000	1 850	8 600	6 800	15,6	0,622	**6014**
	110	13	29 500	25 000	1 230	8 900	5 300	16,2	0,438	**16014**
	110	20	40 500	31 000	1 850	3 250	–	15,6	0,64	**6014-2RSR**
	110	20	40 500	31 000	1 850	7 300	6 800	15,6	0,642	**6014-2Z**
	125	24	66 000	44 000	2 950	8 200	6 100	14,4	1,09	**6214**
	125	24	66 000	44 000	2 950	3 100	–	14,4	1,11	**6214-2RSR**
	125	24	66 000	44 000	2 950	7 000	6 100	14,4	1,11	**6214-2Z**
	150	35	115 000	69 000	4 450	6 800	6 100	13,4	2,55	**6314**
	150	35	115 000	69 000	4 450	2 800	–	13,4	2,6	**6314-2RSR**
	150	35	115 000	69 000	4 450	5 700	6 100	13,4	2,6	**6314-2Z**
	180	42	141 000	97 000	5 800	5 000	5 200	13,3	5,06	**6414**
75	95	10	13 700	13 400	870	3 300	–	16,1	0,15	**61815-2RSR-Y**
	95	10	13 700	13 400	870	8 500	4 950	16,1	0,15	**61815-2RZ-Y**
	95	10	13 700	13 400	870	13 000	4 950	16,1	0,15	**61815-Y**
	105	16	26 000	22 600	1 240	9 000	6 000	16,5	0,36	**61915**
	115	20	42 000	33 500	1 960	8 100	6 300	15,8	0,654	**6015**
	115	13	30 500	27 000	1 290	8 400	4 900	16,5	0,463	**16015**
	115	20	42 000	33 500	1 960	3 050	–	15,8	0,678	**6015-2RSR**
	115	20	42 000	33 500	1 960	6 900	6 300	15,8	0,676	**6015-2Z**
	130	25	70 000	49 000	3 250	7 800	5 900	14,6	1,19	**6215**
	130	25	70 000	49 000	3 250	2 900	–	14,6	1,22	**6215-2RSR**
	130	25	70 000	49 000	3 250	6 600	5 900	14,6	1,21	**6215-2Z**
	160	37	123 000	77 000	4 750	6 300	5 800	13,2	3,18	**6315**
	160	37	123 000	77 000	4 750	2 650	–	13,2	3,18	**6315-2RSR**
	160	37	123 000	77 000	4 750	5 400	5 800	13,2	3,23	**6315-2Z**
	190	45	141 000	97 000	5 800	6 600	5 600	13,3	7	**6415-M**

medias ➤ *https://www.schaeffler.de/std/1E37*

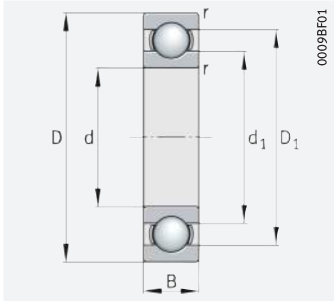


Mounting dimensions

Dimensions					Mounting dimensions		
d	r	D_1	D_2	d_1	d_a	D_a	r_a
	min.	≈	≈	≈	min.	max.	max.
70	0,6	–	85,5	76,6	73,2	86,8	0,6
	0,6	–	85,5	76,6	73,2	86,8	0,6
	0,6	83,6	–	76,6	73,2	86,8	0,6
	1	90,3	–	79,7	74,6	95,4	1
	1	–	92,8	84,1	74,6	95,4	1
	1	–	93,3	79,7	74,6	95,4	1
	1,1	97,3	–	82,8	76	104	1
	0,6	96,2	–	83,7	73,2	106,8	0,6
	1,1	–	100	82,8	76	104	1
	1,1	–	100	82,8	76	104	1
	1,5	108,2	–	86,8	79	116	1,5
	1,5	–	110,7	86,8	79	116	1,5
	1,5	–	110,7	86,8	79	116	1,5
	2,1	126,3	–	95,1	82	138	2,1
	2,1	–	130,2	94,8	82	138	2,1
	2,1	–	130,2	94,8	82	138	2,1
	3	151,6	–	114,4	86	164	2,5
75	0,6	–	90,5	81,6	78,2	91,8	0,6
	0,6	–	90,5	81,6	78,2	91,8	0,6
	0,6	88,6	–	81,6	78,2	91,8	0,6
	1	95,3	–	84,7	79,6	100,4	1
	1,1	102,6	–	88,1	81	109	1
	0,6	101,2	–	88,7	78,2	111,8	0,6
	1,1	–	105,3	88,1	81	109	1
	1,1	–	105,3	88,1	81	109	1
	1,5	113	–	92,1	84	121	1,5
	1,5	–	115,5	92,1	84	121	1,5
	1,5	–	115,5	92,1	84	121	1,5
	2,1	133,3	–	101,8	87	148	2,1
	2,1	–	137,2	101,4	87	148	2,1
	2,1	–	137,2	101,4	87	148	2,1
	3	151,6	–	114,4	91	174	2,5

Deep groove ball bearings

Single row



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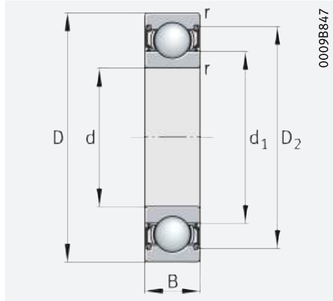
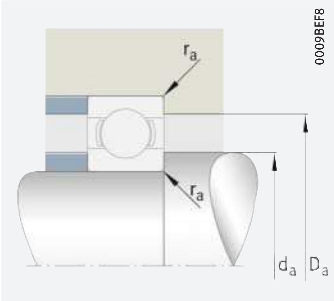


With seal 2RSR, 2RZ, 2Z

d = 80 – 85 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225|1.12 ➤226|1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
80	100	10	13 800	13 800	900	3 100	–	16	0,17	**61816-2RSR-Y**
	100	10	13 800	13 800	900	8 000	4 600	16	0,155	**61816-2RZ-Y**
	100	10	13 800	13 800	900	12 300	4 600	16	0,163	**61816-Y**
	110	16	26 500	24 000	1 320	8 500	5 600	16,6	0,385	**61916**
	125	22	51 000	40 000	2 340	7 500	6 100	15,7	0,845	**6016**
	125	14	34 000	31 500	1 510	7 700	4 600	16,6	0,609	**16016**
	125	22	51 000	40 000	2 340	2 850	–	15,7	0,895	**6016-2RSR**
	125	22	51 000	40 000	2 340	6 300	6 100	15,7	0,893	**6016-2Z**
	140	26	77 000	55 000	3 550	7 300	5 500	15	1,46	**6216**
	140	26	77 000	55 000	3 550	2 700	–	15	1,49	**6216-2RSR**
	140	26	77 000	55 000	3 550	6 200	5 500	15	1,49	**6216-2Z**
	170	39	131 000	87 000	5 200	5 400	5 500	13,3	3,75	**6316**
	170	39	131 000	87 000	5 200	2 470	–	13,3	3,75	**6316-2RSR**
	170	39	131 000	87 000	5 200	4 550	5 500	13,3	3,82	**6316-2Z**
	200	48	173 000	125 000	6 900	5 900	5 400	12,3	8,29	**6416-M**
85	110	13	20 400	19 800	1 130	2 850	–	16,2	0,27	**61817-2RSR-Y**
	110	13	20 400	19 800	1 130	7 200	4 900	16,2	0,27	**61817-2RZ-Y**
	110	13	20 400	19 800	1 130	11 100	4 900	16,2	0,27	**61817-Y**
	120	18	34 000	31 500	1 650	7 700	5 400	16,6	0,557	**61917**
	130	22	53 000	43 000	2 430	7 100	5 800	15,7	0,917	**6017**
	130	14	36 000	33 500	1 840	7 400	4 400	16,6	0,666	**16017**
	130	22	53 000	43 000	2 430	2 700	–	15,7	0,917	**6017-2RSR**
	130	22	53 000	43 000	2 430	6 100	5 800	15,7	0,94	**6017-2Z**
	150	28	89 000	64 000	3 950	6 700	5 300	14,8	1,87	**6217**
	150	28	89 000	64 000	3 950	2 500	–	14,8	1,87	**6217-2RSR**
	150	28	89 000	64 000	3 950	5 700	5 300	14,8	1,91	**6217-2Z**
	180	41	141 000	97 000	5 800	5 000	5 300	13,3	4,25	**6317**
	180	41	141 000	97 000	5 800	2 350	–	13,3	4,25	**6317-2RSR**
	180	41	141 000	97 000	5 800	4 300	5 300	13,3	4,33	**6317-2Z**
	210	52	184 000	136 000	7 500	5 600	5 300	12,3	9,6	**6417-M**

medias ➤ *https://www.schaeffler.de/std/1E38*

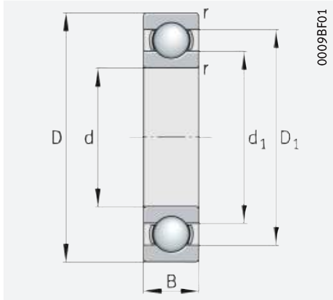


Mounting dimensions

Dimensions					Mounting dimensions		
d	r	D_1	D_2	d_1	d_a	D_a	r_a
	min.	≈	≈	≈	min.	max.	max.
80	0,6	–	95,5	86,6	83,2	96,8	0,6
	0,6	–	95,5	86,6	83,2	96,8	0,6
	0,6	93,6	–	86,6	83,2	96,8	0,6
	1	100,5	–	89,7	84,6	105,4	1
	1,1	111	–	94	86	119	1
	0,6	110,7	–	96,8	83,2	121,8	0,6
	1,1	–	113,7	93,7	86	119	1
	1,1	–	113,7	93,7	86	119	1
	2	121,5	–	98,8	91	129	2
	2	–	124,4	98,5	91	129	2
	2	–	124,4	98,5	91	129	2
	2,1	141,9	–	108,6	92	158	2,1
	2,1	–	145,5	108,2	92	158	2,1
	2,1	–	145,5	108,2	92	158	2,1
	3	162,1	–	117,9	96	184	2,5
85	1	–	104,2	93,2	89,6	105,4	1
	1	–	104,2	93,2	89,6	105,4	1
	1	102	–	93,2	89,6	105,4	1
	1,1	110	–	97,1	89,6	115,4	1
	1,1	116	–	99,6	91	124	1
	0,6	114,7	–	100,9	88,2	126,8	0,6
	1,1	–	119,2	99,2	91	124	1
	1,1	–	119,2	99,2	91	124	1
	2	129,8	–	106,6	96	139	2
	2	–	133,8	106,2	96	139	2
	2	–	133,8	106,2	96	139	2
	3	151,6	–	114,4	99	166	2,5
	3	–	154,9	114	99	166	2,5
	3	–	154,9	114	99	166	2,5
	4	173	–	123,4	105	190	3

Deep groove ball bearings

Single row



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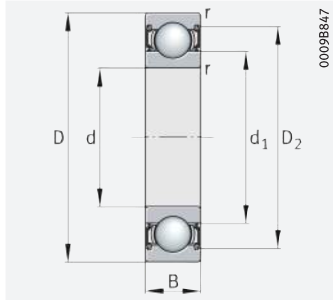
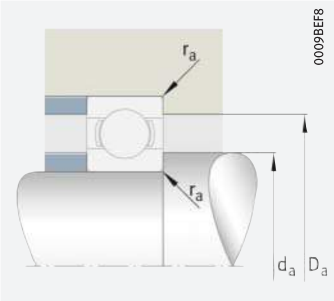


With seal 2RSR, 2RZ, 2Z

d = 90 – 95 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
90	115	13	20 700	20 600	1 170	2 700	–	16,1	0,28	**61818-2RSR-Y**
	115	13	20 700	20 600	1 170	6 900	4 600	16,1	0,28	**61818-2RZ-Y**
	115	13	20 700	20 600	1 170	10 500	4 600	16,1	0,28	**61818-Y**
	125	18	33 500	30 500	1 490	7 400	5 200	15,1	0,59	**61918**
	140	24	62 000	49 500	2 950	6 600	5 600	15,5	1,21	**6018**
	140	16	44 000	39 500	2 020	6 800	4 400	16,4	0,866	**16018**
	140	24	62 000	49 500	2 950	2 500	–	15,5	1,21	**6018-2RSR**
	140	24	62 000	49 500	2 950	5 600	5 600	15,5	1,23	**6018-2Z**
	160	30	102 000	74 000	4 400	6 300	5 100	14,6	2,21	**6218**
	160	30	102 000	74 000	4 400	2 380	–	14,6	2,21	**6218-2RSR**
	160	30	102 000	74 000	4 400	5 400	5 100	14,6	2,26	**6218-2Z**
	190	43	142 000	102 000	5 800	4 900	5 100	13,9	5,43	**6318**
	190	43	142 000	102 000	5 800	2 170	–	13,9	5,396	**6318-2RSR**
	190	43	142 000	102 000	5 800	4 150	5 100	13,9	5,53	**6318-2Z**
	225	54	209 000	162 000	8 900	5 200	4 950	12,1	11,7	**6418-M**
95	120	13	21 000	21 300	1 190	2 600	–	16,1	0,295	**61819-2RSR-Y**
	120	13	21 000	21 300	1 190	6 600	4 350	16,1	0,32	**61819-2RZ-Y**
	120	13	21 000	21 300	1 190	10 000	4 350	16,1	0,295	**61819-Y**
	145	24	64 000	54 000	3 050	6 300	5 300	15,8	1,27	**6019**
	145	16	42 500	41 000	1 990	6 600	4 150	16,6	0,922	**16019**
	145	24	64 000	54 000	3 050	2 420	–	15,8	1,27	**6019-2RSR**
	145	24	64 000	54 000	3 050	5 400	5 300	15,8	1,27	**6019-2Z**
	170	32	116 000	82 000	4 700	5 300	4 950	14,5	2,73	**6219**
	170	32	116 000	82 000	4 700	2 260	–	14,5	2,73	**6219-2RSR**
	170	32	116 000	82 000	4 700	4 550	4 950	14,5	2,79	**6219-2Z**
	200	45	154 000	113 000	6 400	4 600	4 950	13,8	6,23	**6319**
	200	45	154 000	113 000	6 400	2 080	–	13,8	6,317	**6319-2RSR**
	200	45	154 000	113 000	6 400	3 900	4 950	13,8	6,2	**6319-2Z**

medias ➤ *https://www.schaeffler.de/std/1E39*

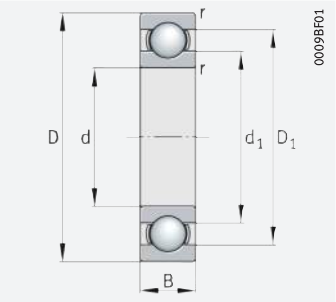


Mounting dimensions

Dimensions					Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_a min.	D_a max.	r_a max.
90	1	–	109,2	98,2	94,6	110,4	1
	1	–	109,2	98,2	94,6	110,4	1
	1	107	–	98,2	94,6	110,4	1
	1,1	113,8	–	101,6	96	119	1
	1,5	124,5	–	106,6	97	133	1,5
	1	122,7	–	107,6	94,6	135,4	1
	1,5	–	126,8	106,2	97	133	1,5
	1,5	–	126,8	106,2	97	133	1,5
	2	138,8	–	112,6	101	149	2
	2	–	143,4	112,3	101	149	2
	2	–	143,4	112,3	101	149	2
	3	157,2	–	123,7	104	176	2,5
	3	–	160,7	123,3	104	176	2,5
	3	–	160,7	123,3	104	176	2,5
	4	184	–	132,2	110	205	3
95	1	–	114,2	103,2	99,6	115,4	1
	1	–	114,2	103,2	99,6	115,4	1
	1	112	–	103,2	99,6	115,4	1
	1,5	129,1	–	111	102	138	1,5
	1	128,4	–	113,8	99,6	140,4	1
	1,5	–	131,8	110,6	102	138	1,5
	1,5	–	131,8	110,6	102	138	1,5
	2,1	146,7	–	118,7	107	158	2,1
	2,1	–	150,9	118,3	107	158	2,1
	2,1	–	150,9	118,3	107	158	2,1
	3	166,9	–	129,1	109	186	2,5
	3	–	170,4	128,7	109	186	2,5
	3	–	170,4	128,7	109	186	2,5

Deep groove ball bearings

Single row



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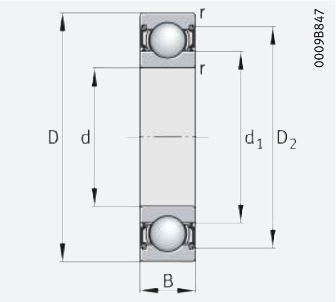
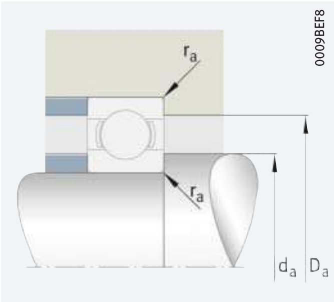


With seal 2RSR, 2RZ, 2Z

d = 100 – 105 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
100	125	13	21 300	22 100	1 210	2 470	–	16	0,31	**61820-2RSR-Y**
	125	13	21 300	22 100	1 210	6 300	4 150	16	0,31	**61820-2RZ-Y**
	125	13	21 300	22 100	1 210	9 600	4 150	16	0,31	**61820-Y**
	150	24	64 000	54 000	2 950	6 100	5 100	15,8	1,32	**6020**
	150	16	46 500	44 500	2 140	6 300	4 000	16,5	0,945	**16020**
	150	24	64 000	54 000	2 950	2 300	–	15,8	1,32	**6020-2RSR**
	150	24	64 000	54 000	2 950	5 200	5 100	15,8	1,35	**6020-2Z**
	180	34	130 000	93 000	5 400	5 000	4 800	14,4	3,3	**6220**
	180	34	130 000	93 000	5 400	2 140	–	14,4	3,3	**6220-2RSR**
	180	34	130 000	93 000	5 400	4 250	4 800	14,4	3,36	**6220-2Z**
	215	47	177 000	137 000	7 100	4 250	4 600	13,7	7,67	**6320**
	215	47	177 000	137 000	7 100	1 940	–	13,7	7,78	**6320-2RSR**
	215	47	177 000	137 000	7 100	3 600	4 600	13,7	7,78	**6320-2Z**
105	130	13	22 100	23 600	1 280	2 360	–	15,9	0,33	**61821-2RSR-Y**
	130	13	22 100	23 600	1 280	6 000	3 900	15,9	0,35	**61821-2RZ-Y**
	130	13	22 100	23 600	1 280	9 200	3 900	15,9	0,33	**61821-Y**
	145	20	46 500	44 500	2 140	6 300	4 600	16,5	0,87	**61921**
	160	26	75 000	64 000	3 450	5 700	4 950	15,7	1,67	**6021**
	160	18	57 000	54 000	2 390	5 900	3 950	16,5	1,244	**16021**
	160	26	75 000	64 000	3 450	2 200	–	15,7	1,6	**6021-2RSR**
	160	26	75 000	64 000	3 450	4 850	4 950	15,7	1,7	**6021-2Z**
	190	36	141 000	105 000	5 700	4 750	4 650	14,4	3,88	**6221**
	190	36	141 000	105 000	5 700	2 030	–	14,4	3,73	**6221-2RSR**
	190	36	141 000	105 000	5 700	4 000	4 650	14,4	3,99	**6221-2Z**
	225	49	188 000	150 000	7 800	4 050	4 450	13,7	8,7	**6321**

medias ➤ *https://www.schaeffler.de/std/1E3A*

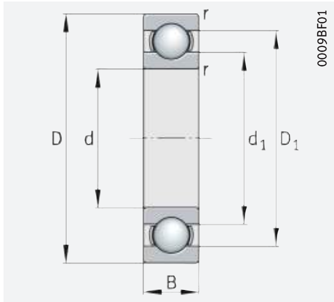


Mounting dimensions

Dimensions					Mounting dimensions		
d	r	D_1	D_2	d_1	d_a	D_a	r_a
	min.	≈	≈	≈	min.	max.	max.
100	1	–	119,2	108,2	104,6	120,4	1
	1	–	119,2	108,2	104,6	120,4	1
	1	117,1	–	108,2	104,6	120,4	1
	1,5	134,1	–	116,6	107	143	1,5
	1	132,7	–	117,6	104,6	145,4	1
	1,5	–	137,3	116,2	107	143	1,5
	1,5	–	137,3	116,2	107	143	1,5
	2,1	155,5	–	125,1	112	168	2,1
	2,1	–	158,9	124,7	112	168	2,1
	2,1	–	158,9	124,7	112	168	2,1
	3	179	–	138,6	114	201	2,5
	3	–	184,6	138,1	114	201	2,5
	3	–	184,6	138,1	114	201	2,5
105	1	–	124,2	113,2	109,6	125,4	1
	1	–	124,2	113,2	109,6	125,4	1
	1	122,1	–	113,2	109,6	125,4	1
	1,1	132,7	–	117,6	111	139	1
	2	142,5	–	122,1	113,8	151,2	2
	1	141,2	–	124,2	109,6	155,4	1
	2	–	145,3	121,7	113,8	151,2	2
	2	–	145,3	121,7	113,8	151,2	2
	2,1	163,2	–	131,9	117	178	2,1
	2,1	–	168,1	131,5	117	178	2,1
	2,1	–	168,1	131,5	117	178	2,1
	3	187,9	–	144,3	119	211	2,5

Deep groove ball bearings

Single row



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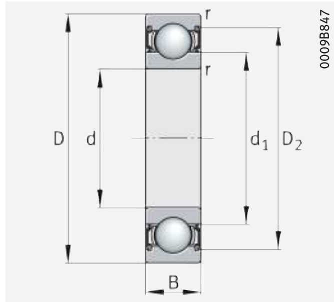
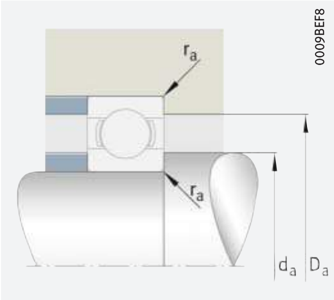


With seal 2RSR, 2RZ, 2Z

d = 110 – 130 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | *1.12* ➤226 | *1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
110	140	16	30 000	30 500	1 610	2 230	–	16	0,5	**61822-2RSR-Y**
	140	16	30 000	30 500	1 610	5 600	4 100	16	0,5	**61822-2RZ-Y**
	140	16	30 000	30 500	1 610	8 500	4 100	16	0,5	**61822-Y**
	170	28	85 000	71 000	3 450	5 300	4 850	15,7	2,06	**6022**
	170	19	61 000	57 000	2 800	5 500	3 850	16,4	1,52	**16022**
	170	28	85 000	71 000	3 450	2 080	–	15,7	2,06	**6022-2RSR**
	170	28	85 000	71 000	3 450	4 550	4 850	15,7	2,11	**6022-2Z**
	200	38	153 000	117 000	6 300	4 450	4 500	14,3	4,64	**6222**
	200	38	153 000	117 000	6 300	3 800	4 500	14,3	4,8	**6222-2Z**
	240	50	201 000	165 000	8 600	3 800	4 150	13,8	10,3	**6322**
	240	50	201 000	165 000	8 600	1 750	–	13,8	10,5	**6322-2RSR**
	240	50	201 000	165 000	8 600	3 250	4 150	13,8	10,5	**6322-2Z**
120	150	16	30 500	33 000	1 680	2 060	–	16	0,55	**61824-2RSR-Y**
	150	16	30 500	33 000	1 680	5 100	3 750	16	0,55	**61824-2RZ-Y**
	150	16	30 500	33 000	1 680	7 900	3 750	16	0,56	**61824-Y**
	180	28	88 000	77 000	3 550	5 000	4 450	15,8	2,18	**6024**
	180	19	65 000	64 000	3 000	5 200	3 550	16,5	1,62	**16024**
	180	28	88 000	77 000	3 550	1 920	–	15,8	2,18	**6024-2RSR**
	180	28	88 000	77 000	3 550	4 250	4 450	15,8	2,23	**6024-2Z**
	215	40	154 000	123 000	6 200	4 200	4 250	14,8	5,62	**6224**
	215	40	154 000	123 000	6 200	1 770	–	14,8	5,8	**6224-2RSR**
	215	40	154 000	123 000	6 200	3 600	4 250	14,8	5,8	**6224-2Z**
	260	55	225 000	195 000	9 500	3 500	3 800	13,8	12,8	**6324**
130	165	18	40 500	43 000	1 790	5 500	3 600	16,2	0,801	**61826**
	180	24	77 000	74 000	3 200	6 400	3 900	16,3	1,7	**61926-M**
	200	33	113 000	101 000	4 850	4 500	4 350	15,8	3,42	**6026**
	200	22	84 000	82 000	3 650	4 650	3 450	16,4	2,41	**16026**
	200	33	113 000	101 000	4 850	1 750	–	15,8	3,16	**6026-2RSR**
	200	33	113 000	101 000	4 850	3 800	4 350	15,8	3,16	**6026-2Z**
	230	40	177 000	146 000	7 500	3 850	3 900	14,5	6	**6226**
	230	40	177 000	146 000	7 500	3 250	3 900	14,5	6,24	**6226-2Z**
	280	58	244 000	214 000	9 800	3 200	3 500	13,5	15,3	**6326**

medias ➤ *https://www.schaeffler.de/std/1E3B*

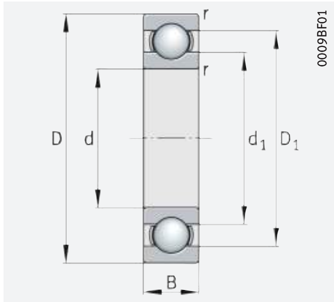


Mounting dimensions

Dimensions					Mounting dimensions		
d	r	D_1	D_2	d_1	d_a	D_a	r_a
	min.	≈	≈	≈	min.	max.	max.
110	1	–	133,3	119,7	114,6	135,4	1
	1	–	133,3	119,7	114,6	135,4	1
	1	130,6	–	119,7	114,6	135,4	1
	2	150,9	–	129,2	118,8	161,2	2
	1	149,5	–	130,7	114,6	165,4	1
	2	–	155	128,7	118,8	161,2	2
	2	–	155	128,7	118,8	161,2	2
	2,1	171,7	–	138,4	122	188	2,1
	2,1	–	177,2	138	122	188	2,1
	3	197,4	–	153,3	124	226	2,5
	3	–	203,1	152,9	124	226	2,5
	3	–	203,1	152,9	124	226	2,5
120	1	–	143,3	129,7	124,6	145,4	1
	1	–	143,3	129,7	124,6	145,4	1
	1	140,6	–	129,7	124,6	145,4	1
	2	161,2	–	139,9	128,8	171,2	2
	1	159,5	–	140,7	124,6	175,4	1
	2	–	165,4	139,4	128,8	171,2	2
	2	–	165,4	139,4	128,8	171,2	2
	2,1	185	–	151,5	132	203	2,1
	2,1	–	190,5	151,1	132	203	2,1
	2,1	–	190,5	151,1	132	203	2,1
	3	215	–	165	134	246	2,5
130	1,1	154,7	–	140	136	159	1
	1,5	164,7	–	145,7	137	173	1,5
	2	177,9	–	153,3	138,8	191,2	2
	1,1	176,7	–	154,7	136	194	1
	2	–	182,1	152,9	138,8	191,2	2
	2	–	182,1	152,9	138,8	191,2	2
	3	198,6	–	161,4	144	216	2,5
	3	–	203,5	161	144	216	2,5
	4	231,3	–	178,9	147	263	3

Deep groove ball bearings

Single row



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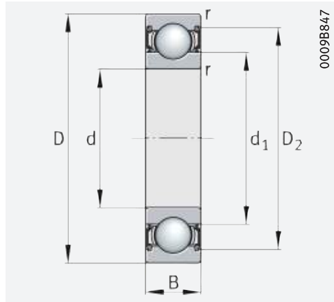
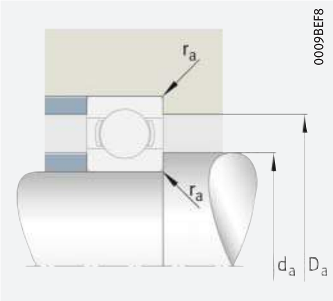


With seal 2RSR, 2RZ, 2Z

d = 140 – 170 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | 1.12 ➤226 | 1.13
			N	N	N	min^{-1}	min^{-1}		≈ kg	
140	175	18	41 500	46 000	1 860	6 700	3 350	16	0,848	**61828-Y**
	210	33	117 000	109 000	5 000	4 250	4 050	16	3,6	**6028**
	210	22	86 000	87 000	3 700	4 400	3 200	16,5	2,55	**16028**
	210	33	117 000	109 000	5 000	1 650	–	16	3,58	**6028-2RSR**
	210	33	117 000	109 000	5 000	3 600	4 050	16	3,56	**6028-2Z**
	250	42	188 000	165 000	8 100	3 600	3 600	14,9	8,07	**6228**
	300	62	270 000	246 000	11 100	3 850	3 250	13,6	21,767	**6328-M**
150	190	20	54 000	60 000	2 420	4 700	3 200	16,1	1,18	**61830**
	225	35	131 000	124 000	5 400	3 950	3 850	16	4,32	**6030**
	225	24	98 000	99 000	4 250	4 050	3 100	16,5	3,17	**16030**
	225	35	131 000	124 000	5 400	1 540	–	16	4,34	**6030-2RSR**
	225	35	131 000	124 000	5 400	3 350	3 850	16	4,3	**6030-2Z**
	270	45	187 000	168 000	7 800	3 350	3 350	15,2	10,3	**6230**
	320	65	300 000	290 000	13 100	2 800	3 000	13,7	22,4	**6330**
160	200	20	55 000	62 000	2 430	4 450	3 000	16,1	1,25	**61832**
	220	28	98 000	99 000	4 250	4 050	3 450	16,5	2,71	**61932**
	240	38	142 000	136 000	5 800	3 700	3 750	16	5,2	**6032**
	240	25	109 000	114 000	4 600	3 800	2 950	16,5	3,8	**16032**
	240	38	142 000	136 000	5 800	1 440	–	16	6,16	**6032-2RSR**
	240	38	142 000	136 000	5 800	3 150	3 750	16	5	**6032-2Z**
	290	48	212 000	203 000	8 900	4 050	3 100	15,2	14,7	**6232-M**
170	215	22	65 000	73 000	2 850	4 100	2 950	16,1	1,63	**61834**
	230	28	109 000	114 000	4 600	3 800	3 150	16,4	2,83	**61934**
	260	42	179 000	172 000	7 400	3 400	3 550	15,7	7,13	**6034**
	260	28	131 000	136 000	5 400	3 500	2 850	16,5	5,15	**16034**
	260	42	179 000	172 000	7 400	1 340	–	15,7	7,3	**6034-2RSR**
	310	52	225 000	224 000	9 400	3 800	2 950	15,3	18,3	**6234-M**

medias ➤ *https://www.schaeffler.de/std/1E3C*

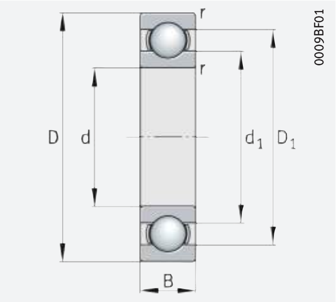


Mounting dimensions

Dimensions					Mounting dimensions		
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_a min.	D_a max.	r_a max.
140	1,1	164	–	150,8	146	169	1
	2	187,5	–	162,3	148,8	201,2	2
	1,1	186,7	–	164,3	146	204	1
	2	–	191,3	161,9	148,8	201,2	2
	2	–	191,3	161,9	148,8	201,2	2
	3	213,8	–	175,9	154	236	2,5
	4	248,8	–	191,2	157	283	3
150	1,1	177,9	–	162,7	156	184	1
	2,1	201,4	–	174,4	160,2	214,8	2,1
	1,1	199	–	176	156	219	1
	2,1	–	206	173,9	160,2	214,8	2,1
	2,1	–	206	173,9	160,2	214,8	2,1
	3	229,1	–	191,6	164	256	2,5
	4	266,2	–	205,5	167	303	3
160	1,1	187,3	–	172,7	166	194	1
	2	199	–	176	168,8	211,2	2
	2,1	214,6	–	186,2	170,2	229,8	2,1
	1,5	212,4	–	187,3	167	233	1,5
	2,1	–	219,7	185,8	170,2	229,8	2,1
	2,1	–	219,7	185,8	170,2	229,8	2,1
	3	245	–	204,9	174	276	2,5
170	1,1	200,8	–	184,4	176	209	1
	2	212,6	–	187,2	178,8	221,2	2
	2,1	231,2	–	199,4	180,2	249,8	2,1
	1,5	228,6	–	202,3	177	253	1,5
	2,1	–	236,5	198,9	180,2	249,8	2,1
	4	260,8	–	219	187	293	3

Deep groove ball bearings

Single row



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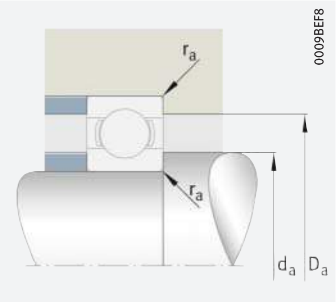


Mounting dimensions

d = 180 – 260 mm

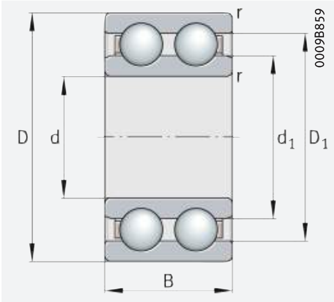
Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤225 | *1.12* ➤226 | *1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
180	225	22	66 000	76 000	2 850	3 900	2 750	16,1	1,71	**61836**
	250	33	131 000	136 000	5 400	3 500	3 200	16,4	4,22	**61936**
	280	31	140 000	146 000	5 200	3 350	2 950	16,4	6,92	**16036**
	280	46	201 000	199 000	8 200	4 050	3 300	15,6	10,6	**6036-M**
	320	52	240 000	244 000	10 300	3 650	2 750	15,3	18,744	**6236-M**
190	240	24	73 000	85 000	3 300	3 650	2 700	16,1	2,24	**61838**
	260	33	140 000	146 000	5 200	3 350	3 000	16,4	4,39	**61938**
	290	31	158 000	168 000	6 300	3 100	2 650	16,5	7,04	**16038**
	290	46	216 000	220 000	9 100	3 850	3 100	15,6	11,3	**6038-M**
200	250	24	74 000	88 000	3 350	3 500	2 550	15,9	2,35	**61840**
	280	38	158 000	168 000	6 300	3 100	2 950	16,4	6,27	**61940**
	310	34	186 000	202 000	7 300	2 850	2 470	16,4	9	**16040**
	310	51	231 000	243 000	9 600	3 650	3 000	15,6	14,4	**6040-M**
220	270	24	78 000	97 000	3 550	3 200	2 320	15,9	2,62	**61844**
	300	38	186 000	202 000	6 900	2 850	2 600	16,4	6,372	**61944**
240	300	28	100 000	124 000	4 350	2 900	2 260	15,9	3,769	**61848**
	320	38	211 000	240 000	8 400	2 600	2 330	16,4	6,88	**61948**
260	320	28	102 000	132 000	4 550	2 700	2 070	15,9	4,31	**61852**

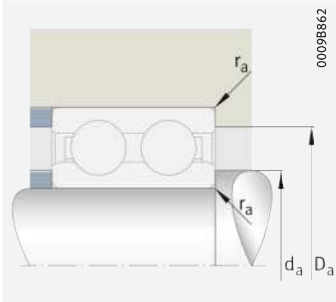
medias ➤ *https://www.schaeffler.de/std/1E3D*

Dimensions				Mounting dimensions		
d	r	D_1	d_1	d_a	D_a	r_a
	min.	≈	≈	min.	max.	max.
180	1,1	211,4	194,4	186	219	1
	2	228,9	202,2	188,8	241,2	2
	2	238,8	211,9	188,8	271,2	2
	2,1	249,3	211,8	190,2	269,8	2,1
	4	272,1	228,6	197	303	3
190	1,5	223,8	206,1	197	233	1,5
	2	238,8	211,9	198,8	251,2	2
	2	255,3	225,7	198,8	281,2	2
	2,1	260,3	220,8	200,2	279,8	2,1
200	1,5	233,8	216,7	207	243	1,5
	2,1	255,3	225,7	210,2	269,8	2,1
	2	276,4	244,5	208,8	301,2	2
	2,1	276,3	234,8	210,2	299,8	2,1
220	1,5	255	235,9	227	263	1,5
	2,1	276,4	244,6	230,2	289,8	2,1
240	2	281,6	259,3	248,8	291,2	2
	2,1	298	262,9	250,2	309,8	2,1
260	2	301,7	279,3	268,8	311,2	2

Deep groove ball bearings

Double row





Mounting dimensions

d = 10 – 90 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Factor	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	f_0	m	➤*225*|*1.12* ➤*226*|*1.13*
			N	N	N	min^{-1}	min^{-1}		≈ kg	
10	30	14	8 300	4 750	240	21 800	21 600	13,1	0,051	**4200-B-TVH**
12	32	14	11 100	6 100	310	19 000	19 100	12,3	0,051	**4201-B-TVH**
15	35	14	12 400	7 400	375	17 100	16 400	13,1	0,08	**4202-B-TVH**
	42	17	15 600	9 500	480	14 900	11 600	13	0,125	**4302-B-TVH**
17	40	16	15 600	9 500	480	14 900	15 100	13	0,1	**4203-B-TVH**
	47	19	20 900	13 200	670	12 500	9 800	13,1	0,178	**4303-B-TVH**
20	47	18	20 900	13 200	670	12 500	13 300	13,1	0,14	**4204-B-TVH**
	52	21	26 000	16 800	850	11 100	9 300	13	0,19	**4304-B-TVH**
25	52	18	22 900	15 700	790	11 100	11 200	13,8	0,19	**4205-B-TVH**
	62	24	34 500	22 900	1 160	9 400	8 500	13	0,28	**4305-B-TVH**
30	62	20	29 000	21 600	1 100	9 400	9 600	14,2	0,28	**4206-B-TVH**
	72	27	44 000	30 000	1 530	8 000	7 500	13	0,5	**4306-B-TVH**
35	72	23	39 500	30 000	1 520	7 900	8 700	14,1	0,45	**4207-B-TVH**
	80	31	58 000	40 500	2 060	6 900	6 900	12,9	0,59	**4307-B-TVH**
40	80	23	42 000	34 500	1 740	7 200	7 500	14,7	0,45	**4208-B-TVH**
	90	33	67 000	48 000	2 430	6 100	6 300	13,2	0,83	**4308-B-TVH**
45	85	23	44 500	38 000	1 930	6 700	6 900	14,9	0,54	**4209-B-TVH**
	100	36	75 000	60 000	3 600	5 400	5 300	13,9	1,23	**4309-B-TVH**
50	90	23	46 500	42 000	2 130	6 300	6 300	15,2	0,68	**4210-B-TVH**
	110	40	92 000	76 000	4 450	4 800	5 000	13,8	1,62	**4310-B-TVH**
55	100	25	43 000	42 500	2 140	5 700	5 900	15,4	0,808	**4211-B-TVH**
	120	43	111 000	90 000	5 400	4 350	4 650	13,8	2,06	**4311-B-TVH**
60	110	28	56 000	56 000	2 850	5 000	5 400	15	1,09	**4212-B-TVH**
	130	46	128 000	106 000	6 200	3 950	4 350	13,8	2,58	**4312-B-TVH**
65	120	31	67 000	67 000	3 350	4 650	5 400	15,3	1,44	**4213-B-TVH**
	140	48	137 000	114 000	6 800	3 850	4 500	13,8	3,49	**4313-B-TVH**
70	125	31	70 000	71 000	3 600	4 300	4 800	15	1,5	**4214-B-TVH**
	150	51	156 000	131 000	7 700	3 550	4 200	13,7	3,99	**4314-B-TVH**
75	130	31	72 000	76 000	3 750	4 100	4 450	14,9	1,58	**4215-B-TVH**
80	140	33	81 000	90 000	4 350	3 800	4 200	15,7	1,98	**4216-B-TVH**
85	150	36	94 000	106 000	4 950	3 500	4 100	15,8	2,5	**4217-B-TVH**
90	160	40	113 000	123 000	5 900	3 300	4 100	15,5	3,15	**4218-B-TVH**

medias ➤ *https://www.schaeffler.de/std/1E3E*

Dimensions				Mounting dimensions		
d	r	D_1	d_1	d_a	D_a	r_a
	min.	≈	≈	min.	max.	max.
10	0,6	23	16,6	14,2	25,8	0,6
12	0,6	25,8	17,8	16,2	27,8	0,6
15	0,6	28,8	21,4	19,2	30,8	0,6
	0,6	32,9	23,8	20,6	36,4	0,6
17	0,6	32,9	23,8	21,2	35,8	0,6
	1	38,5	28,4	22,6	41,4	1
20	1	38,5	28,4	25,6	41,4	1
	1,1	42,3	31,5	27	45	1
25	1	43,6	33,6	30,6	46,4	1
	1,1	49,9	37	32	55	1
30	1	51,8	39,9	35,6	56,4	1
	1,1	59,4	42,6	37	65	1
35	1,1	60,4	46,3	42	65	1
	1,5	68	48,2	44	71	1,5
40	1,1	67,2	53	47	73	1
	1,5	75,6	54,5	49	81	1,5
45	1,1	72,2	58,1	52	78	1
	1,5	86,8	66,7	54	91	1,5
50	1,1	76,9	62,8	57	83	1
	2	96,2	73,6	61	99	2
55	1,5	84,7	71,4	64	91	1,5
	2	105,3	80,4	66	109	2
60	1,5	95,3	79,8	69	101	1,5
	2,1	113,8	87,7	72	118	2,1
65	1,5	101,9	84,2	74	111	1,5
	2,1	116,2	89,2	77	128	2,1
70	1,5	109,4	91,7	79	116	1,5
	2,1	127,1	97,3	82	138	2,1
75	1,5	115	97,6	84	121	1,5
80	2	124	105,2	91	129	2
85	2	132,8	112,7	96	139	2
90	2	140,2	117,6	101	149	2

Angular contact ball bearings

FAG

Matrix for bearing preselection

The matrix gives an overview of the types and design features of angular contact ball bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter (see column "detailed information") and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

Design features and suitability			Single row angular contact ball bearings: single row	detailed information
+++ extremely suitable ++ highly suitable + suitable (+) suitable with restrictions – not suitable ✓ available				➤ 282
Load carrying capacity	radial		++	➤286|1.2
	axial, one direction		++	➤286|1.2
	axial, both directions		++1)	➤286|1.2
	moments		++1)	➤286|1.2
Compen-sation of angular mis-alignments	static		–	➤287|1.3
	dynamic		–	➤287|1.3
Bearing design	cylindrical bore		✓	➤282|1.1
	tapered bore		–	
	separable		–	➤301|1.17
Lubrication	greased		✓3)	➤287|1.4 ➤70
Sealing	open		✓	➤288|1.5 ➤182
	non-contact		✓	➤288|1.5
	contact		✓	➤288|1.5
Operating temperature in °C		from to	–30 +150 4)	➤290|1.8
Suitability for	high speeds		+++	➤288|1.6
	high running accuracy		+	➤114
	low-noise running		++	➤289|1.7 ➤282
	high rigidity		++	➤54
	reduced friction		++	➤56
	length compensation within bearing		–	
	non-locating bearing arrangement		+1)	➤139
	locating bearing arrangement		+++1)	➤139
X-life design			✓	➤285
Bearing bore d in mm		from to	10 180 5)	➤304
Product tables		from page ➤	304	

1) For mounting in pairs only, O or X arrangement

2) Valid for bearings with split inner ring

3) Valid for bearings sealed on both sides

4) Valid for open, ungreased bearings with sheet steel or brass cage

5) Larger catalogue bearings ➤ 🕮 GL 1

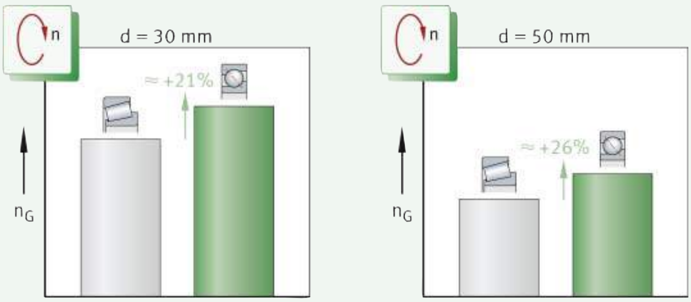
Double row angular contact ball bearings		
double row	detailed information ➤ 314	
++	➤317|2.2	
++	➤317|2.2	
++	➤317|2.2	
+	➤317|2.2	
–	➤317|2.3	
–	➤317|2.3	
✓	➤314|2.1	
–		
✓ [2]	➤327|2.17	
✓ [3]	➤317|2.4 ➤70	
✓	➤318|2.5 ➤182	
✓	➤318|2.5	
✓	➤318|2.5	
–30 +150 [4]	➤319|2.8	
+	➤318|2.6	
++	➤114	
++	➤318|2.7 ➤315	
++	➤54	
++	➤56	
–		
+	➤139	
++	➤139	
✓	➤316	X-life
5 110 [5]	➤330	
330		

1 Single row angular contact ball bearings

Single row angular contact ball bearings are particularly suitable where:

- bearing arrangements must support combined loads, i.e. radial and axial loads acting simultaneously ➤ *283* | *2*
- moderate to high axial loads are present on one side
- rigid axial guidance is required
- the bearing arrangement must be axially clearance-free or preloaded
- high speeds are required under higher radial and axial loads
- the bearing arrangement is to run quietly in addition to meeting the requirements stated above.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤ *280*.



1
Angular contact ball bearings: speed comparison with tapered roller bearings

n_G = *limiting speed*

1.1 Bearing design

Design variants

The standard product range comprises bearings of series 718..-B, 70..-B(-2RS), 72..-B(-2RS), 73..-B(-2RS) and 74..-B.
These bearings are also available for various applications as:

- bearings of basic design for bearing arrangements with single bearings ➤ *283* | *2*
- universal bearings for installation in sets in a tandem, O or X arrangement ➤ *284* | *3*, ➤ *284* | *4*, ➤ *285* | *5*
- X-life bearings ➤ *285*.

Single row angular contact ball bearings are also available in other dimension series, designs and sizes. Information on these bearings is available from Schaeffler on request. Larger catalogue bearings ➤ *GL 1*.

Bearings of basic design for bearing arrangements with single bearings

The forces are transmitted oblique to the radial plane

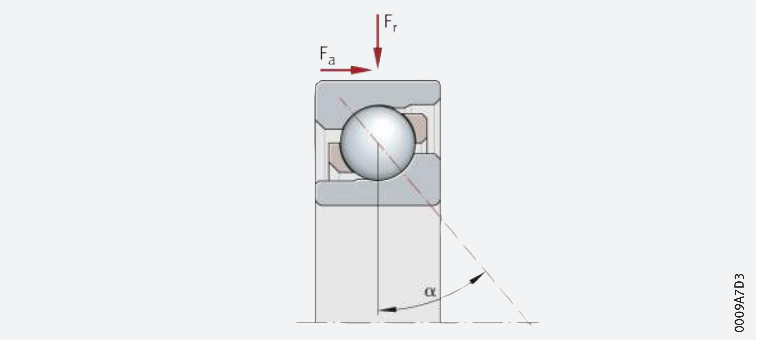
Single row angular contact ball bearings are part of the group of radial ball bearings. These self-retaining units have solid outer and inner rings. The rolling elements are guided by cages made from polyamide, sheet steel, or brass. The bearing rings are designed with one high shoulder and one low shoulder ➤283 | Figure 2. As a result of the different shoulder heights, the mounting method differs from that of deep groove ball bearings. The possible number of balls for angular contact ball bearings with identical dimensions is higher than for deep groove ball bearings. In contrast to deep groove ball bearings, the raceways on the inner and outer rings are arranged obliquely to each other in the direction of the bearing axis. As a result, the forces are transmitted from one raceway to the other at a defined contact angle (oblique to the radial plane) ➤287 | Figure 7.

For bearing positions with only one bearing each

These angular contact ball bearings can be considered when only one bearing is used per bearing position. As the bearings have standard bearing ring tolerances (they are manufactured to tolerance class Normal), they are not suitable for mounting directly adjacent to each other. In such cases, universal bearings should be used.

Figure 2
Single row angular contact ball bearing of basic design

F_r = radial load
F_a = axial load
α = nominal contact angle



Universal bearings for mounting in sets

Bearings can be mounted in pairs in any arrangement required

Single row angular contact ball bearings, which are intended for mounting in pairs (in sets) directly adjacent to each other, are manufactured in the so-called universal design ➤284 | Figure 3, ➤284 | Figure 4, ➤285 | Figure 5. These bearings can be used in pairs in any arrangement without shims. Depending on the design selected, the mounted bearing pair has the required axial clearance, freedom from clearance or preload. This gives easier design of the bearing arrangement and mounting of the bearings.

! When ordering, please state the number of bearings, not the number of bearing pairs.

Suffixes: UA, UB, UO, UL, UM, UH

Bearings of a universal design are indicated by the suffix UA, UB, UO, UL, UM or UH ➤293 | Table 6. If bearings of the universal design are arranged in sets, this gives a defined axial clearance or an axial preload:

- UA = bearing set with small axial internal clearance
- UB = bearing set with smaller axial internal clearance than UA
- UO = bearing set clearance-free in O or X arrangement
- UL = bearing set with light preload
- UM = bearing set with moderate preload
- UH = bearing set with high preload.

Reasons for mounting in sets

Single row angular contact ball bearings are mounted in sets if:

- the load carrying capacity of one bearing is not sufficient (bearing set in a tandem arrangement)
- combined or axial loads occur in both directions and the bearing arrangement must have a defined axial clearance (bearing set in O or X arrangement).

The following arrangements are possible for mounting in sets:

- tandem arrangement ➤284|3
- O arrangement ➤284|4
- X arrangement ➤285|5.

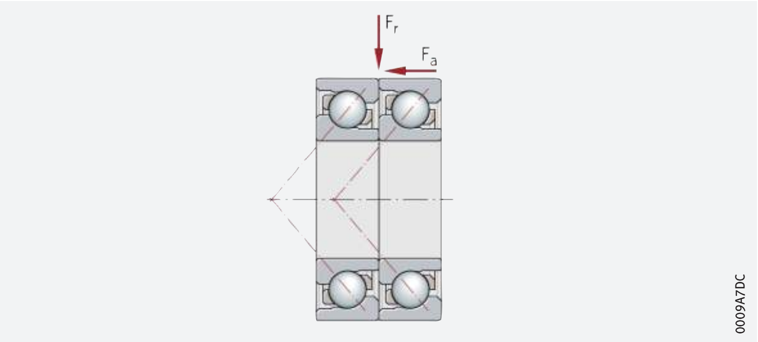
Bearing sets in tandem arrangement

Tandem arrangement

In a tandem arrangement, the contact lines run parallel to each other ➤284|3. Axial forces are distributed equally over both bearings, but can only be supported by the bearing set from one direction. In order to support axial forces from the opposing direction, as well as combined loads, the bearing set is always adjusted against a further bearing.

3
Universal bearings, mounted in set in a tandem arrangement

Bearing set in tandem arrangement



Bearing sets in O arrangement

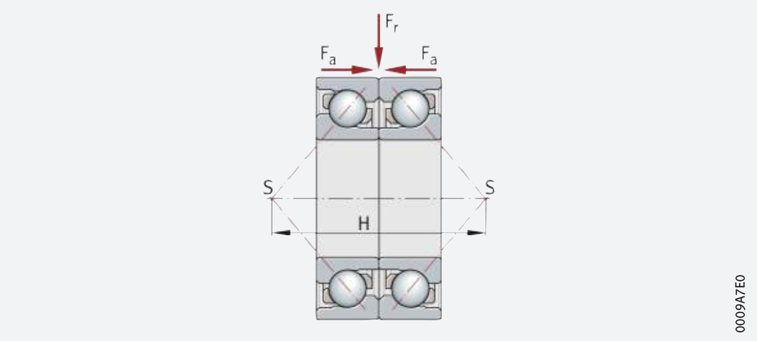
O arrangement

In an O arrangement, the apexes of the cones formed by the contact lines point outwards, i.e. they diverge relative to the bearing axis ➤284|4. Bearing sets in an O arrangement support axial forces from both directions, but only ever with one bearing. Due to the large support spacing (i.e. the spacing between the contact cone apexes), these give relatively rigid bearing arrangements (small tilting clearance) and are also suitable for supporting tilting moments.

4
Universal bearings, mounted in set in an O arrangement

Bearing set in O arrangement

S = *contact cone apex*
H = *support spacing*



Bearing sets in X arrangement

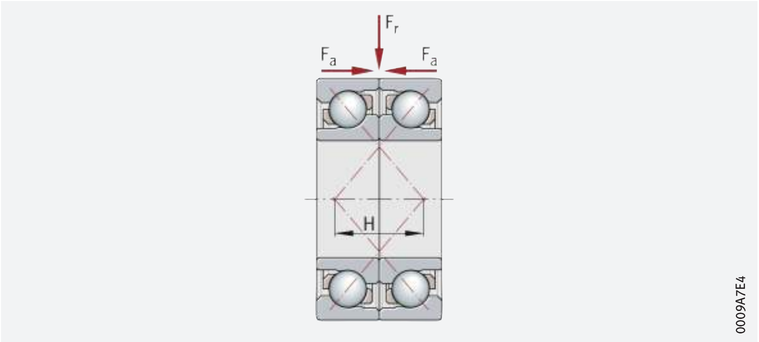
X arrangement

In an X arrangement, the apexes of the cones formed by the contact lines point inwards, i.e. they converge relative to the bearing axis ➤285|5. Once again, bearing sets of this type support axial forces from both directions, but also only ever with one bearing. The support base is, however, smaller than in an O arrangement. As a result, the sets are not as rigid as in an O arrangement. Furthermore, they are less suitable for supporting tilting moments.

5
Universal bearings, mounted in set in an X arrangement

Bearing set in X arrangement

H = *support spacing*



X-life premium quality

Many sizes in series 70..-B, 72..-B, 73..-B and 74..-B are available as X-life bearings ➤304|. These bearings exhibit considerably higher performance than standard single row angular contact ball bearings ➤286|6. This is achieved, for example, through the modified internal construction, higher surface quality of the contact surfaces and optimised cage design, as well as through the improved quality of the steel and rolling elements.

Advantages

Increased customer benefits due to X-life

The technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings ➤286|6
- quieter running
- running with reduced friction and greater energy efficiency
- lower heat generation in the bearing
- higher possible speeds
- lower lubricant consumption and, consequently, longer maintenance intervals
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

Lower operating costs, higher machine availability

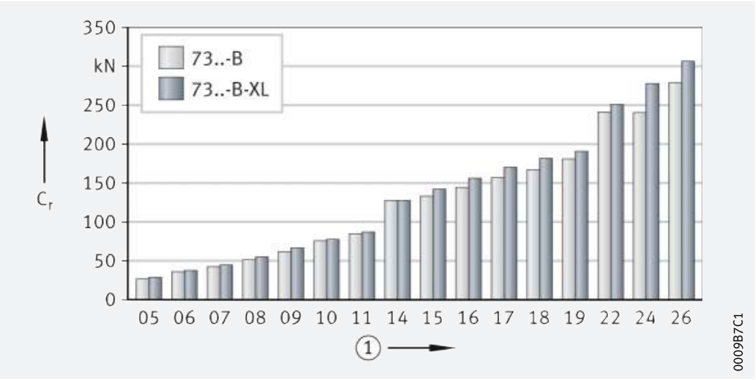
In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

Suffix XL

Single row X-life angular contact ball bearings include the suffix XL in the designation ➤293 | 9, ➤294 | 10 and ➤304 |.

6
Comparison of basic dynamic load rating C_r – bearing series 73..-B-XL, bore code 05 to 26, with a bearing which is not of X-life quality (73..-B)

C_r = basic dynamic load rating
① Bore code



Areas of application

Wide application range

Due to their special technical features, single row X-life angular contact ball bearings are highly suitable for bearing arrangements in:

- compressors
- fluid and hydraulic pumps
- automotive chassis and gearboxes
- industrial gearboxes
- electric motors
- industrial ventilators
- machine tools
- textile machinery.

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤10.

1.2 Load carrying capacity

Radial load

Single row angular contact ball bearings can support high radial forces. Pure radial loads are also possible, if the bearings are adjusted.

Axial loading is only possible on one side

Due to the geometry and position of the raceway shoulders, axial loads are only transmitted from one direction ➤283 | 2. If these angular contact ball bearings are required to support axial forces from both directions, they are adjusted against a second bearing in a mirror image arrangement ➤295 | 11 and ➤295 | 12.

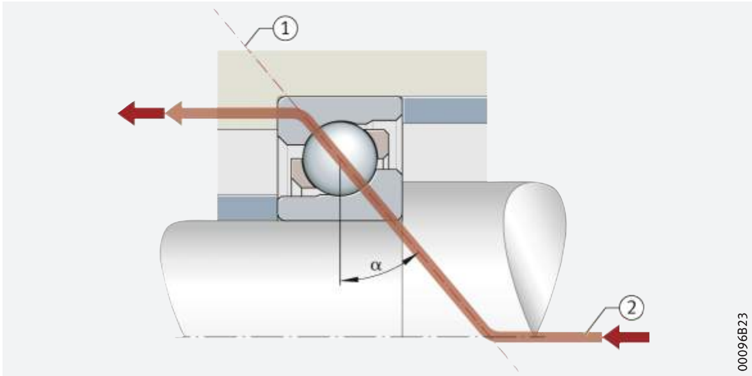
The axial load carrying capacity of the bearings increases with the size of the contact angle

The contact angle α is the angle encompassed by the contact line and the radial plane, under which the load is transmitted from one raceway to the other ➤287 | 7. The axial load carrying capacity of the bearing increases with the value of α, i. e. the greater the angle, the higher the axial load to which the bearing can be subjected. As a result, angular contact ball bearings are more suitable than deep groove ball bearings for supporting higher axial forces. Due to the nominal contact angle of $\alpha = 40°$, single row angular contact ball bearings can support high axial loads on one side.

For information on angular contact ball bearings available with contact angles other than $\alpha = 40°$, please consult Schaeffler.

7
Contact angle and force flow

α = contact angle
① Contact line
② Force flow



Load carrying capacity of bearing sets

The basic dynamic and static load ratings C_r and C_{0r} in the product tables always refer to the single bearing. If two bearings of the same size and design are arranged immediately adjacent to each other in an O or X arrangement, the following will apply to the bearing pairs:

- $C_r = 1{,}625 \cdot C_{r\ \text{single bearing}}$
- $C_{0r} = 2 \cdot C_{0r\ \text{single bearing}}$.

1.3 Compensation of angular misalignments

✎ The angular adjustment facility of the bearings is very limited

Single row angular contact ball bearings are not suitable for the compensation of angular misalignments. In addition, misalignments induce internal forces in the bearing, which not only lead to higher temperatures, but also to a reduction in the bearing rating life.

Angular contact ball bearings arranged in sets

Misalignments in angular contact ball bearings mounted in sets lead – particularly with a small internal clearance and an O arrangement – to increased loads on the balls and cage, as the angular misalignments are supported under constraint between the balls and raceways. This can, in turn, have a negative effect on the operating life of the bearings. In addition, it should be noted that running noise is increased by a misalignment of the bearing rings.

1.4 Lubrication

✎ Greased bearings are maintenance-free

Angular contact ball bearings sealed on both sides are greased with a high quality grease and do not require relubrication.

✎ Ungreased bearings must be lubricated

Open bearings and bearings with seals on one side are not greased. These bearings must be lubricated with oil or grease.

✎ Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

✎ Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

1.5 Sealing

Sealing with contact seals 2RS

Bearings with the suffix 2RS have lip seals on both sides ➤293|6. Due to their good sealing action, they are suitable for use in dusty, contaminated or damp environments.

Open bearings

In the case of unsealed bearings, sealing of the bearing position must be carried out by the adjacent construction. The sealing system should reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

1.6 Speeds

Limiting speeds and reference speeds in the product tables

Two speeds are generally indicated in the product tables ➤304|:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

!

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

The values given in the product tables are valid for oil lubrication in the case of bearings without seals or shields and for grease lubrication where bearings are supplied greased and with seals or shields.

Values for grease lubrication

For grease lubrication, 75% of the value stated in the product tables is permissible in each case.

Reference speeds

$n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

Bearings with contact seals

For bearings with contact seals, no reference speeds are defined in accordance with DIN ISO 15312:2004. As a result, only the limiting speed n_G is given in the product tables for these bearings.

Bearing sets of universal design

Bearing pairs usually operate at lower speeds than single bearings

Angular contact ball bearings of universal design can be used in an X, O or tandem arrangement ➤284|3 to ➤285|5. The thermally safe operating speed of the bearing pair is then approximately 20% below the calculated permissible operating speed of the single bearing.

1.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

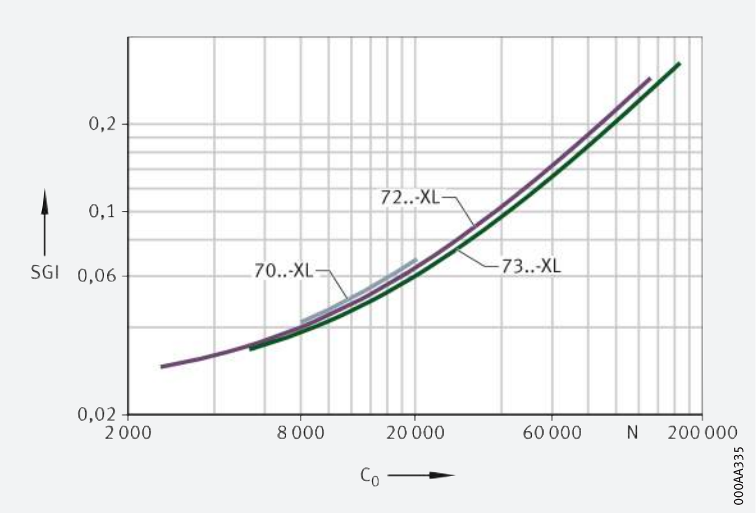
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

8 *Schaeffler Noise Index for single row angular contact ball bearings*

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and rolling elements
- the cage
- the lubricant
- the seals.

Possible operating temperatures of single row angular contact ball bearings ➤290|▦1.

▦1
Permissible temperature ranges

Operating temperature	Single row angular contact ball bearings, open		Single row angular contact ball bearings, sealed
	with sheet steel or brass cage	with polyamide cage PA66	
	−30 °C to +150 °C, for D > 240 mm up to +200 °C	−30 °C to +120 °C	−30 °C to +110 °C, limited by the lubricant and seal material

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

Solid cages made from brass and PA66, as well as sheet steel cages, are used as standard

Standard cages and additional cage designs for single row angular contact ball bearings are made from brass, polyamide or steel ➤290|▦2. Other cages are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass or sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦2
Cage, cage suffix, bore code

Bearing series	Solid cage made from polyamide PA66		Solid brass cage		Sheet steel cage
	TVH, TVP		MP		JP
	standard	also available for	standard	also available for	also available for
	Bore code				
718	06 to 16	–	–	–	–
70	04 to 08	–	–	–	–
72	up to 20, 22 to 26	–	21, from 28	00, 03, from 05	up to 20, 22
73	up to 20, 22 to 26	–	21, from 28	from 04	up to 20, 22
74	–	07 to 15	05 to 16	–	07 to 15

1.10 Internal clearance

Axial internal clearance, preload and preload force of bearing sets with universal bearings in O or X arrangement

Valid for bearing sets in O or X arrangement

Values for axial internal clearance, preload and preload force of bearings of universal design ➤291|3. The values for axial internal clearance are valid for unmounted bearing sets in an O or X arrangement, which are free from load and measurement forces (without elastic deformation).

The angular contact ball bearings can also be supplied with a different internal clearance. Please consult Schaeffler in this case.

3 *Axial internal clearance, preload and preload force of bearing sets with universal bearings in O or X arrangement for tolerance classes Normal, 6, 5*

UA = bearing with small axial internal clearance
UB = bearing with smaller axial internal clearance than UA
UO = bearing clearance-free in O or X arrangement
UL = bearing with light preload

Bore code	Axial internal clearance or preload of bearing pair Nominal dimension µm							Preload force $F_{V\,max}$ N			
	UA	UB	UO	UL				UL			
	Bearing series										
	70..-B, 72..-B, 73..-B, 74..-B			70..-B	72..-B	73..-B	74..-B	70..-B	72..-B	73..-B	74..-B
00	22	14	0	–	–3	–	–	–	38	–	–
01	24	15	0	–	–4	–5	–	–	53	82	–
02	24	15	0	–	–4	–5	–	–	62	99	–
03	24	15	0	–	–4	–6	–	–	77	123	–
04	28	16	0	–4	–5	–6	–8	103	103	146	258
05	34	19	0	–4	–4	–6	–8	115	112	200	300
06	34	19	0	–5	–5	–7	–8	141	157	250	365
07	40	22	0	–5	–6	–7	–9	172	208	300	462
08	40	22	0	–5	–6	–8	–10	200	246	385	535
09	44	24	0	–	–6	–9	–10	–	277	462	600
10	44	24	0	–	–6	–10	–10	–	288	535	692
11	46	25	0	–	–7	–10	–11	–	358	600	785
12	46	25	0	–	–7	–10	–11	–	431	692	877
13	46	25	0	–	–8	–11	–12	–	492	785	977
14	50	27	0	–	–8	–11	–12	–	535	877	1 154
15	50	27	0	–	–8	–12	–13	–	523	977	1 154
16	50	27	0	–	–8	–12	–16	–	615	1 077	1 385
17	54	31	0	–	–8	–13	–	–	692	1 154	–
18	54	31	0	–	–9	–13	–	–	815	1 231	–
19	54	31	0	–	–10	–14	–	–	892	1 331	–
20	54	31	0	–	–11	–14	–	–	992	1 485	–
21	58	34	0	–	–11	–14	–	–	1 100	1 538	–
22	58	34	0	–	–12	–15	–	–	1 177	1 723	–
24	58	34	0	–	–12	–16	–	–	1 277	1 923	–
26	60	34	0	–	–12	–17	–	–	1 431	2 115	–
28	60	34	0	–	–12	–17	–	–	1 508	2 308	–
30	60	34	0	–	–13	–18	–	–	1 723	2 500	–
32	60	34	0	–	–13	–18	–	–	1 815	2 769	–
34	70	40	0	–	–14	–19	–	–	2 038	3 115	–

Tolerances for axial internal clearance and preload

Tolerances for axial internal clearance and preload of bearing sets with universal bearings in O and X arrangement ➤292|4.

4
Tolerances for axial internal clearance and preload of bearing sets with universal bearings in O or X arrangement

Bore code	Tolerances µm					
	Bearing series					
	70..-B, 72..-B		73..-B		74..-B	
	Tolerance class					
	Normal, 6	5	Normal, 6	5	Normal, 6	5
00 to 07	+8 0	+6 0	+8 0	+6 0	+8 0	+6 0
08 to 09	+8 0	+6 0	+8 0	+6 0	+12 0	+10 0
10 to 11	+8 0	+6 0	+12 0	+10 0	+12 0	+10 0
12 to 34	+12 0	+10 0	+12 0	+10 0	+12 0	+10 0

1.11 Dimensions, tolerances

Dimension standards

DIN ISO

The main dimensions of angular contact ball bearings of the basic design correspond to DIN 628-1:2008 and ISO 12044:2014. Nominal dimensions of angular contact ball bearings ➤*304*|.

Chamfer dimensions

DIN ISO

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤*135*|*7.11*. Nominal value of chamfer dimension ➤*304*|.

Tolerances

DIN ISO

The tolerances for the dimensional and running accuracy of single row angular contact ball bearings correspond to tolerance class Normal in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ➤*122*|*8*.

Tolerances for bearings of universal design

Single row bearings are also available in tolerance class 5

In addition to the tolerance class Normal (no tolerance suffix), angular contact ball bearings of universal designs UA, UB, UO and UL are also available by agreement in tolerance class 5 and, in some cases, in tolerance class 6. Tolerance values in accordance with ISO 492 ➤*122*|*8* to ➤*127*|*16*. The tolerance suffix for bearings of universal design in tolerance class 5 is then:

- P5-UA, P5-UB, P5-UO, P5-UL.

!

The bores of bearings of universal design for all tolerance classes are uniformly toleranced to tolerance class 5 (no special suffix). The bearing width for universal bearings is toleranced to ISO 492:2014. For width tolerances ➤*292*|*5*.

5
Tolerance for ring width in bearings of universal design

Tolerance symbols ➤122|
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Width deviation $t_{\Delta Bs}$ µm			
		Bearings in tolerance class			
		Normal, 6		5	
over	incl.	U	L	U	L
–	50	0	–250	0	–250
50	80	0	–380	0	–250
80	120	0	–380	0	–380
120	180	0	–500	0	–380
180	315	0	–500	0	–500

1.12 Suffixes

For a description of the suffixes used in this chapter ➤293|▦6 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦**6**
Suffixes and corresponding descriptions

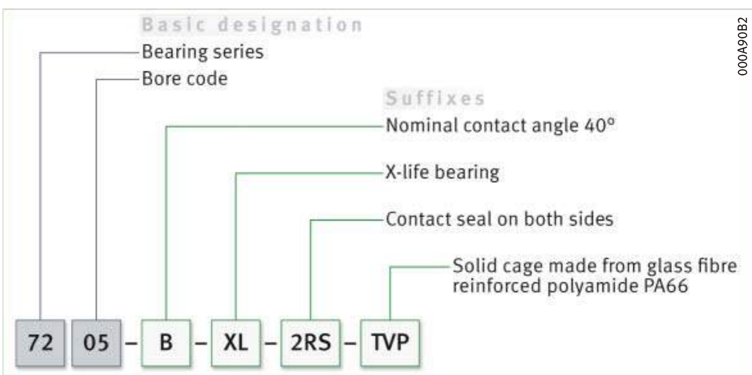
Suffix	Description of suffix	
B	Modified internal construction, nominal contact angle α = 40°	Standard
JP	Sheet steel cage	Standard, dependent on bore code
MP	Solid brass cage	
TVH, TVP	Solid cage made from glass fibre reinforced polyamide PA66	
P5	Bearing in tolerance class 5	Special design, available by agreement
2RS	Contact seal on both sides (lip seal)	Standard
UA	Universal design for fitting in pairs, bearing pair has a small axial internal clearance in O and X arrangement	
UB	Universal design for fitting in pairs, bearing pair has a smaller axial internal clearance in O and X arrangement than in UA	
UH	Universal design for fitting in pairs, bearing pair has a high preload in O and X arrangement	Available by agreement
UL	Universal design for fitting in pairs, bearing pair has a light preload in O and X arrangement	Standard
UM	Universal design for fitting in pairs, bearing pair has a moderate preload in O and X arrangement	Available by agreement
UO	Universal design for fitting in pairs, bearing pair is clearance-free in O and X arrangement	Standard
XL	X-life bearing, dependent on bore code and bearing type	Standard

1.13 Structure of bearing designation

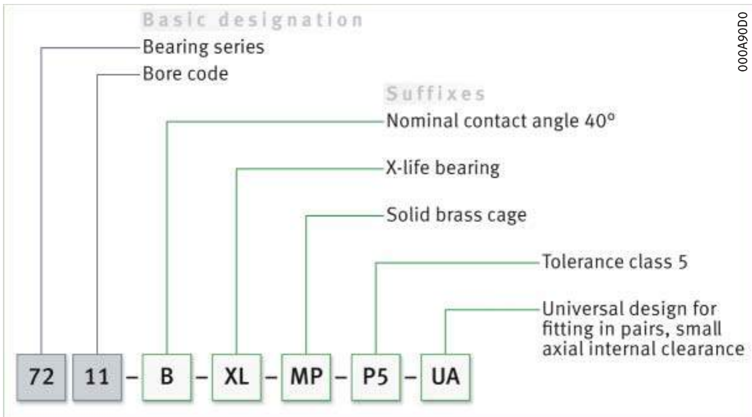
✎ Examples of composition of bearing designation

The designation of bearings follows a set model. Examples ➤293|⌂9 and ➤294|⌂10. The composition of designations is subject to DIN 623-1 ➤102|⌂10.

⌂**9**
Single row angular contact ball bearing of basic design: designation structure



10
Single row angular contact ball bearing of universal design: designation structure



1.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used directly in the rating life equation for P ($P = F_r$).

✎ P is a substitute force for combined load and various load cases

If this condition is not met, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ $F_a/F_r \leqq 1,14$ or $F_a/F_r > 1,14$

The calculation of P is dependent on the load ratio F_a/F_r and the factor 1,14.

✎ Tandem arrangement

For single bearings under dynamic load and bearing pairs in a tandem arrangement ➤*294*|*1* and ➤*294*|*2*.

1
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq 1{,}14 \quad \Rightarrow \quad P = F_r$$

2
Equivalent dynamic load

$$\frac{F_a}{F_r} > 1{,}14 \quad \Rightarrow \quad P = 0{,}35 \cdot F_r + 0{,}57 \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Resulting axial force ➤*295*|*7*. The information in the section “Calculation of internal resulting axial force F_a for single bearings and for bearings in a tandem arrangement” must be taken into consideration when calculating F_a ➤*295*.

✎ Bearing pairs in O or X arrangement

For bearing pairs under dynamic load in O or X arrangement ➤*294*|*3* and ➤*294*|*4*.

3
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq 1{,}14 \quad \Rightarrow \quad P = F_r + 0{,}55 \cdot F_a$$

4
Equivalent dynamic load

$$\frac{F_a}{F_r} > 1{,}14 \quad \Rightarrow \quad P = 0{,}57 \cdot F_r + 0{,}93 \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Resulting axial force ➤*294*|*2* and ➤*295*|*7*.

Calculation of internal resulting axial force F_a for single bearings and for bearings in a tandem arrangement

Equations for calculation of internal resulting axial force F_a

Single row angular contact ball bearings transmit radial forces from one raceway to the other oblique to the bearing axis. In the case of a shaft supported by two single row angular contact ball bearings of identical or different size, the radial load on bearing A therefore leads, due to the inclination of the raceways ($\alpha \neq 0°$), to an axial load on bearing B. The radial load on bearing B also has the effect of an axial load on bearing A; external forces in bearing systems of this type ➤295|11 and ➤295|12. This internal resulting axial force F_a must be taken into consideration in the calculation of the equivalent dynamic bearing load P. Equations for calculation of resulting axial force F_a ➤295|7. The table shows the magnitude of the resulting axial force – that is the sum of or the difference between the internal and external axial force – for bearing arrangements in accordance with ➤295|11 and ➤295|12.
The following applies to the table: the bearing aligned to the external axial force K_a is marked A and the opposing bearing is marked B.

Preconditions for calculation

Bearing A is subjected to a radial load F_{rA}, bearing B to a radial load F_{rB} ➤295|11 and ➤295|12. F_{rA} and F_{rB} act at the central pressure points of the bearings (dimension a in the product tables) and are always regarded as positive. The bearings are clearance-free, but without preload.

7
Calculation of internal resulting axial force F_a

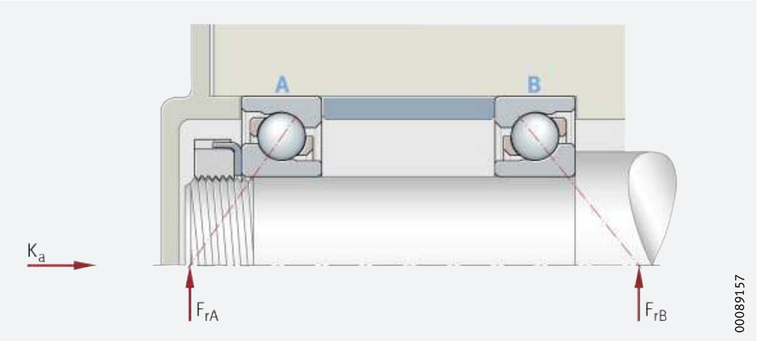
F_a = *internal resulting axial force, which must be used in the calculation of the equivalent dynamic bearing load P.*

$Y_A = Y_B = 0,57$

Case	Load ratio	External axial force	Resulting axial force F_a	
			Bearing A	Bearing B
1	$\frac{F_{rA}}{Y_A} \leq \frac{F_{rB}}{Y_B}$	$K_a \geqq 0$	$F_a = K_a + 0,5 \cdot \frac{F_{rB}}{Y_B}$	F_a is not taken into consideration in the calculation
2	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$K_a > 0,5 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	$F_a = K_a + 0,5 \cdot \frac{F_{rB}}{Y_B}$	F_a is not taken into consideration in the calculation
3	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$K_a \leqq 0,5 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	F_a is not taken into consideration in the calculation	$F_a = 0,5 \cdot \frac{F_{rA}}{Y_A} - K_a$

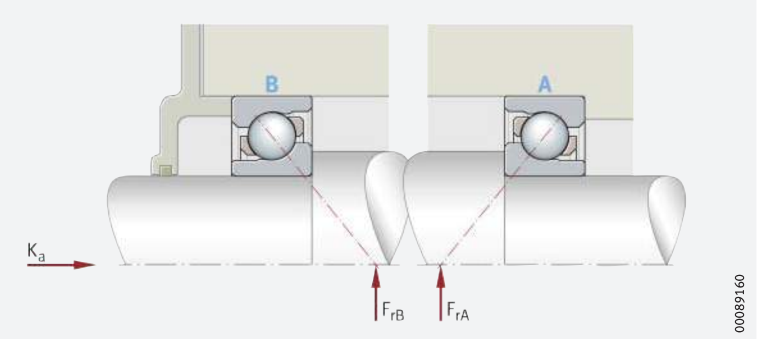
11
Adjusted bearing arrangement with two single row angular contact ball bearings in O arrangement, external forces

K_a = *external axial force acting on the bearing*
F_{rA} = *radial load, bearing A*
F_{rB} = *radial load, bearing B*



12
Adjusted bearing arrangement with two single row angular contact ball bearings in X arrangement, external forces

K_a = *external axial force acting on the bearing*
F_{rA} = *radial load, bearing A*
F_{rB} = *radial load, bearing B*



Example of calculation of internal resulting axial force F_a

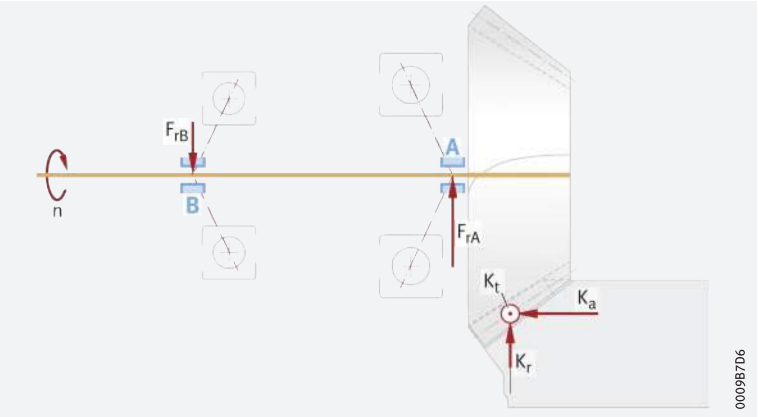
Bearing arrangement for pinion shaft

Single row angular contact ball bearings are used for the bearing arrangement of a pinion shaft ➤296| 13. The bearing arrangement should be adjusted and in an O arrangement. In order to calculate the basic rating life, the equivalent dynamic bearing load P must be determined.

13
Load scheme for pinion shaft

K_a = external axial force = 6,52 kN
K_r = external radial force = 0,82 kN
K_t = tangential force = 5,88 kN

Resulting radial forces F_r
Bearing A, F_{rA} = 7,30 kN
Bearing B, F_{rB} = 2,20 kN



In a bearing arrangement with two single bearings, the resulting axial force F_a must be taken into consideration

Bearing A supports the external axial force K_a. Since this is an adjusted bearing arrangement with two single bearings, the internal resulting axial force F_a in the bearing system must be taken into consideration in the bearing calculation in accordance with ➤295| 7. For both angular contact ball bearings $Y_A = Y_B = 0,57$. Loads ➤296| 13.

Step 1

Calculate the load ratio using ➤296| 5.

5
Load ratio

$$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$$

$$\frac{7,30\ \text{kN}}{0,57} > \frac{2,20\ \text{kN}}{0,57}$$

Step 2

Compare the result with possible cases ➤295| 7. Case 2 or case 3 can be considered ➤296| 8.

8
Calculation of internal resulting axial force F_a

Parameters ➤294| 2
$Y_A = Y_B = 0,57$

Case	Load ratio	External axial force	Resulting axial force F_a	
			Bearing A	Bearing B
2	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$K_a > 0,5 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	$F_a = K_a + 0,5 \cdot \frac{F_{rB}}{Y_B}$	–
3		$K_a \leqq 0,5 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	–	$F_a = 0,5 \cdot \frac{F_{rA}}{Y_A} - K_a$

Step 3

Using ➤297| ƒ 6, check whether case 2 applies ➤296| ▦ 8.

ƒ 6
External axial force in relation to load ratio

$$K_a > 0{,}5\left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$$

$$6{,}52\,\text{kN} > 0{,}5\left(\frac{7{,}30\,\text{kN}}{0{,}57} - \frac{2{,}20\,\text{kN}}{0{,}57}\right)$$
$$> 0{,}5\left(12{,}807\,\text{kN} - 3{,}859\,\text{kN}\right)$$
$$6{,}52\,\text{kN} > 4{,}474\,\text{kN}$$

If case 2 applies ➤296| ▦ 8.

Step 4

Calculating F_a

Using ➤297| ƒ 7, calculate the internal resulting axial force F_a for bearing A. The calculations are in accordance with ➤296| ▦ 8, case 2.

ƒ 7
Internal resulting axial force

$$F_a = K_a + 0{,}5 \cdot \frac{F_{rB}}{Y_B}$$

$$F_a = 6{,}52\,\text{kN} + 0{,}5 \cdot \frac{2{,}20\,\text{kN}}{0{,}57}$$
$$= 8{,}45\,\text{kN}$$

Using value F_a in the calculation of P

For calculation of the equivalent dynamic bearing load P, the calculated value for F_a in ➤294| ƒ 2 is then used for bearing A, since $F_a/F_{rA} > 1{,}14$ ($8{,}45\text{ kN}/7{,}30\text{ kN} > 1{,}14$).

Equivalent static bearing load

Tandem arrangement

For single bearings under static load and bearing pairs in a tandem arrangement ➤297| ƒ 8 and ➤297| ƒ 9.

ƒ 8
Equivalent static load

$$\frac{F_{0a}}{F_{0r}} \leqq 1{,}9 \quad \Rightarrow \quad P_0 = F_{0r}$$

ƒ 9
Equivalent static load

$$\frac{F_{0a}}{F_{0r}} > 1{,}9 \quad \Rightarrow \quad P_0 = 0{,}5 \bullet F_{0r} + 0{,}26 \bullet F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load).

For bearing pairs under static load in an O or X arrangement ➤297| ƒ 10.

ƒ 10
Equivalent static load

$$P_0 = F_{0r} + 0{,}52 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load).

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤298|ƒ 11.

ƒ 11
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

1.15 Minimum load

In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/100$ is required

In order that no slippage occurs between the contact partners, the angular contact ball bearings must be constantly subjected to a sufficiently high load. Based on experience, a minimum radial load of the order of $P > C_{0r}/100$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

1.16 Design of bearing arrangements

Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and thus also achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤299|▦ 9 to ➤300|▦ 11.

Radial location of bearings – fit recommendations

For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦ 6 and ➤158|▦ 7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦ 2
- shaft fits ➤150
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦ 4
- housing fits ➤158

Axial location of bearings – location methods

The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings and retaining rings etc., are fundamentally suitable ➤*295*| *11* and ➤*295*| *12*.

Dimensional, geometrical and running accuracy of the bearing seats

A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For single row angular contact ball bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7; with tolerance class 6, the shaft seat should correspond to a minimum of IT5 and the housing seat to IT6. Guide values for the geometrical and positional tolerances of bearing seating surfaces ➤*299*| *9*, tolerances t_1 to t_3 in accordance with ➤*168*| *11*. Numerical values for IT grades ➤*299*| *10*.

9
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class to ISO 492	Bearing tolerance class to DIN 620	Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades): Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	
6	P6	Shaft	IT5	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	
		Housing	IT6	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	

10
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm: over 3 incl. 6	over 6 incl. 10	over 10 incl. 18	over 18 incl. 30	over 30 incl. 50	over 50 incl. 80	over 80 incl. 120	over 120 incl. 180
	Values in µm							
IT3	2,5	2,5	3	4	4	5	6	8
IT4	4	4	5	6	7	8	10	12
IT5	5	6	8	9	11	13	15	18
IT6	8	9	11	13	16	19	22	25
IT7	12	15	18	21	25	30	35	40

Roughness of cylindrical bearing seats

Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤300|▦11.

▦ **11**
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Mounting dimensions for the contact surfaces of bearing rings

The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of abutment shoulders ➤304|▦. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

If single row angular contact bearings are mounted in a tandem arrangement, it must be ensured that the end faces of the outer rings in contact with each other have sufficient overlap. In case of doubt, please consult Schaeffler.

Adjustment of bearings

Always adjust single bearings against a second bearing

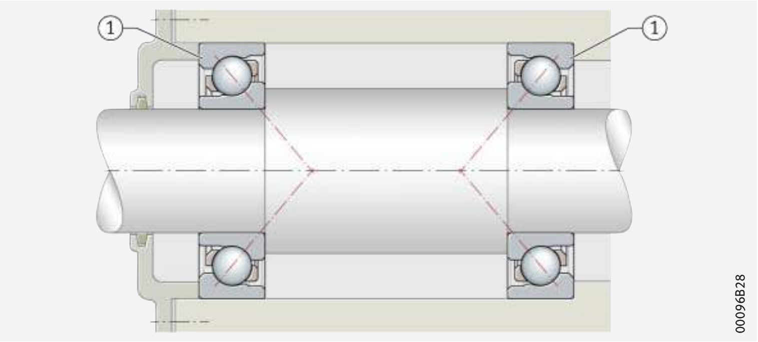
Single row angular contact ball bearings must always be used with a second bearing or as a bearing set ➤300|14. If two individual single row angular contact ball bearings are used, these must be adjusted against each other until the requisite preload or desired clearance is achieved.

Select the adjustment such that full function and operational reliability of the bearings is ensured

The correct adjustment of the bearings has a considerable influence on the function and operational reliability of the bearing arrangement. If the clearance is too large, the load carrying capacity of the bearings will not be fully utilised; if the preload is too high, the increased friction losses will give rise to higher operating temperatures, which will, in turn, have a negative effect on the rating life of the bearings.

14
Adjusted bearing arrangement with two single row angular contact ball bearings

① *Angular contact ball bearings mounted in X arrangement*



Adjustment not required for bearing sets

Universal bearings arranged immediately adjacent to each other, or matched bearings, do not need to be adjusted. In such cases, the desired operating clearance or required preload is achieved by selecting the internal clearance or preload class in conjunction with the suitable shaft and housing fits. As a result, particular attention must be paid to the correct selection of internal clearance or preload for these bearing sets.

1.17 Mounting and dismounting

The mounting and dismounting options for angular contact ball bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

Ensure that the bearings are not damaged during mounting

Single row angular contact ball bearings are not separable. In the mounting of such bearings, the mounting forces must always be applied to the bearing ring with a tight fit.

Schaeffler Mounting Handbook

Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤ *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

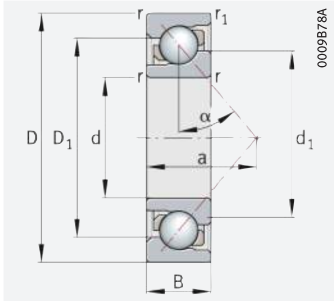
1.19 Further information

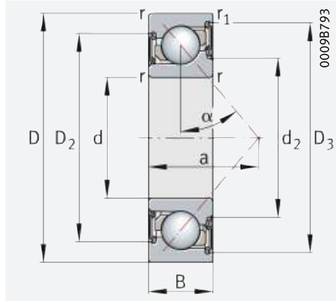
In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Angular contact ball bearings

Single row



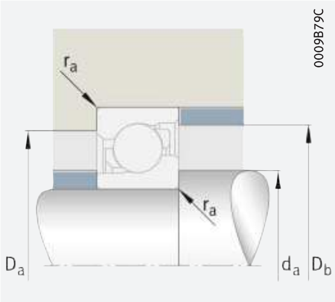


With seal 2RS

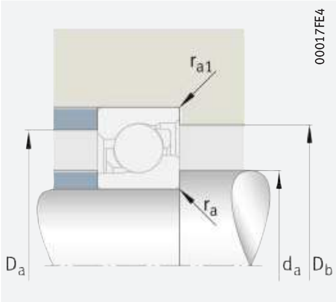
d = 10 – 20 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤293 | 1.12 ➤293 | 1.13 X-life ➤285
			N	N	N	min^{-1}	min^{-1}	≈ kg	
10	30	9	5 300	2 600	174	34 500	22 600	0,033	**7200-B-XL-JP**
	30	9	5 300	2 600	174	34 500	22 600	0,032	**7200-B-XL-TVP**
	30	9	5 300	2 600	174	16 100	–	0,037	**7200-B-XL-2RS-TVP**
12	32	10	7 400	3 550	241	30 000	21 100	0,037	**7201-B-XL-JP**
	32	10	7 400	3 550	241	30 000	21 100	0,038	**7201-B-XL-TVP**
	32	10	7 400	3 550	241	14 800	–	0,037	**7201-B-XL-2RS-TVP**
	37	12	11 400	5 300	355	25 500	16 300	0,066	**7301-B-XL-JP**
	37	12	11 400	5 300	355	25 500	16 300	0,06	**7301-B-XL-TVP**
15	35	11	8 400	4 450	300	27 000	19 100	0,045	**7202-B-XL-JP**
	35	11	8 400	4 450	300	27 000	19 100	0,044	**7202-B-XL-TVP**
	35	11	8 400	4 450	300	12 800	–	0,048	**7202-B-XL-2RS-TVP**
	42	13	14 200	7 200	485	22 200	14 200	0,084	**7302-B-XL-JP**
	42	13	14 200	7 200	485	22 200	14 200	0,081	**7302-B-XL-TVP**
	42	13	14 200	7 200	485	11 100	–	0,082	**7302-B-XL-2RS-TVP**
17	40	12	10 500	5 700	380	23 400	17 100	0,067	**7203-B-XL-JP**
	40	12	10 500	5 700	380	23 400	17 100	0,065	**7203-B-XL-TVP**
	40	12	10 500	5 700	380	11 100	–	0,068	**7203-B-XL-2RS-TVP**
	47	14	17 600	9 000	610	19 600	12 800	0,117	**7303-B-XL-JP**
	47	14	17 600	9 000	610	19 600	12 800	0,11	**7303-B-XL-TVP**
	47	14	17 600	9 000	610	9 800	–	0,112	**7303-B-XL-2RS-TVP**
20	42	12	14 500	8 000	540	20 500	14 400	0,061	**7004-B-XL-TVP**
	42	12	14 500	8 000	540	9 800	–	0,061	**7004-B-XL-2RS-TVP**
	47	14	14 000	7 800	520	19 700	15 400	0,106	**7204-B-XL-JP**
	47	14	14 000	7 800	520	19 700	15 400	0,103	**7204-B-XL-TVP**
	47	14	14 000	7 800	520	9 500	–	0,107	**7204-B-XL-2RS-TVP**
	52	15	20 400	11 100	750	17 600	11 500	0,149	**7304-B-XL-JP**
	52	15	20 400	11 100	750	17 600	11 500	0,147	**7304-B-XL-TVP**
	52	15	20 400	11 100	750	8 600	–	0,147	**7304-B-XL-2RS-TVP**

medias ➤ *https://www.schaeffler.de/std/1DED*



Mounting dimensions

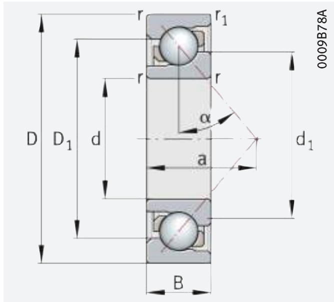


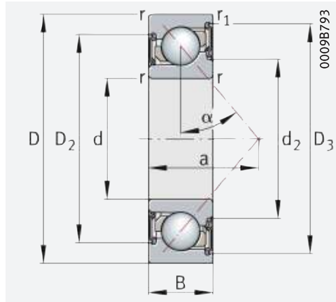
Mounting dimensions

Dimensions									Nominal contact angle	Mounting dimensions				
d	r	r_1	D_1	D_2	D_3	d_1	d_2	a	α	d_a	D_a	D_b	r_a	r_{a1}
	min.	min.	≈	≈	≈	≈	≈	≈	°	min.	max.	max.	max.	max.
10	0,6	0,3	22	–	–	18,3	–	13	40	14,2	25,8	27,6	0,6	0,3
	0,6	0,3	22	–	–	18,3	–	13	40	14,2	25,8	27,6	0,6	0,3
	0,6	0,3	22	23,2	25,4	–	15,5	13	40	14,2	25,8	27,6	0,6	0,3
12	0,6	0,3	24,6	–	–	19,8	–	14	40	16,2	27,8	29,6	0,6	0,3
	0,6	0,3	24,6	–	–	19,8	–	14	40	16,2	27,8	29,6	0,6	0,3
	0,6	0,3	24,6	25,9	28,8	–	17	14	40	16,2	27,8	29,6	0,6	0,3
	1	0,6	27,2	–	–	22,3	–	16	40	17,6	31,4	32,8	1	0,6
	1	0,6	27,2	–	–	22,3	–	16	40	17,6	31,4	32,8	1	0,6
15	0,6	0,3	27,6	–	–	22,8	–	16	40	19,2	30,8	32,6	0,6	0,3
	0,6	0,3	27,6	–	–	22,8	–	16	40	19,2	30,8	32,6	0,6	0,3
	0,6	0,3	27,6	29,2	32,1	–	19,7	16	40	19,2	30,8	32,6	0,6	0,3
	1	0,6	31,7	–	–	26	–	18	40	20,6	36,4	37,8	1	0,6
	1	0,6	31,7	–	–	26	–	18	40	20,6	36,4	37,8	1	0,6
	1	0,6	31,7	33,3	38,1	–	22,9	18	40	20,6	36,4	37,8	1	0,6
17	0,6	0,3	31,5	–	–	26	–	18	40	21,2	35,8	37,6	0,6	0,6
	0,6	0,3	31,5	–	–	26	–	18	40	21,2	35,8	37,6	0,6	0,6
	0,6	0,3	31,5	33,1	36,3	–	22,9	18	40	21,2	35,8	37,6	0,6	0,6
	1	0,6	35,5	–	–	29,2	–	20	40	22,6	41,4	42,8	1	0,6
	1	0,6	35,5	–	–	29,2	–	20	40	22,6	41,4	42,8	1	0,6
	1	0,6	35,5	37,2	42,6	–	26,1	20	40	22,6	41,4	42,8	1	0,6
20	0,6	0,3	34,8	–	–	28,9	–	12	40	23,2	38,8	40	0,6	0,3
	0,6	0,3	34,8	35,5	39,8	–	26,5	12	40	23,2	38,8	40	0,6	0,3
	1	0,6	37	–	–	30,5	–	21	40	25,6	41,4	42,8	1	0,6
	1	0,6	37	–	–	30,5	–	21	40	25,6	41,4	42,8	1	0,6
	1	0,6	37	39,2	43	–	26,8	21	40	25,6	41,4	42,8	1	0,6
	1,1	0,6	39,7	–	–	33	–	23	40	27	45	47,8	1	0,6
	1,1	0,6	39,7	–	–	33	–	23	40	27	45	47,8	1	0,6
	1,1	0,6	39,7	41,4	47,1	–	30	23	40	27	45	47,8	1	0,6

Angular contact ball bearings

Single row



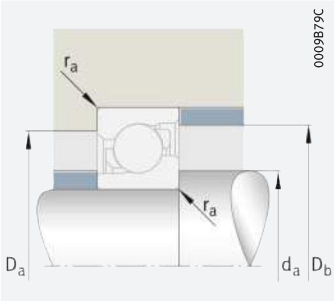


With seal 2RS

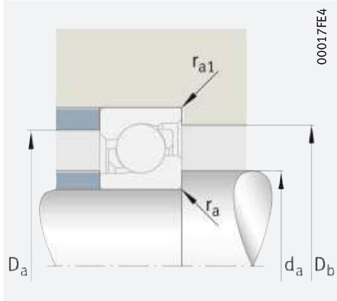
d = 25 – 35 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤293 | 1.12 ➤293 | 1.13 X-life ➤285
			N	N	N	min^{-1}	min^{-1}	≈ kg	
25	47	12	16 000	9 900	670	18 100	12 000	0,071	**7005-B-XL-TVP**
	47	12	16 000	9 900	670	7 900	–	0,071	**7005-B-XL-2RS-TVP**
	52	15	15 300	9 000	600	17 400	13 700	0,13	**7205-B-XL-JP**
	52	15	15 300	9 000	600	17 400	13 700	0,127	**7205-B-XL-TVP**
	52	15	15 300	9 000	600	8 000	–	0,132	**7205-B-XL-2RS-TVP**
	62	17	28 000	15 800	1 070	14 300	9 800	0,242	**7305-B-XL-JP**
	62	17	28 000	15 800	1 070	14 300	9 800	0,223	**7305-B-XL-TVP**
	62	17	28 000	15 800	1 070	7 100	–	0,231	**7305-B-XL-2RS-TVP**
	80	21	43 500	26 000	1 750	15 100	7 500	0,585	**7405-B-XL-MP**
30	42	7	5 600	4 550	295	20 600	9 600	0,026	**71806-B-TVH**
	55	13	19 900	13 400	900	15 200	10 200	0,109	**7006-B-XL-TVP**
	55	13	19 900	13 400	900	6 500	–	0,109	**7006-B-XL-2RS-TVP**
	62	16	21 700	14 100	950	14 400	11 200	0,203	**7206-B-XL-JP**
	62	16	21 700	14 100	950	14 400	11 200	0,197	**7206-B-XL-TVP**
	62	16	21 700	14 100	950	6 500	–	0,204	**7206-B-XL-2RS-TVP**
	72	19	35 500	22 100	1 490	12 300	8 600	0,362	**7306-B-XL-JP**
	72	19	35 500	22 100	1 490	12 300	8 600	0,341	**7306-B-XL-TVP**
	72	19	35 500	22 100	1 490	6 000	–	0,341	**7306-B-XL-2RS-TVP**
	90	23	51 000	30 500	2 050	13 100	6 800	0,791	**7406-B-XL-MP**
35	47	7	6 000	5 300	350	18 100	8 200	0,029	**71807-B-TVH**
	62	14	24 300	17 200	1 160	13 400	9 000	0,14	**7007-B-XL-TVP**
	62	14	24 300	17 200	1 160	6 000	–	0,14	**7007-B-XL-2RS-TVP**
	72	17	28 000	19 000	1 280	12 200	9 600	0,29	**7207-B-XL-JP**
	72	17	28 000	19 000	1 280	12 200	9 600	0,282	**7207-B-XL-TVP**
	72	17	28 000	19 000	1 280	5 600	–	0,292	**7207-B-XL-2RS-TVP**
	80	21	43 000	27 500	1 860	10 800	7 900	0,48	**7307-B-XL-JP**
	80	21	43 000	27 500	1 860	10 800	7 900	0,48	**7307-B-XL-TVP**
	80	21	43 000	27 500	1 860	5 300	–	0,477	**7307-B-XL-2RS-TVP**
	100	25	65 000	43 000	2 900	11 000	5 400	1,014	**7407-B-XL-MP**

medias ➤ *https://www.schaeffler.de/std/1DEE*



Mounting dimensions

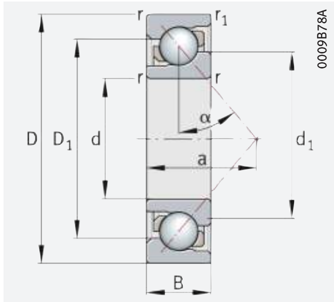


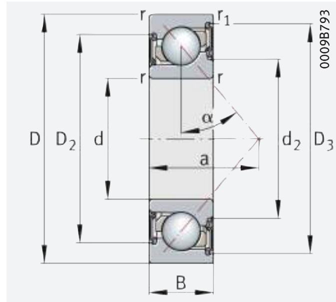
Mounting dimensions

Dimensions									Nominal contact angle	Mounting dimensions				
d	r	r_1	D_1	D_2	D_3	d_1	d_2	a	α	d_a	D_a	D_b	r_a	r_{a1}
	min.	min.	≈	≈	≈	≈	≈	≈	°	min.	max.	max.	max.	max.
25	0,6	0,3	39,8	–	–	33,9	–	21	40	28,2	43,8	45	0,6	0,3
	0,6	0,3	39,8	40,5	44,8	–	31,5	21	40	28,2	43,8	45	0,6	0,3
	1	0,6	42	–	–	35,5	–	24	40	30,6	46,4	47,8	1	0,6
	1	0,6	42	–	–	35,5	–	24	40	30,6	46,4	47,8	1	0,6
	1	0,6	42	44,1	48	–	31,8	24	40	30,6	46,4	47,8	1	0,6
	1,1	0,6	48	–	–	39,9	–	27	40	32	55	57,8	1	0,6
	1,1	0,6	48	–	–	39,9	–	27	40	32	55	57,8	1	0,6
	1,1	0,6	48	50,3	57,1	–	36,2	27	40	32	55	57,8	1	0,6
	1,5	1	57,9	–	–	48,2	–	33	40	36	69	74,4	1,5	1
30	0,3	0,2	37,3	–	–	34,7	–	18,6	40	32	40	40	0,3	0,2
	1	0,6	47,1	–	–	41,3	–	24	40	34,6	50,4	51,8	1	0,6
	1	0,6	47,1	47,7	51,9	–	38	24	40	34,6	50,4	51,8	1	0,6
	1	0,6	49,5	–	–	43,2	–	27	40	35,6	56,4	57,8	1	0,6
	1	0,6	49,5	–	–	43,2	–	27	40	35,6	56,4	57,8	1	0,6
	1	0,6	49,5	51,7	57,1	–	39,5	27	40	35,6	56,4	57,8	1	0,6
	1,1	0,6	55,9	–	–	47,1	–	31	40	37	65	67,8	1	0,6
	1,1	0,6	55,9	–	–	47,1	–	31	40	37	65	67,8	1	0,6
	1,1	0,6	55,9	58,5	65,9	–	42,7	31	40	37	65	67,8	1	0,6
	1,5	1	66	–	–	55,3	–	37	40	41	79	84,4	1,5	1
35	0,3	0,2	42,3	–	–	39,7	–	20,7	40	37	45	45,6	0,3	0,2
	1	0,6	53,4	–	–	47	–	27	40	39,6	57,4	58,8	1	0,6
	1	0,6	53,4	54	58,9	–	43,6	27	40	39,6	57,4	58,8	1	0,6
	1,1	0,6	57,6	–	–	50,2	–	31	40	42	65	67,8	1	0,6
	1,1	0,6	57,6	–	–	50,2	–	31	40	42	65	67,8	1	0,6
	1,1	0,6	57,6	60,2	66,5	–	45,8	31	40	42	65	67,8	1	0,6
	1,5	1	63	–	–	53,1	–	35	40	44	71	74,4	1,5	1
	1,5	1	63	–	–	53,1	–	35	40	44	71	74,4	1,5	1
	1,5	1	63	65,6	73,9	–	48,7	35	40	44	71	74,4	1,5	1
	1,5	1	79,8	–	–	66,7	–	41	40	46	94,4	100	1,5	1

Angular contact ball bearings

Single row



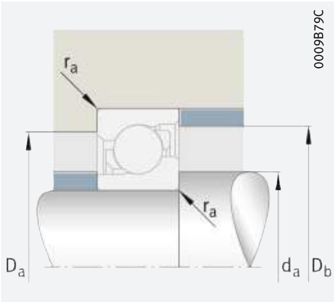


With seal 2RS

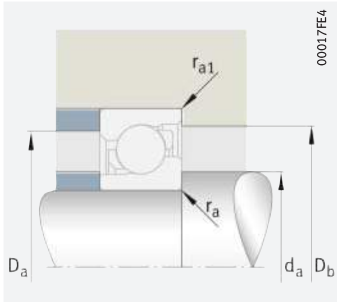
d = 40 – 55 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤293|1.12 ➤293|1.13 X-life ➤285
			N	N	N	min^{-1}	min^{-1}	≈ kg	
40	52	7	6 300	5 800	395	16 200	7 200	0,033	**71808-B-TVH**
	68	15	28 000	20 300	1 370	12 100	8 400	0,176	**7008-B-XL-TVP**
	68	15	28 000	20 300	1 370	5 200	–	0,17	**7008-B-XL-2RS-TVP**
	80	18	34 000	23 500	1 580	10 900	8 600	0,372	**7208-B-XL-JP**
	80	18	34 000	23 500	1 580	10 900	8 600	0,367	**7208-B-XL-TVP**
	80	18	34 000	23 500	1 580	5 000	–	0,379	**7208-B-XL-2RS-TVP**
	90	23	53 000	34 500	2 320	9 500	7 100	0,646	**7308-B-XL-JP**
	90	23	53 000	34 500	2 320	9 500	7 100	0,61	**7308-B-XL-TVP**
	90	23	53 000	34 500	2 320	4 650	–	0,61	**7308-B-XL-2RS-TVP**
	110	27	75 000	50 000	3 400	9 900	5 000	1,338	**7408-B-XL-MP**
45	58	7	6 600	6 500	450	14 500	6 300	0,041	**71809-B-TVH**
	85	19	37 500	27 000	1 810	10 000	8 000	0,411	**7209-B-XL-JP**
	85	19	37 500	27 000	1 810	10 000	8 000	0,405	**7209-B-XL-TVP**
	85	19	37 500	27 000	1 810	4 550	–	0,405	**7209-B-XL-2RS-TVP**
	100	25	65 000	43 000	2 900	8 400	6 500	0,937	**7309-B-XL-JP**
	100	25	65 000	43 000	2 900	8 400	6 500	0,937	**7309-B-XL-TVP**
	120	29	86 000	61 000	4 100	9 100	4 650	1,684	**7409-B-XL-MP**
50	65	7	7 000	7 400	520	12 900	5 400	0,058	**71810-B-TVH**
	90	20	39 000	28 500	1 920	9 300	7 600	0,466	**7210-B-XL-JP**
	90	20	39 000	28 500	1 920	9 300	7 600	0,456	**7210-B-XL-TVP**
	90	20	39 000	28 500	1 920	4 200	–	0,468	**7210-B-XL-2RS-TVP**
	110	27	75 000	50 000	3 400	7 600	6 100	1,13	**7310-B-XL-JP**
	110	27	75 000	50 000	3 400	7 600	6 100	1,05	**7310-B-XL-TVP**
	130	31	96 000	69 000	4 650	8 300	4 400	2,054	**7410-B-XL-MP**
55	72	9	11 800	11 800	760	11 400	5 600	0,084	**71811-B-TVH**
	100	21	49 000	38 500	2 600	8 300	6 800	0,645	**7211-B-XL-JP**
	100	21	49 000	38 500	2 600	8 300	6 800	0,604	**7211-B-XL-TVP**
	120	29	86 000	61 000	4 100	7 000	5 600	1,46	**7311-B-XL-JP**
	120	29	86 000	61 000	4 100	7 000	5 600	1,38	**7311-B-XL-TVP**
	140	33	110 000	82 000	5 400	7 700	4 150	2,64	**7411-B-XL-MP**

medias ➤ *https://www.schaeffler.de/std/1DEF*



Mounting dimensions

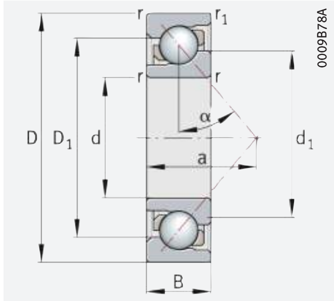


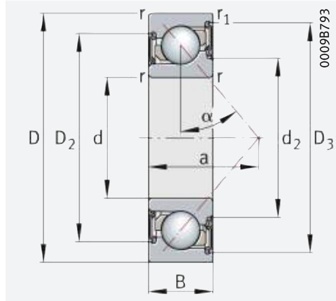
Mounting dimensions

Dimensions									Nominal contact angle	Mounting dimensions				
d	r	r_1	D_1	D_2	D_3	d_1	d_2	a	α	d_a	D_a	D_b	r_a	r_{a1}
	min.	min.	≈	≈	≈	≈	≈	≈	°	min.	max.	max.	max.	max.
40	0,3	0,2	47,3	–	–	44,7	–	22,8	40	42	50	50	0,3	0,2
	1	0,6	58,8	–	–	51,9	–	30	40	44,6	63,4	64,8	1	0,6
	1	0,6	58,8	59,4	65	–	48,3	30	40	44,6	63,4	64,8	1	0,6
	1,1	0,6	64,4	–	–	56,4	–	34	40	47	73	75,8	1	0,6
	1,1	0,6	64,4	–	–	56,4	–	34	40	47	73	75,8	1	0,6
	1,1	0,6	64,4	67	73,8	–	52	34	40	47	73	75,8	1	0,6
	1,5	1	71,3	–	–	60	–	39	40	49	81	84,4	1,5	1
	1,5	1	71,3	–	–	60	–	39	40	49	81	84,4	1,5	1
	1,5	1	71,3	73,9	83,3	–	55,6	39	40	49	81	84,4	1,5	1
	2	1	87,6	–	–	73,1	–	45	40	53	97	104,4	2	1
45	0,3	0,2	52,8	–	–	50,2	–	25,1	40	47	56	56	0,3	0,2
	1,1	0,6	69,8	–	–	61,2	–	37	40	52	78	80,8	1	0,6
	1,1	0,6	69,8	–	–	61,2	–	37	40	52	78	80,8	1	0,6
	1,1	0,6	69,8	72,4	79,6	–	56,8	37	40	52	78	80,8	1	0,6
	1,5	1	79,8	–	–	66,7	–	43	40	54	91	94,4	1,5	1
	1,5	1	79,8	–	–	66,7	–	43	40	54	91	94,4	1,5	1
	2	1	95,3	–	–	80,3	–	49	40	58	107	114,4	2	1
50	0,3	0,2	59,3	–	–	56,7	–	27,8	40	52	63	63	0,3	0,2
	1,1	0,6	74,8	–	–	66,3	–	39	40	57	83	85,8	1	0,6
	1,1	0,6	74,8	–	–	66,3	–	39	40	57	83	85,8	1	0,6
	1,1	0,6	74,8	77,4	84,6	–	61,8	39	40	57	83	85,8	1	0,6
	2	1	87,6	–	–	73,1	–	47	40	61	99	104,4	2	1
	2	1	87,6	–	–	73,1	–	47	40	61	99	104,4	2	1
	2,1	1,1	103,4	–	–	87,3	–	53	40	64	116	121	2,1	1
55	0,3	0,2	65,3	–	–	61,7	–	31,1	40	57	70	70	0,3	0,2
	1,5	1	83	–	–	72,6	–	43	40	64	91	94,4	1,5	1
	1,5	1	83	–	–	72,6	–	43	40	64	91	94,4	1,5	1
	2	1	95,3	–	–	80,3	–	51	40	66	109	114,4	2	1
	2	1	95,3	–	–	80,3	–	51	40	66	109	114,4	2	1
	2,1	1,1	111,5	–	–	95,3	–	57	40	69	126	131	2,1	1

Angular contact ball bearings

Single row



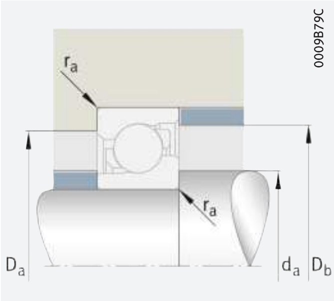


With seal 2RS

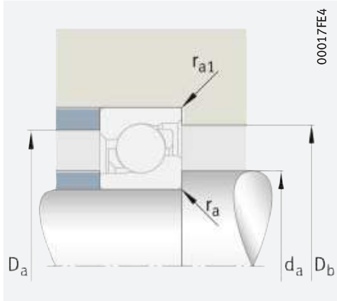
d = 60 – 80 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤293 | 1.12 ➤293 | 1.13 X-life ➤285
			N	N	N	min^{-1}	min^{-1}	≈ kg	
60	78	10	12 300	12 800	840	10 500	5 400	0,11	**71812-B-TVH**
	110	22	59 000	45 000	3 050	7 500	6 200	0,782	**7212-B-XL-JP**
	110	22	59 000	45 000	3 050	7 500	6 200	0,808	**7212-B-XL-TVP**
	110	22	59 000	45 000	3 050	3 450	–	0,78	**7212-B-XL-2RS-TVP**
	130	31	96 000	69 000	4 650	6 400	5 300	1,74	**7312-B-XL-JP**
	130	31	96 000	69 000	4 650	6 400	5 300	1,71	**7312-B-XL-TVP**
	150	35	126 000	93 000	6 000	7 100	3 950	3,106	**7412-B-XL-MP**
65	85	10	15 200	15 800	970	9 600	4 850	0,13	**71813-B-TVH**
	120	23	67 000	55 000	3 700	6 900	5 700	1,08	**7213-B-XL-JP**
	120	23	67 000	55 000	3 700	6 900	5 700	1	**7213-B-XL-TVP**
	140	33	110 000	82 000	5 400	5 900	5 000	2,22	**7313-B-XL-JP**
	140	33	110 000	82 000	5 400	5 900	5 000	2,12	**7313-B-XL-TVP**
	160	37	140 000	107 000	6 700	6 600	3 800	3,709	**7413-B-XL-MP**
70	90	10	15 800	17 200	1 070	9 000	4 500	0,14	**71814-B-TVH**
	125	24	74 000	62 000	4 200	6 500	5 400	1,17	**7214-B-XL-JP**
	125	24	74 000	62 000	4 200	6 500	5 400	1,08	**7214-B-XL-TVP**
	125	24	74 000	62 000	4 200	3 000	–	1,081	**7214-B-XL-2RS-TVP**
	150	35	126 000	93 000	6 000	5 500	4 750	2,76	**7314-B-XL-JP**
	150	35	126 000	93 000	6 000	5 500	4 750	2,58	**7314-B-XL-TVP**
	180	42	167 000	138 000	8 100	5 800	3 450	5,386	**7414-B-XL-MP**
75	95	10	16 200	18 100	1 140	8 500	4 150	0,15	**71815-B-TVH**
	130	25	73 000	62 000	4 100	6 300	5 300	1,25	**7215-B-XL-JP**
	130	25	73 000	62 000	4 100	6 300	5 300	1,16	**7215-B-XL-TVP**
	160	37	140 000	107 000	6 700	5 100	4 500	3,29	**7315-B-XL-JP**
	160	37	140 000	107 000	6 700	5 100	4 500	3,1	**7315-B-XL-TVP**
	190	45	167 000	138 000	8 100	5 800	3 750	6,7	**7415-B-XL-MP**
80	100	10	16 500	19 100	1 200	8 000	3 900	0,155	**71816-B-TVH**
	140	26	85 000	72 000	4 650	5 800	4 950	1,53	**7216-B-XL-JP**
	140	26	85 000	72 000	4 650	5 800	4 950	1,42	**7216-B-XL-TVP**
	170	39	155 000	124 000	7 500	4 750	4 250	3,86	**7316-B-XL-JP**
	170	39	155 000	124 000	7 500	4 750	4 250	3,66	**7316-B-XL-TVP**
	200	48	200 000	169 000	9 600	5 300	3 600	7,477	**7416-B-XL-MP**

medias ➤ *https://www.schaeffler.de/std/1DF0*



Mounting dimensions

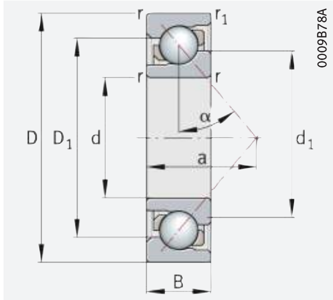


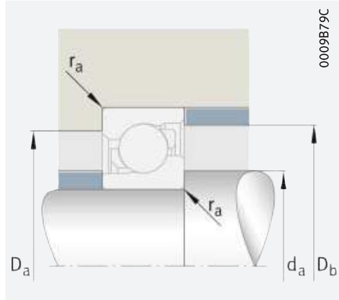
Mounting dimensions

Dimensions									Nominal contact angle	Mounting dimensions				
d	r	r_1	D_1	D_2	D_3	d_1	d_2	a	α	d_a	D_a	D_b	r_a	r_{a1}
	min.	min.	≈	≈	≈	≈	≈	≈	°	min.	max.	max.	max.	max.
60	0,3	0,2	70,8	–	–	67,2	–	33,9	40	62	76	76,6	0,3	0,2
	1,5	1	90,8	–	–	80,3	–	47	40	69	101	104,4	1,5	1
	1,5	1	90,8	–	–	80,3	–	47	40	69	101	104,4	1,5	1
	1,5	1	90,8	94,4	103,4	–	75,3	47	40	69	101	104,4	1,5	1
	2,1	1,1	103,4	–	–	87,3	–	55	40	72	118	123	2,1	1
	2,1	1,1	103,4	–	–	87,3	–	55	40	72	118	123	2,1	1
	2,1	1,1	119,6	–	–	102,3	–	62	40	74	136	141	2,1	1
65	0,6	0,3	77	–	–	73	–	36,5	40	68,2	81,8	83	0,6	0,3
	1,5	1	98,9	–	–	86,3	–	51	40	74	111	114,4	1,5	1
	1,5	1	98,9	–	–	86,3	–	51	40	74	111	114,4	1,5	1
	2,1	1,1	111,5	–	–	95,3	–	60	40	77	128	133	2,1	1
	2,1	1,1	111,5	–	–	95,3	–	60	40	77	128	133	2,1	1
	2,1	1,1	128	–	–	109,2	–	66	40	79	146	151	2,1	1
70	0,6	0,3	82	–	–	78	–	38,5	40	73,2	86,8	88	0,6	0,3
	1,5	1	104	–	–	92,3	–	53	40	79	116	119,4	1,5	1
	1,5	1	104	–	–	92,3	–	53	40	79	116	119,4	1,5	1
	1,5	1	104	107,6	117,9	–	87,3	53	40	79	116	119,4	1,5	1
	2,1	1,1	119,6	–	–	102,3	–	64	40	82	138	143	2,1	1
	2,1	1,1	119,6	–	–	102,3	–	64	40	82	138	143	2,1	1
	3	1,1	144,3	–	–	123,1	–	73	40	86	164	171	2,5	1
75	0,6	0,3	87	–	–	83	–	40,7	40	78,2	91,8	93	0,6	0,3
	1,5	1	109,2	–	–	96,5	–	56	40	84	121	124,4	1,5	1
	1,5	1	109,2	–	–	96,5	–	56	40	84	121	124,4	1,5	1
	2,1	1,1	128	–	–	109,2	–	68	40	87	148	153	2,1	1
	2,1	1,1	128	–	–	109,2	–	68	40	87	148	153	2,1	1
	3	1,1	144,3	–	–	123,1	–	78	40	91	174	181	2,5	1
80	0,6	0,3	92	–	–	88	–	42,8	40	85,2	96,8	98	0,6	0,3
	2	1	117,2	–	–	102,9	–	59	40	91	129	134,4	2	1
	2	1	117,2	–	–	102,9	–	59	40	91	129	134,4	2	1
	2,1	1,1	136,7	–	–	115,7	–	72	40	92	158	163	2,1	1
	2,1	1,1	136,7	–	–	115,7	–	72	40	92	158	163	2,1	1
	3	1,1	153,9	–	–	129	–	83	40	96	184	191	2,5	1

Angular contact ball bearings

Single row



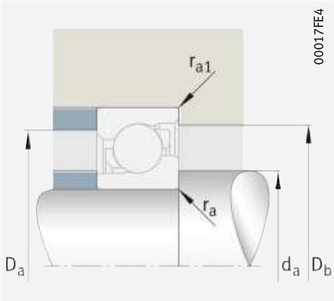


Mounting dimensions

d = 85 – 180 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	➤293|1.12 ➤293|1.13 X-life ➤285
85	150	28	97 000	86 000	5 300	5 400	4 750	1,94	**7217-B-XL-JP**
	150	28	97 000	86 000	5 300	5 400	4 750	1,82	**7217-B-XL-TVP**
	180	41	167 000	138 000	8 100	4 450	4 100	4,4	**7317-B-XL-JP**
	180	41	167 000	138 000	8 100	4 450	4 100	4,26	**7317-B-XL-TVP**
90	160	30	114 000	98 000	5 900	5 000	4 550	2,38	**7218-B-XL-JP**
	160	30	114 000	98 000	5 900	5 000	4 550	2,21	**7218-B-XL-TVP**
	190	43	180 000	155 000	8 800	4 200	3 900	5,14	**7318-B-XL-JP**
	190	43	180 000	155 000	8 800	4 200	3 900	5	**7318-B-XL-TVP**
95	170	32	123 000	106 000	6 200	4 700	4 450	2,64	**7219-B-XL-TVP**
	200	45	189 000	167 000	9 300	4 000	3 800	5,93	**7319-B-XL-JP**
	200	45	189 000	167 000	9 300	4 000	3 800	5,78	**7319-B-XL-TVP**
100	180	34	148 000	132 000	7 500	4 400	4 200	3,45	**7220-B-XL-JP**
	180	34	142 000	124 000	7 100	4 400	4 250	3,17	**7220-B-XL-TVP**
	215	47	214 000	197 000	10 600	3 700	3 550	7,38	**7320-B-XL-JP**
	215	47	214 000	197 000	10 600	3 700	3 550	7,16	**7320-B-XL-TVP**
105	190	36	155 000	142 000	7 900	5 400	4 100	4,18	**7221-B-XL-MP**
	225	49	225 000	214 000	11 200	4 600	3 400	9,3	**7321-B-XL-MP**
110	200	38	167 000	154 000	8 300	3 950	3 950	4,7	**7222-B-XL-JP**
	200	38	167 000	154 000	8 300	3 950	3 950	4,44	**7222-B-XL-TVP**
	240	50	250 000	245 000	12 500	3 300	3 150	9,97	**7322-B-XL-JP**
	240	50	250 000	245 000	12 500	3 300	3 150	9,74	**7322-B-XL-TVP**
120	215	40	182 000	178 000	9 300	3 650	3 700	5,4	**7224-B-XL-TVP**
	260	55	275 000	285 000	13 900	3 050	2 850	12,52	**7324-B-XL-TVP**
130	230	40	200 000	204 000	10 300	3 400	3 350	6,12	**7226-B-XL-TVP**
	280	58	305 000	325 000	15 400	2 800	2 600	15,1	**7326-B-XL-TVP**
140	250	42	214 000	231 000	11 100	4 050	3 100	8,55	**7228-B-XL-MP**
	300	62	310 000	375 000	12 700	3 350	2 400	20,5	**7328-B-MP**
150	270	45	245 000	275 000	12 800	3 750	2 850	10,9	**7230-B-XL-MP**
	320	65	340 000	430 000	14 200	3 150	2 200	24,8	**7330-B-MP**
160	290	48	241 000	305 000	10 400	3 500	2 650	13,5	**7232-B-MP**
170	310	52	270 000	355 000	11 600	3 250	2 440	16,7	**7234-B-MP**
180	320	52	280 000	380 000	12 100	3 100	2 290	17,503	**7236-B-MP**

medias ➤ *https://www.schaeffler.de/std/1DF1*



Mounting dimensions

Dimensions						Nominal contact angle	Mounting dimensions				
d	r	r_1	D_1	d_1	a	α	d_a	D_a	D_b	r_a	r_{a1}
	min.	min.	≈	≈	≈	°	min.	max.	max.	max.	max.
85	2	1	125	110,6	63	40	96	139	144,4	2	1
	2	1	125	110,6	63	40	96	139	144,4	2	1
	3	1,1	144	122	76	40	99	166	173	2,5	1
	3	1,1	144	122	76	40	99	166	173	2,5	1
90	2	1	133,4	117,5	67	40	101	149	154,4	2	1
	2	1	133,4	117,5	67	40	101	149	154,4	2	1
	3	1,1	152,4	130,1	80	40	104	176	183	2,5	1
	3	1,1	152,4	130,1	80	40	104	176	183	2,5	1
95	2,1	1,1	141,5	125,3	72	40	107	158	163	2,1	1
	3	1,1	159,5	137,1	84	40	109	186	193	2,5	1
	3	1,1	159,5	137,1	84	40	109	186	193	2,5	1
100	2,1	1,1	149,6	132,3	76	40	112	168	173	2,1	1
	2,1	1,1	149,6	132,3	76	40	112	168	173	2,1	1
	3	1,1	171,7	146,3	90	40	114	201	208	2,5	1
	3	1,1	171,7	146,3	90	40	114	201	208	2,5	1
105	2,1	1,1	157,7	138,2	80	40	117	178	183	2,1	1
	3	1,1	178,9	154	94	40	119	211	218	2,5	1
110	2,1	1,1	165,7	144,9	84	40	122	188	193	2,1	1
	2,1	1,1	165,7	144,9	84	40	122	188	193	2,1	1
	3	1,1	190,9	162,3	98	40	124	226	233	2,5	1
	3	1,1	190,9	162,3	98	40	124	226	233	2,5	1
120	2,1	1,1	178,9	157,2	90	40	132	203	208	2,1	1
	3	1,1	207,1	176,4	107	40	134	246	253	2,5	1
130	3	1,1	191,8	169,6	96	40	144	216	223	2,5	1
	4	1,5	222,5	188,5	115	40	147	263	271	3	1,5
140	3	1,1	207,5	183,5	103	40	154	236	243	2,5	1
	4	1,5	239,5	204,4	123	40	157	283	291	3	1,5
150	3	1,1	223,5	197,5	111	40	164	256	263	2,5	1
	4	1,5	255,8	218,3	131	40	167	303	311	3	1,5
160	3	1,1	238	212	118	40	174	276	283	2,5	1
170	4	1,5	255,8	227,4	127	40	187	293	301	3	1,5
180	4	1,5	265,8	237,4	131	40	197	303	311	3	1,5

2 Double row angular contact ball bearings

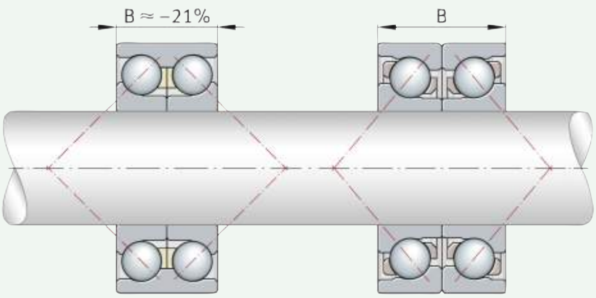
Double row angular contact ball bearings are particularly suitable where:

- the design envelope is not sufficient under high loads for a pair of single row angular contact ball bearings
- high radial and axial loads are acting simultaneously
- tilting moments must also be supported
- a relatively rigid bearing arrangement is required
- the bearing arrangement is to run quietly in addition to meeting the requirements stated above.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤280.

1
Double row angular contact ball bearing – comparison of design envelope with bearing set composed of single row angular contact ball bearings

B = *total width of bearing or bearing set*



2.1 Bearing design

Design variants

Double row angular contact ball bearings are available as:

- bearings of basic design ➤315| 2
- bearings with filling slot ➤315| 3
- bearings with split inner ring ➤316| 4
- X-life bearings ➤316.

Larger catalogue bearings and other bearing designs ➤ *GL 1*.

Bearings of basic design

Comparable with a pair of single row angular contact ball bearings

Double row bearings correspond in their structure to a pair of single row angular contact ball bearings in an O arrangement, but they are narrower to a certain extent. They differ in the size of the contact angle α and the design of the bearing rings. Due to the manufacturing processes used, open bearings, which are also available with sealing washers or sealing shields, can have turned recesses in the outer and/or inner ring for sealing washers or sealing shields.

Extensive and versatile range of product variants

Bearings of series 38..-B(-2RSR, -2Z), 30..-B(-2RSR, -2Z), 32..-B(-2RSR, -2Z), 32..-BD(-2HRS), 33..-B(-2RSR, -2Z), 33..BD(-2HRS) are self-retaining. They do not have filling slots in the end faces of the bearings rings ➤315| 2. Bearings of series 32..-BD and 33..-BD have an optimised internal construction.

In design terms, double row angular contact ball bearings thus fulfil the requirements for:

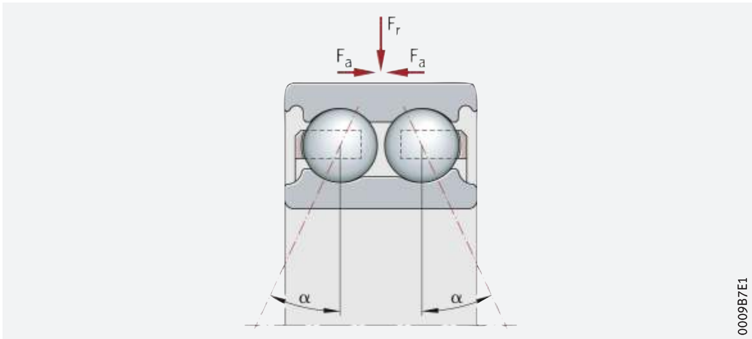
- supporting axial loads in both directions and high radial loads
- low-noise running
- versatile application.

✎ Nominal contact angle α = 25° or 30°

The nominal contact angle α in B designs is 25°, in the case of the BD variant, this is 30°.

Figure 2
Double row angular contact ball bearing of basic design

F_r = radial load
F_a = axial load
α = nominal contact angle



Bearings with filling slot

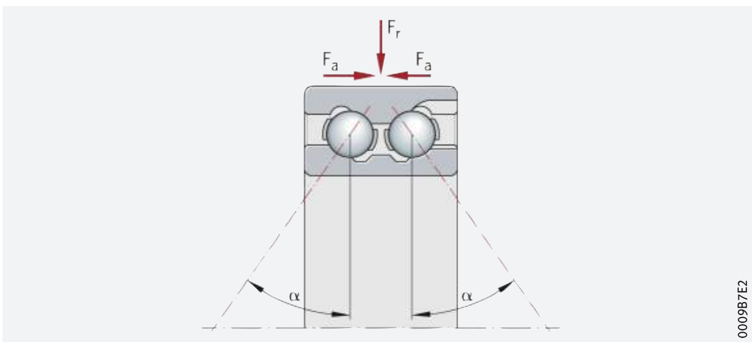
✎ Nominal contact angle α = 35°

Angular contact ball bearings of series 32 and 33 are self-retaining. They have filling slots on one end face of the bearing ring for filling the bearings with rolling elements ➤315|Figure 3. The nominal contact angle is α = 35°.

⚠ These series must be fitted such that the main load direction is supported by the row of balls without filling slots under axial load.

Figure 3
Double row angular contact ball bearing with filling slot

F_r = radial load
F_a = axial load
α = nominal contact angle



Bearings with split inner ring

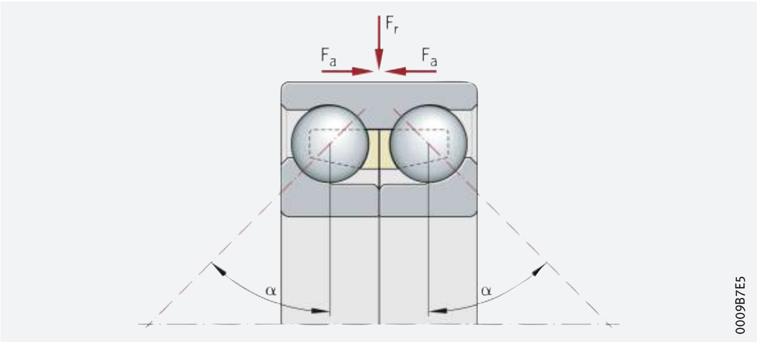
✎ Nominal contact angle α = 45°

In angular contact ball bearings of series 33..-DA, the inner ring is split ➤316|Figure 4. The inner rings are not self-retaining. Filling the bearings with a large number of balls – in conjunction with the internal design of the bearing and the contact angle of 45° – allows high alternating axial loads to be supported.

⚠ The inner ring halves are matched to the particular bearing and must not be interchanged with those of other bearings of the same size.

4
Double row angular contact ball bearing with split inner ring

F_r = *radial load*
F_a = *axial load*
α = *nominal contact angle*



X-life premium quality

Bearings of series 32..-BD and 33..-BD are X-life bearings ➤330|. These bearings exhibit considerably higher performance than standard double row angular contact ball bearings ➤316| 5. This is achieved, for example, through the modified internal construction, higher surface quality of the contact surfaces and optimised cage design, as well as through the improved quality of the steel and rolling elements.

Advantages

Increased customer benefits due to X-life

The technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings ➤316| 5
- quieter running
- running with reduced friction and greater energy efficiency
- lower heat generation in the bearing
- higher possible speeds
- lower lubricant consumption and, consequently, longer maintenance intervals
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

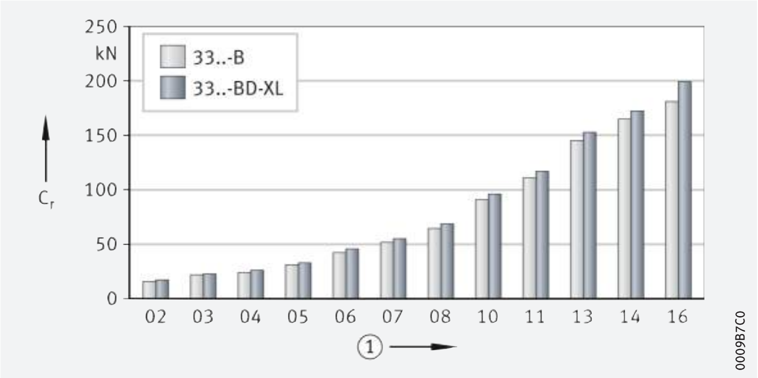
Suffix XL

X-life angular contact ball bearings include the suffix XL in the designation ➤322| 7, ➤323| 8 and ➤330|.

5
Comparison of basic dynamic load rating C_r – bearing series 33..-BD-XL, bore code 02 to 16, with a bearing which is not of X-life quality (33..-B)

C_r = *basic dynamic load rating*

① *Bore code*



Areas of application

Wide application range

Due to their special technical features, double row X-life angular contact ball bearings are highly suitable for bearing arrangements in:

- compressors
- fluid and hydraulic pumps
- automotive chassis and gearboxes
- industrial gearboxes
- agricultural vehicles
- elevators and packaging equipment
- heavy motorbikes
- machine tools
- textile machinery.

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤*10*.

2.2 Load carrying capacity

Capable of supporting axial loads in both directions and radial loads

In addition to high radial loads, double row angular contact ball bearings can also support axial forces in both directions and tilting moments ➤*315*|*2*. They are highly suitable for bearing arrangements with rigid axial guidance.

Contact angle and axial load carrying capacity

The bearings are available with α = 25°, 30°, 35° and 45° ➤*315*|*2* to ➤*316*|*4*. The axial load carrying capacity increases with the size of the contact angle. In bearings without filling slots, it is the same in both directions.

2.3 Compensation of angular misalignments

The angular adjustment facility is very limited

The bearings are not suitable for the compensation of angular misalignments. In addition, misalignments induce internal forces, which not only lead to higher temperatures, but also to a reduction in the bearing rating life.

2.4 Lubrication

Angular contact ball bearings sealed on both sides are maintenance-free

Open bearings and bearings with seals on both sides are greased using a high quality grease. Bearings sealed on both sides are maintenance-free for many applications, i.e. they do not require relubrication.

Open bearings must be lubricated

Angular contact ball bearings without seals and with seals on one side of series 32.., 33.., 33..-DA, 32..-BD and 33..-BD are preserved and not greased. These bearings must be lubricated with oil or grease.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

2.5 Sealing

✎ 2RS, 2RSR and 2HRS seals are contact designs

Series 38..-B, 30..-B, 32..-B and 33..-B with the suffix 2RS, 2RSR and 2HRS have lip seals in axial contact on both sides and in radial contact ➤322|▦5. Bearings with the suffix RS, HRS and RSR are sealed on one side with lip seals in axial and radial contact.

✎ 2Z sealing shields and 2RZ seals are non-contact designs

Bearing series with the suffix 2Z have sheet steel sealing shields on both sides. Bearings with the suffix 2RZ are fitted with rubberised gap seals on both sides.

✎ Open bearings

In the case of unsealed bearings, sealing must be carried out by the adjacent construction. The sealing system should reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

2.6 Speeds

✎ Limiting speeds and reference speeds in the product tables

The product tables give two speeds for most bearings ➤330|▦:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

!

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

The values given in the product tables are valid for oil lubrication in the case of bearings without seals or shields and for grease lubrication where bearings are supplied greased and with seals or shields.

✎ Values for grease lubrication

For grease lubrication, 75% of the value stated in the product tables is permissible in each case.

Reference speeds

✎ $n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

✎ Bearings with contact seals

For bearings with contact seals, no reference speeds are defined in accordance with DIN ISO 15312:2004. As a result, only the limiting speed n_G is given in the product tables for these bearings.

2.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

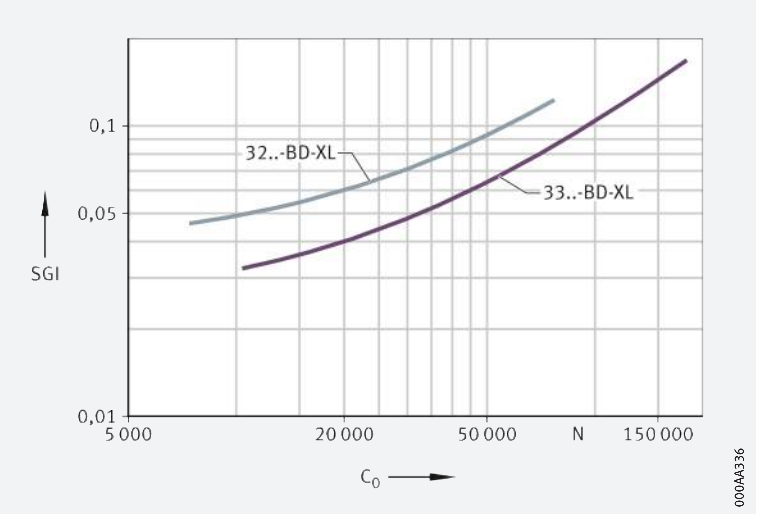
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- **medias** ➤ https://medias.schaeffler.com.

6
Schaeffler Noise Index for double row angular contact ball bearings

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



2.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and rolling elements
- the cage
- the lubricant
- the seals.

Possible operating temperatures of double row angular contact ball bearings ➤319|1.

1
Permissible temperature ranges

Operating temperature	Double row angular contact ball bearings, open		Double row angular contact ball bearings, sealed
	with sheet steel or brass cage	with polyamide cage PA66	
🌡	ungreased –30 °C to +150 °C	–30 °C to +120 °C, limited by the cage material	–30 °C to +110 °C, limited by the lubricant and seal material
	series 30, 38, 32..-BD and 33..-BD, D ≦ 90 mm, –30 °C to +120 °C		

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

2.9 Cages

✎ Solid cages made from brass and PA66, as well as sheet steel cages, are used as standard

Standard cages and additional cage designs for double row angular contact ball bearings are made from brass, polyamide or steel ➤320|▦2. Other cages are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass or sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦2
Cage, cage suffix, bore code

Bearing series	Solid cage made from polyamide PA66 TVH, TVP		Solid brass cage M, MA		Sheet steel cage –	
	standard	also available for	standard	also available for	standard	also available for
	Bore code					
32	–	–	19, 21, 22	18, 20	17, 18, 20	–
33	–	–	17, 19, 20, 22	18	14 to 16, 18	20
30..-B	up to 08	–	–	–	–	–
32..-B	00, 01, 14 to 18, 20	–	–	–	–	–
33..-B	01, 12	–	–	–	–	–
38..-B	00 to 12, 14, 16, 18, 20	–	–	–	–	–
32..-BD	–	02 to 13	–	–	02 to 13	–
33..-BD	–	02 to 11, 13, 14, 16	–	–	04 to 11, 13, 14	–
33..-DA	05	–	08, 10, 11, 15 to 22	05, 06, 07, 09, 12, 13, 14	06, 07, 09, 12, 13, 14	05

2.10 Internal clearance

Axial internal clearance – bearings with unsplit inner ring

Double row angular contact ball bearings with unsplit inner ring of the basic design have the axial internal clearance CN (group N) in accordance with DIN 628-3:2008 ➤321|▦3.

Bearings can also be supplied with an axial internal clearance which is larger or smaller than CN (C3, C4 or C2). In this case, please contact Schaeffler.

3
Axial internal clearance of double row angular contact ball bearings with unsplit inner ring

Nominal bore diameter d mm		Axial internal clearance							
		C2 (Group 2) µm		CN (Group N) µm		C3 (Group 3) µm		C4 (Group 4) µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	10	1	11	5	21	12	28	25	45
10	18	1	12	6	23	13	31	27	47
18	24	2	14	7	25	16	34	27	47
24	30	2	15	8	27	18	37	30	50
30	40	2	16	9	29	21	40	33	54
40	50	2	18	11	33	23	44	36	58
50	65	3	22	13	36	26	48	40	63
65	80	3	24	15	40	30	54	46	71
80	100	3	26	18	46	35	63	55	83
100	120	4	30	22	53	42	73	65	96
120	140	4	34	25	59	48	82	74	108

Axial internal clearance – bearings with split inner ring

Standard corresponds approximately to C3 for unsplit bearings

Bearings with a split inner ring are intended for higher axial loads. As a result, they generally also have a tighter fit than unsplit bearings. Their normal internal clearance corresponds approximately to the internal clearance group C3 for unsplit bearings ➤321 | 4.

4
Axial internal clearance of double row angular contact ball bearings with split inner ring

Nominal bore diameter d mm		Axial internal clearance					
		C2 (Group 2) µm		CN (Group N) µm		C3 (Group 3) µm	
over	incl.	min.	max.	min.	max.	min.	max.
24	30	8	27	16	35	27	46
30	40	9	29	18	38	30	50
40	50	11	33	22	44	36	58
50	65	13	36	25	48	40	63
65	80	15	40	29	54	46	71

2.11 Dimensions, tolerances

Dimension standards

DIN ISO

The main dimensions of double row angular contact ball bearings correspond to DIN 628-3:2008. Nominal dimensions of double row angular contact ball bearings ➤330 |.

Chamfer dimensions

DIN ISO

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤135 | 7.11. Nominal value of chamfer dimension ➤330 |.

Tolerances

DIN ISO

The tolerances for the dimensional and running accuracy of double row angular contact ball bearings correspond to tolerance class Normal in accordance with ISO 492:2014; the dimensional and running tolerances of bearings with the suffix BD correspond to the tolerance class 6 in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ➤122 | 8 and ➤124 | 11.

2.12 Suffixes

For a description of the suffixes used in this chapter ➤322|▦5 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦5
Suffixes and corresponding descriptions

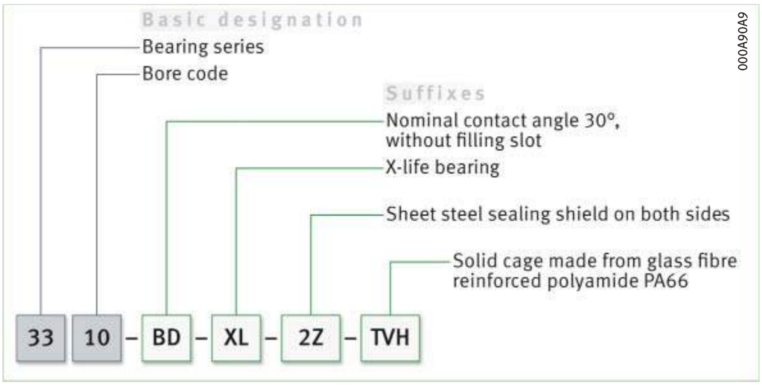
Suffix	Description of suffix	
B	Modified internal construction, nominal contact angle α = 25°, without filling slot	Standard
BD	Modified internal construction, nominal contact angle α = 30°, without filling slot	
C2	Axial internal clearance C2 (smaller than normal)	Available by agreement
C3	Axial internal clearance C3 (larger than normal)	
C4	Axial internal clearance C4 (larger than C3)	
DA	Inner ring split, nominal contact angle α = 45°	Standard
M	Solid brass cage, ball-guided	Standard, dependent on bore code
MA	Solid brass cage, guided on outer ring	
TVH	Solid cage made from glass fibre reinforced polyamide PA66, ball-guided	
2HRS	Contact seal on both sides, axial contact (lip seal)	Standard
2RS	Contact seal on both sides, axial contact (lip seal)	
2RSR	Contact seal on both sides, radial contact (lip seal)	
2RZ	Non-contact seal on both sides (rubberised gap seal)	
2Z	Non-contact sealing shield on both sides (sheet metal gap seal)	
HRS	Contact seal on one side, axial contact (lip seal)	Special design, available by agreement
RS	Contact seal on one side, axial contact (lip seal)	
RSR	Contact seal on one side, radial contact (lip seal)	
RZ	Non-contact seal on one side (rubberised gap seal)	
Z	Non-contact sealing shield on one side (sheet metal gap seal)	
XL	X-life bearing, dependent on bore code and bearing type	

2.13 Structure of bearing designation

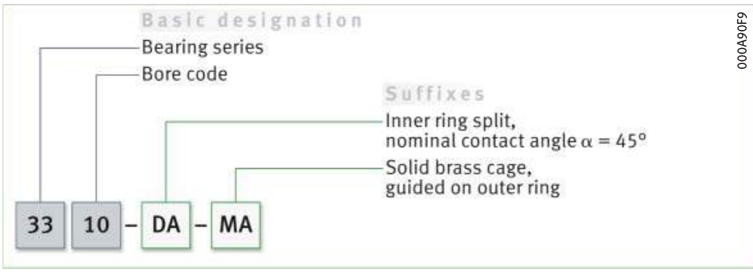
✎ *Examples of composition of bearing designation*

The designation of bearings follows a set model. Examples ➤322|⌂7 and ➤323|⌂8. The composition of designations is subject to DIN 623-1 ➤102|⌂10.

⌂7
Double row angular contact ball bearing of basic design: designation structure



8
Double row angular contact ball bearing with split inner ring: designation structure



2.14 Dimensioning

Equivalent dynamic bearing load

Valid for α = 25°, 30°, 35°, 45°

The calculation of P is dependent on the nominal contact angle α of the bearing, the load ratio F_a/F_r and the calculation factors from ➤323| 1 to ➤323| 8.

!

The further fundamental information on the calculation of the equivalent dynamic bearing load must be observed ➤294|1.14.

1
Equivalent dynamic load α = 25°

$$\frac{F_a}{F_r} \leqq 0{,}68 \quad \Rightarrow \quad P = F_r + 0{,}92 \cdot F_a$$

2
Equivalent dynamic load α = 25°

$$\frac{F_a}{F_r} > 0{,}68 \quad \Rightarrow \quad P = 0{,}67 \cdot F_r + 1{,}41 \cdot F_a$$

3
Equivalent dynamic load α = 30°

$$\frac{F_a}{F_r} \leqq 0{,}8 \quad \Rightarrow \quad P = F_r + 0{,}78 \cdot F_a$$

4
Equivalent dynamic load α = 30°

$$\frac{F_a}{F_r} > 0{,}8 \quad \Rightarrow \quad P = 0{,}63 \cdot F_r + 1{,}24 \cdot F_a$$

5
Equivalent dynamic load α = 35°

$$\frac{F_a}{F_r} \leqq 0{,}95 \quad \Rightarrow \quad P = F_r + 0{,}66 \cdot F_a$$

6
Equivalent dynamic load α = 35°

$$\frac{F_a}{F_r} > 0{,}95 \quad \Rightarrow \quad P = 0{,}6 \cdot F_r + 1{,}07 \cdot F_a$$

7
Equivalent dynamic load α = 45°

$$\frac{F_a}{F_r} \leqq 1{,}34 \quad \Rightarrow \quad P = F_r + 0{,}47 \cdot F_a$$

8
Equivalent dynamic load α = 45°

$$\frac{F_a}{F_r} > 1{,}34 \quad \Rightarrow \quad P = 0{,}54 \cdot F_r + 0{,}81 \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load.

Equivalent static bearing load

Valid for $\alpha = 25°, 30°, 35°, 45°$

The calculation of the equivalent static bearing load P_0 is dependent on the nominal contact angle α and the calculation factors ➤324 | 9 to ➤324 | 12.

9
Equivalent static load $\alpha = 25°$

$$P_0 = F_{0r} + 0{,}76 \cdot F_{0a}$$

10
Equivalent static load $\alpha = 30°$

$$P_0 = F_{0r} + 0{,}66 \cdot F_{0a}$$

11
Equivalent static load $\alpha = 35°$

$$P_0 = F_{0r} + 0{,}58 \cdot F_{0a}$$

12
Equivalent static load $\alpha = 45°$

$$P_0 = F_{0r} + 0{,}44 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load).

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤324 | 13.

13
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

2.15 Minimum load

In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/100$ is required

In order that no slippage occurs between the contact partners, the double row angular contact ball bearings must be constantly subjected to a sufficiently high load. Based on experience, a minimum radial load of the order of $P > C_{0r}/100$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

2.16 Design of bearing arrangements

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and thus also achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤326|▦6 to ➤326|▦8.

Radial location of bearings – fit recommendations

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158

Axial location of bearings – location methods

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings and retaining rings etc., are fundamentally suitable.

Dimensional, geometrical and running accuracy of the bearing seats

✎ For bearings with tolerance class Normal, a minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For double row angular contact ball bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7; with tolerance class 6, the shaft seat should correspond to a minimum of IT5 and the housing seat to a minimum of IT6. Guide values for the geometrical and positional tolerances of bearing seating surfaces ➤326|▦6, tolerances t_1 to t_3 in accordance with ➤168|11. Numerical values for IT grades ➤326|▦7.

6
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	
6	P6	Shaft	IT5	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	
		Housing	IT6	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	

7
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm							
	over **3**	**6**	**10**	**18**	**30**	**50**	**80**	**120**
	incl. **6**	**10**	**18**	**30**	**50**	**80**	**120**	**180**
	Values in µm							
IT3	2,5	2,5	3	4	4	5	6	8
IT4	4	4	5	6	7	8	10	12
IT5	5	6	8	9	11	13	15	18
IT6	8	9	11	13	16	19	22	25
IT7	12	15	18	21	25	30	35	40

Roughness of cylindrical bearing seats

✎ Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤326| 8.

8
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Mounting dimensions for the contact surfaces of bearing rings

✎ The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of abutment shoulders ➤330|. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

2.17 Mounting and dismounting

The mounting and dismounting options for angular contact ball bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎ Ensure that the bearings are not damaged during mounting

In the mounting of non-separable (self-retaining) angular contact ball bearings, the mounting forces must always be applied to the bearing ring with a tight fit.

Bearings with split inner ring

✎ Simplified mounting of bearings due to split inner ring

These angular contact ball bearings are not self-retaining. As a result, the outer ring with the ball and cage assembly can be mounted separately from the two inner ring halves. This gives simplified mounting of the bearings.

Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤ *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

2.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

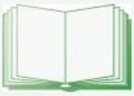
Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

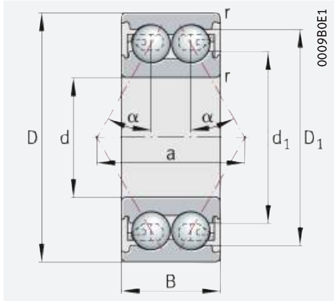
2.19 Further information



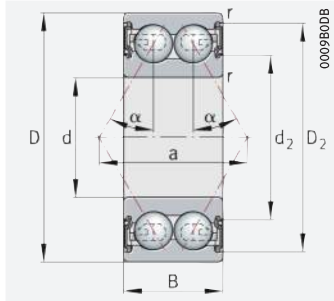
In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Angular contact ball bearings
Double row



38..-B, 30..-B, 32..-B, 33..-B,
32..-BD, 33..-BD, 32, 33

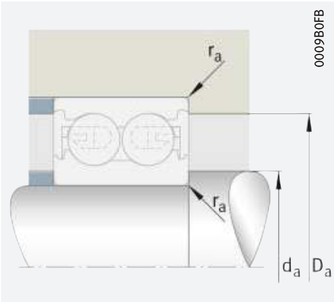


38..-B, 30..-B, 32..-B, 33..-B,
32..-BD, 33..-BD;
with seal 2HRS, 2RS, 2RSR, 2RZ, 2Z

d = 5 – 12 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322|2.12 ➤322|2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
5	14	7	1 780	940	47,5	51 000	31 500	0,005	**30/5-B-TVH**
	14	7	1 780	940	47,5	38 000	31 500	0,006	**30/5-B-2Z-TVH**
	14	7	1 780	940	47,5	30 500	–	0,006	**30/5-B-2RSR-TVH**
6	17	9	3 050	1 400	72	42 000	32 000	0,011	**30/6-B-TVH**
	17	9	3 050	1 400	72	31 500	32 000	0,011	**30/6-B-2Z-TVH**
	17	9	3 050	1 400	72	28 000	–	0,011	**30/6-B-2RSR-TVH**
7	19	10	3 650	1 690	86	39 500	31 500	0,01	**30/7-B-TVH**
	19	10	3 650	1 690	86	29 500	31 500	0,01	**30/7-B-2Z-TVH**
	19	10	3 650	1 690	86	25 500	–	0,01	**30/7-B-2RSR-TVH**
8	22	11	5 100	2 600	132	34 500	26 000	0,018	**30/8-B-TVH**
	22	11	5 100	2 600	132	26 000	26 000	0,018	**30/8-B-2Z-TVH**
	22	11	5 100	2 600	132	25 500	–	0,018	**30/8-B-2RSR-TVH**
10	19	7	2 080	1 370	70	40 500	21 000	0,008	**3800-B-TVH**
	19	7	2 080	1 370	70	30 500	21 000	0,008	**3800-B-2RZ-TVH**
	19	7	2 080	1 370	70	21 100	–	0,008	**3800-B-2RS-TVH**
	26	12	5 700	3 200	192	31 000	21 900	0,022	**3000-B-TVH**
	26	12	5 700	3 200	161	23 400	21 900	0,022	**3000-B-2RZ-TVH**
	26	12	5 700	3 200	161	18 100	–	0,022	**3000-B-2RS-TVH**
	30	14	7 800	4 450	226	21 100	21 000	0,052	**3200-B-TVH**
	30	14	7 800	4 450	226	21 100	21 000	0,05	**3200-B-2Z-TVH**
	30	14	7 800	4 450	226	16 100	–	0,053	**3200-B-2RS-TVH**
12	21	7	2 150	1 520	77	37 500	18 100	0,009	**3801-B-TVH**
	21	7	2 150	1 520	77	28 000	18 100	0,01	**3801-B-2RZ-TVH**
	21	7	2 150	1 520	77	17 500	–	0,01	**3801-B-2RS-TVH**
	28	12	6 100	3 700	188	29 500	19 300	0,025	**3001-B-TVH**
	28	12	6 100	3 700	188	22 000	19 300	0,032	**3001-B-2RZ-TVH**
	28	12	6 100	3 700	188	15 800	–	0,032	**3001-B-2RS-TVH**
	32	15,9	10 500	5 800	295	18 400	20 000	0,051	**3201-B-TVH**
	32	15,9	10 500	5 800	295	18 400	20 000	0,06	**3201-B-2Z-TVH**
	32	15,9	10 500	5 800	295	15 000	–	0,057	**3201-B-2RS-TVH**
	37	19	14 600	8 300	420	20 400	13 000	0,093	**3301-B-TVH**
	37	19	14 600	8 300	420	15 300	13 000	0,093	**3301-B-2Z-TVH**
	37	19	14 600	8 300	420	14 100	–	0,093	**3301-B-2RS-TVH**

medias ➤ *https://www.schaeffler.de/std/1D8D*

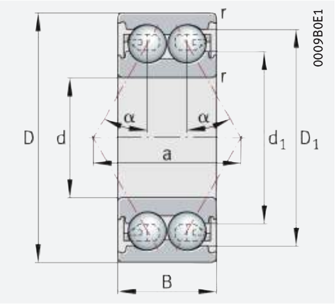


Mounting dimensions

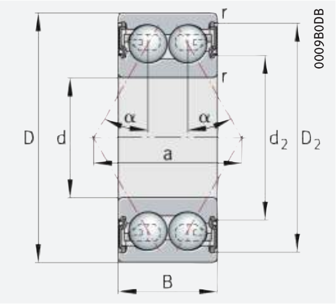
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
5	0,2	11,2	–	8,8	–	6,9	25	6,4	12,6	0,2
	0,2	–	12,7	–	8,5	6,9	25	6,4	12,6	0,2
	0,2	–	12,7	–	8,5	6,9	25	6,4	12,6	0,2
6	0,3	13,4	–	9,6	–	8,8	25	8	15	0,3
	0,3	–	14,8	–	8,3	8,8	25	8	15	0,3
	0,3	–	14,8	–	8,3	8,8	25	8	15	0,3
7	0,3	14,6	–	10,4	–	9,6	25	9	17	0,3
	0,3	–	16,5	–	9	9,6	25	9	17	0,3
	0,3	–	16,5	–	9	9,6	25	9	17	0,3
8	0,3	17,6	–	12,6	–	11,2	25	10	20	0,3
	0,3	–	19	–	10,5	11,2	25	10	20	0,3
	0,3	–	19	–	10,5	11,2	25	10	20	0,3
10	0,3	15,9	–	13,3	–	9	25	12	17	0,3
	0,3	–	16,7	–	12,2	9	25	12	17	0,3
	0,3	–	16,7	–	12,2	9	25	12	17	0,3
	0,3	20,6	–	15,8	–	12,6	25	12	24	0,3
	0,3	–	21,2	–	14,2	12,6	25	12	24	0,3
	0,3	–	21,2	–	14,2	12,3	25	12	24	0,3
	0,6	23	–	16,6	–	14,79	25	14,2	25,8	0,6
	0,6	–	24,9	–	15,5	14,79	25	14,2	25,8	0,6
	0,6	–	24,9	–	15,5	14,79	25	14,2	25,8	0,6
12	0,3	18	–	15,3	–	9,9	25	14	19	0,3
	0,3	–	18,9	–	14,2	9,9	25	14	19	0,3
	0,3	–	18,9	–	14,2	9,9	25	14	19	0,3
	0,3	22,5	–	17,6	–	13,5	25	14	26	0,3
	0,3	–	23,2	–	16,4	13,5	25	14	26	0,3
	0,3	–	23,2	–	16,4	13,5	25	14	26	0,3
	0,6	26	–	17,8	–	16,53	25	16,2	27,8	0,6
	0,6	–	27,8	–	17,1	16,53	25	16,2	27,8	0,6
	0,6	–	27,8	–	17,1	16,53	25	16,2	27,8	0,6
	1	30,5	–	21,7	–	19,8	25	17,6	31,4	1
	1	–	32,1	–	18,7	19,8	25	17,6	31,4	1
	1	–	32,1	–	18,7	19,8	25	17,6	31,4	1

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

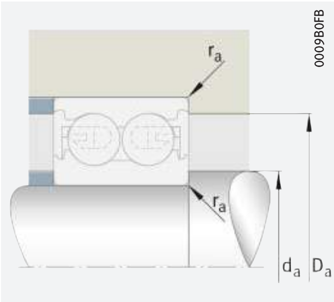


38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD; with seal 2HRS, 2RS, 2RSR, 2RZ, 2Z

d = 15 – 17 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322|2.12 ➤322|2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
15	24	7	2 080	1 560	79	33 500	14 900	0,01	**3802-B-TVH**
	24	7	2 080	1 560	79	25 000	14 900	0,012	**3802-B-2RZ-TVH**
	24	7	2 080	1 560	79	14 600	–	0,012	**3802-B-2RS-TVH**
	32	13	8 500	5 400	280	23 900	15 700	0,042	**3002-B-TVH**
	32	13	8 500	5 400	280	17 900	15 700	0,05	**3002-B-2RZ-TVH**
	32	13	8 500	5 400	280	13 000	–	0,05	**3002-B-2RS-TVH**
	35	15,9	12 600	7 400	500	22 300	18 500	0,066	**3202-BD-XL-TVH**
	35	15,9	12 600	7 400	500	16 700	18 500	0,065	**3202-BD-XL-2Z-TVH**
	35	15,9	12 600	7 400	500	16 700	–	0,065	**3202-BD-XL-2HRS-TVH**
	42	19	17 000	10 400	700	18 400	12 100	0,124	**3302-BD-XL-TVH**
	42	19	17 000	10 400	700	13 800	12 100	0,122	**3302-BD-XL-2Z-TVH**
	42	19	17 000	10 400	700	13 800	–	0,122	**3302-BD-XL-2HRS-TVH**
17	26	7	2 430	2 020	105	30 500	13 200	0,011	**3803-B-TVH**
	26	7	2 430	2 020	105	23 000	13 200	0,013	**3803-B-2RZ-TVH**
	26	7	2 430	2 020	105	13 200	–	0,013	**3803-B-2RS-TVH**
	35	14	9 100	6 100	305	22 500	15 300	0,042	**3003-B-TVH**
	35	14	9 100	6 100	305	16 800	15 300	0,057	**3003-B-2RZ-TVH**
	35	14	9 100	6 100	305	12 300	–	0,055	**3003-B-2RS-TVH**
	40	17,5	15 500	9 500	640	19 400	16 600	0,095	**3203-BD-XL-TVH**
	40	17,5	15 500	9 500	640	14 600	16 600	0,094	**3203-BD-XL-2Z-TVH**
	40	17,5	15 500	9 500	640	14 600	–	0,093	**3203-BD-XL-2HRS-TVH**
	47	22,2	22 500	13 100	880	16 600	12 600	0,177	**3303-BD-XL-TVH**
	47	22,2	22 500	13 100	880	12 400	12 600	0,176	**3303-BD-XL-2Z-TVH**
	47	22,2	22 500	13 100	880	12 400	–	0,176	**3303-BD-XL-2HRS-TVH**

medias ➤ *https://www.schaeffler.de/std/1D8E*

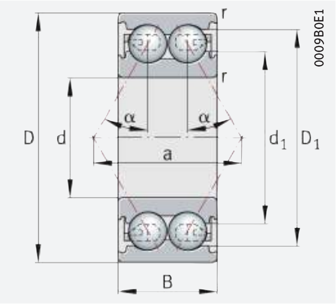


Mounting dimensions

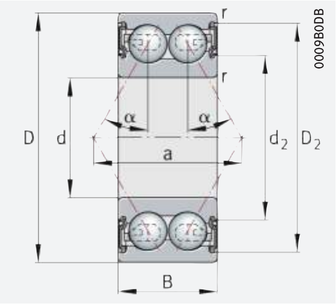
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
15	0,3	20,9	–	18,3	–	11,3	25	17	22	0,3
	0,3	–	21,8	–	17,2	11,3	25	17	22	0,3
	0,3	–	21,8	–	17,2	11,3	25	17	22	0,3
	0,3	27,2	–	21,3	–	18,4	25	17	30	0,3
	0,3	–	27,9	–	19,7	18,4	25	17	30	0,3
	0,3	–	27,9	–	19,7	18,4	25	17	30	0,3
	0,6	29,4	–	22,2	–	20,7	30	19,2	30,8	0,6
	0,6	–	31,1	–	21	20,7	30	19,2	30,8	0,6
	0,6	–	31,1	–	21	20,7	30	19,2	30,8	0,6
	1	35,7	–	27,2	–	24,8	30	20,6	36,4	1
	1	–	37,9	–	25,8	24,8	30	20,6	36,4	1
	1	–	37,9	–	25,8	24,8	30	20,6	36,4	1
17	0,3	22,9	–	20,3	–	12,3	25	19	24	0,3
	0,3	–	23,8	–	19,2	12,3	25	19	24	0,3
	0,3	–	23,8	–	19,2	12,3	25	19	24	0,3
	0,3	29,1	–	23,1	–	17,1	25	19	33	0,3
	0,3	–	29,8	–	21	17,1	25	19	33	0,3
	0,3	–	29,8	–	21	17,1	25	19	33	0,3
	0,6	33,9	–	25,8	–	23,5	30	21,2	35,8	0,6
	0,6	–	36,1	–	24,4	23,5	30	21,2	35,8	0,6
	0,6	–	36,1	–	24,4	23,5	30	21,2	35,8	0,6
	1	39	–	28,5	–	27,5	30	22,6	41,4	1
	1	–	41,1	–	27,1	27,5	30	22,6	41,4	1
	1	–	41,1	–	27,1	27,5	30	22,6	41,4	1

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

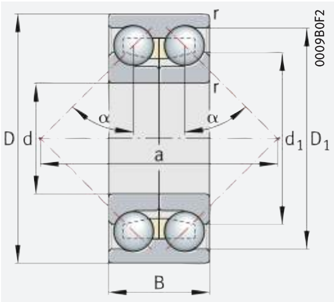


38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD;
with seal 2HRS, 2RS, 2RSR, 2RZ, 2Z

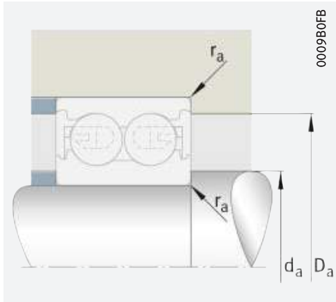
d = 20 – 25 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322 | 2.12 ➤322 | 2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
20	32	10	5 600	4 750	240	23 200	11 800	0,024	**3804-B-TVH**
	32	10	5 600	4 750	240	17 400	11 800	0,026	**3804-B-2RZ-TVH**
	32	10	5 600	4 750	240	10 700	–	0,026	**3804-B-2RS-TVH**
	42	16	14 300	9 400	475	18 100	13 200	0,08	**3004-B-TVH**
	42	16	14 300	9 400	475	13 600	13 200	0,094	**3004-B-2RZ-TVH**
	42	16	14 300	9 400	475	10 500	–	0,094	**3004-B-2RS-TVH**
	47	20,6	20 600	12 900	870	16 100	14 700	0,154	**3204-BD-XL-TVH**
	47	20,6	20 600	12 900	870	12 100	14 700	0,153	**3204-BD-XL-2Z-TVH**
	47	20,6	20 600	12 900	870	12 100	–	0,149	**3204-BD-XL-2HRS-TVH**
	52	22,2	24 600	15 900	1 070	14 700	10 400	0,215	**3304-BD-XL-TVH**
	52	22,2	24 600	15 900	1 070	11 000	10 400	0,214	**3304-BD-XL-2Z-TVH**
	52	22,2	24 600	15 900	1 070	11 000	–	0,217	**3304-BD-XL-2HRS-TVH**
25	37	10	5 900	5 500	275	20 400	10 300	0,034	**3805-B-TVH**
	37	10	5 900	5 500	275	15 300	10 300	0,036	**3805-B-2RZ-TVH**
	37	10	5 900	5 500	275	9 300	–	0,036	**3805-B-2RS-TVH**
	47	16	15 200	10 900	550	15 900	11 100	0,1	**3005-B-TVH**
	47	16	15 200	10 900	550	11 900	11 100	0,1	**3005-B-2RZ-TVH**
	47	16	15 200	10 900	550	8 800	–	0,1	**3005-B-2RS-TVH**
	52	20,6	22 000	15 200	1 020	14 300	12 500	0,174	**3205-BD-XL-TVH**
	52	20,6	22 000	15 200	1 020	10 700	12 500	0,175	**3205-BD-XL-2Z-TVH**
	52	20,6	22 000	15 200	1 020	10 700	–	0,176	**3205-BD-XL-2HRS-TVH**
	62	25,4	30 000	23 200	1 400	13 100	8 400	0,341	**3305-DA-TVP**
	62	25,4	31 500	21 000	1 410	12 400	9 400	0,352	**3305-BD-XL-TVH**
	62	25,4	31 500	21 000	1 410	9 300	9 400	0,348	**3305-BD-XL-2Z-TVH**
	62	25,4	31 500	21 000	1 410	9 300	–	0,352	**3305-BD-XL-2HRS-TVH**

medias ➤ *https://www.schaeffler.de/std/1D8F*



33..-DA;
split inner ring

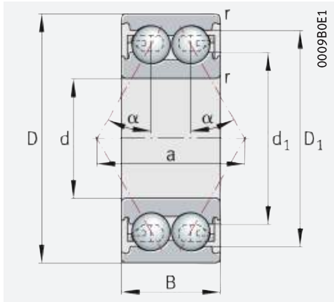


Mounting dimensions

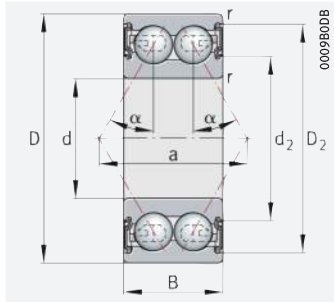
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
20	0,3	29,2	–	25,1	–	16,1	25	22	30	0,3
	0,3	–	30,1	–	23,9	16,1	25	22	30	0,3
	0,3	–	30,1	–	23,9	16,1	25	22	30	0,3
	0,6	35	–	27,1	–	21,1	25	23,2	38,8	0,6
	0,6	–	36,4	–	25,3	21,1	25	23,2	38,8	0,6
	0,6	–	36,4	–	25,3	21,1	25	23,2	38,8	0,6
	1	40,1	–	30,8	–	27,9	30	25,6	41,4	1
	1	–	42,2	–	29,2	27,9	30	25,6	41,4	1
	1	–	42,2	–	29,2	27,9	30	25,6	41,4	1
	1,1	44	–	33,5	–	30,4	30	27	45	1
	1,1	–	46,1	–	31,9	30,4	30	27	45	1
	1,1	–	46,1	–	31,9	30,4	30	27	45	1
25	0,3	33,2	–	29,1	–	17,9	25	27	35	0,3
	0,3	–	34,1	–	27,9	17,9	25	27	35	0,3
	0,3	–	34,1	–	27,9	17,9	25	27	35	0,3
	0,6	40,1	–	32,1	–	23,4	25	28,2	43,8	0,6
	0,6	–	41,8	–	30,3	23,4	25	28,2	43,8	0,6
	0,6	–	41,8	–	30,3	23,4	25	28,2	43,8	0,6
	1	45,1	–	35,8	–	30,8	30	30,6	46,4	1
	1	–	47,6	–	34,2	30,8	30	30,6	46,4	1
	1	–	47,6	–	34,2	30,8	30	30,6	46,4	1
	1,1	51,8	–	41	–	56	45	32	55	1
	1,1	51,5	–	39,5	–	35,4	30	32	55	1
	1,1	–	53,7	–	37,6	35,4	30	32	55	1
	1,1	–	53,7	–	37,6	35,4	30	32	55	1

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

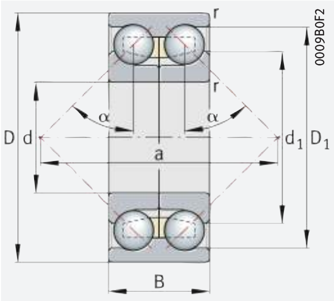


38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD; with seal 2HRS, 2RS, 2RSR, 2RZ, 2Z

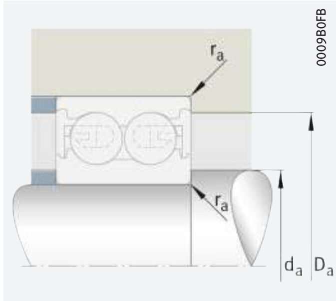
d = 30 – 35 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322|2.12 ➤322|2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
30	42	10	6 100	6 000	315	17 700	8 700	0,035	**3806-B-TVH**
	42	10	6 100	6 000	315	13 300	8 700	0,037	**3806-B-2RZ-TVH**
	42	10	6 100	6 000	315	8 100	–	0,037	**3806-B-2RS-TVH**
	55	19	19 900	15 400	780	13 500	10 100	0,16	**3006-B-TVH**
	55	19	19 900	15 400	780	10 100	10 100	0,16	**3006-B-2RZ-TVH**
	55	19	19 900	15 400	780	7 400	–	0,16	**3006-B-2RS-TVH**
	62	23,8	31 000	22 200	1 490	11 900	11 100	0,288	**3206-BD-XL-TVH**
	62	23,8	31 000	22 200	1 490	9 000	11 100	0,283	**3206-BD-XL-2Z-TVH**
	62	23,8	31 000	22 200	1 490	9 000	–	0,29	**3206-BD-XL-2HRS-TVH**
	72	30,2	41 500	34 500	1 820	10 900	7 500	0,657	**3306-DA**
	72	30,2	43 000	29 500	1 990	10 400	8 500	0,543	**3306-BD-XL-TVH**
	72	30,2	43 000	29 500	1 990	7 800	8 500	0,54	**3306-BD-XL-2Z-TVH**
	72	30,2	43 000	29 500	1 990	7 800	–	0,549	**3306-BD-XL-2HRS-TVH**
35	47	10	6 500	6 800	365	15 500	7 400	0,039	**3807-B-TVH**
	47	10	6 500	6 800	365	11 700	7 400	0,041	**3807-B-2RZ-TVH**
	47	10	6 500	6 800	365	7 000	–	0,041	**3807-B-2RS-TVH**
	62	20	24 000	19 100	970	11 700	8 800	0,2	**3007-B-TVH**
	62	20	24 000	19 100	970	8 800	8 800	0,224	**3007-B-2RZ-TVH**
	62	20	24 000	19 100	970	6 400	–	0,224	**3007-B-2RS-TVH**
	72	27	41 000	30 000	2 030	10 100	9 900	0,436	**3207-BD-XL-TVH**
	72	27	41 000	30 000	2 030	7 600	9 900	0,432	**3207-BD-XL-2Z-TVH**
	72	27	41 000	30 000	2 030	7 600	–	0,44	**3207-BD-XL-2HRS-TVH**
	80	34,9	50 000	41 000	2 600	9 600	7 100	0,889	**3307-DA**
	80	34,9	55 000	36 500	2 460	9 000	8 100	0,706	**3307-BD-XL-TVH**
	80	34,9	55 000	36 500	2 460	6 800	8 100	0,702	**3307-BD-XL-2Z-TVH**
	80	34,9	55 000	36 500	2 460	6 800	–	0,717	**3307-BD-XL-2HRS-TVH**

medias ➤ *https://www.schaeffler.de/std/1D90*



33..-DA;
split inner ring

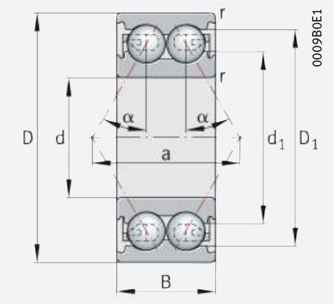


Mounting dimensions

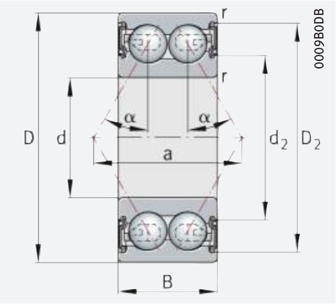
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
30	0,3	38	–	34	–	20,2	25	32	40	0,3
	0,3	–	39	–	32,9	20,2	25	32	40	0,3
	0,3	–	39	–	32,9	20,2	25	32	40	0,3
	1	46,7	–	37,3	–	27,4	25	34,6	50,4	1
	1	–	49,1	–	35,6	27,4	25	34,6	50,4	1
	1	–	49,1	–	35,6	27,4	25	34,6	50,4	1
	1	53,3	–	42,2	–	36,4	30	35,6	56,4	1
	1	–	55,8	–	40,3	36,4	30	35,6	56,4	1
	1	–	55,8	–	40,3	36,4	30	35,6	56,4	1
	1,1	61,5	–	48,2	–	67	45	37	65	1
	1,1	60,5	–	46,3	–	41,9	30	37	65	1
	1,1	–	63,5	–	44,4	41,9	30	37	65	1
	1,1	–	63,5	–	44,4	41,9	30	37	65	1
35	0,3	43	–	39	–	22,6	25	37	45	0,3
	0,3	–	44,1	–	37,6	22,6	25	37	45	0,3
	0,3	–	44,1	–	37,6	22,6	25	37	45	0,3
	1	53,3	–	43,7	–	30,9	25	39,6	57,4	1
	1	–	55,3	–	40,5	30,9	25	39,6	57,4	1
	1	–	55,3	–	40,5	30,9	25	39,6	57,4	1
	1,1	62,4	–	49,1	–	42,5	30	42	65	1
	1,1	–	65,4	–	46,9	42,5	30	42	65	1
	1,1	–	65,4	–	46,9	42,5	30	42	65	1
	1,5	69,5	–	55,2	–	75	45	44	71	1,5
	1,5	68,9	–	51,8	–	48	30	44	71	1,5
	1,5	–	71,9	–	49,6	48	30	44	71	1,5
	1,5	–	71,9	–	49,6	48	30	44	71	1,5

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

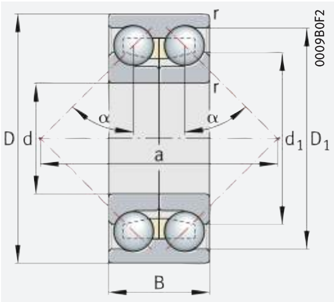


38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD; with seal 2HRS, 2RS, 2RSR, 2RZ, 2Z

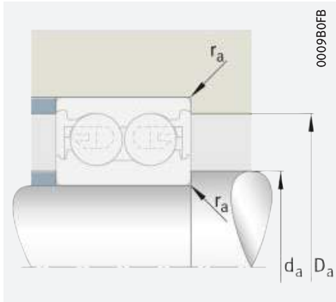
d = 40 – 50 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322 | 2.12 ➤322 | 2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
40	52	10	6 900	7 600	415	13 700	6 300	0,044	**3808-B-TVH**
	52	10	6 900	7 600	415	10 300	6 300	0,046	**3808-B-2RZ-TVH**
	52	10	6 900	7 600	415	6 100	–	0,046	**3808-B-2RS-TVH**
	68	21	25 000	21 300	1 080	10 600	8 000	0,25	**3008-B-TVH**
	68	21	25 000	21 300	1 080	8 000	8 000	0,25	**3008-B-2RZ-TVH**
	68	21	25 000	21 300	1 080	5 600	–	0,25	**3008-B-2RS-TVH**
	80	30,2	51 000	38 000	2 550	8 900	9 100	0,591	**3208-BD-XL-TVH**
	80	30,2	51 000	38 000	2 550	6 700	9 100	0,58	**3208-BD-XL-2Z-TVH**
	80	30,2	51 000	38 000	2 550	6 700	–	0,597	**3208-BD-XL-2HRS-TVH**
	90	36,5	62 000	52 000	3 250	10 700	6 000	1,2	**3308-DA-MA**
	90	36,5	67 000	48 500	3 250	8 000	7 000	0,969	**3308-BD-XL-TVH**
	90	36,5	67 000	48 500	3 250	6 000	7 000	0,967	**3308-BD-XL-2Z-TVH**
	90	36,5	67 000	48 500	3 250	6 000	–	0,985	**3308-BD-XL-2HRS-TVH**
45	58	10	7 000	8 100	455	12 400	5 700	0,055	**3809-B-TVH**
	58	10	7 000	8 100	455	9 300	5 700	0,058	**3809-B-2RZ-TVH**
	58	10	7 000	8 100	455	5 500	–	0,058	**3809-B-2RS-TVH**
	85	30,2	50 000	39 000	2 650	8 300	8 400	0,622	**3209-BD-XL-TVH**
	85	30,2	50 000	39 000	2 650	6 300	8 400	0,618	**3209-BD-XL-2Z-TVH**
	85	30,2	50 000	39 000	2 650	6 300	–	0,626	**3209-BD-XL-2HRS-TVH**
	100	39,7	71 000	64 000	3 500	7 500	5 800	1,55	**3309-DA**
	100	39,7	72 000	54 000	3 600	7 300	6 700	1,335	**3309-BD-XL-TVH**
	100	39,7	72 000	54 000	3 600	5 500	6 700	1,315	**3309-BD-XL-2Z-TVH**
	100	39,7	72 000	54 000	3 600	5 500	–	1,314	**3309-BD-XL-2HRS-TVH**
50	65	12	8 500	10 200	570	10 900	5 400	0,09	**3810-B-TVH**
	65	12	8 500	10 200	570	8 100	5 400	0,093	**3810-B-2RZ-TVH**
	65	12	8 500	10 200	570	4 800	–	0,093	**3810-B-2RS-TVH**
	90	30,2	53 000	44 000	3 000	7 800	7 600	0,672	**3210-BD-XL-TVH**
	90	30,2	53 000	44 000	3 000	5 900	7 600	0,667	**3210-BD-XL-2Z-TVH**
	90	30,2	53 000	44 000	3 000	5 900	–	0,668	**3210-BD-XL-2HRS-TVH**
	110	44,4	90 000	84 000	5 200	8 700	5 300	2,24	**3310-DA-MA**
	110	44,4	93 000	70 000	4 700	6 500	6 300	1,749	**3310-BD-XL-TVH**
	110	44,4	93 000	70 000	4 700	4 900	6 300	1,75	**3310-BD-XL-2Z-TVH**
	110	44,4	93 000	70 000	4 700	4 900	–	1,748	**3310-BD-XL-2HRS-TVH**

medias ➤ *https://www.schaeffler.de/std/1D91*



33..-DA;
split inner ring

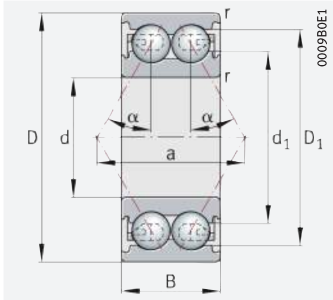


Mounting dimensions

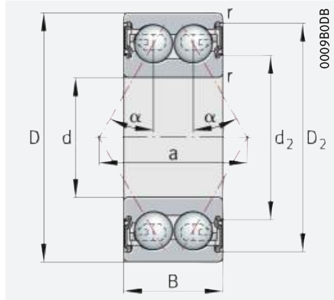
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
40	0,3	48,5	–	44,6	–	25,2	25	42	50	0,3
	0,3	–	49,6	–	43,5	25,2	25	42	50	0,3
	0,3	–	49,6	–	43,5	25,2	25	42	50	0,3
	1	58,8	–	49,2	–	33,4	25	44,6	63,4	1
	1	–	61,2	–	46,7	33,4	25	44,6	63,4	1
	1	–	61,2	–	46,7	33,4	25	44,6	63,4	1
	1,1	69,6	–	54,9	–	47,4	30	47	73	1
	1,1	–	72,6	–	52,8	47,4	30	47	73	1
	1,1	–	72,6	–	52,8	47,4	30	47	73	1
	1,5	79,7	–	61,7	–	85	45	49	81	1,5
	1,5	77	–	59	–	53,1	30	49	81	1,5
	1,5	–	79,9	–	56,8	53,1	30	49	81	1,5
	1,5	–	79,9	–	56,8	53,1	30	49	81	1,5
45	0,3	53,6	–	49,6	–	27,5	25	47	56	0,3
	0,3	–	54,6	–	48,1	27,5	25	47	56	0,3
	0,3	–	54,6	–	48,1	27,5	25	47	56	0,3
	1,1	75,1	–	59,9	–	50,3	30	52	78	1
	1,1	–	78,1	–	57,7	50,3	30	52	78	1
	1,1	–	78,1	–	57,7	50,3	30	52	78	1
	1,5	86,7	–	68,3	–	93	45	54	91	1,5
	1,5	84,4	–	65,5	–	57,8	30	54	91	1,5
	1,5	–	87,3	–	63,3	57,8	30	54	91	1,5
	1,5	–	87,3	–	63,3	57,8	30	54	91	1,5
50	0,3	60,7	–	56,3	–	31	25	52	63	0,3
	0,3	–	61,7	–	55,2	31	25	52	63	0,3
	0,3	–	61,7	–	55,2	31	25	52	63	0,3
	1,1	80,1	–	64,9	–	53,2	30	57	83	1
	1,1	–	82,9	–	62,8	53,2	30	57	83	1
	1,1	–	82,9	–	62,8	53,2	30	57	83	1
	2	96,9	–	77,3	–	104	45	61	99	2
	2	93,3	–	71,5	–	64,2	30	61	99	2
	2	–	96,8	–	69,1	64,2	30	61	99	2
	2	–	96,8	–	69,1	64,2	30	61	99	2

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

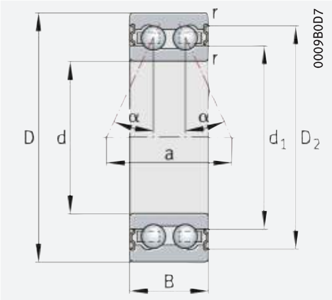


38..-B, 30..-B, 32..-BD, 33..-BD; with seal 2HRS, 2RS, 2RZ, 2Z

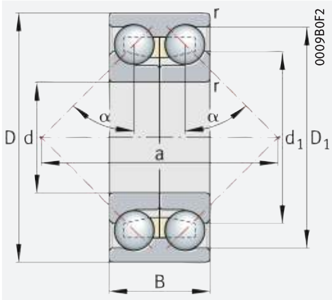
d = 55 – 65 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322|2.12 ➤322|2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
55	72	13	10 700	13 100	730	9 600	4 850	0,13	**3811-B-TVH**
	72	13	10 700	13 100	730	7 200	4 850	0,134	**3811-B-2RZ-TVH**
	72	13	10 700	13 100	730	4 300	–	0,134	**3811-B-2RS-TVH**
	100	33,3	61 000	51 000	3 450	7 100	7 200	0,94	**3211-BD-XL-TVH**
	100	33,3	61 000	51 000	3 450	5 300	7 200	0,93	**3211-BD-XL-2Z-TVH**
	100	33,3	61 000	51 000	3 450	5 300	–	0,933	**3211-BD-XL-2HRS-TVH**
	120	49,2	105 000	101 000	5 400	8 000	5 200	2,85	**3311-DA-MA**
	120	49,2	116 000	88 000	6 000	5 800	5 900	2,28	**3311-BD-XL-TVH**
	120	49,2	116 000	88 000	6 000	4 350	5 900	2,265	**3311-BD-XL-2Z-TVH**
	120	49,2	116 000	88 000	6 000	4 350	–	2,264	**3311-BD-XL-2HRS-TVH**
60	78	14	14 200	17 100	940	8 800	4 700	0,161	**3812-B-TVH**
	78	14	14 200	17 100	940	6 600	4 700	0,166	**3812-B-2RZ-TVH**
	78	14	14 200	17 100	940	4 050	–	0,166	**3812-B-2RS-TVH**
	110	36,5	75 000	64 000	4 300	6 300	6 700	1,25	**3212-BD-XL-TVH**
	110	36,5	75 000	64 000	4 300	4 750	6 700	1,24	**3212-BD-XL-2Z-TVH**
	110	36,5	75 000	64 000	4 300	4 750	–	1,25	**3212-BD-XL-2HRS-TVH**
	130	54	121 000	118 000	6 500	5 500	4 850	3,39	**3312-DA**
	130	54	126 000	103 000	5 200	3 950	5 000	2,85	**3312-B-TVH**
	130	54	126 000	103 000	5 200	3 950	5 000	2,92	**3312-B-2Z-TVH**
	130	54	126 000	103 000	5 200	3 300	–	2,92	**3312-B-2RSR-TVH**
65	120	38,1	86 000	77 000	5 200	5 700	6 000	1,604	**3213-BD-XL-TVH**
	120	38,1	86 000	77 000	5 200	4 300	6 000	1,602	**3213-BD-XL-2Z-TVH**
	120	38,1	86 000	77 000	5 200	4 300	–	1,6	**3213-BD-XL-2HRS-TVH**
	140	58,7	139 000	137 000	7 200	5 100	4 650	4,384	**3313-DA**
	140	58,7	150 000	119 000	7 900	4 900	5 300	4,1	**3313-BD-XL-TVH**
	140	58,7	150 000	119 000	7 900	3 650	5 300	4,1	**3313-BD-XL-2Z-TVH**

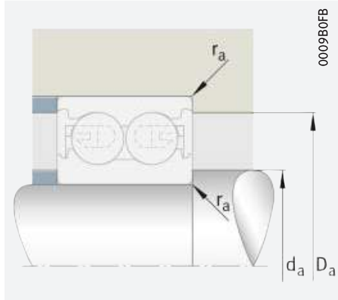
medias ➤ *https://www.schaeffler.de/std/1D92*



32..-B, 33..-B;
with seal 2RSR, 2Z



33..-DA;
split inner ring

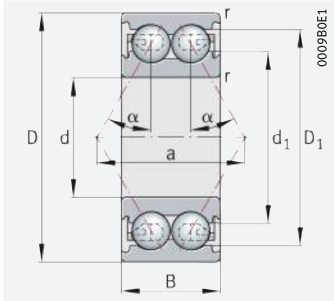


Mounting dimensions

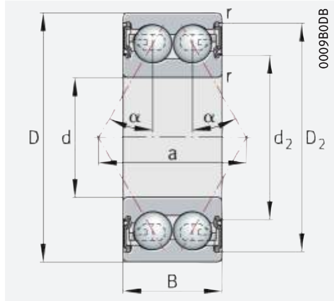
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
55	0,3	68	–	63,1	–	34,9	25	57	70	0,3
	0,3	–	69,1	–	61,4	34,9	25	57	70	0,3
	0,3	–	69,1	–	61,4	34,9	25	57	70	0,3
	1,5	87,8	–	71,6	–	58,4	30	64	91	1,5
	1,5	–	90,8	–	69,2	58,4	30	64	91	1,5
	1,5	–	90,8	–	69,2	58,4	30	64	91	1,5
	2	105,3	–	81,6	–	111	45	66	109	2
	2	103,3	–	78,8	–	71,4	30	66	109	2
	2	–	106,8	–	76,4	71,4	30	66	109	2
	2	–	106,8	–	76,4	71,4	30	66	109	2
60	0,3	73	–	67,1	–	38,1	25	62	76	0,3
	0,3	–	74,8	–	67,3	38,1	25	62	76	0,3
	0,3	–	74,8	–	67,3	38,1	25	62	76	0,3
	1,5	97	–	79	–	64,7	30	69	101	1,5
	1,5	–	100,5	–	76,6	64,7	30	69	101	1,5
	1,5	–	100,5	–	76,6	64,7	30	69	101	1,5
	2,1	115,8	–	91,9	–	122	45	72	118	2,1
	2,1	108,7	–	81,6	–	67,3	25	72	118	2,1
	2,1	–	113,1	81,25	–	67,3	25	72	118	2,1
	2,1	–	113,1	81,25	–	67,3	25	72	118	2,1
65	1,5	106,6	–	87,7	–	70,6	30	74	111	1,5
	1,5	–	110,1	–	85,3	70,6	30	74	111	1,5
	1,5	–	110,1	–	85,3	70,6	30	74	111	1,5
	2,1	124,1	–	98,4	–	131	45	77	128	2,1
	2,1	120,5	–	93,4	–	83,49	30	77	128	2,1
	2,1	–	125	–	90,6	83,49	30	77	128	2,1

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

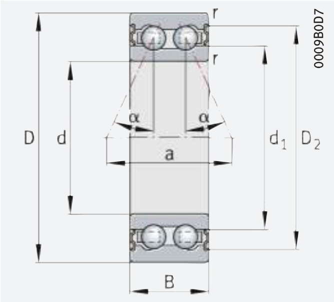


38..-B, 30..-B, 32..-BD, 33..-BD; with seal 2HRS, 2RS, 2RZ, 2Z

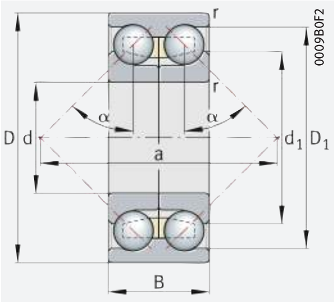
d = 70 – 85 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322|2.12 ➤322|2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
70	90	15	18 800	23 200	1 280	7 500	4 050	0,2	**3814-B-TVH**
	90	15	18 800	23 200	1 280	5 700	4 050	0,205	**3814-B-2RZ-TVH**
	90	15	18 800	23 200	1 280	3 450	–	0,205	**3814-B-2RS-TVH**
	125	39,7	82 000	79 000	4 000	4 150	5 600	1,78	**3214-B-TVH**
	125	39,7	82 000	79 000	4 000	4 150	5 600	1,78	**3214-B-2Z-TVH**
	125	39,7	82 000	79 000	4 000	3 100	–	1,78	**3214-B-2RSR-TVH**
	150	63,5	157 000	157 000	8 200	4 800	4 550	5,359	**3314-DA**
	150	63,5	172 000	135 000	8 700	4 550	5 100	4,499	**3314-BD-XL-TVH**
	150	63,5	172 000	135 000	8 700	3 400	5 100	4,5	**3314-BD-XL-2Z-TVH**
	150	63,5	167 000	176 000	8 500	4 750	4 500	4,89	**3314**
75	130	41,3	88 000	85 000	4 250	3 900	5 300	1,907	**3215-B-TVH**
	130	41,3	88 000	85 000	4 250	3 900	5 300	1,94	**3215-B-2Z-TVH**
	130	41,3	88 000	85 000	4 250	2 900	–	1,939	**3215-B-2RSR-TVH**
	160	68,3	184 000	179 000	10 000	5 800	4 350	5,904	**3315-DA-MA**
	160	68,3	192 000	209 000	9 700	4 400	4 250	6,16	**3315**
80	100	15	19 200	24 800	1 390	6 800	3 650	0,22	**3816-B-TVH**
	100	15	19 200	24 800	1 390	5 100	3 650	0,23	**3816-B-2RZ-TVH**
	100	15	19 200	24 800	1 390	3 100	–	0,23	**3816-B-2RS-TVH**
	140	44,4	99 000	102 000	4 950	3 650	5 100	2,403	**3216-B-TVH**
	140	44,4	99 000	102 000	4 950	3 650	5 100	2,48	**3216-B-2Z-TVH**
	140	44,4	99 000	102 000	4 950	2 700	–	2,48	**3216-B-2RSR-TVH**
	170	68,3	192 000	196 000	9 600	5 400	3 900	7,879	**3316-DA-MA**
	170	68,3	199 000	180 000	10 700	3 950	4 300	6,4	**3316-BD-XL-TVH**
	170	68,3	199 000	180 000	10 700	2 950	–	6,3	**3316-BD-XL-2HRS-TVH**
	170	68,3	208 000	226 000	10 300	4 150	3 900	6,785	**3316**
85	150	49,2	135 000	127 000	5 900	3 350	4 900	3	**3217-B-TVH**
	150	49,2	135 000	127 000	5 900	3 350	4 900	3,3	**3217-B-2Z-TVH**
	150	49,2	135 000	127 000	5 900	2 600	–	3,3	**3217-B-2RS-TVH**
	150	49,2	128 000	154 000	7 200	4 650	4 700	3,32	**3217**
	180	73	229 000	255 000	11 100	5 000	3 600	8,46	**3317-M**
	180	73	209 000	221 000	10 700	5 200	3 750	9,39	**3317-DA-MA**

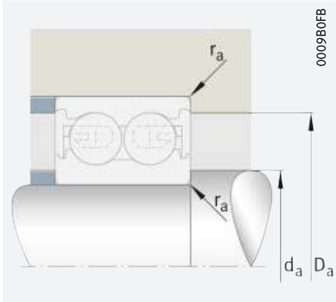
medias ➤ *https://www.schaeffler.de/std/1D93*



32..-B, 33..-B;
with seal 2RSR, 2Z



33..-DA;
split inner ring

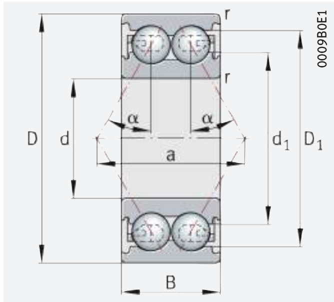


Mounting dimensions

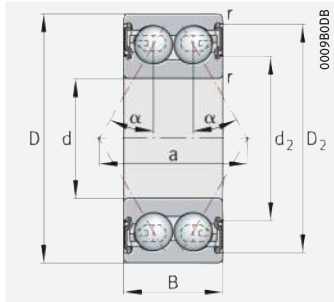
Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
70	0,6	84,5	–	77,7	–	43,6	25	73,2	86,8	0,6
	0,6	–	86,3	–	76,6	43,6	25	73,2	86,8	0,6
	0,6	–	86,3	–	76,6	43,6	25	73,2	86,8	0,6
	1,5	106,3	–	87	–	61,6	25	79	116	1,5
	1,5	–	110,7	86,8	–	61,6	25	79	116	1,5
	1,5	–	110,7	86,8	–	61,6	25	79	116	1,5
	2,1	132,4	–	103,4	–	141	45	82	138	2,1
	2,1	129,2	–	100,3	–	89,409	30	82	138	2,1
	2,1	–	133,7	–	96,9	89,409	30	82	138	2,1
	2,1	131,9	–	98,5	–	109,02	35	82	138	2,1
75	1,5	112,6	–	92,4	–	65,2	25	84	121	1,5
	1,5	–	115,5	92,1	–	65,2	25	84	121	1,5
	1,5	–	115,5	92,1	–	65,2	25	84	121	1,5
	2,1	141,3	–	109,3	–	150	45	87	148	2,1
	2,1	141,2	–	105,5	–	116,6	35	87	148	2,1
80	0,6	93,5	–	86,7	–	47,8	25	83,2	96,8	0,6
	0,6	–	95,3	–	85,5	47,8	25	83,2	96,8	0,6
	0,6	–	95,3	–	85,5	47,8	25	83,2	96,8	0,6
	2	120,3	–	98,8	–	69,13	25	91	129	2
	2	–	124,5	98,5	–	69,13	25	91	129	2
	2	–	124,5	98,5	–	69,13	25	91	129	2
	2,1	149,9	–	118,7	–	159	45	92	158	2,1
	2,1	148	–	116,7	–	100,8	30	92	158	2,1
	2,1	–	151,9	–	114	100,8	30	92	158	2,1
	2,1	149,7	–	111,8	–	122,53	35	92	158	2,1
85	2	130,4	–	105	–	75,9	25	96	139	2
	2	–	135,1	–	102,3	75,9	25	96	139	2
	2	–	135,1	–	102,3	75,9	25	96	139	2
	2	135,1	–	108,5	–	106,3	35	96	139	2
	3	160	–	119,6	–	131,48	35	99	166	2,5
	3	156,5	–	124,3	–	167	45	99	166	2,5

Angular contact ball bearings

Double row



38..-B, 30..-B, 32..-B, 33..-B, 32..-BD, 33..-BD, 32, 33

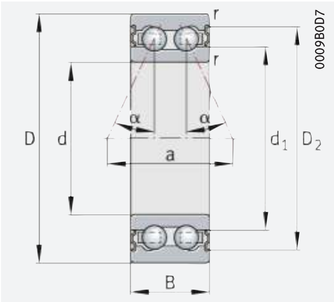


38..-B, 30..-B, 32..-BD, 33..-BD; with seal 2HRS, 2RS, 2RZ, 2Z

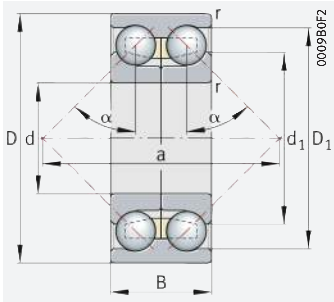
d = 90 – 110 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤322 | 2.12 ➤322 | 2.13 X-life ➤316
			N	N	N	min^{-1}	min^{-1}	≈ kg	
90	115	19	27 000	35 500	1 940	5 900	3 550	0,41	**3818-B-TVH**
	115	19	27 000	35 500	1 940	2 750	–	0,422	**3818-B-2RS-TVH**
	160	52,4	142 000	142 000	6 300	4 100	4 500	3,8	**3218-B-TVH**
	160	52,4	142 000	142 000	6 300	2 370	–	4	**3218-B-2RS-TVH**
	160	52,4	143 000	172 000	7 800	4 350	4 550	4,14	**3218**
	190	73	226 000	247 000	11 300	4 850	3 450	10,41	**3318-DA-MA**
	190	73	260 000	295 000	12 600	3 650	3 350	9,14	**3318**
95	170	55,6	161 000	193 000	8 500	5 300	4 350	5,06	**3219-M**
	200	77,8	270 000	315 000	13 100	4 450	3 200	11,21	**3319-M**
100	125	19	28 000	39 000	2 060	5 300	3 100	0,45	**3820-B-TVH**
	125	19	28 000	39 000	2 060	2 470	–	0,463	**3820-B-2RS-TVH**
	180	60,3	185 000	173 000	7 400	3 650	4 400	5,4	**3220-B-TVH**
	180	60,3	185 000	173 000	7 400	2 750	4 400	5,5	**3220-B-2Z-TVH**
	180	60,3	185 000	173 000	7 400	2 210	–	5,5	**3220-B-2RS-TVH**
	180	60,3	186 000	235 000	10 000	3 750	4 050	5,975	**3220**
	215	82,6	285 000	340 000	13 700	4 200	3 000	14,03	**3320-M**
	215	82,6	260 000	305 000	13 200	4 300	3 050	15,61	**3320-DA-MA**
105	190	65,1	215 000	270 000	11 100	4 600	3 850	7,4	**3221-M**
110	200	69,8	236 000	290 000	11 900	4 400	3 750	9,03	**3222-M**
	240	92,1	330 000	425 000	16 300	3 750	2 650	20	**3322-M**
	240	92,1	310 000	385 000	16 900	3 800	2 700	21,75	**3322-DA-MA**

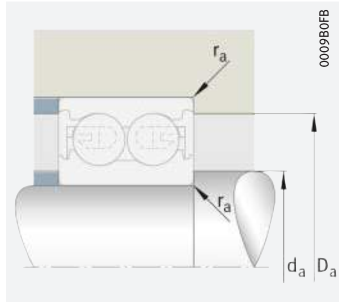
medias ➤ *https://www.schaeffler.de/std/1D94*



32..-B, 33..-B;
with seal 2RSR, 2Z



33..-DA;
split inner ring



Mounting dimensions

Dimensions							Nominal contact angle	Mounting dimensions		
d	r	D_1	D_2	d_1	d_2	a	α	d_a	D_a	r_a
	min.	≈	≈	≈	≈	≈	°	min.	max.	max.
90	1	106,6	–	98,44	–	55	25	94,6	110,4	1
	1	–	107,2	–	96,2	55	25	94,6	110,4	1
	2	141,6	–	116,4	–	81,4	25	104	146	2
	2	–	145,2	–	112,1	81,4	25	104	146	2
	2	143,7	–	115,6	–	112,5	35	104	146	2
	3	166,2	–	131,9	–	177	45	104	176	2,5
	3	168,2	–	126,1	–	136,03	35	104	176	2,5
95	2,1	152,8	–	122,2	–	119,8	35	107	158	2,1
	3	177,3	–	133	–	143,28	35	109	186	2,5
100	1	117,9	–	109,54	–	60,2	25	104,6	120,4	1
	1	–	118,5	–	107,3	60,2	25	104,6	120,4	1
	2,1	155,7	–	124,7	–	91,3	25	112	168	2,1
	2,1	–	157,4	–	121,3	91,3	25	112	168	2,1
	2,1	–	157,4	–	121,3	91,3	25	112	168	2,1
	2,1	163,7	–	131	–	127,43	35	112	168	2,1
	3	188,7	–	142,5	–	153,28	35	114	201	2,5
	3	187,1	–	147,5	–	197,5	45	114	201	2,5
105	2,1	172,1	–	138	–	134,68	35	117	178	2,1
110	2,1	180,1	–	143,3	–	143,5	35	122	188	2,1
	3	209,6	–	161,54	–	170,54	35	124	226	2,5
	3	207,3	–	164,5	–	221	45	124	226	2,5

Four point contact bearings

FAG

Matrix for bearing preselection

The matrix gives an overview of the types and design features of four point contact bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter (see column "detailed information") and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

Design features and suitability			Four point contact bearings: with/without retaining slots	detailed information ➤ 350
+++ extremely suitable ++ highly suitable + suitable (+) suitable with restrictions – not suitable/not applicable ✓ available				
Load carrying capacity	radial		(+)	➤352 | 1.2
	axial, one direction		++	➤352 | 1.2
	axial, both directions		++	➤352 | 1.2
	moments		(+)	➤352 | 1.2
Compensation of angular misalignments	static		–	➤352 | 1.3
	dynamic		–	➤352 | 1.3
Bearing design	cylindrical bore		✓	➤350 | 1.1
	tapered bore		–	
	separable		✓	➤360 | 1.17
Lubrication	greased		–	➤353 | 1.4
Sealing	open		✓	➤353 | 1.5
	non-contact		–	➤353 | 1.5
	contact		–	➤353 | 1.5
Operating temperature in °C		from to	–30 +150[1]	➤354 | 1.8
Suitability for	high speeds		(+)	➤353 | 1.6
	high running accuracy		(+)	➤356 | 1.11 ➤114
	low-noise running		(+)	➤353 | 1.7
	high rigidity		+	➤54
	reduced friction		+	➤56
	length compensation within bearing		–	
	non-locating bearing arrangement		–	➤139
	locating bearing arrangement		++	➤139
X-life bearings			✓	➤351
Bearing bore d in mm		from to	17 200[2]	➤362
Product tables		from page ➤	362	

[1] Valid for bearings with brass cages, D ≦ 240 mm

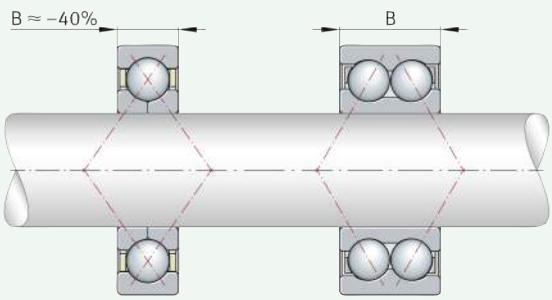
[2] Larger catalogue bearings ➤ 🕮 GL 1

1 Four point contact bearings

Four point contact bearings are particularly suitable where:

- predominantly axial loads must be supported ➤352|1.2
- the axial design envelope is not sufficient for double row radial angular contact ball bearings
- radial forces must be supported by a separate radial bearing ➤351|3
- axial forces occur in both directions and a close axial guidance is required in conjunction with a small bearing width, e.g. in gearbox engineering.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤349.



1
Four point contact bearing and double row angular contact ball bearing – comparison of design envelope

B = *bearing width*

1.1 Bearing design

Design variants

Four point contact bearings are available as:

- bearings of basic design ➤351|2
- bearings with retaining slots in the outer ring ➤351|3
- X-life bearings ➤351.

Bearings of basic design

Comparable, in terms of product design, with single row radial angular contact ball bearings

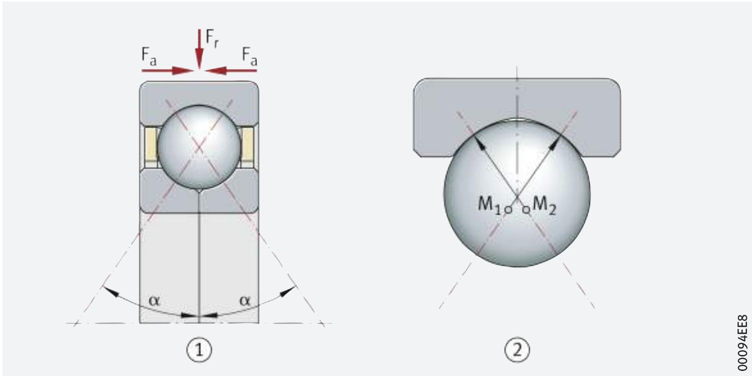
Four point contact bearings are single row, non-self-retaining radial ball bearings. They are similar in their structure to single row radial angular contact ball bearings; the raceways on the inner rings are, however, designed such that they can support axial loads in both directions ➤351|2 and ➤352|1.2. The centre points of curvature of the arc-shaped raceways on the inner and outer ring are offset relative to each other in such a way that the balls are in contact with the bearing rings at four points under radial load ➤351|2 and ➤352|1.2.

Smaller axial section height than double row angular contact ball bearings

These bearings have solid outer rings, split inner rings and ball and cage assemblies with brass or polyamide cages ➤355|1.9. The two-piece inner ring allows a large complement of balls to be accommodated in the bearing. The inner ring halves are matched to the particular bearing and must not be interchanged with those of other bearings of the same size. In an axial direction, four point contact bearings are considerably narrower than, for example, double row angular contact ball bearings.

2
Four point contact bearing of basic design

α = nominal contact angle
M_1, M_2 = centres of curvature of outer ring raceway
F_r = radial load
F_a = axial load
① Four point contact bearing, split inner ring, without retaining slots in the outer ring
② Raceway geometry



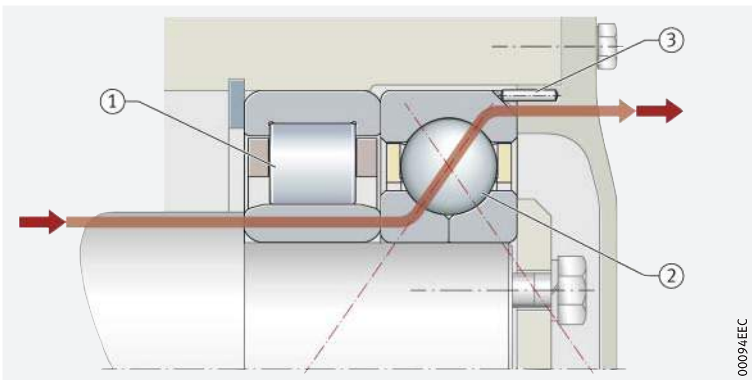
Bearings with retaining slots in the outer ring

The retaining slots allow simple location of the bearing in the housing

Four point contact bearings are often combined with a radial bearing and used as an axial bearing with radial clearance in a housing ➤351|3, ➤358|1.16. For quick and secure location of the bearings in the housing, larger bearings therefore have two retaining slots in one end face of the outer ring offset by 180° ➤351|3. Locking pins engage in these retaining slots and locate the outer ring in the housing.

3
Four point contact bearing used as an axial bearing, radial clearance on outer ring, axial force flow

① Cylindrical roller bearing (radial bearing)
② Four point contact bearing with retaining slots in outer ring (axial bearing, outer ring not radially retained)
③ Locking pin for location of outer ring



X-life premium quality

X-life

Four point contact bearings are available in certain sizes as X-life bearings. These bearings exhibit considerably higher performance than standard four point contact bearings ➤352|4. This is achieved, for example, through the modified internal construction, higher surface quality of the contact surfaces and optimised cage design, as well as through the improved quality of the steel and rolling elements.

Advantages

Increased customer benefits due to X-life

The technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings ➤286|6
- quieter running
- running with reduced friction and greater energy efficiency
- lower heat generation in the bearing
- higher possible speeds
- lower lubricant consumption and, consequently, longer maintenance intervals
- a measurably longer operating life
- high operational security
- compact, environmentally-friendly bearing arrangements.

Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

Suffix XL

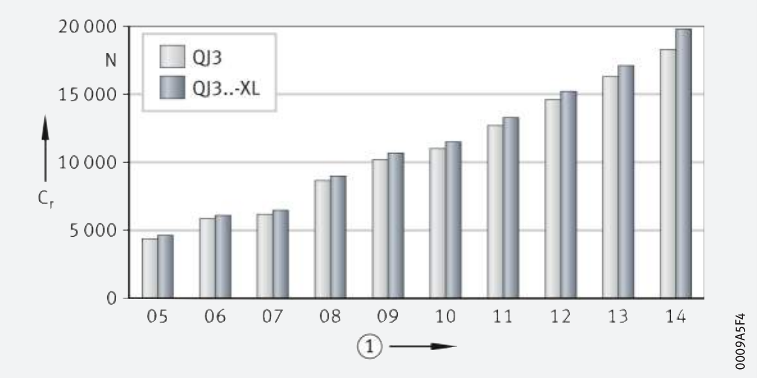
X-life four point contact bearings include the suffix XL in the designation ➤356| 4, ➤356| 6 and ➤362| .

4

Comparison of basic dynamic load rating C_r – bearing series QJ3..-XL, bore code 5 to 14, with a bearing which is not of X-life quality

C_r = *basic dynamic load rating*

① *Bore code*



Areas of application

Wide application range

Due to their special technical features, X-life four point contact bearings are highly suitable for bearing arrangements in:

- compressors
- fluid and hydraulic pumps
- automotive chassis and gearboxes
- gearboxes for industrial, rail and wind turbine applications
- agricultural vehicles and equipment.

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤10.

1.2 Load carrying capacity

Capable of supporting high axial loads in both directions

Due to the design of the raceways with their high shoulders, the large nominal contact angle of α_0 = 35° and the large number of rolling elements, four point contact bearings have a very high axial load carrying capacity. They are suitable for alternating, purely axial loads or predominantly axial load. The balls are in contact with the inner ring and outer ring each at one point only, as is the case with a single row angular contact ball bearing under axial load ➤351| 2.

The radial load carrying capacity of the bearings is low. If predominantly radial load is present, four point contact bearings should not be used due to the higher friction in the four point contact.

1.3 Compensation of angular misalignments

Four point contact bearings cannot compensate misalignments

Four point contact bearings are not suitable for the compensation of angular misalignments due to housing deformations or shaft deflections. The possible skewing of the inner ring in relation to the outer ring depends, for example, on the bearing load, the operating clearance and the bearing size, and is very small.

Skewing of the bearing rings increases the running noise, places increased strain on the cages and has a harmful influence on the operating life of the bearings.

1.4 Lubrication

✎ Oil or grease lubrication

The bearings are not greased. They must be lubricated with oil or grease.

✎ Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

✎ Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

1.5 Sealing

✎ The bearings are of an open design

Four point contact bearings are supplied without seals. As a result, sealing of the bearing position must be carried out in the adjacent construction. The sealing system should reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

1.6 Speeds

✎ Higher speeds are only possible under purely axial load

Due to the four point contact and resulting higher level of friction, the speed suitability of the bearings is heavily restricted under radial load. Higher speeds can only be achieved if four point contact ball bearings are subjected to purely axial load.

✎ Limiting speeds and reference speeds in the product tables

Two speeds are generally indicated in the product tables ➤362|:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speed

!

The limiting speed n_G is the kinematically permissible speed of a bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64. The values in the product tables are valid for oil lubrication.

✎ Values for grease lubrication

For grease lubrication, 75% of the value stated in the product tables is permissible in each case.

Reference speeds

✎ $n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

1.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

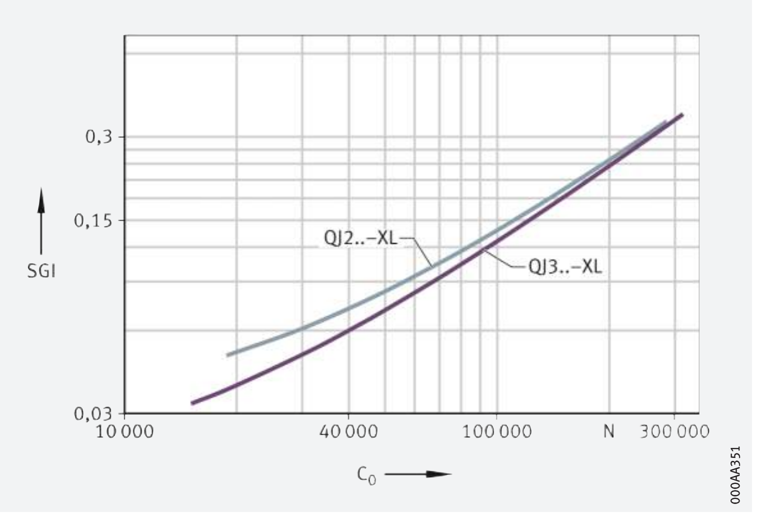
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

5
Schaeffler Noise Index for four point contact bearings

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and rolling elements
- the cage
- the lubricant.

Possible operating temperatures of four point contact bearings ➤354| 1.

1
Permissible temperature ranges

Operating temperature	Four point contact bearings	
	with brass cage	with polyamide cage PA66
	−30 °C to +150 °C, for D > 240 mm up to +200 °C	−30 °C to +120 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

✎ *Solid cages made from brass and polyamide PA66 are used as standard*

Standard cages and additional designs for four point contact bearings ➤355|▦2. Other cage designs are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass or sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦**2**
Cage, cage suffix, bore code

Bearing series	Solid brass cage MPA		Solid cage made from polyamide PA66 TVP	
	standard	also available for	standard	also available for
	Bore code			
QJ10	12, 17, 19, 21, 22, 24, 26, 30 to 40	–	–	–
QJ2	up to 08, 10, 13, 16, 17, from 19	09, 11, 12, 14, 15, 18	09, 11,12, 14, 15, 18	08
QJ3	03, 04, from 10	05 to 09	05 to 09	–

1.10 Internal clearance

Axial internal clearance

✎ *The standard is CN*

Four point contact bearings are manufactured as standard with axial internal clearance CN (normal) ➤355|▦3. CN is not stated in the designation.

Certain sizes are also available by agreement with the smaller internal clearance C2 and with the larger internal clearance C3 and C4.

The values for axial internal clearance correspond to DIN 628-4:2008 (ISO 5753-2:2010) ➤355|▦3. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

▦**3**
Axial internal clearance of four point contact bearings

Nominal bore diameter d mm		Axial internal clearance C2 (Group 2) µm		CN (Group N) µm		C3 (Group 3) µm		C4 (Group 4) µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
10	18	15	65	50	95	85	130	120	165
18	40	25	75	65	110	100	150	135	185
40	60	35	85	75	125	110	165	150	200
60	80	45	100	85	140	125	175	165	215
80	100	55	110	95	150	135	190	180	235
100	140	70	130	115	175	160	220	205	265
140	180	90	155	135	200	185	250	235	300
180	220	105	175	155	225	210	280	260	330

1.11 Dimensions, tolerances

Dimension standards

DIN ISO

The main dimensions of four point contact bearings correspond to DIN 628-4:2008. Nominal dimensions of four point contact bearings ➤*362*|▦.

Chamfer dimensions

DIN ISO

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤*135*|*7.11*. Nominal value of chamfer dimension ➤*362*|▦.

Tolerances

DIN ISO

The tolerances for the dimensional and running accuracy of four point contact bearings correspond to tolerance class Normal in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ➤*122*|▦*8*.

Retaining slots

DIN ISO

The dimensions and tolerances of the retaining slots correspond to ISO 20515:2012 and DIN 628-4:2008.

1.12 Suffixes

For a description of the suffixes used in this chapter ➤*356*|▦*4* and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦ *4*
Suffixes and corresponding descriptions

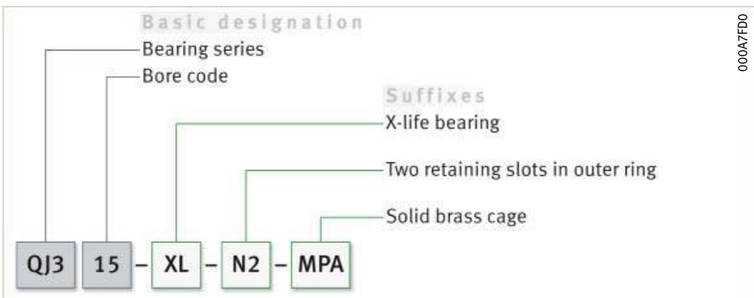
Suffix	Description of suffix	
C2	Axial internal clearance C2 (smaller than normal)	Special design, available by agreement
C3	Axial internal clearance C3 (larger than normal)	
C4	Axial internal clearance C4 (larger than C3)	
MPA	Solid brass cage, guided on outer ring	Standard, cage material dependent on bearing series and bore code
TVP	Solid cage made from glass fibre reinforced polyamide PA66	
XL	X-life bearing	Standard, dependent on bore code and bearing type
N2	Two retaining slots in outer ring	Standard for larger bearings

1.13 Structure of bearing designation

✎ *Example of composition of bearing designation*

The designation of bearings follows a set model. For an example ➤*356*|⊡*6*. The composition of designations is subject to DIN 623-1 ➤*102*|⊡*10*.

⊡ *6*
Four point contact bearing with two retaining slots in the outer ring: designation structure



1.14 Dimensioning

Equivalent dynamic bearing load

✎ *$P = F_r$ under purely radial load of constant magnitude and direction*

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

✎ *P is a substitute force for combined load and various load cases*

If this condition is not met, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ *$F_a/F_r \leqq 0{,}95$ or $F_a/F_r > 0{,}95$*

The calculation of P is dependent on the load ratio F_a/F_r and the factor 0,95 ➤357|ƒ 1 and ➤357|ƒ 2.

ƒ 1
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq 0{,}95 \quad \Rightarrow \quad P = F_r + 0{,}66 \cdot F_a$$

ƒ 2
Equivalent dynamic load

$$\frac{F_a}{F_r} > 0{,}95 \quad \Rightarrow \quad P = 0{,}6 \cdot F_r + 1{,}07 \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load.

Equivalent static bearing load

For four point contact bearings under static load ➤357|ƒ 3.

ƒ 3
Equivalent static load

$$P_0 = F_{0r} + 0{,}58 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load).

Static load safety factor

✎ *$S_0 = C_0/P_0$*

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤357|ƒ 4.

ƒ 4
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

1.15 Minimum load

✎ *In order to prevent damage due to slippage, a minimum axial load of $F_a \geqq 1{,}2 \cdot F_r$ is required*

In order to ensure low friction in the bearing, especially at high speeds, a minimum axial load is required. In order to prevent an excessive increase in friction in the bearing, the axial force should be sufficiently high that the rolling elements are in contact with the inner and outer ring raceway at only one point. This is ensured if $F_a \geqq 1{,}2 \cdot F_r$.

1.16 Design of bearing arrangements

✎ Used as axial bearing

If a four point contact bearing is used as a pure axial bearing, the outer ring must have a large radial clearance in the housing, in order that the bearing is not subjected to radial load ➤351|3.

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and thus also achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway (not applicable to bearings with radially relieved outer rings). The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤359|5 to ➤359|7.

Radial location of bearings – fit recommendations

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|6 and ➤158|7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|2
- shaft fits ➤150|6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|4
- housing fits ➤158|7.

✎ Location of the outer ring by means of retaining slots

For location of the bearings in the housing by means of retaining slots and locking pin ➤351|3.

Axial location of bearings – location methods

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings and retaining rings etc., are fundamentally suitable ➤351|3.

Dimensional, geometrical and running accuracy of the bearing seats

✎ A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For four point contact bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7. Guide values for the geometrical and positional tolerances of bearing seating surfaces ➤359|5, tolerances t_1 to t_3 in accordance with ➤168|11. Numerical values for IT grades ➤359|6.

5
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	

6
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm							
over	**10**	**18**	**30**	**50**	**80**	**120**	**180**	**250**
incl.	**18**	**30**	**50**	**80**	**120**	**180**	**250**	**315**
	Values in µm							
IT4	5	6	7	8	10	12	14	16
IT5	8	9	11	13	15	18	20	23
IT6	11	13	16	19	22	25	29	32
IT7	18	21	25	30	35	40	46	52

Roughness of cylindrical bearing seating surfaces

✎ *Ra must not be too high*

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤*359*| *7*.

7
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Mounting dimensions for the contact surfaces of bearing rings

✎ *The contact surfaces for the rings must be of sufficient height*

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of the abutment shoulders ➤*362*|. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

1.17 Mounting and dismounting

The mounting and dismounting options for four point contact bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎ As the bearings are not self-retaining, they are easy to mount

Four point contact bearings are not self-retaining. As a result, the outer ring with the ball and cage assembly can be mounted separately from the two inner ring halves ➤*350*|*1.1*. This gives simplified mounting of the bearings.

Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤*https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

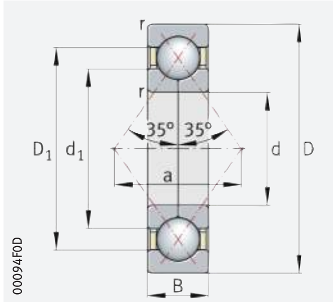
The following link will take you to the Schaeffler electronic product catalogue: ➤*https://medias.schaeffler.com*.

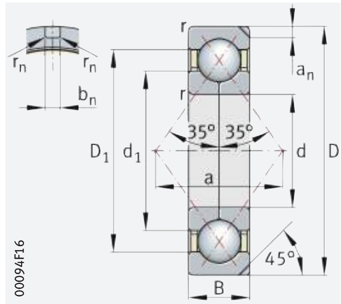
1.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Four point contact bearings



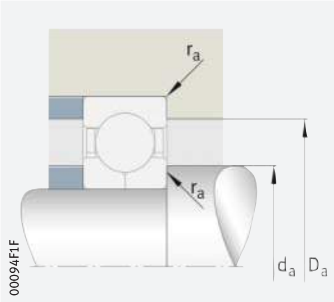


N2 variant

d = 17 – 85 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤356|1.12 ➤356|1.13 X-life ➤351
			N	N	N	min^{-1}	min^{-1}	≈ kg	
17	47	14	24 500	15 100	1 100	29 500	12 000	0,148	**QJ303-XL-MPA**
20	52	15	31 000	19 600	1 320	26 000	10 700	0,184	**QJ304-XL-MPA**
25	52	15	26 000	18 800	1 260	25 500	12 300	0,171	**QJ205-XL-MPA**
	62	17	46 500	31 500	2 120	14 100	8 800	0,256	**QJ305-XL-TVP**
30	62	16	37 500	27 500	1 880	21 100	10 200	0,254	**QJ206-XL-MPA**
	72	19	61 000	43 000	2 900	11 900	7 600	0,379	**QJ306-XL-TVP**
35	72	17	45 000	35 500	2 400	18 000	8 500	0,359	**QJ207-XL-MPA**
	80	21	65 000	51 000	3 400	10 800	7 000	0,516	**QJ307-XL-TVP**
40	80	18	58 000	46 500	3 150	10 600	7 500	0,399	**QJ208-XL-TVP**
	90	23	90 000	69 000	4 650	9 300	6 200	0,695	**QJ308-XL-TVP**
45	85	19	66 000	57 000	3 850	9 800	6 900	0,467	**QJ209-XL-TVP**
	100	25	107 000	83 000	6 100	8 300	5 700	0,934	**QJ309-XL-TVP**
50	90	20	62 000	56 000	3 850	13 900	6 700	0,609	**QJ210-XL-MPA**
	110	27	115 000	92 000	6 600	11 300	5 400	1,39	**QJ310-XL-MPA**
55	100	21	81 000	76 000	5 200	8 200	5 800	0,697	**QJ211-XL-TVP**
	120	29	133 000	108 000	7 900	10 300	5 000	1,76	**QJ311-XL-MPA**
60	95	18	47 500	52 000	2 600	13 100	5 800	0,42	**QJ1012-MPA**
	110	22	98 000	93 000	6 400	7 400	5 300	0,889	**QJ212-XL-TVP**
	130	31	152 000	126 000	8 900	9 500	4 700	2,2	**QJ312-XL-MPA**
65	120	23	106 000	104 000	7 000	10 300	4 900	1,27	**QJ213-XL-MPA**
	140	33	171 000	145 000	10 500	8 700	4 450	2,71	**QJ313-XL-MPA**
70	125	24	123 000	122 000	9 100	6 500	4 600	1,19	**QJ214-XL-TVP**
	150	35	198 000	165 000	11 500	8 100	4 200	3,29	**QJ314-XL-MPA**
75	130	25	129 000	130 000	9 100	6 200	4 450	1,34	**QJ215-XL-TVP**
	160	37	229 000	204 000	14 000	7 600	3 900	3,95	**QJ315-XL-N2-MPA**
80	140	26	136 000	137 000	9 400	8 600	4 250	1,84	**QJ216-XL-MPA**
	170	39	226 000	220 000	10 800	7 000	3 750	4,65	**QJ316-N2-MPA**
85	130	22	80 000	95 000	4 650	9 200	4 250	1,11	**QJ1017-N2-MPA**
	150	28	158 000	160 000	10 800	8 000	4 050	2,3	**QJ217-XL-MPA**
	180	41	248 000	255 000	12 400	6 600	3 550	5,53	**QJ317-N2-MPA**

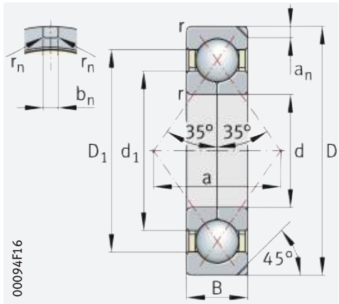
medias ➤ *https://www.schaeffler.de/std/1D9E*



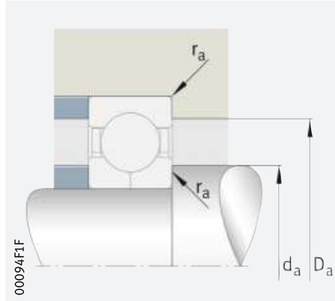
Mounting dimensions

Dimensions								Mounting dimensions		
d	r min.	D_1 ≈	d_1 ≈	a ≈	a_n	b_n	r_n	d_a min.	D_a max.	r_a max.
17	1	36,4	27,8	22	–	–	–	22,6	41,4	1
20	1,1	41,4	30,6	26	–	–	–	27	45	1
25	1	43,1	33,9	27	–	–	–	31	46	1
	1,1	49,5	37,5	31	–	–	–	32	55	1
30	1	50,7	40,4	32	–	–	–	36	56	1
	1,1	58	44	36	–	–	–	37	65	1
35	1,1	59,1	48	38	–	–	–	42	65	1
	1,5	64,8	50,8	41	–	–	–	44	71	1,5
40	1,1	66,8	53,7	42	–	–	–	47	73	1
	1,5	73,4	56,7	46	–	–	–	49	81	1,5
45	1,1	72	58,5	45	–	–	–	52	78	1
	1,5	81,7	63,4	51	–	–	–	54	91	1,5
50	1,1	76,4	63,7	49	–	–	–	57	83	1
	2	89,6	70,5	56	–	–	–	61	99	2
55	1,5	84,7	70,4	54	–	–	–	64	91	1,5
	2	97,8	77,2	61	–	–	–	66	109	2
60	1,1	83,1	72,4	54	–	–	–	66	89	1
	1,5	93	77,1	60	–	–	–	69	101	1,5
	2,1	106,9	84,2	67	–	–	–	72	118	2,1
65	1,5	101,5	84,2	65	–	–	–	74	111	1,5
	2,1	114,4	91	72	–	–	–	77	128	2,1
70	1,5	106,3	89,1	68	–	–	–	79	116	1,5
	2,1	123,6	97,7	77	–	–	–	82	138	2,1
75	1,5	111,5	93,9	72	–	–	–	84	121	1,5
	2,1	131	104,4	82	10,1	8,5	2	87	148	2,1
80	2	119,6	100,9	77	–	–	–	91	129	2
	2,1	140,8	110,7	88	10,1	8,5	2	92	158	2,1
85	1,1	114,8	101,1	75	5	6,5	0,5	91	124	1
	2	128,6	107,6	82	–	–	–	96	139	2
	3	148,7	117,9	93	11,7	10,5	2	99	166	2,5

Four point contact bearings



N2 variant



Mounting dimensions

d = 90 – 200 mm

Main dimensions d	 D	 B	Basic load ratings dyn. C_r N	 stat. C_{0r} N	Fatigue limit load C_{ur} N	Limiting speed n_G min^{-1}	Speed rating $n_{\vartheta r}$ min^{-1}	Mass m ≈ kg	Designation ➤356 1.12 ➤356 1.13 X-life ➤351
90	160	30	189 000	198 000	12 500	4 950	3 750	2,35	**QJ218-XL-N2-TVP**
	190	43	265 000	285 000	12 900	6 300	3 350	6,31	**QJ318-N2-MPA**
95	145	24	98 000	121 000	5 600	8 200	3 850	1,56	**QJ1019-N2-MPA**
	170	32	190 000	212 000	10 100	7 000	3 700	3,41	**QJ219-N2-MPA**
	200	45	285 000	315 000	14 100	5 900	3 250	7,45	**QJ319-N2-MPA**
100	180	34	224 000	241 000	11 200	6 600	3 550	4,02	**QJ220-N2-MPA**
	215	47	325 000	365 000	16 300	5 400	3 000	9,04	**QJ320-N2-MPA**
105	160	26	117 000	145 000	6 400	7 400	3 550	2,035	**QJ1021-N2-MPA**
	190	36	233 000	255 000	11 600	6 200	3 450	4,81	**QJ221-N2-MPA**
110	170	28	138 000	184 000	7 900	6 900	3 350	2,524	**QJ1022-N2-MPA**
	200	38	249 000	285 000	12 300	5 900	3 350	5,66	**QJ222-N2-MPA**
	240	50	345 000	415 000	17 400	4 950	2 700	12,2	**QJ322-N2-MPA**
120	180	28	145 000	200 000	8 300	6 500	3 100	2,707	**QJ1024-N2-MPA**
	215	40	285 000	340 000	14 700	5 400	3 050	6,74	**QJ224-N2-MPA**
	260	55	385 000	485 000	19 300	4 550	2 480	15,6	**QJ324-N2-MPA**
130	230	40	295 000	370 000	15 400	5 100	2 800	7,66	**QJ226-N2-MPA**
	280	58	425 000	570 000	21 600	4 200	2 220	19,2	**QJ326-N2-MPA**
140	250	42	315 000	420 000	16 500	4 700	2 600	9,69	**QJ228-N2-MPA**
	300	62	470 000	660 000	24 900	3 900	2 030	23,2	**QJ328-N2-MPA**
150	225	35	205 000	295 000	10 900	5 100	2 650	6,167	**QJ1030-N2-MPA**
	270	45	350 000	485 000	18 400	4 350	2 360	12,2	**QJ230-N2-MPA**
	320	65	510 000	730 000	25 500	3 650	1 870	28	**QJ330-N2-MPA**
160	240	38	231 000	335 000	11 900	4 750	2 600	6,35	**QJ1032-N2-MPA**
	290	48	370 000	530 000	19 900	4 050	2 200	15,3	**QJ232-N2-MPA**
170	260	42	280 000	430 000	14 800	4 350	2 340	8,788	**QJ1034-N2-MPA**
	310	52	420 000	630 000	22 800	3 750	2 010	18,6	**QJ234-N2-MPA**
180	280	46	340 000	510 000	18 700	4 050	2 140	11,42	**QJ1036-N2-MPA**
	320	52	435 000	680 000	23 900	3 600	1 870	19,6	**QJ236-N2-MPA**
190	290	46	345 000	540 000	19 200	3 900	2 010	11,4	**QJ1038-N2-MPA**
200	310	51	390 000	620 000	21 300	3 600	1 890	15	**QJ1040-N2-MPA**

medias ➤ *https://www.schaeffler.de/std/1D9F*

Dimensions								Mounting dimensions		
d	r	D_1	d_1	a	a_n	b_n	r_n	d_a	D_a	r_a
	min.	≈	≈	≈				min.	max.	max.
90	2	136,1	114,3	88	8,1	6,5	1	101	149	2
	3	157,1	124,5	98	11,7	10,5	2	104	176	2,5
95	1,5	128,1	112,9	84	5	6,5	0,5	102	138	1,5
	2,1	144,4	121	93	8,1	6,5	1	107	158	2,1
	3	165,4	131,2	103	11,7	10,5	2	109	186	2,5
100	2,1	153,6	127,7	98	10,1	8,5	2	112	168	2,1
	3	176,6	139	110	11,7	10,5	2	114	201	2,5
105	2	141,5	124,6	93	6,5	6,5	0,5	114	151	2
	2,1	161,6	134,8	103	10,1	8,5	2	117	178	2,1
110	2	149,8	131,3	98	6,5	6,5	0,5	119	161	2
	2,1	169,8	141,7	109	10,1	8,5	2	122	188	2,1
	3	195,5	156,5	123	11,7	10,5	2	124	226	2,5
120	2	159,2	141,3	105	6,5	6,5	0,5	129	171	2
	2,1	183,7	152,8	117	11,7	10,5	2	132	203	2,1
	3	210,6	169,9	133	11,7	10,5	2	134	246	2,5
130	3	196,2	165,4	127	11,7	10,5	2	144	216	2,5
	4	228	184,1	144	12,7	10,5	2	147	263	3
140	3	210,5	180	137	11,7	10,5	2	154	236	2,5
	4	243	197,5	154	12,7	10,5	2	157	283	3
150	2,1	199,4	176,8	131	8,1	6,5	1	160,2	214,8	2,1
	3	226,7	193,8	147	11,7	10,5	2	164	256	2,5
	4	261	211,2	165	12,7	10,5	2	167	303	3
160	2,1	212,8	188,5	140	10,1	8,5	2	170	230	2,1
	3	240	208,1	158	12,7	10,5	2	174	276	2,5
170	2,1	229,5	201,9	151	11,7	10,5	2	180,2	249,8	2,1
	4	260,5	221,5	168	12,7	10,5	2	187	293	3
180	2,1	245	215,5	161	11,7	10,5	2	190,2	269,8	2,1
	4	269	231	175	12,7	10,5	2	197	303	3
190	2,1	256,2	225,3	168	11,7	10,5	2	200,2	279,8	2,1
200	2,1	271,5	238,9	179	12,7	10,5	2	210,2	299,8	2,1

Self-aligning ball bearings

FAG

Matrix for bearing preselection

The matrix gives an overview of the types and design features of self-aligning ball bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter (see column "detailed information") and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

Design features and suitability

+++ extremely suitable
++ highly suitable
+ suitable
(+) suitable with restrictions
– not suitable/not applicable
✓ available

Design features and suitability			Self-aligning ball bearings: cylindrical or tapered bore	with extended inner ring	with adapter sleeve	detailed information ➤ 370
Load carrying capacity	radial		++	++	++	➤372 | 1.2
	axial, one direction		(+)	(+)	(+)	➤372 | 1.2
	axial, both directions		(+)	(+)	(+)	➤372 | 1.2
	moments		–	–	–	
Compensation of angular misalignments	static		+++	+++	+++	➤372 | 1.3
	dynamic		+++	+++	+++	➤372 | 1.3
Bearing design	cylindrical bore		✓	✓	✓	➤370 | 1.1
	tapered bore		✓	–	–	➤370 | 1.1
	separable		–	–	–	➤383 | 1.17
Lubrication	greased		✓1)	–	✓1)	➤373 | 1.4
Sealing	open		✓	✓	✓	➤373 | 1.5
	non-contact		–	–	–	
	contact		✓	–	✓	➤373 | 1.5
Operating temperature in °C		from to	–30 +150 2)	–30 +150	–30 +150 2)	➤374 | 1.8
Suitability for	high speeds		+	+	+	➤374 | 1.6
	high running accuracy		–	–	–	➤376 | 1.11 ➤114
	low-noise running		(+)	(+)	(+)	➤374 | 1.7 ➤27
	high rigidity		(+)	(+)	(+)	➤54
	reduced friction		++	++	++	➤56
	length compensation within bearing		–	–	–	
	non-locating bearing arrangement		+	+	+	➤139
	locating bearing arrangement		+	+	+	➤139
X-life design			–	–	–	
Bearing bore 3) d in mm		from to	5 150	20 60	17 100	➤386
Product tables		from page ➤	386	400	402	

1) Sealed bearings only

2) Valid for open bearings with brass cage

3) For bearings with adapter sleeve: inside diameter of adapter sleeve

1 Self-aligning ball bearings

Self-aligning ball bearings are particularly suitable:

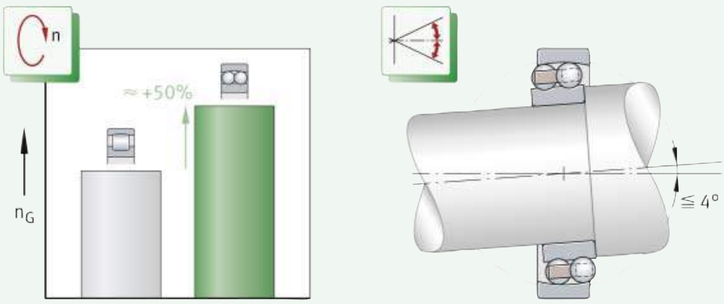
- if there is skewing between the outer and inner ring (for the compensation of angular misalignments) ➤372|1.3
- for bearing arrangements with high radial loads ➤372|1.2
- for higher speeds on account of their point contact, than barrel roller bearings with line contact
- where bearings with the above-mentioned characteristics are expected to run more quietly and at lower temperatures, even at high speeds.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤369.

1

Self-aligning ball bearing: speed comparison with barrel roller bearing, compensation of misalignments

n_G = *limiting speed*



1.1 Bearing design

Design variants

Self-aligning ball bearings are available as:

- bearings of basic design ➤371|2
- bearings with extended inner ring and locating slot ➤371|3
- bearings with adapter sleeve ➤371|4
- bearings with ball projection ➤372|5.

Bearings of basic design

The outer ring has a curved raceway

Self-aligning ball bearings are double row, self-retaining radial ball bearings, which are part of the group of self-aligning bearings. The outer ring has a single concave raceway for the two rows of balls. As a result, the bearings permit the compensation of static and dynamic angular misalignments (skewing between the inner and outer ring) within certain limits ➤372|1.3. The inner ring has two formed raceway grooves in which the rolling elements run. Solid cages made from polyamide PA66 or brass are used ➤375|2.

The bore is cylindrical or tapered

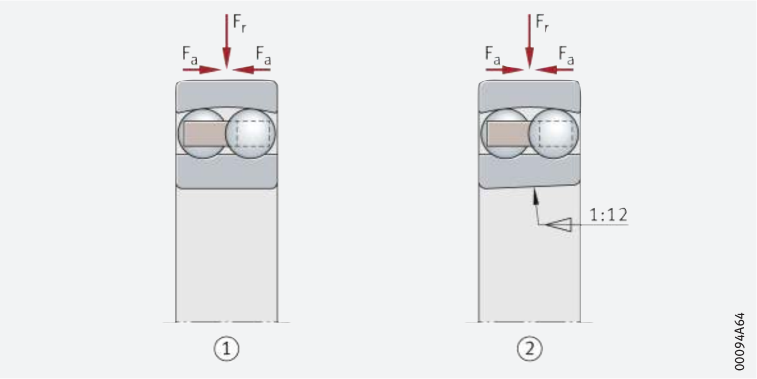
Bearings of basic design are supplied with a cylindrical bore; self-aligning ball bearings of series 12, 13, 22 and 23 are also available with a tapered bore ➤371|2.

Bearings with a tapered bore have a bore taper of 1:12 and the suffix K ➤377|5.

2
Self-aligning ball bearings of basic design

F_r = radial load
F_a = axial load

① Self-aligning ball bearing with cylindrical bore, open
② Self-aligning ball bearing with tapered bore, open, bore taper 1:12



Bearings with extended inner ring and locating slot

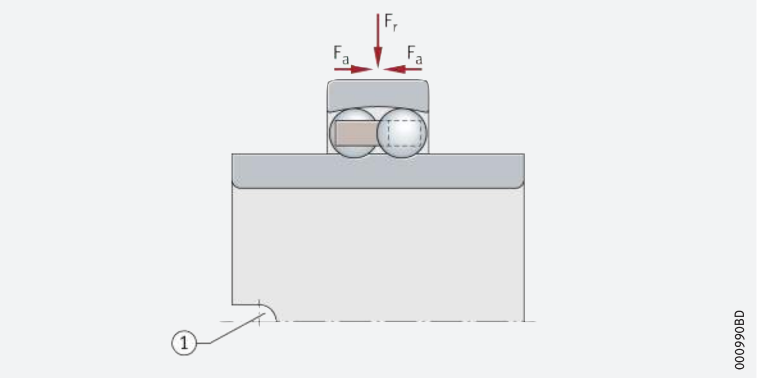
Suitable for simple bearing arrangements

Self-aligning ball bearings of series 112 have an extended inner ring with cylindrical bore on both sides and a slot on one side of the inner ring ➤371|3. These bearings are particularly suitable for simple bearing arrangements with conventional shafts. Due to the bearing bore tolerance J7, mounting and dismounting of this type is very simple. The slot is used to locate the bearings in an axial direction by means of a grub screw; ➤380|8.

3
Self-aligning ball bearing with extended inner ring and locating slot

F_r = radial load
F_a = axial load

① Locating slot



Bearings with adapter sleeve

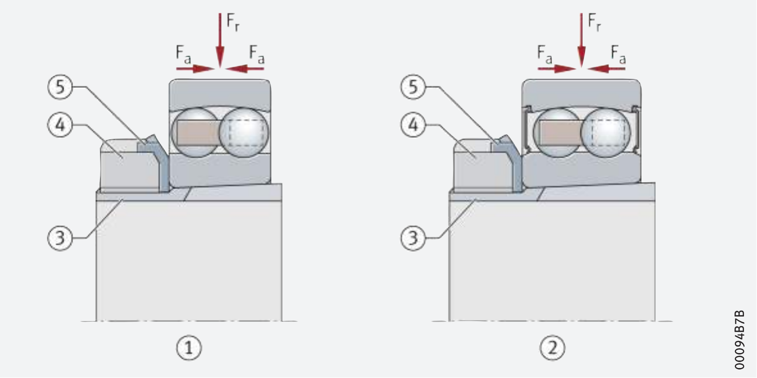
Ready-to-fit bearing mounting kits facilitate the ordering and mounting of self-aligning ball bearings

Complete bearing mounting kits are also available for use in locating self-aligning ball bearings with a tapered bore on a cylindrical shaft journal. These units comprise the bearing, slotted adapter sleeve, tab washer and locknut (series 12..-K + H, 13..-K + H, 22..-K + H, 23..-K + H, 22..-K-2RS + H) ➤371|4. Adapter sleeves allow bearings to be located on smooth and stepped shafts. The adapter sleeves must also be stated when placing the order. Ordering example ➤377|7.

4
Self-aligning ball bearings with adapter sleeve

F_r = radial load
F_a = axial load

① Self-aligning ball bearing, open
② Self-aligning ball bearing, lip seal on both sides
③ Adapter sleeve
④ Locknut
⑤ Tab washer



Bearings with ball projection

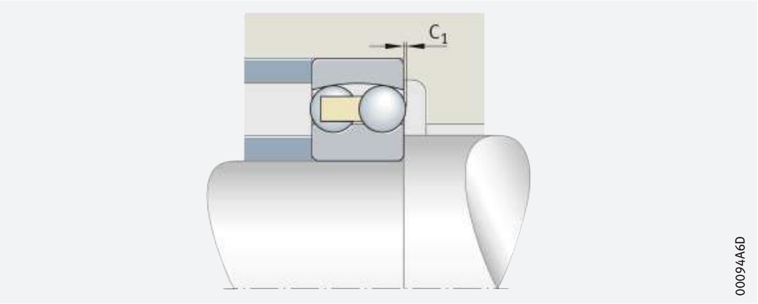
The dimension C_1 must be observed

In some self-aligning ball bearings with a brass cage (bearings with the suffix M), the balls project to a certain extent at the sides ➤372|5.

The projection is marked C_1 in the product tables. This must be taken into consideration when defining the dimensions for the adjacent parts.

5
Self-aligning ball bearing with ball projection

C_1 = ball projection



1.2 Load carrying capacity

Suitable for high radial and low axial loads

In addition to high radial forces, self-aligning ball bearings also support low axial forces from both directions ➤371|2 to ➤371|4. Due to the point contact with which the rolling elements are in contact with the raceways, the radial load carrying capacity of the bearings is lower than for barrel roller bearings with line contact.

Axial load carrying capacity of bearings with adapter sleeve

Where bearings with adapter sleeves are located on a smooth shaft without a fixed stop (e.g. rigid shoulder), their axial load carrying capacity is dependent on the friction between the shaft and the sleeve.

If there is any doubt about the axial load carrying capacity of the location method, please consult Schaeffler.

1.3 Compensation of angular misalignments

Self-aligning ball bearings compensate dynamic and static angular misalignments

Due to the concave rolling element raceway in the outer ring, self-aligning ball bearings are capable of angular adjustment. As a result, they permit skewing between the outer and inner ring within certain limits, without causing damage to the bearings, and can thus compensate misalignments, shaft deflections and housing deformations.

Permissible adjustment angle

With a rotating inner ring, self-aligning ball bearings can swivel up to 4° from their central position

Under normal operating conditions and with a rotating inner ring, self-aligning ball bearings can swivel up to 4° from their central position, whereas sealed bearings can swivel up to 1,5°. The extent to which these values can be used in practice is, however, essentially dependent on the design of the bearing arrangement.

If the outer ring rotates or the inner ring undergoes tumbling motion, the angular adjustment facility is considerably smaller. In such cases, please consult Schaeffler.

1.4 Lubrication

Greased bearings are maintenance-free

Sealed self-aligning ball bearings are lubricated with a high quality lithium soap grease with a mineral oil base, which has good anti-corrosion characteristics. The grease filling is measured so that it is sufficient for the entire life of the bearing. As a result, these bearings are maintenance-free.

! Do not wash greased bearings out prior to mounting. If mounting is carried out using thermal tools, the bearings should not be heated to a temperature in excess of +80 °C, taking account of the grease filling and seal material. If higher heating temperatures are required, it must be ensured that the permissible upper temperature limits for grease and seals are not exceeded. Schaeffler recommends the use of induction heating devices for heating purposes ➤231.

Lubrication for ungreased bearings

Open bearings are not greased. They can be lubricated from the end faces using oil or grease.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

1.5 Sealing

Also available with lip seals

Self-aligning ball bearings of series 22 and 23 are also available with contact seals on both sides of the bearing ➤371 | 4. The integration of such seals into the bearing provides a compact, economical and reliable solution for the sealing of bearing arrangements. In order that the highest possible sealing effect can still be achieved with minimum friction, the seal lips are in contact with the ground opposing running surface of the inner ring under light pressure. The sealing material used is the proven, oil-resistant and wear-resistant elastomer material NBR. Sealed self-aligning ball bearings have the suffix 2RS ➤377 | 5.

Sealing can be achieved in the adjacent construction, if the bearings are open

In the case of unsealed bearings, sealing of the bearing position must be carried out in the adjacent construction. The sealing system should reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

1.6 Speeds

Speeds in the product tables

The product tables give two speeds for most bearings ➤386|:
- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤*64*.

The values given in the product tables are valid for oil lubrication in the case of bearings without seals and for grease lubrication where bearings are supplied greased and with seals.

Values for grease lubrication

For grease lubrication, 85% of the value stated in the product tables is permissible in each case.

Reference speeds

$n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤*64*.

Bearings with contact seals

For bearings with contact seals, no reference speeds are defined in accordance with DIN ISO 15312:2004. As a result, only the limiting speed n_G is given in the product tables for these bearings.

1.7 Noise

Schaeffler Noise Index

The Schaeffler Noise Index (SGI) is not yet available for this bearing type ➤*69*. The data for these bearing series will be introduced and updated in stages.

Further information:
- ***medias*** ➤*https://medias.schaeffler.com*.

1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:
- the dimensional stability of the bearing rings and rolling elements
- the cage
- the lubricant
- the seals.

Possible operating temperatures of self-aligning ball bearings ➤*675*| *5*.

1
Permissible temperature ranges

Operating temperature	Open self-aligning ball bearings		Sealed self-aligning ball bearings
	with brass cage	with polyamide cage PA66	
	−30 °C to +150 °C	−30 °C to +120 °C	−30 °C to +100 °C, limited by the lubricant and seal material

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

✎ *Solid cages made from brass and polyamide PA66 are used as standard*

Standard cages and additional cage designs for self-aligning ball bearings ➤375|▦2. Other cage designs are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass or sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦2
Cage, cage suffix, bore code

Bearing series	Solid cage made from polyamide PA66	Solid brass cage	
	TVH	M	
	standard	standard	also available for
	Bore code		
10	8	–	–
12	up to 18	from 19	–
13	up to 13	from 14	03
22	up to 16, 18	17, from 19	12, 14
23	up to 13	from 14	05 to 10, 12, 13
112	04 to 12	–	–

1.10 Internal clearance

Radial internal clearance – bearings with cylindrical bore

✎ *The standard is CN*

Self-aligning ball bearings with cylindrical bore are manufactured as standard with radial internal clearance CN (normal) ➤375|▦3. CN is not stated in the designation.

Certain sizes are also available by agreement with the larger internal clearance C3.

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤375|▦3. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

▦3
Radial internal clearance of self-aligning ball bearings with cylindrical bore

Nominal bore diameter		Radial internal clearance			
d		CN (Group N)		C3 (Group 3)	
mm		μm		μm	
over	incl.	min.	max.	min.	max.
–	6	5	15	10	20
6	10	6	17	12	25
10	14	6	19	13	26
14	18	8	21	15	28
18	24	10	23	17	30
24	30	11	24	19	35
30	40	13	29	23	40
40	50	14	31	25	44
50	65	16	36	30	50
65	80	18	40	35	60
80	100	22	48	42	70
100	120	25	56	50	83
120	140	30	68	60	100
140	160	35	80	70	120

Radial internal clearance – bearings with tapered bore

The standard is C3

Self-aligning ball bearings with tapered bore are manufactured as standard with the larger radial internal clearance C3 ➤376|▦4.

Certain sizes are also available by agreement with internal clearance CN (normal).

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤376|▦4. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

▦4
Radial internal clearance of self-aligning ball bearings with tapered bore

Nominal bore diameter d mm		Radial internal clearance			
		CN (Group N) µm		C3 (Group 3) µm	
over	incl.	min.	max.	min.	max.
18	24	13	26	20	33
24	30	15	28	23	39
30	40	19	35	29	46
40	50	22	39	33	52
50	65	27	47	41	61
65	80	35	57	50	75
80	100	42	68	62	90
100	120	50	81	75	108
120	140	60	98	90	130
140	160	65	110	100	150

1.11 Dimensions, tolerances

Dimension standards

The main dimensions of self-aligning ball bearings correspond to DIN 630:2011, with the exception of bearing series 112. Nominal dimensions of self-aligning ball bearings ➤386|▦.

Series 112

The dimensions of self-aligning ball bearings with extended inner ring (bearing series 112) correspond to DIN 630-2, which was withdrawn in 1993. Nominal dimensions of bearings ➤400|▦.

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤135|7.11. Nominal value of chamfer dimension ➤386|▦.

Tolerances

The tolerances for the dimensional and running accuracy of self-aligning ball bearings correspond to tolerance class Normal in accordance with ISO 492:2014, except for the bearing bore of bearing series 112, which is manufactured to tolerance class J7. Tolerance values in accordance with ISO 492 ➤122|▦8.

1.12 Suffixes

For a description of the suffixes used in this chapter ➤377|▦5 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦**5**
Suffixes and corresponding descriptions

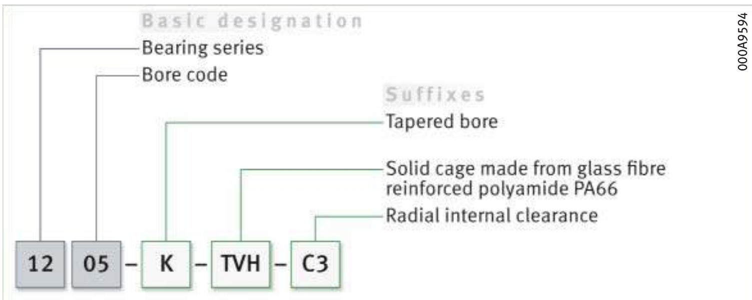
Suffix	Description of suffix	
C3	Radial internal clearance C3 (larger than normal)	Standard for bearings with tapered bore
CN	Radial internal clearance CN (normal)	Special design for bearings with tapered bore, available by agreement
K	Tapered bore	Standard
M	Solid brass cage	Standard, cage material dependent on bearing series and bore code
TVH	Solid cage made from glass fibre reinforced polyamide PA66	
2RS	Contact seal on both sides	Dependent on bearing series

1.13 Structure of bearing designation

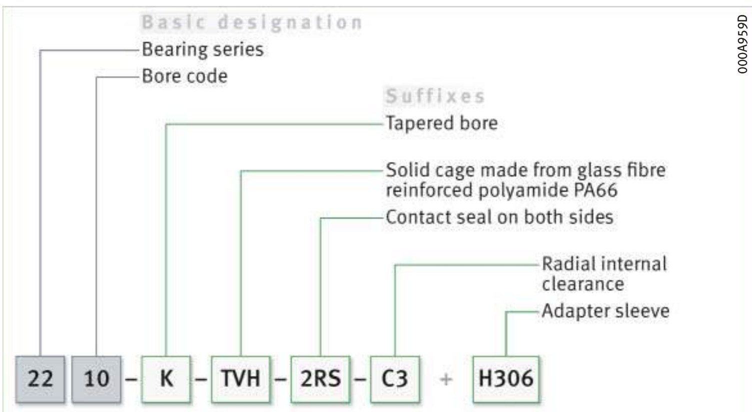
✎ *Examples of composition of bearing designation*

The designation of bearings follows a set model. Examples ➤*377*|*6* and ➤*377*|*7*. The composition of designations is subject to DIN 623-1 ➤*102*|*10*.

6
Self-aligning ball bearing with tapered bore: designation structure



7
Self-aligning ball bearing with tapered bore and adapter sleeve: designation structure



1.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

✎ P is a substitute force for combined load and various load cases

If this condition is not met, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ $F_a/F_r \leqq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factor e ➤378| ƒ 1 and ➤378| ƒ 2.

ƒ 1
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r + Y_1 \cdot F_a$$

ƒ 2
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}65 \cdot F_r + Y_2 \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load
e, Y_1, Y_2	–	Factors ➤386|.

Equivalent static bearing load

For self-aligning ball bearings subjected to static load ➤378| ƒ 3.

ƒ 3
Equivalent static load

$$P_0 = F_{0r} + Y_0 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load)
Y_0	–	Axial load factor ➤386|.

Static load safety factor

✎ $S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤378| ƒ 4.

ƒ 4
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

1.15 Minimum load

✎ In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/100$ is required

In order that no slippage occurs between the contact partners, the self-aligning ball bearings must be constantly subjected to a sufficiently high load. Based on experience, a minimum radial load of the order of $P > C_{0r}/100$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

1.16 Design of bearing arrangements

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical or tapered seating surface ➤380|Fig. 8 to ➤381|Fig. 11. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤381|Table 6 to ➤382|Table 8.

Radial location – fit recommendations for bearings with cylindrical bore

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|Table 6 and ➤158|Table 7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|Table 2
- shaft fits ➤150|Table 6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|Table 4
- housing fits ➤158|Table 7
- shaft tolerances for adapter sleeves and withdrawal sleeves ➤166|Table 8.

Axial location – location methods for bearings with cylindrical bore

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings, retaining rings, adapter and withdrawal sleeves etc., are fundamentally suitable.

Axial location – bearing series 112

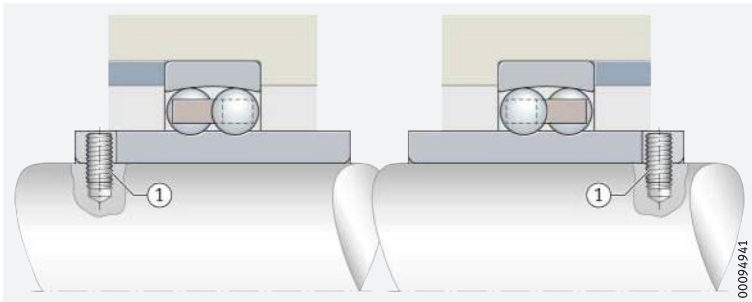
✎ Simple location by means of a grub screw

Bearings of series 112 are axially located by means of a grub screw, which engages in the slot in the bearing inner ring ➤380|8. The grub screw also prevents the inner ring creeping on the shaft.

! If a shaft is to be supported by two bearings, the slots in the inner ring must either be arranged on the sides of the bearings facing towards or away from each other ➤380|8.

8
Axial location of bearing series 112 using grub screw and arrangement of self-aligning ball bearings, where a shaft is supported by two bearings

① *Grub screw*



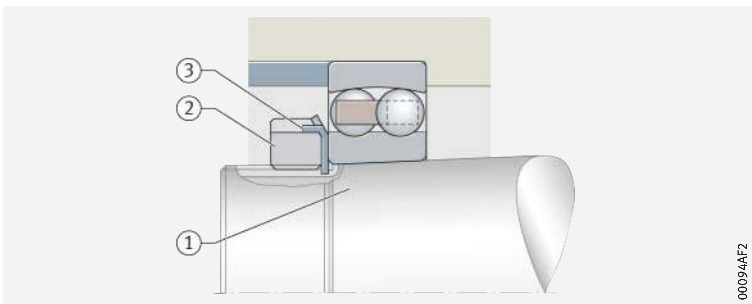
Axial location – bearings with tapered bore

✎ Location by means of locknut and tab washer

If a bearing with a tapered bore is mounted directly on a tapered journal, the bearing can be axially located with ease using a locknut and tab washer ➤380|9.

9
Self-aligning ball bearing with tapered bore, mounted directly on the tapered shaft journal

① *Tapered journal with fixing thread*
② *Locknut*
③ *Tab washer*



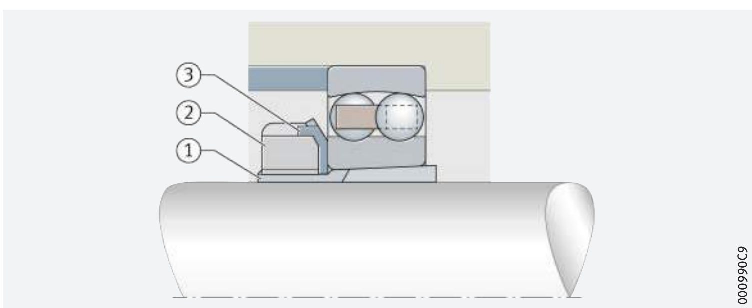
Location of bearings by means of adapter sleeve

✎ Mounting can be carried out quickly and reliably by means of wrench sets from Schaeffler

Self-aligning ball bearings with a tapered bore can be located easily and with operational liability on smooth or stepped cylindrical shafts by means of an adapter sleeve ➤380|10. The adapter sleeve does not need to be secured on the shaft by any additional means. The bearings can be positioned at any point on smooth shafts. Axial load carrying capacity of bearing arrangements by means of adapter sleeve connection ➤372|1.2.

10
Self-aligning ball bearing with adapter sleeve located on smooth shaft

① *Adapter sleeve*
② *Locknut*
③ *Tab washer*

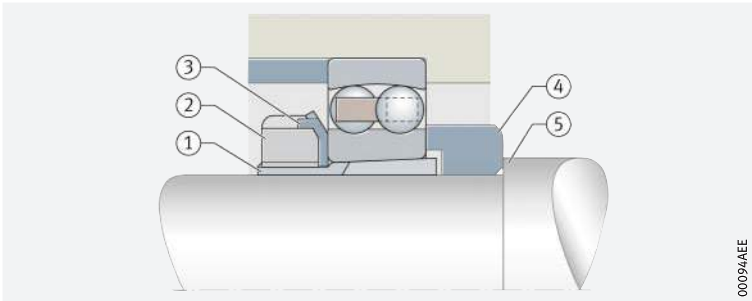


Location by means of adapter sleeve, axial abutment by means of a support ring

If very high axial forces are present, a support ring can also be used to provide axial abutment ➤381| 11. In this instance, the mounting dimensions of the support ring B_a and d_b in the product tables must be observed ➤386|.

11
Stepped shaft, axial abutment by means of a support ring

① *Adapter sleeve*
② *Locknut*
③ *Tab washer*
④ *Support ring*
⑤ *Shaft shoulder*



Dimensional, geometrical and running accuracy of cylindrical bearing seats

A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For self-aligning ball bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7. Guide values for the geometrical and positional tolerances of bearing seating surfaces ➤381| 6, tolerances t_1 to t_3 in accordance with ➤168| 11. Numerical values for IT grades ➤381| 7.

6
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	

7
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm						
	over **18**	**30**	**50**	**80**	**120**	**180**	**250**
	incl. **30**	**50**	**80**	**120**	**180**	**250**	**315**
	Values in µm						
IT4	6	7	8	10	12	14	16
IT5	9	11	13	15	18	20	23
IT6	13	16	19	22	25	29	32
IT7	21	25	30	35	40	46	52

Roughness of cylindrical bearing seating surfaces

Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤382|▦8.

▦8
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Tolerances for tapered bearing seats

Specifications for tapered bearing seats

For bearings located directly on a tapered shaft journal ➤380|9, the data are in accordance with ➤171|12.

Mounting dimensions for the contact surfaces of bearing rings

The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of the abutment shoulders ➤386|▦. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

Suitable bearing housings for self-aligning ball bearings

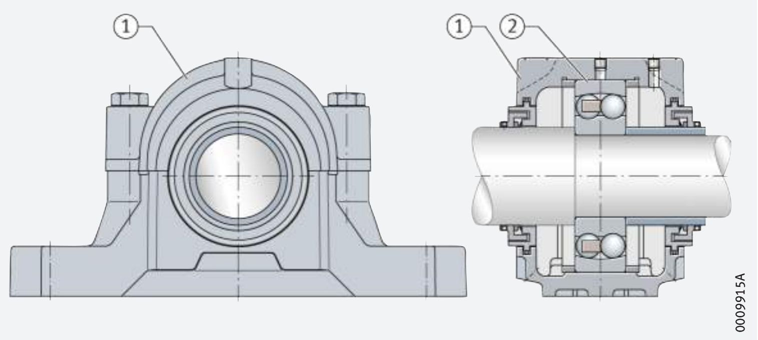
A large range of housings is available

For economical, operationally reliable and easily interchangeable bearing arrangement units, the self-aligning ball bearings can also be combined with Schaeffler bearing housings ➤382|12. These easy-to-fit units fulfil all of the requirements for modern machine and plant designs with favourable maintenance-related characteristics.

Due to the large number of application areas, an extensive range of bearing housings is available for bearings with cylindrical and tapered bores. These include split and unsplit plummer block housings, take-up housings, flanged housings and housings for specific industrial and railway applications. Detailed information on bearing housings can be found in publication GK 1 ➤https://www.schaeffler.de/std/1D54. This book can be ordered from Schaeffler.

12
Split plummer block housing with a self-aligning ball bearing

① Split plummer block housing SNV
② Self-aligning ball bearing



1.17 Mounting and dismounting

The mounting and dismounting options for self-aligning ball bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎ Ensure that the bearings are not damaged during mounting

Self-aligning ball bearings are not separable. In the mounting of non-separable bearings, the mounting forces must always be applied to the bearing ring with a tight fit.

Mounting of bearings with a tapered bore

✎ Suitable methods

Bearings with a tapered bore are mounted with a tight fit on the shaft or adapter and withdrawal sleeve. The measurement of the reduction in radial internal clearance or of the axial drive-up distance of the inner ring on the tapered bearing seat serves as an indication of the tight fit.

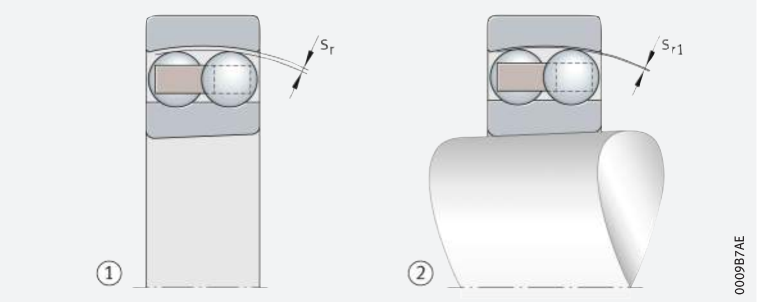
Measuring the reduction in radial internal clearance

✎ The measurement is usually carried out with a feeler gauge

The reduction in radial internal clearance is the difference between the radial internal clearance before mounting and the bearing clearance after mounting of the bearing ➤383|13. The radial internal clearance must be measured first. During pressing on, the radial clearance (bearing clearance) must be checked until the necessary reduction in the radial internal clearance and thus the required tight fit is achieved.

13
Reduction in radial internal clearance

s_r = radial internal clearance before mounting
s_{r1} = radial internal clearance after mounting
$s_r - s_{r1}$ = reduction in radial internal clearance
① Before mounting
② After mounting

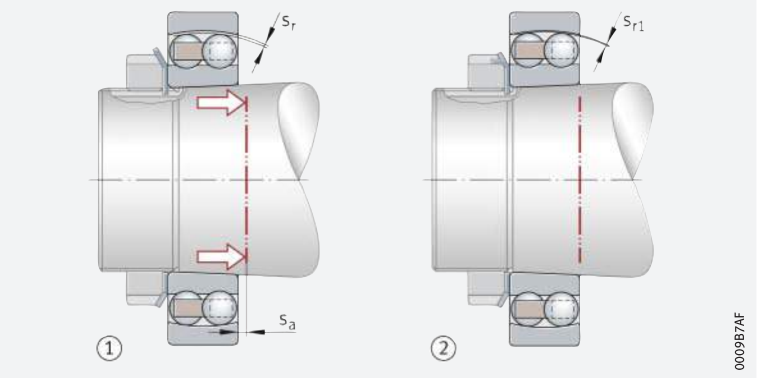


Measuring the axial drive-up distance

The axial drive-up distance can also be measured in place of the reduction in radial internal clearance ➤383|14.

14
Axial drive-up distance

s_a = axial press-on distance (axial drive-up distance of the bearing)
s_r = radial internal clearance
s_{r1} = radial internal clearance after pressing on
$s_r - s_{r1}$ = reduction in radial internal clearance
① Before pressing on
② After pressing on



The malfunction-free operation of bearings presupposes that these have been mounted correctly. An insufficient operating clearance or inadequately tight fit on the shaft generally leads to bearing damage.

If there is any uncertainty regarding the practical application of both methods, Schaeffler must always be consulted.

The mounting of self-aligning ball bearings is also described in the Schaeffler publication BA 28. This BA publication can be requested from Schaeffler.

Schaeffler Mounting Handbook

Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤*https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤*https://medias.schaeffler.com*.

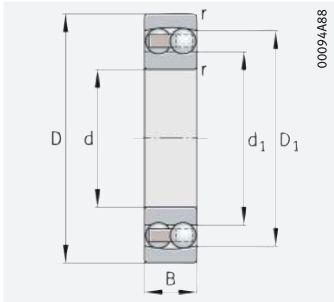
1.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

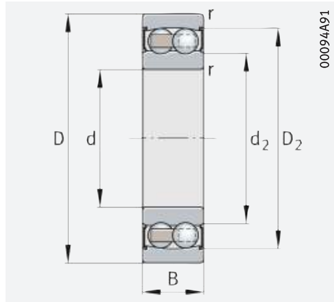
- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore

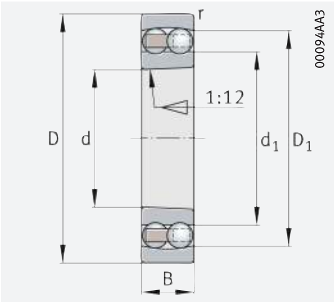


Cylindrical bore with seal 2RS

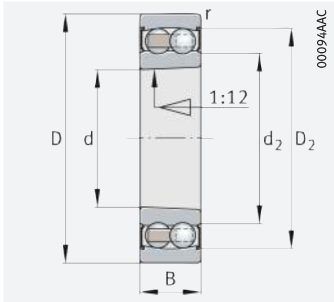
d = 5 – 20 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤377 | 1.12 ➤377 | 1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
5	19	6	2 600	475	29,5	41 500	24 500	0,01	**135-TVH**
6	19	6	2 600	475	29,5	41 500	30 500	0,009	**126-TVH**
7	22	7	2 750	560	34,5	39 000	26 500	0,014	**127-TVH**
8	22	7	2 750	560	34,5	39 000	27 000	0,014	**108-TVH**
9	26	8	3 950	800	50	33 500	24 100	0,022	**129-TVH**
10	30	9	5 700	1 180	73	29 500	22 100	0,034	**1200-TVH**
	30	14	5 700	1 180	73	16 500	27 000	0,053	**2200-2RS-TVH**
	30	14	8 800	1 730	107	25 500	26 000	0,045	**2200-TVH**
12	32	10	5 700	1 250	78	28 000	21 300	0,041	**1201-TVH**
	32	14	5 700	1 250	78	14 700	27 000	0,058	**2201-2RS-TVH**
	32	14	9 400	1 920	120	24 200	23 300	0,05	**2201-TVH**
	37	12	9 800	2 140	133	22 300	16 200	0,067	**1301-TVH**
15	35	11	7 700	1 730	108	23 800	19 100	0,048	**1202-TVH**
	35	14	7 700	1 730	108	13 300	27 000	0,061	**2202-2RS-TVH**
	35	14	9 600	2 080	130	22 200	19 600	0,057	**2202-TVH**
	42	17	9 800	2 260	141	11 200	27 000	0,114	**2302-2RS-TVH**
	42	17	17 400	3 800	237	17 200	15 600	0,111	**2302-TVH**
17	40	12	8 100	2 000	124	21 800	17 400	0,073	**1203-TVH**
	40	16	8 100	2 000	124	11 300	27 000	0,098	**2203-2RS-TVH**
	40	16	11 800	2 750	171	19 100	17 400	0,088	**2203-TVH**
	47	14	12 900	3 150	197	17 800	13 300	0,065	**1303-TVH**
	47	19	12 900	3 150	197	10 100	27 000	0,175	**2303-2RS-TVH**
	47	19	13 900	3 150	197	17 000	14 900	0,155	**2303-TVH**
20	47	14	10 100	2 600	161	18 100	15 300	0,116	**1204-K-TVH-C3**
	47	14	10 100	2 600	161	18 100	15 300	0,118	**1204-TVH**
	47	18	10 100	2 600	161	9 400	–	0,151	**2204-2RS-TVH**
	47	18	14 700	3 500	219	16 300	15 600	0,134	**2204-TVH**
	52	15	12 700	3 300	206	16 100	11 600	0,163	**1304-TVH**
	52	21	12 700	3 300	206	8 500	–	0,23	**2304-2RS-TVH**
	52	21	17 600	4 250	265	15 000	13 800	0,206	**2304-TVH**

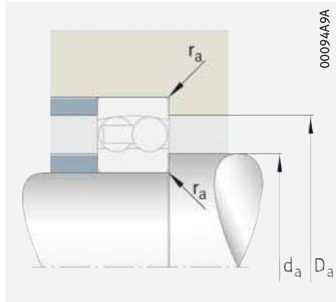
medias ➤ *https://www.schaeffler.de/std/1D7E*



Tapered bore



Tapered bore with seal 2RS

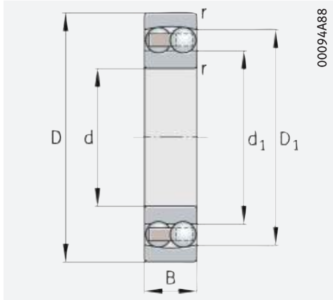


Mounting dimensions

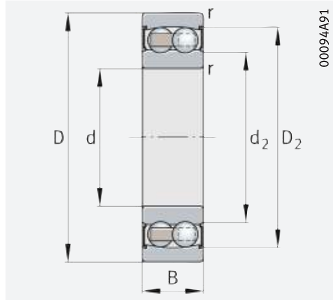
Dimensions						Mounting dimensions			Calculation factors			
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	≈	min.	max.	max.				
5	0,3	14,5	–	10,1	–	7,4	16,6	0,3	0,35	1,82	2,82	1,91
6	0,3	14,7	–	10,1	–	8,4	16,6	0,3	0,35	1,82	2,82	1,91
7	0,3	17,1	–	12,4	–	9,4	19,6	0,3	0,33	1,92	2,97	2,01
8	0,3	16,8	–	12,4	–	10,6	19,4	0,3	0,33	1,92	2,97	2,01
9	0,6	20	–	14,5	–	13,2	21,8	0,6	0,32	1,95	3,01	2,04
10	0,6	23,3	–	16,3	–	14,2	25,8	0,6	0,32	1,95	3,02	2,05
	0,6	–	25,2	–	14,1	14,2	25,8	0,6	0,32	1,95	3,02	2,05
	0,6	24	–	15,1	–	14,2	25,8	0,6	0,58	1,09	1,69	1,14
12	0,6	25,1	–	18,2	–	16,2	27,8	0,6	0,37	1,69	2,62	1,77
	0,6	–	27,2	–	16,2	16,2	27,8	0,6	0,37	1,69	2,62	1,77
	0,6	25,9	–	17,1	–	16,2	27,8	0,6	0,53	1,2	1,85	1,25
	1	29,7	–	20,3	–	17,6	31,4	1	0,35	1,8	2,79	1,89
15	0,6	28,8	–	20,2	–	19,2	30,8	0,6	0,34	1,86	2,88	1,95
	0,6	–	30,2	–	19	19,2	30,8	0,6	0,34	1,86	2,88	1,95
	0,6	29,2	–	20,3	–	19,2	30,8	0,6	0,46	1,37	2,13	1,44
	1	–	34,9	–	23,9	20,6	36,4	1	0,35	1,79	2,77	1,88
	1	34,4	–	22,5	–	20,6	36,4	1	0,51	1,23	1,91	1,29
17	0,6	32	–	23,7	–	21,2	35,8	0,6	0,33	1,93	2,99	2,03
	0,6	–	34,3	–	21,6	21,2	35,8	0,6	0,33	1,93	2,99	2,03
	0,6	33,9	–	23,9	–	21,2	35,8	0,6	0,46	1,37	2,12	1,43
	1	37	–	26,7	–	22,6	41,4	1	0,32	1,94	3	2,03
	1	–	39,4	–	23,9	22,6	41,4	1	0,32	1,94	3	2,03
	1	37,3	–	26,2	–	22,6	41,4	1	0,53	1,19	1,85	1,25
20	1	37,8	–	29,2	–	25,6	41,4	1	0,28	2,24	3,46	2,34
	1	37,8	–	29,2	–	25,6	41,4	1	0,28	2,24	3,46	2,34
	1	–	41	–	25,8	25,6	41,4	1	0,28	2,24	3,46	2,34
	1	39,1	–	28	–	25,6	41,4	1	0,44	1,45	2,24	1,51
	1,1	41,5	–	31,6	–	27	45	1	0,29	2,17	3,35	2,27
	1,1	–	44,4	–	27,2	27	45	1	0,29	2,17	3,35	2,27
	1,1	41,2	–	29,1	–	27	45	1	0,51	1,23	1,9	1,29

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore

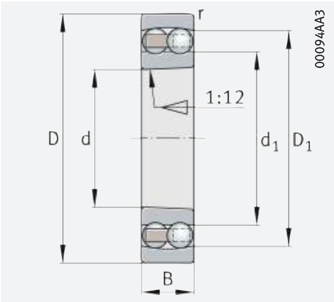


Cylindrical bore with seal 2RS

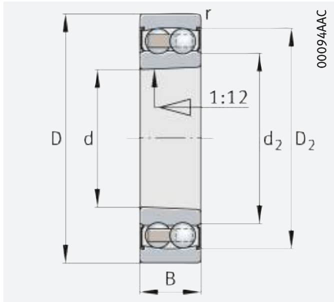
d = 25 – 35 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤377 | 1.12 ➤377 | 1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
25	52	15	12 300	3 250	203	15 500	13 400	0,135	**1205-K-TVH-C3**
	52	15	12 300	3 250	203	15 500	13 400	0,138	**1205-TVH**
	52	18	12 300	3 250	203	8 100	–	0,161	**2205-2RS-TVH**
	52	18	12 300	3 250	203	8 100	–	0,157	**2205-K-2RS-TVH-C3**
	52	18	17 300	4 400	275	14 400	13 400	0,152	**2205-K-TVH-C3**
	52	18	17 300	4 400	275	14 400	13 400	0,156	**2205-TVH**
	62	17	18 300	4 950	310	12 900	10 000	0,254	**1305-K-TVH-C3**
	62	17	18 300	4 950	310	12 900	10 000	0,258	**1305-TVH**
	62	24	18 300	4 950	310	7 000	–	0,367	**2305-2RS-TVH**
	62	24	25 000	6 500	405	12 200	11 900	0,328	**2305-K-TVH-C3**
	62	24	25 000	6 500	405	12 200	11 900	0,335	**2305-TVH**
30	62	16	15 900	4 600	285	13 100	11 400	0,217	**1206-K-TVH-C3**
	62	16	15 900	4 600	285	13 100	11 400	0,221	**1206-TVH**
	62	20	15 900	4 600	285	6 800	–	0,274	**2206-2RS-TVH**
	62	20	15 900	4 600	285	6 800	–	0,268	**2206-K-2RS-TVH-C3**
	62	20	26 000	6 900	425	11 500	11 400	0,246	**2206-K-TVH-C3**
	62	20	26 000	6 900	425	11 500	11 400	0,252	**2206-TVH**
	72	19	21 700	6 300	390	11 100	8 700	0,379	**1306-K-TVH-C3**
	72	19	21 700	6 300	390	11 100	8 700	0,384	**1306-TVH**
	72	27	21 700	6 300	390	5 900	–	0,554	**2306-2RS-TVH**
	72	27	32 500	8 700	540	10 200	10 400	0,476	**2306-K-TVH-C3**
	72	27	32 500	8 700	540	10 200	10 400	0,488	**2306-TVH**
35	72	17	16 000	5 100	315	11 600	9 800	0,319	**1207-K-TVH-C3**
	72	17	16 000	5 100	315	11 600	9 800	0,324	**1207-TVH**
	72	23	16 000	5 100	315	5 600	–	0,442	**2207-2RS-TVH**
	72	23	16 000	5 100	315	5 600	–	0,432	**2207-K-2RS-TVH-C3**
	72	23	33 000	8 900	560	9 800	10 300	0,38	**2207-K-TVH-C3**
	72	23	33 000	8 900	560	9 800	10 300	0,389	**2207-TVH**
	80	21	25 500	7 800	485	9 700	7 800	0,5	**1307-K-TVH-C3**
	80	21	25 500	7 800	485	9 700	7 800	0,507	**1307-TVH**
	80	31	25 500	7 800	485	5 200	–	0,744	**2307-2RS-TVH**
	80	31	40 500	11 100	690	8 900	9 800	0,657	**2307-K-TVH-C3**
	80	31	40 500	11 100	690	8 900	9 800	0,675	**2307-TVH**

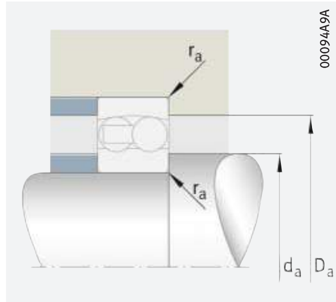
medias ➤ *https://www.schaeffler.de/std/1D7F*



Tapered bore



Tapered bore with seal 2RS

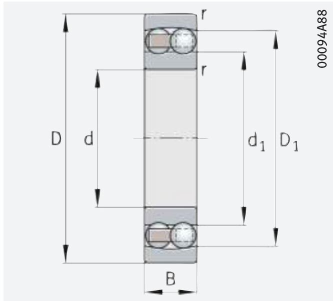


Mounting dimensions

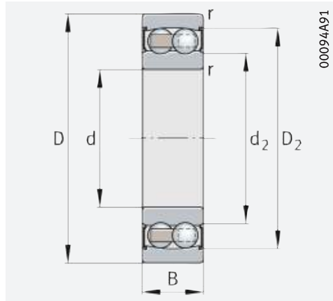
Dimensions						Mounting dimensions			Calculation factors			
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2 ≈	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0
25	1	43,6	–	33,3	–	30,6	46,4	1	0,27	2,37	3,66	2,48
	1	43,6	–	33,3	–	30,6	46,4	1	0,27	2,37	3,66	2,48
	1	–	45,3	–	30,7	30,6	46,4	1	0,27	2,37	3,66	2,48
	1	–	45,3	–	30,7	30,6	46,4	1	0,27	2,37	3,66	2,48
	1	44,4	–	32,3	–	30,6	46,4	1	0,35	1,78	2,75	1,86
	1	44,4	–	32,3	–	30,6	46,4	1	0,35	1,78	2,75	1,86
	1,1	50,4	–	38,1	–	32	55	1	0,28	2,29	3,54	2,4
	1,1	50,4	–	38,1	–	32	55	1	0,28	2,29	3,54	2,4
	1,1	–	52,4	–	33,5	32	55	1	0,28	2,29	3,54	2,4
	1,1	49,9	–	35,5	–	32	55	1	0,48	1,32	2,04	1,38
	1,1	49,9	–	35,5	–	32	55	1	0,48	1,32	2,04	1,38
30	1	51,6	–	40,1	–	35,6	56,4	1	0,25	2,53	3,91	2,65
	1	51,6	–	40,1	–	35,6	56,4	1	0,25	2,53	3,91	2,65
	1	–	53,3	–	37,3	35,6	56,4	1	0,25	2,53	3,91	2,65
	1	–	53,3	–	37,3	35,6	56,4	1	0,25	2,53	3,91	2,65
	1	53,7	–	38,5	–	35,6	56,4	1	0,3	2,13	3,29	2,23
	1	53,7	–	38,5	–	35,6	56,4	1	0,3	2,13	3,29	2,23
	1,1	58,9	–	45,1	–	37	65	1	0,26	2,39	3,71	2,51
	1,1	58,9	–	45	–	37	65	1	0,26	2,39	3,71	2,51
	1,1	–	62,3	–	40,6	37	65	1	0,26	2,39	3,71	2,51
	1,1	58,8	–	41,5	–	37	65	1	0,45	1,4	2,17	1,47
	1,1	58,8	–	41,5	–	37	65	1	0,45	1,4	2,17	1,47
35	1,1	59,1	–	47,7	–	42	65	1	0,22	2,8	4,34	2,94
	1,1	59,1	–	47,7	–	42	65	1	0,22	2,8	4,34	2,94
	1,1	–	63,4	–	43,5	42	65	1	0,22	2,8	4,34	2,94
	1,1	–	63,4	–	43,5	42	65	1	0,22	2,8	4,34	2,94
	1,1	62,4	–	45,7	–	42	65	1	0,3	2,13	3,29	2,23
	1,1	62,4	–	45,7	–	42	65	1	0,3	2,13	3,29	2,23
	1,5	70,1	–	51,3	–	44	71	1,5	0,26	2,47	3,82	2,59
	1,5	70,1	–	51,3	–	44	71	1,5	0,26	2,47	3,82	2,59
	1,5	–	68,4	–	44,9	44	71	1,5	0,26	2,47	3,82	2,59
	1,5	66,1	–	46,9	–	44	71	1,5	0,47	1,35	2,1	1,42
	1,5	66,1	–	46,9	–	44	71	1,5	0,47	1,35	2,1	1,42

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore

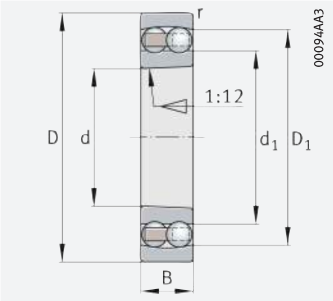


Cylindrical bore with seal 2RS

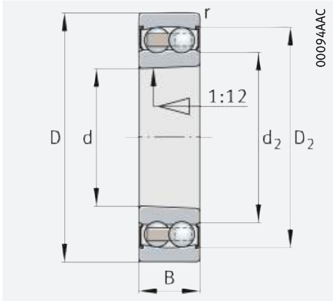
d = 40 – 50 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤377|1.12 ➤377|1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
40	80	18	19 400	6 500	400	10 100	8 600	0,408	**1208-K-TVH-C3**
	80	18	19 400	6 500	400	10 100	8 600	0,414	**1208-TVH**
	80	23	19 400	6 500	400	4 950	–	0,528	**2208-2RS-TVH**
	80	23	19 400	6 500	400	4 950	–	0,517	**2208-K-2RS-TVH-C3**
	80	23	32 500	9 400	580	8 900	8 700	0,465	**2208-K-TVH-C3**
	80	23	32 500	9 400	580	8 900	8 700	0,476	**2208-TVH**
	90	23	30 000	9 600	600	8 600	7 200	0,698	**1308-K-TVH-C3**
	90	23	30 000	9 600	600	8 600	7 200	0,708	**1308-TVH**
	90	33	30 000	9 600	600	4 650	–	1,01	**2308-2RS-TVH**
	90	33	46 000	13 400	830	7 900	8 700	0,899	**2308-K-TVH-C3**
	90	33	46 000	13 400	830	7 900	8 700	0,922	**2308-TVH**
45	85	19	22 000	7 300	455	9 300	8 200	0,454	**1209-K-TVH-C3**
	85	19	22 000	7 300	455	9 300	8 200	0,462	**1209-TVH**
	85	23	22 000	7 300	455	4 650	–	0,548	**2209-2RS-TVH**
	85	23	22 000	7 300	455	4 650	–	0,535	**2209-K-2RS-TVH-C3**
	85	23	28 500	8 900	550	8 600	7 800	0,505	**2209-K-TVH-C3**
	85	23	28 500	8 900	550	8 600	7 800	0,517	**2209-TVH**
	100	25	38 500	12 600	780	7 500	6 700	0,939	**1309-K-TVH-C3**
	100	25	38 500	12 600	780	7 500	6 700	0,953	**1309-TVH**
	100	36	38 500	12 600	780	4 200	–	1,34	**2309-2RS-TVH**
	100	36	55 000	16 500	1 030	7 000	8 000	1,19	**2309-K-TVH-C3**
	100	36	55 000	16 500	1 030	7 000	8 000	1,22	**2309-TVH**
50	90	20	22 900	8 000	500	8 700	7 700	0,516	**1210-K-TVH-C3**
	90	20	22 900	8 000	500	8 700	7 700	0,526	**1210-TVH**
	90	23	22 900	8 000	500	4 250	–	0,606	**2210-2RS-TVH**
	90	23	22 900	8 000	500	4 250	–	0,593	**2210-K-2RS-TVH-C3**
	90	23	28 500	9 400	580	8 100	7 100	0,543	**2210-K-TVH-C3**
	90	23	28 500	9 400	580	8 100	7 100	0,556	**2210-TVH**
	110	27	42 000	14 100	880	6 900	6 300	1,19	**1310-K-TVH-C3**
	110	27	42 000	14 100	880	6 900	6 300	1,21	**1310-TVH**
	110	40	42 000	14 100	880	3 750	–	1,82	**2310-2RS-TVH**
	110	40	66 000	20 100	1 250	6 300	7 600	1,64	**2310-TVH**

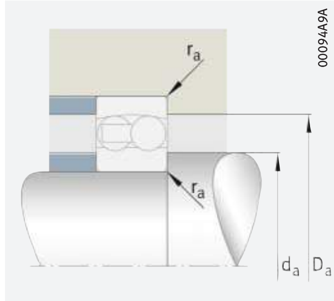
medias ➤ *https://www.schaeffler.de/std/1D80*



Tapered bore



Tapered bore with seal 2RS

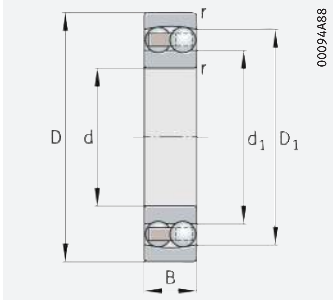


Mounting dimensions

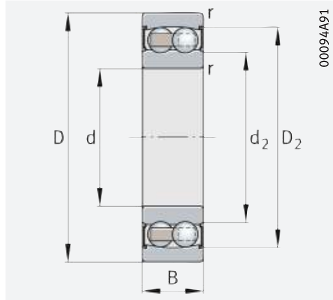
Dimensions						Mounting dimensions			Calculation factors			
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2 ≈	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0
40	1,1	67,3	–	54	–	47	73	1	0,22	2,9	4,49	3,04
	1,1	67,3	–	54	–	47	73	1	0,22	2,9	4,49	3,04
	1,1	–	70,3	–	49,2	47	73	1	0,22	2,9	4,49	3,04
	1,1	–	70,3	–	49,2	47	73	1	0,22	2,9	4,49	3,04
	1,1	70,2	–	52,5	–	47	73	1	0,26	2,43	3,76	2,54
	1,1	70,2	–	52,5	–	47	73	1	0,26	2,43	3,76	2,54
	1,5	74,7	–	57,8	–	49	81	1,5	0,25	2,52	3,9	2,64
	1,5	74,7	–	57,8	–	49	81	1,5	0,25	2,52	3,9	2,64
	1,5	–	77,3	–	51	49	81	1,5	0,25	2,52	3,9	2,64
	1,5	74,5	–	53,7	–	49	81	1,5	0,43	1,45	2,25	1,52
	1,5	74,5	–	53,7	–	49	81	1,5	0,43	1,45	2,25	1,52
45	1,1	72,1	–	57,7	–	52	78	1	0,21	3,04	4,7	3,18
	1,1	72,1	–	57,7	–	52	78	1	0,21	3,04	4,7	3,18
	1,1	–	76	–	53,8	52	78	1	0,21	3,04	4,7	3,18
	1,1	–	76	–	53,8	52	78	1	0,21	3,04	4,7	3,18
	1,1	75,4	–	59	–	52	78	1	0,26	2,43	3,76	2,54
	1,1	75,4	–	59	–	52	78	1	0,26	2,43	3,76	2,54
	1,5	83,5	–	64,1	–	54	91	1,5	0,25	2,5	3,87	2,62
	1,5	83,5	–	64,1	–	54	91	1,5	0,25	2,5	3,87	2,62
	1,5	–	85,8	–	57,5	54	91	1,5	0,25	2,5	3,87	2,62
	1,5	83,6	–	60,1	–	54	91	1,5	0,43	1,48	2,29	1,55
	1,5	83,6	–	60,1	–	54	91	1,5	0,43	1,48	2,29	1,55
50	1,1	77,1	–	62,7	–	57	83	1	0,2	3,17	4,9	3,32
	1,1	77,1	–	62,7	–	57	83	1	0,2	3,17	4,9	3,32
	1,1	–	79	–	60,5	57	83	1	0,2	3,17	4,9	3,32
	1,1	–	79	–	60,5	57	83	1	0,2	3,17	4,9	3,32
	1,1	80,5	–	64	–	57	83	1	0,24	2,61	4,05	2,74
	1,1	80,5	–	64	–	57	83	1	0,24	2,61	4,05	2,74
	2	91,7	–	71,2	–	61	99	2	0,24	2,6	4,03	2,73
	2	91,7	–	71,2	–	61	99	2	0,24	2,6	4,03	2,73
	2	–	95,1	–	65,9	61	99	2	0,24	2,6	4,03	2,73
	2	91,4	–	65,9	–	61	99	2	0,43	1,47	2,27	1,54

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore

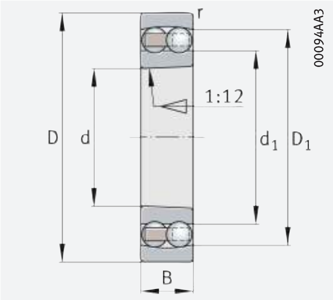


Cylindrical bore with seal 2RS

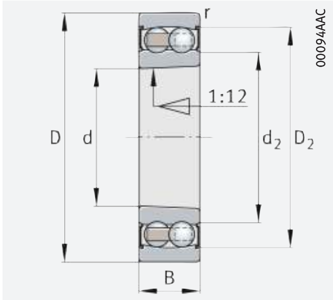
d = 55 – 65 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤377 | 1.12 ➤377 | 1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
55	100	21	27 000	9 900	620	7 700	6 900	0,682	**1211-K-TVH-C3**
	100	21	27 000	9 900	620	7 700	6 900	0,693	**1211-TVH**
	100	25	27 000	9 900	620	3 850	–	0,825	**2211-2RS-TVH**
	100	25	27 000	9 900	620	3 850	–	0,808	**2211-K-2RS-TVH-C3**
	100	25	39 000	12 400	770	7 000	6 700	0,73	**2211-K-TVH-C3**
	100	25	39 000	12 400	770	7 000	6 700	0,746	**2211-TVH**
	120	29	52 000	17 700	1 100	6 100	5 800	1,55	**1311-K-TVH-C3**
	120	29	52 000	17 700	1 100	6 100	5 800	1,57	**1311-TVH**
	120	43	52 000	17 700	1 100	3 450	–	2,28	**2311-2RS-TVH**
	120	43	77 000	23 800	1 480	5 700	7 100	2,02	**2311-K-TVH-C3**
	120	43	77 000	23 800	1 480	5 700	7 100	2,07	**2311-TVH**
60	110	22	30 500	11 400	710	6 900	6 300	0,88	**1212-K-TVH-C3**
	110	22	30 500	11 400	710	6 900	6 300	0,894	**1212-TVH**
	110	28	30 500	11 400	710	3 450	–	1,13	**2212-2RS-TVH**
	110	28	30 500	11 400	710	3 450	–	1,13	**2212-K-2RS-TVH-C3**
	110	28	48 000	16 300	1 020	6 300	6 400	1,03	**2212-K-TVH-C3**
	110	28	48 000	16 300	1 020	6 300	6 400	1,06	**2212-TVH**
	130	31	58 000	20 600	1 280	5 500	5 200	1,94	**1312-K-TVH-C3**
	130	31	58 000	20 600	1 280	5 500	5 200	1,97	**1312-TVH**
	130	46	89 000	28 000	1 740	5 200	6 700	2,52	**2312-K-TVH-C3**
	130	46	89 000	28 000	1 740	5 200	6 700	2,58	**2312-TVH**
65	120	23	31 000	12 400	770	6 500	5 800	1,13	**1213-K-TVH-C3**
	120	23	31 000	12 400	770	6 500	5 800	1,14	**1213-TVH**
	120	31	31 000	12 400	770	3 150	–	1,53	**2213-2RS-TVH**
	120	31	31 000	12 400	770	3 150	–	1,5	**2213-K-2RS-TVH-C3**
	120	31	58 000	19 000	1 190	5 600	6 200	1,33	**2213-K-TVH-C3**
	120	31	58 000	19 000	1 190	5 600	6 200	1,36	**2213-TVH**
	140	33	63 000	22 700	1 380	5 200	5 100	2,41	**1313-K-TVH-C3**
	140	33	63 000	22 700	1 380	5 200	5 100	2,44	**1313-TVH**
	140	48	98 000	32 000	1 980	4 750	6 100	3,16	**2313-K-TVH-C3**
	140	48	98 000	32 000	1 980	4 750	6 100	3,23	**2313-TVH**

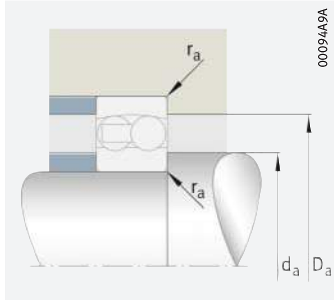
medias ➤ *https://www.schaeffler.de/std/1D81*



Tapered bore



Tapered bore with seal 2RS

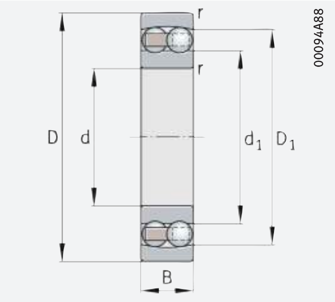


Mounting dimensions

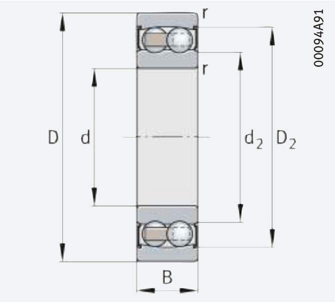
Dimensions						Mounting dimensions			Calculation factors			
d	r	D_1	D_2	d_1	d_2	d_a	D_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	≈	min.	max.	max.				
55	1,5	86,4	–	69,5	–	64	91	1,5	0,19	3,31	5,12	3,47
	1,5	86,4	–	69,5	–	64	91	1,5	0,19	3,31	5,12	3,47
	1,5	–	88,2	–	68	64	91	1,5	0,19	3,31	5,12	3,47
	1,5	–	88,2	–	68	64	91	1,5	0,19	3,31	5,12	3,47
	1,5	89,8	–	69,6	–	64	91	1,5	0,22	2,92	4,52	3,06
	1,5	89,8	–	69,6	–	64	91	1,5	0,22	2,92	4,52	3,06
	2	101	–	78	–	66	109	2	0,24	2,66	4,12	2,79
	2	101	–	78	–	66	109	2	0,24	2,66	4,12	2,79
	2	–	106,4	–	70,5	66	109	2	0,24	2,66	4,12	2,79
	2	100,2	–	71,7	–	66	109	2	0,42	1,51	2,33	1,58
	2	100,2	–	71,7	–	66	109	2	0,42	1,51	2,33	1,58
60	1,5	95,2	–	78	–	69	101	1,5	0,18	3,47	5,37	3,64
	1,5	95,2	–	78	–	69	101	1,5	0,18	3,47	5,37	3,64
	1,5	–	99,5	–	70,4	69	101	1,5	0,18	3,47	5,37	3,64
	1,5	–	99,5	–	70,4	69	101	1,5	0,18	3,47	5,37	3,64
	1,5	98,2	–	76,6	–	69	101	1,5	0,23	2,69	4,16	2,82
	1,5	98,2	–	76,6	–	69	101	1,5	0,23	2,69	4,16	2,82
	2,1	112,2	–	87	–	72	118	2,1	0,23	2,77	4,28	2,9
	2,1	112,2	–	87	–	72	118	2,1	0,23	2,77	4,28	2,9
	2,1	108,5	–	77	–	72	118	2,1	0,41	1,55	2,4	1,62
	2,1	108,5	–	77	–	72	118	2,1	0,41	1,55	2,4	1,62
65	1,5	102,7	–	85,2	–	74	111	1,5	0,18	3,57	5,52	3,74
	1,5	102,7	–	85,2	–	74	111	1,5	0,18	3,57	5,52	3,74
	1,5	–	107,8	–	78	74	111	1,5	0,18	3,57	5,52	3,74
	1,5	–	107,8	–	78	74	111	1,5	0,18	3,57	5,52	3,74
	1,5	106,9	–	82,4	–	74	111	1,5	0,23	2,78	4,31	2,92
	1,5	106,9	–	82,4	–	74	111	1,5	0,23	2,78	4,31	2,92
	2,1	118,2	–	92,7	–	77	128	2,1	0,23	2,75	4,26	2,88
	2,1	118,2	–	92,7	–	77	128	2,1	0,23	2,75	4,26	2,88
	2,1	118,3	–	85,6	–	77	128	2,1	0,39	1,62	2,51	1,7
	2,1	118,3	–	85,6	–	77	128	2,1	0,39	1,62	2,51	1,7

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore

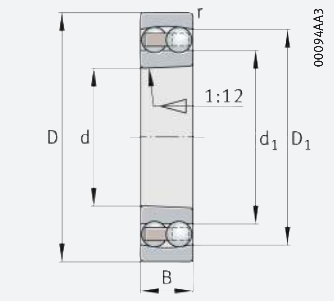


Cylindrical bore with seal 2RS

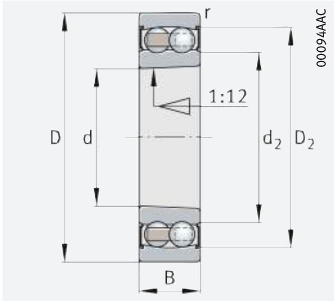
d = 70 – 85 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤377 | 1.12 ➤377 | 1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
70	125	24	35 000	13 700	850	6 200	5 900	1,23	**1214-K-TVH-C3**
	125	24	35 000	13 700	850	6 200	5 900	1,25	**1214-TVH**
	125	31	35 000	13 700	850	3 050	–	1,59	**2214-2RS-TVH**
	125	31	44 000	16 900	1 050	8 800	5 900	1,69	**2214-M**
	150	35	75 000	27 500	1 620	7 200	4 950	3,11	**1314-M**
	150	51	112 000	37 000	2 210	6 600	5 800	4,38	**2314-M**
75	130	25	39 000	15 600	950	5 700	5 500	1,32	**1215-K-TVH-C3**
	130	25	39 000	15 600	950	5 700	5 500	1,34	**1215-TVH**
	130	31	44 500	17 600	1 080	5 600	5 600	1,6	**2215-K-TVH-C3**
	130	31	44 500	17 600	1 080	5 600	5 600	1,6	**2215-TVH**
	160	37	80 000	29 500	1 690	6 700	4 750	3,52	**1315-K-M-C3**
	160	37	80 000	29 500	1 690	6 700	4 750	3,56	**1315-M**
	160	55	125 000	42 000	2 420	6 100	5 600	5,21	**2315-K-M-C3**
	160	55	125 000	42 000	2 420	6 100	5 600	5,33	**2315-M**
80	140	26	40 000	16 800	990	5 300	5 100	1,62	**1216-K-TVH-C3**
	140	26	40 000	16 800	990	5 300	5 100	1,65	**1216-TVH**
	140	33	49 500	19 800	1 180	5 300	5 400	1,97	**2216-K-TVH-C3**
	140	33	49 500	19 800	1 180	5 300	5 400	2,01	**2216-TVH**
	170	39	89 000	33 000	1 810	6 200	4 500	4,5	**1316-K-M-C3**
	170	39	89 000	33 000	1 810	6 200	4 500	4,56	**1316-M**
	170	58	139 000	48 500	2 700	5 700	5 400	6,05	**2316-K-M-C3**
	170	58	139 000	48 500	2 700	5 700	5 400	6,2	**2316-M**
85	150	28	49 500	20 600	1 180	4 900	4 950	2,03	**1217-K-TVH-C3**
	150	28	49 500	20 600	1 180	4 900	4 950	2,07	**1217-TVH**
	150	36	59 000	23 400	1 340	7 200	5 200	2,73	**2217-K-M-C3**
	150	36	59 000	23 400	1 340	7 200	5 200	2,79	**2217-M**
	180	41	99 000	37 500	2 010	5 800	4 300	5,32	**1317-K-M-C3**
	180	41	99 000	37 500	2 010	5 800	4 300	5,39	**1317-M**
	180	60	143 000	51 000	2 750	5 400	5 200	7,04	**2317-K-M-C3**
	180	60	143 000	51 000	2 750	5 400	5 200	7,2	**2317-M**

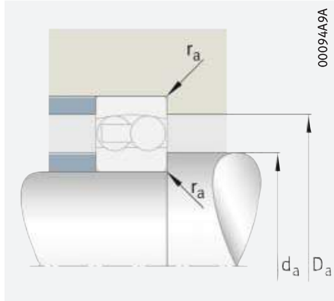
medias ➤ *https://www.schaeffler.de/std/1D82*



Tapered bore



Tapered bore with seal 2RS

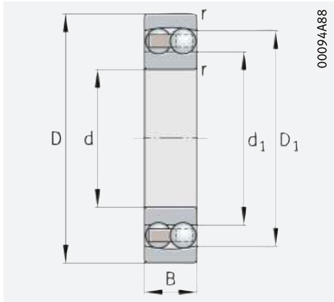


Mounting dimensions

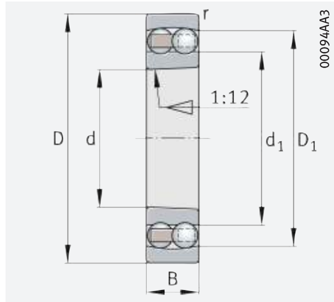
Dimensions						Mounting dimensions			Calculation factors			
d	r min.	D_1 ≈	D_2 ≈	d_1 ≈	d_2 ≈	d_a min.	D_a max.	r_a max.	e	Y_1	Y_2	Y_0
70	1,5	106,1	–	87,2	–	79	116	1,5	0,19	3,36	5,21	3,52
	1,5	106,1	–	87,2	–	79	116	1,5	0,19	3,36	5,21	3,52
	1,5	–	110,8	–	84,7	79	116	1,5	0,19	3,36	5,21	3,52
	1,5	108,9	–	87,6	–	79	116	1,5	0,27	2,34	3,62	2,45
	2,1	126,4	–	97,7	–	82	138	2,1	0,23	2,79	4,32	2,93
	2,1	127,2	–	91,9	–	82	138	2,1	0,38	1,65	2,55	1,73
75	1,5	113,6	–	93,7	–	84	121	1,5	0,19	3,32	5,15	3,48
	1,5	113,6	–	93,7	–	84	121	1,5	0,19	3,32	5,15	3,48
	1,5	114,3	–	93,3	–	84	121	1,5	0,26	2,47	3,82	2,59
	1,5	114,3	–	93,3	–	84	121	1,5	0,26	2,47	3,82	2,59
	2,1	134,8	–	104,8	–	87	148	2,1	0,23	2,77	4,29	2,9
	2,1	134,8	–	104,8	–	87	148	2,1	0,23	2,77	4,29	2,9
	2,1	135,2	–	100,5	–	87	148	2,1	0,38	1,64	2,54	1,72
	2,1	135,2	–	100,5	–	87	148	2,1	0,38	1,64	2,54	1,72
80	2	122,1	–	101,8	–	91	129	2	0,16	3,9	6,03	4,08
	2	122,1	–	102	–	91	129	2	0,16	3,9	6,03	4,08
	2	121	–	99,2	–	91	129	2	0,25	2,48	3,84	2,6
	2	121	–	99,2	–	91	129	2	0,25	2,48	3,84	2,6
	2,1	144,3	–	110,6	–	92	158	2,1	0,22	2,87	4,44	3
	2,1	144,3	–	110,6	–	92	158	2,1	0,22	2,87	4,44	3
	2,1	144,1	–	107,6	–	92	158	2,1	0,37	1,7	2,62	1,78
	2,1	144,1	–	107,6	–	92	158	2,1	0,37	1,7	2,62	1,78
85	2	130,4	–	107,5	–	96	139	2	0,17	3,73	5,78	3,91
	2	130,4	–	107,5	–	96	139	2	0,17	3,73	5,78	3,91
	2	130	–	105,2	–	96	139	2	0,26	2,46	3,81	2,58
	2	130	–	105,2	–	96	139	2	0,26	2,46	3,81	2,58
	3	151,9	–	117,2	–	99	166	2,5	0,22	2,88	4,46	3,02
	3	151,9	–	117,2	–	99	166	2,5	0,22	2,88	4,46	3,02
	3	152,2	–	114,4	–	99	166	2,5	0,37	1,68	2,61	1,76
	3	152,2	–	114,4	–	99	166	2,5	0,37	1,68	2,61	1,76

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore



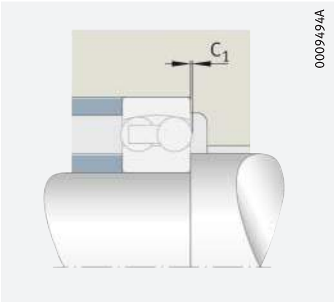
Tapered bore

d = 90 – 105 mm

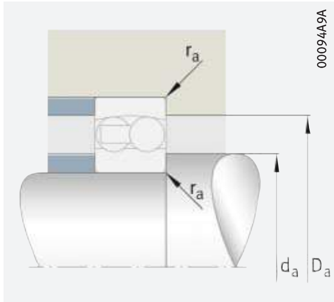
Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤377|1.12 ➤377|1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
90	160	30	57 000	23 300	1 300	4 550	4 850	2,48	**1218-K-TVH-C3**
	160	30	57 000	23 300	1 300	4 550	4 850	2,52	**1218-TVH**
	160	40	71 000	28 500	1 580	4 400	5 200	3,18	**2218-K-TVH-C3**
	160	40	71 000	28 500	1 580	4 400	5 200	3,18	**2218-TVH**
	190	43	109 000	42 500	2 230	5 500	4 200	6,27	**1318-K-M-C3**
	190	43	109 000	42 500	2 230	5 500	4 200	6,35	**1318-M**
	190	64	156 000	57 000	3 000	5 100	5 000	8,38	**2318-K-M-C3**
	190	64	156 000	57 000	3 000	5 100	5 000	8,58	**2318-M**
95	170	32	64 000	27 000	1 450	6 300	4 600	3,28	**1219-K-M-C3**
	170	32	64 000	27 000	1 450	6 300	4 600	3,32	**1219-M**
	170	43	84 000	34 000	1 840	6 100	5 000	4,24	**2219-K-M-C3**
	170	43	84 000	34 000	1 840	6 100	5 000	4,33	**2219-M**
	200	45	134 000	50 000	2 550	5 100	4 050	7,2	**1319-K-M-C3**
	200	45	134 000	50 000	2 550	5 100	4 050	7,29	**1319-M**
	200	67	167 000	63 000	3 250	4 800	4 750	9,97	**2319-K-M-C3**
	200	67	167 000	63 000	3 250	4 800	4 750	10,2	**2319-M**
100	180	34	70 000	29 500	1 550	6 000	4 500	3,94	**1220-K-M-C3**
	180	34	70 000	29 500	1 550	6 000	4 500	3,99	**1220-M**
	180	46	98 000	40 000	2 120	5 700	4 900	5,1	**2220-K-M-C3**
	180	46	98 000	40 000	2 120	5 700	4 900	5,21	**2220-M**
	215	47	145 000	57 000	2 800	4 700	3 850	8,95	**1320-K-M-C3**
	215	47	145 000	57 000	2 800	4 700	3 850	9,06	**1320-M**
	215	73	196 000	78 000	3 900	4 300	4 350	12,7	**2320-K-M-C3**
	215	73	196 000	78 000	3 900	4 300	4 350	12,9	**2320-M**
105	190	36	75 000	32 000	1 640	5 700	4 350	4,75	**1221-M**
	225	49	158 000	64 000	3 100	4 450	3 750	10,3	**1321-M**

medias ➤ *https://www.schaeffler.de/std/1D83*

1) The ball projection must be taken into consideration when designing the adjacent construction.



Ball projection C_1

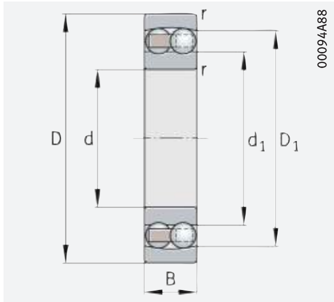


Mounting dimensions

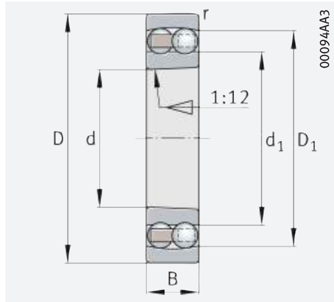
Dimensions					Mounting dimensions			Calculation factors			
d	r	D_1	d_1	C_1[1)]	d_a	D_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	min.	max.	max.				
90	2	138,7	112,7	–	101	149	2	0,17	3,74	5,79	3,92
	2	138,7	112,7	–	101	149	2	0,17	3,74	5,79	3,92
	2	139,4	111,5	–	101	149	2	0,27	2,33	3,61	2,44
	2	139,4	111,5	–	101	149	2	0,27	2,33	3,61	2,44
	3	159,8	124,4	–	104	176	2,5	0,22	2,83	4,38	2,97
	3	159,8	124,4	–	104	176	2,5	0,22	2,83	4,38	2,97
	3	159,8	115,7	–	104	176	2,5	0,39	1,63	2,53	1,71
	3	159,8	115,7	–	104	176	2,5	0,39	1,63	2,53	1,71
95	2,1	148,2	120,5	–	107	158	2,1	0,17	3,73	5,78	3,91
	2,1	148,2	120,5	–	107	158	2,1	0,17	3,73	5,78	3,91
	2,1	147,9	118,9	–	107	158	2,1	0,27	2,32	3,59	2,43
	2,1	147,9	118,9	–	107	158	2,1	0,27	2,32	3,59	2,43
	3	169,9	127,6	1,6	109	186	2,5	0,23	2,73	4,23	2,86
	3	169,9	127,6	1,6	109	186	2,5	0,23	2,73	4,23	2,86
	3	167,7	121,6	–	109	186	2,5	0,38	1,66	2,57	1,74
	3	167,7	121,6	–	109	186	2,5	0,38	1,66	2,57	1,74
100	2,1	155,2	127,3	–	112	168	2,1	0,18	3,58	5,53	3,75
	2,1	155,2	127,3	–	112	168	2,1	0,18	3,58	5,53	3,75
	2,1	156,9	124,4	–	112	168	2,1	0,27	2,33	3,61	2,44
	2,1	156,9	124,4	–	112	168	2,1	0,27	2,33	3,61	2,44
	3	181,3	135,9	2,4	114	201	2,5	0,24	2,68	4,15	2,81
	3	181,3	135,9	2,4	114	201	2,5	0,24	2,68	4,15	2,81
	3	182,7	130,8	–	114	201	2,5	0,38	1,67	2,58	1,75
	3	182,7	130,8	–	114	201	2,5	0,38	1,67	2,58	1,75
105	2,1	155,2	133,9	–	117	178	2,1	0,18	3,54	5,48	3,71
	3	190,5	143,2	2,5	119	211	2,5	0,23	2,75	4,25	2,88

Self-aligning ball bearings

With cylindrical or tapered bore



Cylindrical bore



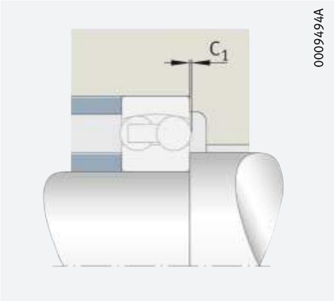
Tapered bore

d = 110 – 150 mm

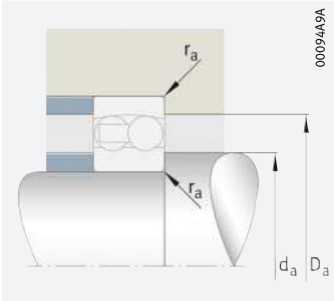
Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	➤377|1.12 ➤377|1.13
110	200	38	89 000	38 000	1 900	5 300	4 250	5,49	**1222-K-M-C3**
	200	38	89 000	38 000	1 900	5 300	4 250	5,57	**1222-M**
	200	53	126 000	51 000	2 550	5 000	4 700	7,27	**2222-K-M-C3**
	200	53	126 000	51 000	2 550	5 000	4 700	7,45	**2222-M**
	240	50	165 000	71 000	3 300	4 200	3 400	12,2	**1322-K-M-C3**
	240	50	165 000	71 000	3 300	4 200	3 400	12,3	**1322-M**
	240	80	221 000	94 000	4 400	3 850	3 900	17,5	**2322-K-M-C3**
	240	80	221 000	94 000	4 400	3 850	3 900	18,1	**2322-M**
120	215	42	121 000	52 000	2 500	4 750	4 200	7,13	**1224-M**
130	230	46	125 000	55 000	2 550	4 450	4 000	8,67	**1226-M**
140	250	50	163 000	74 000	3 300	3 900	3 650	11,2	**1228-M**
150	270	54	180 000	86 000	3 700	3 600	3 400	14,6	**1230-M**

medias ➤ *https://www.schaeffler.de/std/1D84*

1) The ball projection must be taken into consideration when designing the adjacent construction.



Ball projection C_1

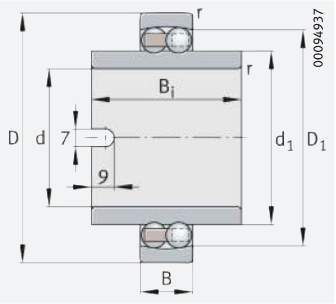


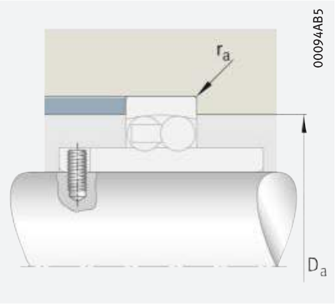
Mounting dimensions

Dimensions					Mounting dimensions			Calculation factors			
d	r	D_1	d_1	C_1[1)]	d_a	D_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	min.	max.	max.				
110	2,1	173,2	140,2	–	122	188	2,1	0,17	3,61	5,59	3,78
	2,1	173,2	140,2	–	122	188	2,1	0,17	3,61	5,59	3,78
	2,1	174,1	136,9	–	122	188	2,1	0,28	2,23	3,45	2,33
	2,1	174,1	136,9	–	122	188	2,1	0,28	2,23	3,45	2,33
	3	202,5	154,5	2,7	124	226	2,5	0,23	2,79	4,32	2,92
	3	202,5	154,5	2,7	124	226	2,5	0,23	2,79	4,32	2,92
	3	201,8	145,5	–	124	226	2,5	0,37	1,69	2,62	1,77
	3	201,8	145,5	–	124	226	2,5	0,37	1,69	2,62	1,77
120	2,1	187,3	149	1,8	132	203	2,1	0,2	3,11	4,81	3,25
130	3	200	161,5	0,6	144	216	2,5	0,19	3,24	5,02	3,4
140	3	220,5	175	2,7	154	236	2,5	0,21	3,05	4,71	3,19
150	3	237,9	186,7	3,8	164	256	2,5	0,22	2,9	4,49	3,04

Self-aligning ball bearings

With extended inner ring





Mounting dimensions

d = 20 – 60 mm

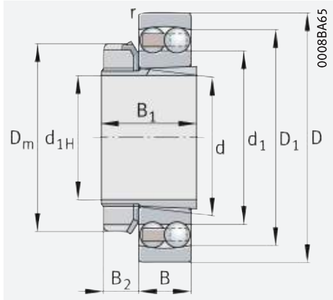
Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	m ≈ kg	➤377 | 1.12 ➤377 | 1.13
20	47	14	10 100	2 600	161	18 100	0,186	**11204-TVH**
25	52	15	12 300	3 250	203	15 500	0,22	**11205-TVH**
30	62	16	15 900	4 600	285	13 100	0,35	**11206-TVH**
35	72	17	16 000	5 100	315	11 600	0,54	**11207-TVH**
40	80	18	19 400	6 500	400	10 100	0,72	**11208-TVH**
45	85	19	22 000	7 300	455	9 300	0,77	**11209-TVH**
50	90	20	22 900	8 000	500	8 700	0,85	**11210-TVH**
55	100	21	27 000	9 900	620	7 700	1,17	**11211-TVH**
60	110	22	30 500	11 400	710	6 900	1,5	**11212-TVH**

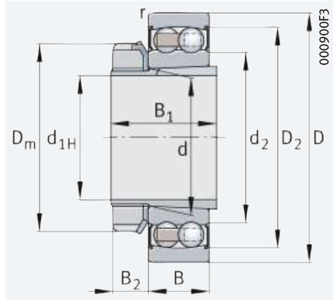
medias ➤ *https://www.schaeffler.de/std/1D85*

Dimensions					Mounting dimensions		Calculation factors			
d	r	B_i	D_1	d_1	D_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	max.	max.				
20	1	40	37,8	29,2	41,4	1	0,28	2,24	3,46	2,34
25	1	44	43,6	33,3	46,4	1	0,27	2,37	3,66	2,48
30	1	48	51,6	40,1	56,4	1	0,25	2,53	3,91	2,65
35	1,1	52	59,1	47,7	65	1	0,22	2,8	4,34	2,94
40	1,1	56	67,3	54	73	1	0,22	2,9	4,49	3,04
45	1,1	58	72,1	57,7	78	1	0,21	3,04	4,7	3,18
50	1,1	58	77,1	62,7	83	1	0,2	3,17	4,9	3,32
55	1,5	60	86,4	69,5	91	1,5	0,19	3,31	5,12	3,47
60	1,5	62	95,2	78	101	1,5	0,18	3,47	5,37	3,64

Self-aligning ball bearings

With adapter sleeve



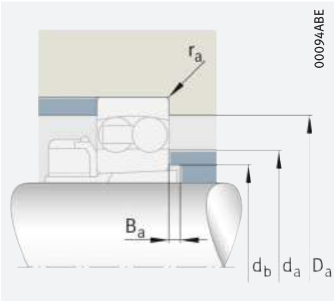


With seal 2RS

d_{1H} = 17 – 45 mm

Main dimensions				Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤377|1.12 ➤377|1.13	
d_{1H}	d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	Adapter sleeve ≈ kg	Bearing	Adapter sleeve
17	20	47	14	10 100	2 600	161	18 100	15 300	0,116	0,04	**1204-K-TVH-C3**	**H204**
20	25	52	15	12 300	3 250	203	15 500	13 400	0,135	0,07	**1205-K-TVH-C3**	**H205**
	25	52	18	12 300	3 250	203	8 100	–	0,157	0,07	**2205-K-2RS-TVH-C3**	**H305**
	25	52	18	17 300	4 400	275	14 400	13 400	0,152	0,07	**2205-K-TVH-C3**	**H305**
	25	62	17	18 300	4 950	310	12 900	10 000	0,254	0,07	**1305-K-TVH-C3**	**H305**
	25	62	24	25 000	6 500	405	12 200	11 900	0,328	0,09	**2305-K-TVH-C3**	**H2305**
25	30	62	16	15 900	4 600	285	13 100	11 400	0,217	0,1	**1206-K-TVH-C3**	**H206**
	30	62	20	15 900	4 600	285	6 800	–	0,268	0,11	**2206-K-2RS-TVH-C3**	**H306**
	30	62	20	26 000	6 900	425	11 500	11 400	0,246	0,11	**2206-K-TVH-C3**	**H306**
	30	72	19	21 700	6 300	390	11 100	8 700	0,379	0,11	**1306-K-TVH-C3**	**H306**
	30	72	27	32 500	8 700	540	10 200	10 400	0,476	0,13	**2306-K-TVH-C3**	**H2306**
30	35	72	17	16 000	5 100	315	11 600	9 800	0,319	0,136	**1207-K-TVH-C3**	**H207**
	35	72	23	16 000	5 100	315	5 600	–	0,432	0,153	**2207-K-2RS-TVH-C3**	**H307**
	35	72	23	33 000	8 900	560	9 800	10 300	0,38	0,153	**2207-K-TVH-C3**	**H307**
	35	80	21	25 500	7 800	485	9 700	7 800	0,5	0,153	**1307-K-TVH-C3**	**H307**
	35	80	31	40 500	11 100	690	8 900	9 800	0,657	0,16	**2307-K-TVH-C3**	**H2307**
35	40	80	18	19 400	6 500	400	10 100	8 600	0,408	0,177	**1208-K-TVH-C3**	**H208**
	40	80	23	19 400	6 500	400	4 950	–	0,517	0,192	**2208-K-2RS-TVH-C3**	**H308**
	40	80	23	32 500	9 400	580	8 900	8 700	0,465	0,192	**2208-K-TVH-C3**	**H308**
	40	90	23	30 000	9 600	600	8 600	7 200	0,698	0,192	**1308-K-TVH-C3**	**H308**
	40	90	33	46 000	13 400	830	7 900	8 700	0,899	0,23	**2308-K-TVH-C3**	**H2308**
40	45	85	19	22 000	7 300	455	9 300	8 200	0,454	0,23	**1209-K-TVH-C3**	**H209**
	45	85	23	22 000	7 300	455	4 650	–	0,535	0,253	**2209-K-2RS-TVH-C3**	**H309**
	45	85	23	28 500	8 900	550	8 600	7 800	0,505	0,253	**2209-K-TVH-C3**	**H309**
	45	100	25	38 500	12 600	780	7 500	6 700	0,939	0,253	**1309-K-TVH-C3**	**H309**
	45	100	36	55 000	16 500	1 030	7 000	8 000	1,19	0,298	**2309-K-TVH-C3**	**H2309**
45	50	90	20	22 900	8 000	500	8 700	7 700	0,516	0,276	**1210-K-TVH-C3**	**H210**
	50	90	23	22 900	8 000	500	4 250	–	0,593	0,306	**2210-K-2RS-TVH-C3**	**H310**
	50	90	23	28 500	9 400	580	8 100	7 100	0,543	0,306	**2210-K-TVH-C3**	**H310**
	50	110	27	42 000	14 100	880	6 900	6 300	1,19	0,306	**1310-K-TVH-C3**	**H310**

medias ➤ *https://www.schaeffler.de/std/1D86*

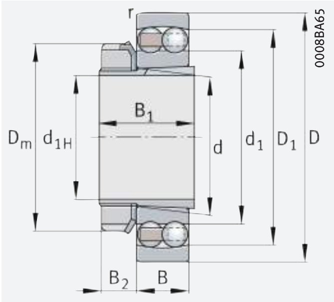


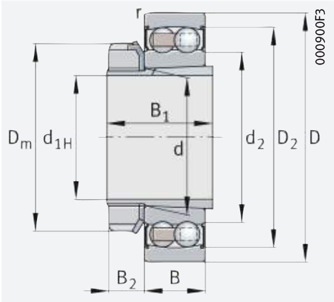
Mounting dimensions

Dimensions									Mounting dimensions					Calculation factors			
d_{1H}	r	D_1	D_2	d_1	d_2	D_m	B_1	B_2	d_a	D_a	d_b	B_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	≈			≈	max.	max.	min.	min.	max.				
17	1	37,8	–	29,2	–	32	24	7	27	41,4	23	5	1	0,28	2,24	3,46	2,34
20	1	43,6	–	33,3	–	38	26	8,25	32	46,4	28	5	1	0,27	2,37	3,66	2,48
	1	–	45,3	–	30,7	38	29	8,25	32	46,4	28	5	1	0,27	2,37	3,66	2,48
	1	44,4	–	32,3	–	38	29	8,25	32	46,4	28	5	1	0,35	1,78	2,75	1,86
	1,1	50,4	–	38,1	–	38	29	8,25	35	55	28	6	1	0,28	2,29	3,54	2,4
	1,1	49,9	–	35,5	–	38	35	8,25	34	55	30	5	1	0,48	1,32	2,04	1,38
25	1	51,6	–	40,1	–	45	27	8,25	38	56,4	33	5	1	0,25	2,53	3,91	2,65
	1	–	53,3	–	37,3	45	31	8,25	38	56,4	33	5	1	0,25	2,53	3,91	2,65
	1	53,7	–	38,5	–	45	31	8,25	38	56,4	33	5	1	0,3	2,13	3,29	2,23
	1,1	58,9	–	45,1	–	45	31	8,25	42	65	33	6	1	0,26	2,39	3,71	2,51
	1,1	58,8	–	41,5	–	45	38	8,25	40	65	35	5	1	0,45	1,4	2,17	1,47
30	1,1	59,1	–	47,7	–	52	29	9,25	45	65	38	5	1	0,22	2,8	4,34	2,94
	1,1	–	63,4	–	43,5	52	35	9,25	45	65	38	5	1	0,22	2,8	4,34	2,94
	1,1	62,4	–	45,7	–	52	35	9,25	44	65	39	5	1	0,3	2,13	3,29	2,23
	1,5	70,1	–	51,3	–	52	35	9,25	49	71	39	8	1,5	0,26	2,47	3,82	2,59
	1,5	66,1	–	46,9	–	52	43	9,25	45	71	40	5	1,5	0,47	1,35	2,1	1,42
35	1,1	67,3	–	54	–	58	31	10,25	52	73	43	5	1	0,22	2,9	4,49	3,04
	1,1	–	70,3	–	49,2	58	36	10,25	52	73	43	5	1	0,22	2,9	4,49	3,04
	1,1	70,2	–	52,5	–	58	36	10,25	50	73	44	5	1	0,26	2,43	3,76	2,54
	1,5	74,7	–	57,8	–	58	36	10,25	55	81	44	5	1,5	0,25	2,52	3,9	2,64
	1,5	74,5	–	53,7	–	58	46	10,25	51	81	45	5	1,5	0,43	1,45	2,25	1,52
40	1,1	72,1	–	57,7	–	65	33	11,25	57	78	48	5	1	0,21	3,04	4,7	3,18
	1,1	–	76	–	53,8	65	39	11,25	57	78	48	5	1	0,21	3,04	4,7	3,18
	1,1	75,4	–	59	–	65	39	11,25	56	78	50	8	1	0,26	2,43	3,76	2,54
	1,5	83,5	–	64,1	–	65	39	11,25	61	91	50	5	1,5	0,25	2,5	3,87	2,62
	1,5	83,6	–	60,1	–	65	50	11,25	57	91	50	5	1,5	0,43	1,48	2,29	1,55
45	1,1	77,1	–	62,7	–	70	35	12,25	62	83	53	5	1	0,2	3,17	4,9	3,32
	1,1	–	79	–	60,5	70	42	12,25	62	83	53	5	1	0,2	3,17	4,9	3,32
	1,1	80,5	–	64	–	70	42	12,25	61	83	55	10	1	0,24	2,61	4,05	2,74
	2	91,7	–	71,2	–	70	42	12,25	68	99	55	5	2	0,24	2,6	4,03	2,73

Self-aligning ball bearings

With adapter sleeve



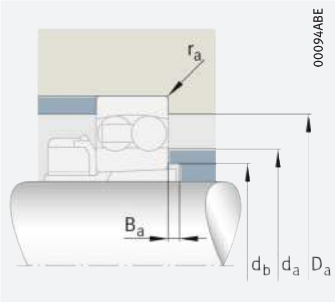


With seal 2RS

d_{1H} = 50 – 75 mm

Main dimensions				Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤377|1.12 ➤377|1.13	
d_{1H}	d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	Bearing	Adapter sleeve	Bearing	Adapter sleeve
				N	N	N	min^{-1}	min^{-1}	≈ kg	≈ kg		
50	55	100	21	27 000	9 900	620	7 700	6 900	0,682	0,319	**1211-K-TVH-C3**	**H211**
	55	100	25	27 000	9 900	620	3 850	–	0,808	0,358	**2211-K-2RS-TVH-C3**	**H311**
	55	100	25	39 000	12 400	770	7 000	6 700	0,73	0,358	**2211-K-TVH-C3**	**H311**
	55	120	29	52 000	17 700	1 100	6 100	5 800	1,55	0,358	**1311-K-TVH-C3**	**H311**
	55	120	43	77 000	23 800	1 480	5 700	7 100	2,02	0,435	**2311-K-TVH-C3**	**H2311**
55	60	110	22	30 500	11 400	710	6 900	6 300	0,88	0,35	**1212-K-TVH-C3**	**H212**
	60	110	28	30 500	11 400	710	3 450	–	1,13	0,401	**2212-K-2RS-TVH-C3**	**H312**
	60	110	28	48 000	16 300	1 020	6 300	6 400	1,03	0,401	**2212-K-TVH-C3**	**H312**
	60	130	31	58 000	20 600	1 280	5 500	5 200	1,94	0,401	**1312-K-TVH-C3**	**H312**
	60	130	46	89 000	28 000	1 740	5 200	6 700	2,52	0,493	**2312-K-TVH-C3**	**H2312**
60	65	120	23	31 000	12 400	770	6 500	5 800	1,13	0,4	**1213-K-TVH-C3**	**H213**
	65	120	31	31 000	12 400	770	3 150	–	1,5	0,471	**2213-K-2RS-TVH-C3**	**H313**
	65	120	31	58 000	19 000	1 190	5 600	6 200	1,33	0,471	**2213-K-TVH-C3**	**H313**
	65	140	33	63 000	22 700	1 380	5 200	5 100	2,41	0,471	**1313-K-TVH-C3**	**H313**
	65	140	48	98 000	32 000	1 980	4 750	6 100	3,16	0,57	**2313-K-TVH-C3**	**H2313**
	70	125	24	35 000	13 700	850	6 200	5 900	1,23	0,63	**1214-K-TVH-C3**	**H214**
65	75	130	25	39 000	15 600	950	5 700	5 500	1,32	0,71	**1215-K-TVH-C3**	**H215**
	75	130	31	44 500	17 600	1 080	5 600	5 600	1,6	0,86	**2215-K-TVH-C3**	**H315**
	75	160	37	80 000	29 500	1 690	6 700	4 750	3,52	1,06	**1315-K-M-C3**	**H315**
	75	160	55	125 000	42 000	2 420	6 100	5 600	5,21	0,89	**2315-K-M-C3**	**H2315**
70	80	140	26	40 000	16 800	990	5 300	5 100	1,62	0,89	**1216-K-TVH-C3**	**H216**
	80	140	33	49 500	19 800	1 180	5 300	5 400	1,97	1,06	**2216-K-TVH-C3**	**H316**
	80	170	39	89 000	33 000	1 810	6 200	4 500	4,5	1,06	**1316-K-M-C3**	**H316**
	80	170	58	139 000	48 500	2 700	5 700	5 400	6,05	1,31	**2316-K-M-C3**	**H2316**
75	85	150	28	49 500	20 600	1 180	4 900	4 950	2,03	1,03	**1217-K-TVH-C3**	**H217**
	85	150	36	59 000	23 400	1 340	7 200	5 200	2,73	1,21	**2217-K-M-C3**	**H317**
	85	180	41	99 000	37 500	2 010	5 800	4 300	5,32	1,21	**1317-K-M-C3**	**H317**
	85	180	60	143 000	51 000	2 750	5 400	5 200	7,04	1,47	**2317-K-M-C3**	**H2317**

medias ➤ *https://www.schaeffler.de/std/1D87*

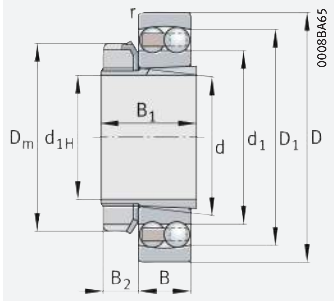


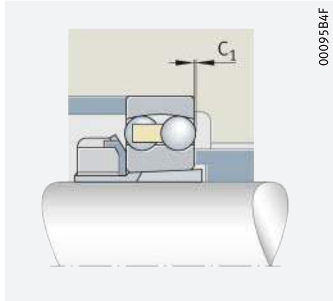
Mounting dimensions

Dimensions									Mounting dimensions					Calculation factors			
d_{1H}	r	D_1	D_2	d_1	d_2	D_m	B_1	B_2	d_a	D_a	d_b	B_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈	≈	≈			≈	max.	max.	min.	min.	max.				
50	1,5	86,4	–	69,5	–	75	37	12,5	69	91	60	6	1,5	0,19	3,31	5,12	3,47
	1,5	–	88,2	–	68	75	45	12,5	69	91	60	6	1,5	0,19	3,31	5,12	3,47
	1,5	89,8	–	69,6	–	75	45	12,5	68	91	60	10	1,5	0,22	2,92	4,52	3,06
	2	101	–	78	–	75	45	12,5	74	109	60	6	2	0,24	2,66	4,12	2,79
	2	100,2	–	71,7	–	75	59	12,5	69	109	61	6	2	0,42	1,51	2,33	1,58
55	1,5	95,2	–	78	–	80	38	12,5	75	101	64	5	1,5	0,18	3,47	5,37	3,64
	1,5	–	99,5	–	70,4	80	47	12,5	75	101	64	5	1,5	0,18	3,47	5,37	3,64
	1,5	98,2	–	76,6	–	80	47	12,5	73	101	65	8	1,5	0,23	2,69	4,16	2,82
	2,1	112,2	–	87	–	80	47	12,5	83	118	65	5	2,1	0,23	2,77	4,28	2,9
	2,1	108,5	–	77	–	80	62	12,5	74	118	66	5	2,1	0,41	1,55	2,4	1,62
60	1,5	102,7	–	85,2	–	85	40	13,5	83	111	70	5	1,5	0,18	3,57	5,52	3,74
	1,5	–	107,8	–	78	85	50	13,5	83	111	70	5	1,5	0,18	3,57	5,52	3,74
	1,5	106,9	–	82,4	–	85	50	13,5	79	111	70	8	1,5	0,23	2,78	4,31	2,92
	2,1	118,2	–	92,7	–	85	50	13,5	89	128	70	5	2,1	0,23	2,75	4,26	2,88
	2,1	118,3	–	85,6	–	85	65	13,5	82	128	72	5	2,1	0,39	1,62	2,51	1,7
	1,5	106,1	–	87,2	–	92	41	13,5	86	116	75	5	1,5	0,19	3,36	5,21	3,52
65	1,5	113,6	–	93,7	–	98	43	14,5	92	121	80	5	1,5	0,19	3,32	5,15	3,48
	1,5	114,3	–	93,3	–	98	55	14,5	90	121	80	12	1,5	0,26	2,47	3,82	2,59
	2,1	134,8	–	104,8	–	98	55	14,5	100	148	80	5	2,1	0,23	2,77	4,29	2,9
	2,1	135,2	–	100,5	–	98	73	14,5	94	148	82	5	2,1	0,38	1,64	2,54	1,72
70	2	122,1	–	101,8	–	105	46	16,75	99	129	85	5	2	0,16	3,9	6,03	4,08
	2	121	–	99,2	–	105	59	16,75	96	129	85	12	2	0,25	2,48	3,84	2,6
	2,1	144,3	–	110,6	–	105	59	16,75	107	158	85	5	2,1	0,22	2,87	4,44	3
	2,1	144,1	–	107,6	–	105	78	16,75	100	158	88	5	2,1	0,37	1,7	2,62	1,78
75	2	130,4	–	107,5	–	110	50	17,75	105	139	90	6	2	0,17	3,73	5,78	3,91
	2	130	–	105,2	–	110	63	17,75	102	139	91	12	2	0,26	2,46	3,81	2,58
	3	151,9	–	117,2	–	110	63	17,75	114	166	91	6	2,5	0,22	2,88	4,46	3,02
	3	152,2	–	114,4	–	110	82	17,75	106	166	94	6	2,5	0,37	1,68	2,61	1,76

Self-aligning ball bearings

With adapter sleeve





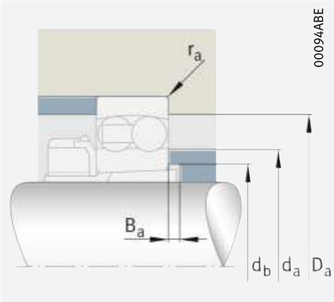
Ball projection C_1 [1)]

d_{1H} = 80 – 100 mm

Main dimensions				Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤377|1.12 ➤377|1.13	
d_{1H}	d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	Adapter sleeve ≈ kg	Bearing	Adapter sleeve
80	90	160	30	57 000	23 300	1 300	4 550	4 850	2,48	1,21	**1218-K-TVH-C3**	**H218**
	90	160	40	71 000	28 500	1 580	4 400	5 200	3,18	1,41	**2218-K-TVH-C3**	**H318**
	90	190	43	109 000	42 500	2 230	5 500	4 200	6,27	1,41	**1318-K-M-C3**	**H318**
	90	190	64	156 000	57 000	3 000	5 100	5 000	8,38	1,71	**2318-K-M-C3**	**H2318**
85	95	170	32	64 000	27 000	1 450	6 300	4 600	3,28	1,39	**1219-K-M-C3**	**H219**
	95	170	43	84 000	34 000	1 840	6 100	5 000	4,24	1,58	**2219-K-M-C3**	**H319**
	95	200	45	134 000	50 000	2 550	5 100	4 050	7,2	1,58	**1319-K-M-C3**	**H319**
	95	200	67	167 000	63 000	3 250	4 800	4 750	9,97	1,95	**2319-K-M-C3**	**H2319**
90	100	180	34	70 000	29 500	1 550	6 000	4 500	3,94	1,52	**1220-K-M-C3**	**H220**
	100	180	46	98 000	40 000	2 120	5 700	4 900	5,1	1,76	**2220-K-M-C3**	**H320**
	100	215	47	145 000	57 000	2 800	4 700	3 850	8,95	1,76	**1320-K-M-C3**	**H320**
	100	215	73	196 000	78 000	3 900	4 300	4 350	12,7	2,2	**2320-K-M-C3**	**H2320**
100	110	200	38	89 000	38 000	1 900	5 300	4 250	5,49	1,95	**1222-K-M-C3**	**H222**
	110	200	53	126 000	51 000	2 550	5 000	4 700	7,27	2,25	**2222-K-M-C3**	**H322**
	110	240	50	165 000	71 000	3 300	4 200	3 400	12,2	2,25	**1322-K-M-C3**	**H322**
	110	240	80	221 000	94 000	4 400	3 850	3 900	17,5	2,78	**2322-K-M-C3**	**H2322**

medias ➤ *https://www.schaeffler.de/std/1DCB*

[1)] The ball projection must be taken into consideration when designing the adjacent construction.



Mounting dimensions

Dimensions								Mounting dimensions					Calculation factors			
d_{1H}	r	D_1	d_1	D_m	B_1	B_2	C_1[1)]	d_a	D_a	d_b	B_a	r_a	e	Y_1	Y_2	Y_0
	min.	≈	≈			≈		max.	max.	min.	min.	max.				
80	2	138,7	112,7	120	52	17,75	–	110	149	95	6	2	0,17	3,74	5,79	3,92
	2	139,4	111,5	120	65	17,75	–	108	149	96	10	2	0,27	2,33	3,61	2,44
	3	159,8	124,4	120	65	17,75	–	120	176	96	6	2,5	0,22	2,83	4,38	2,97
	3	159,8	115,7	120	86	17,75	–	112	176	100	6	2,5	0,39	1,63	2,53	1,71
85	2,1	148,2	120,5	125	55	18,75	–	117	158	100	7	2,1	0,17	3,73	5,78	3,91
	2,1	147,9	118,9	125	68	18,75	–	114	158	102	9	2,1	0,27	2,32	3,59	2,43
	3	169,9	127,6	125	68	18,75	1,6	126	186	102	7	2,5	0,23	2,73	4,23	2,86
	3	167,7	121,6	125	90	18,75	–	117	186	105	7	2,5	0,38	1,66	2,57	1,74
90	2,1	155,2	127,3	130	58	19,75	–	124	168	106	7	2,1	0,18	3,58	5,53	3,75
	2,1	156,9	124,4	130	71	19,75	–	120	168	108	8	2,1	0,27	2,33	3,61	2,44
	3	181,3	135,9	130	71	19,75	2,4	132	201	108	7	2,5	0,24	2,68	4,15	2,81
	3	182,7	130,8	130	97	19,75	–	125	201	110	7	2,5	0,38	1,67	2,58	1,75
100	2,1	173,2	140,2	145	63	20,75	–	138	188	116	7	2,1	0,17	3,61	5,59	3,78
	2,1	174,1	136,9	145	77	20,75	–	132	188	118	6	2,1	0,28	2,23	3,45	2,33
	3	202,5	154,5	145	77	20,75	2,7	150	226	118	9	2,5	0,23	2,79	4,32	2,92
	3	201,8	145,5	145	105	20,75	–	139	226	121	7	2,5	0,37	1,69	2,62	1,77

Cylindrical roller bearings

Matrix for bearing preselection

The matrix gives an overview of the types and design features of cylindrical roller bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter (see column "detailed information") and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

Design features and suitability

+++ extremely suitable
++ highly suitable
+ suitable
(+) suitable with restrictions
– not suitable/not applicable
✓ available

Design features and suitability		Cylindrical roller bearings with cage, single row: non-locating bearing	semi-locating bearing	locating bearing	detailed information ➤ 350
Load carrying capacity	radial	+++	+++	+++	➤352 | 1.2
	axial, one direction	–	+	+	➤352 | 1.2
	axial, both directions	–	–	+	➤352 | 1.2
	moments	–	–	–	➤352 | 1.2
Compensation of angular misalignments	static	(+)	(+)	(+)	➤352 | 1.3
	dynamic	(+)	(+)	(+)	➤352 | 1.3
Bearing design	cylindrical bore	✓	✓	✓	➤350 | 1.1
	tapered bore	–	–	–	
	separable	✓	✓	✓	➤360 | 1.17
Lubrication	greased	–	–	–	➤353 | 1.4
Sealing	open	✓	✓	✓	➤353 | 1.5
	non-contact	–	–	–	➤353 | 1.5
	contact	–	–	–	➤353 | 1.5
Operating temperature in °C	from to	−30 +150[3]	−30 +150[3]	−30 +150[3]	➤354 | 1.8
Suitability for	high speeds	++	++[5]	++[5]	➤353 | 1.6 ➤24
	high running accuracy	++	++	++	➤356 | 1.11 ➤114
	low-noise running	+	(+)	(+)	➤421 | 1.7 ➤27
	high rigidity	++	++	++	➤54
	reduced friction	++	++	++	➤56
	length compensation within bearing	+++	(+)	–	➤413 ➤25
	non-locating bearing arrangement	+++	+	–	➤139
	locating bearing arrangement	–	+	++	➤139
X-life bearings		✓	✓	✓	➤351
Bearing bore d in mm	from to	15 710[8]	15 280[8]	15 280[8]	➤362
Product tables	from page ➤	362	450	450	

1) Valid only for series SL1923
2) Valid only for non-locating bearings SL0248 and SL0249
3) Valid for bearings with sheet steel cage or brass cage
4) With greasing using GA22
5) For low axial load only
6) Valid for locating bearings SL0148 and SL0149
7) Only semi-locating bearings SL1850
8) Larger catalogue bearings ➤ 🕮 GL 1

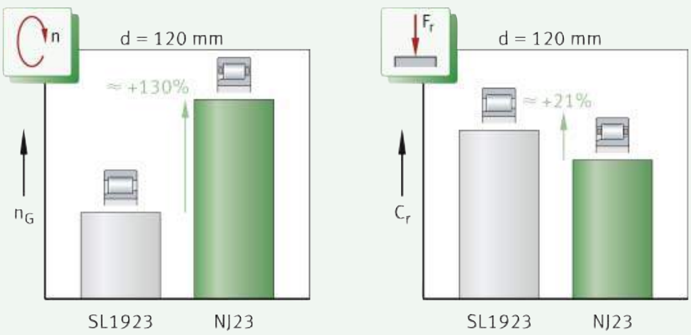
	Cylindrical roller bearings with disc cage or spacers			Single row full complement cylindrical roller bearings		Double row full complement cylindrical roller bearings			
	with disc cage	with spacers	detailed information ➤ 478	semi-locating bearing	detailed information ➤ 498	locating/semi-locating/non-locating bearing	locating bearing with annular slots	detailed information ➤ 524	
	+++	+++	➤480|2.2	+++	➤501|3.2	+++	+++	➤528|4.2	F_r
	+	+	➤480|2.2	+	➤501|3.2	(+)	(+)	➤528|4.2	F_a
	–	–	➤480|2.2	–	➤501|3.2	(+)	(+)	➤528|4.2	F_a
	–	–	➤480|2.2	–	➤501|3.2	+	+	➤528|4.2	M
	(+)	(+)	➤483|2.3	(+)	➤503|3.3	–	–	➤530|4.3	
	(+)	(+)	➤483|2.3	(+)	➤503|3.3	–	–	➤530|4.3	
	✓	✓	➤478|2.1	✓	➤503|3.3	✓	✓	➤530|4.3	
	–	–		–		–	–		
	✓	✓	➤492|2.17	✓1)	➤511|3.17	✓2)	–	➤540|4.17	
	–	–	➤484|2.4	–	➤504|3.4	–	✓	➤530|4.4	
	✓	✓	➤484|2.5	✓	➤504|3.5	✓	–	➤531|4.5	
	–	–	➤484|2.5	–	➤504|3.5	–	–	➤531|4.5	
	–	–	➤484|2.5	–	➤504|3.5	–	✓	➤531|4.5	
	–30 +120	–30 +120	➤486|2.8	–30 +120	➤505|3.8	–30 +120	–40 4) +80	➤532|4.8	
	++	++	➤484|2.6	–	➤504|3.6	–	–	➤531|4.6	n
	+	(+)	➤488|2.11 ➤24	+	➤506|3.11 ➤24	+	+	➤534|4.11 ➤24	
	(+)	(+)	➤485|2.7 ➤27	–	➤504|3.7	–	–	➤531|4.7	
	++	++	➤54	+++	➤54	+++	+++	➤54	
	+	+	➤56	–	➤56	–	–	➤56	
	(+)	(+)	➤25	(+)	➤25	–6)	–	➤525 ➤25	
	+	+	➤139	+	➤139	+6)	+	➤139	
	+	+	➤139	+	➤139	+6)	+	➤139	
	✓	✓	➤480	✓	➤500	✓7)	–	➤527	X-life
	80 300 8)	25 120	➤494	20 500 8)	➤514	20 400 8)	20 300 8)	➤542	
	494	496		514		542	550		

1 Single row cylindrical roller bearings with cage

Single row cylindrical roller bearings with cage are suitable where:

- bearing arrangements are subjected to very high radial loads ➤*417*|*1.2*
- not only high radial forces but also axial loads from one or both directions must be supported by the bearing position (semi-locating or locating bearing function) ➤*417*|*1.2*
- bearing arrangements must have very high rigidity
- axial displacements of the shaft relative to the housing must be compensated without constraint in the bearing (in the case of bearings with a non-locating or semi-locating bearing function) ➤*412*|*1.1*
- high radial loads and very high speeds occur but the very high radial load carrying capacity of full complement cylindrical roller bearings is not required ➤*420*|*1.6*
- the bearings should be separable (one bearing ring can be removed) for easier mounting ➤*412*|*1.1*.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*410*.



1
Cylindrical roller bearing with cage/full complement bearing, comparison of speed and load carrying capacity

n_G = *limiting speed*
C_r = *basic dynamic load rating*
SL1923 = *full complement cylindrical roller bearing*
NJ23 = *cylindrical roller bearing with cage*

1.1 Bearing design

Design variants

Single row cylindrical roller bearings with cage are available in the basic design as:

- type NU (non-locating bearing) ➤*414*|*3*
- type N (non-locating bearing) ➤*414*|*3*
- type NJ (semi-locating bearing) ➤*414*|*4*
- type NUP (locating bearing) ➤*414*|*4*
- X-life bearings ➤*415*.

In addition to the bearings described here, Schaeffler supplies single row cylindrical roller bearings with cage in other types, series and dimensions. These products are described in some cases in special publications. If necessary, please contact Schaeffler. Larger catalogue bearings ➤ *GL 1*.

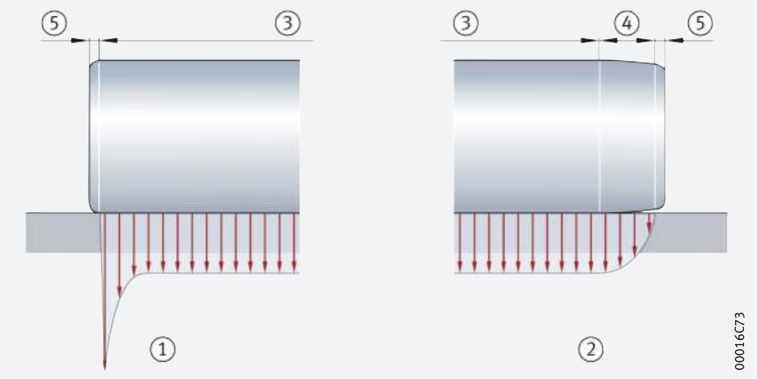
Bearings of basic design – standard range

Key features

Single row cylindrical roller bearings with cage are part of the group of radial roller bearings. In contrast to the ball, the roller has a larger contact area perpendicular to the roller axis. As a result, it can transmit higher forces, has greater rigidity and allows smaller rolling element diameters under the same load. The single row bearings comprise solid outer rings, inner rings and cages that are fitted with a large number of cylindrical rollers. The rollers have profiled ends, i.e. they have a slight lateral curvature towards the ends. This modified line contact between the rolling elements and raceways prevents damaging edge stresses ➤*413*|*2*. In all standard designs, the cylindrical rollers are guided between rigid ribs by at least one bearing ring. Together with the cage and rollers, this forms a ready-to-fit unit. The other bearing ring can be removed. As a result, the inner ring and outer ring can be mounted separately. Tight fits can thus be achieved on both rings. Bearings of the basic design are manufactured in many different types that differ essentially in the arrangement of the ribs on the inner ring and outer ring. Depending on the design, they are used as non-locating bearings, semi-locating bearings or locating bearings.

2
Roller profile and stress distribution

1. *Cylindrical roller profile (high stress peaks)*
2. *Roller with profiled ends (no stress peak)*
3. *Cylindrical centre region*
4. *Region of logarithmic tapering*
5. *Rounding of edge*



Type NU

Bearings with non-locating bearing function

In bearings of type NU, the outer ring has two rigid ribs, while the inner ring has no ribs ➤*414*|*3*. As a result, axial displacements of the shaft relative to the housing are possible in both directions and within certain limits. During rotational motion, length compensation occurs without constraint in the bearing between the rollers and the raceway without ribs and is therefore practically free from friction. The maximum axial displacement s is given in the product tables. The bearings are used as non-locating bearings, i.e. they cannot guide the shaft axially in either direction ➤*417*|*1.2*. For use as semi-locating bearings, they can be combined with the L-section ring HJ ➤*415*|*5*.

Type N

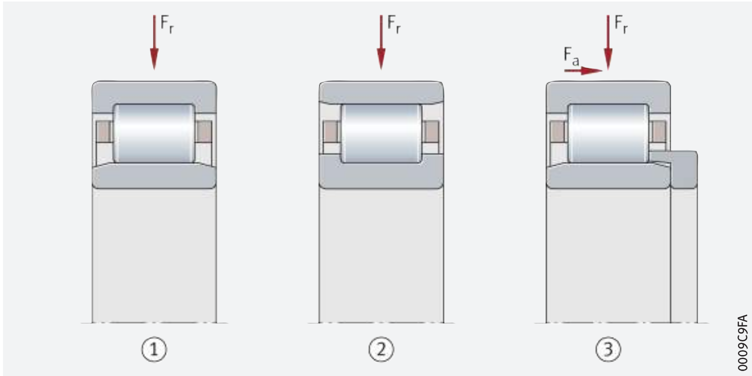
Bearings with non-locating bearing function

Cylindrical roller bearings of type N have two rigid ribs on the inner ring, while the outer ring has no ribs ➤*414*|*3*. Due to the absence of ribs, axial displacements of the shaft relative to the housing are possible in both directions within the bearing. The maximum axial displacement s is given in the product tables. Bearings of type N are used as non-locating bearings, i.e. they cannot guide the shaft axially in either direction ➤*417*|*1.2*.

3
Single row cylindrical roller bearings – non-locating or semi-locating bearings

F_r = *radial load*
F_a = *axial load*

① *Cylindrical roller bearing NU (non-locating bearing)*
② *Cylindrical roller bearing N (non-locating bearing)*
③ *Cylindrical roller bearing NU + L-section ring HJ (semi-locating bearing)*



Type NJ

Bearings with semi-locating bearing function

Bearings of type NJ have two rigid ribs on the outer ring and one rigid rib on the inner ring ➤*414*|*4*. With these cylindrical roller bearings, axial displacements of the shaft relative to the housing are possible in one direction only. The maximum axial displacement s is given in the product tables. Bearings of type NJ are used as semi-locating bearings, i.e. they can guide the shaft axially in one direction ➤*417*|*1.2*. Semi-locating bearings NJ can be combined with an L-section ring HJ to form a locating bearing unit ➤*415*|*5*.

Type NUP

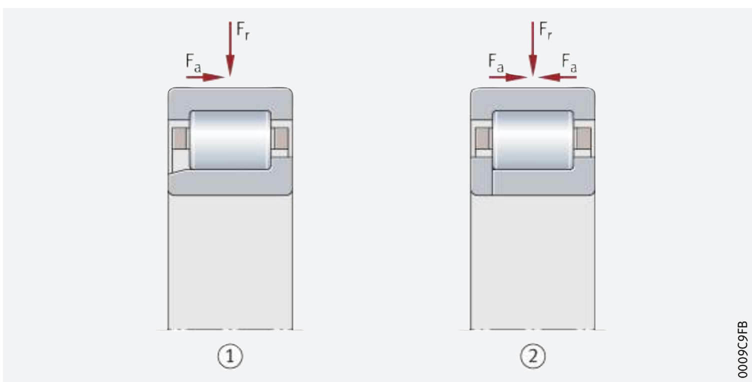
Bearings with locating bearing function

Cylindrical roller bearings of type NUP have two rigid ribs on the outer ring as well as one rigid rib and one loose rib washer on the inner ring ➤*414*|*4*. With these cylindrical roller bearings, axial displacements between the shaft and the housing are not possible. Bearings of type NUP are used as locating bearings, i.e. they can guide the shaft axially in both directions ➤*417*|*1.2*.

4
Single row cylindrical roller bearings – semi-locating or locating bearings

F_r = *radial load*
F_a = *axial load*

① *Cylindrical roller bearing NJ (semi-locating bearing)*
② *Cylindrical roller bearing NUP (locating bearing)*



L-section rings

Functional expansion by means of L-section rings

In order to expand the function of cylindrical roller bearings NU and NJ, these types can be combined with L-section rings HJ ➤*415*|*5*. In this way, bearings NU can perform a semi-locating bearing function, while bearings NJ in combination with L-section rings can perform a locating bearing function ➤*415*|*5*.

! Cylindrical roller bearings NU must not be mounted with two L-section rings, since this can lead to axial bracing of the rollers.

✎ Areas of application of L-section rings

L-section rings can be advantageous where:

- the inner ring in locating bearing arrangements that are subjected to high loads has a very tight fit; bearings of type NJ + HJ permit tighter fits than bearings NUP, which have a shortened inner ring and a loose rib washer
- the shaft must be axially guided in one or both directions and bearings NJ or NUP are not available
- the design of the bearing arrangement and the mounting and dismounting of the bearings should be simplified.

✎ Design of L-section rings

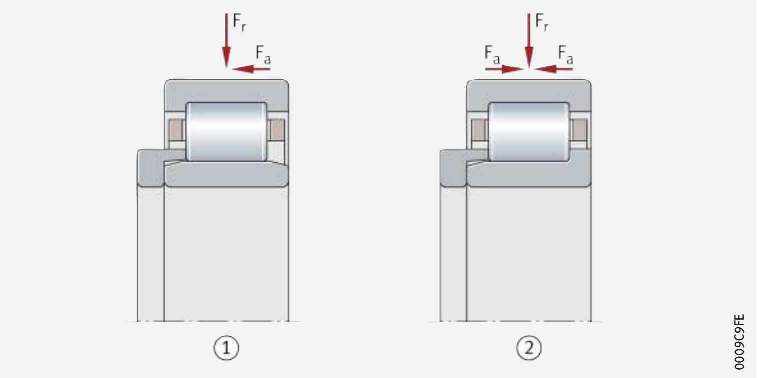
The L-section rings are made from rolling bearing steel and are hardened and ground. The axial runout of the lateral faces corresponds to the normal tolerances of the appropriate bearings. Where available, the L-section rings are listed in the product tables together with the associated bearings (e.g. bearing NJ206-E-TVP2 + L-section ring HJ206-E). Since the L-section rings are not a component of the bearing, these must always be ordered together with the bearing ➤426| 14.

5

Cylindrical roller bearings with L-section rings – semi-locating or locating bearings

F_r = radial load
F_a = axial load

① Cylindrical roller bearing NU + L-section ring HJ (semi-locating bearing)
② Cylindrical roller bearing NJ + L-section ring HJ (locating bearing)



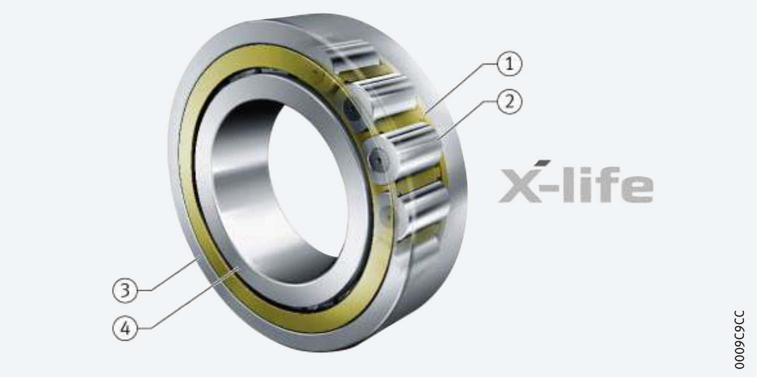
X-life premium quality

Single row cylindrical roller bearings with cage are supplied up to an outside diameter D = 320 mm as X-life bearings ➤415| 6. These bearings exhibit considerably higher performance than comparable standard cylindrical roller bearings. This is achieved, for example, through the modified internal construction, the optimised contact geometry between the rollers and raceways, the better surface quality ➤416| 7 and the optimised roller guidance and lubricant film formation.

6

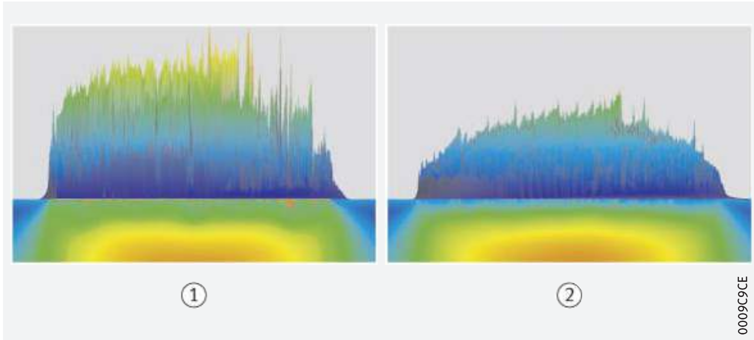
Cylindrical roller bearing in X-life design

① Brass cage
② Cylindrical roller, honed
③ Outer ring, honed
④ Inner ring, honed



7
Comparison of surface qualities

① *Standard surface – a rough surface causes stress peaks under radial load*
② *X-life surface – a higher surface quality reduces stress peaks; this increases the bearing operating life*



Advantages

Increased customer benefits due to X-life

These technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings ➤*413*|*2* and ➤*416*|*8*
- a higher fatigue limit load
- lower heat generation in the bearing
- lower lubricant consumption and therefore longer maintenance intervals if relubrication is carried out
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

Interchangeable with comparable standard bearings

Since X-life cylindrical roller bearings have the same dimensions as the corresponding standard bearings, the latter can be replaced without any problems by the higher-performance X-life bearings. The major advantages of X-life can therefore also be used for existing bearing arrangements with standard bearings.

Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

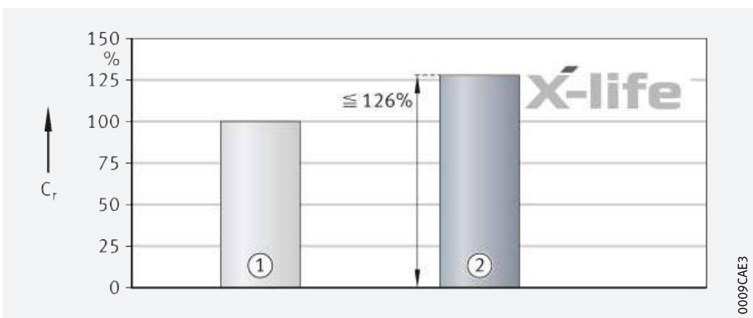
Suffix XL

X-life cylindrical roller bearings include the suffix XL in the designation ➤*425*|*1.12* and ➤*434*|.

8
Cylindrical roller bearing with cage: comparison of basic dynamic load rating C_r with bearings without X-life quality

C_r = *radial basic dynamic load rating*

① *Bearing without X-life quality*
② *X-life cylindrical roller bearing*



Areas of application

Due to their special technical features, X-life cylindrical roller bearings are highly suitable, for example, for bearing arrangements in:

- heavy industry (steel production)
- power transmission (gearbox engineering)
- processing machines and construction machinery
- wind turbines (gearbox applications).

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤*10*.

1.2 Load carrying capacity

✎ Designed for very high radial loads

Depending on the type, single row cylindrical roller bearings can support not only very high radial forces but also high axial loads on one or both sides:

- The types N and NU can only support radial loads. If NU bearings are combined with an L-section ring, these can also support axial loads on one side ➤*414*|*3*.
- The type NJ can support axial loads on one side and radial loads. If this type is combined with an L-section ring, it can support axial loads on both sides ➤*415*|*5*.
- The type NUP can support axial loads on both sides and radial loads.

✎ Higher capacity roller set in variant E

Bearings with the suffix E have a higher capacity roller set and are thus designed for very high load carrying capacity.

Higher axial load carrying capacity of bearings with toroidal crowned roller end face

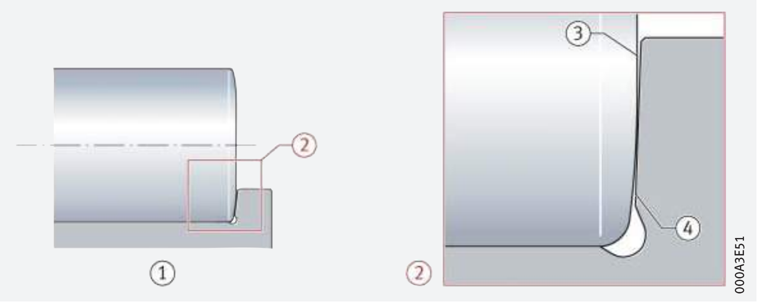
✎ Neither wear nor fatigue occurs on the rib contact running and roller end faces

In the case of cylindrical roller bearings with toroidal crowned rollers (TB design), the axial load carrying capacity has been significantly improved with the aid of new calculation and manufacturing methods. A special curvature of the roller end faces facilitates optimum contact conditions between the rollers and ribs ➤*417*|*9*. As a result, the axial contact pressures on the rib are significantly minimised and a lubricant film capable of supporting higher loads is formed. Under standard operating conditions, this completely eliminates wear and fatigue at the rib contact running and roller end faces. In addition, the frictional torque is reduced by up to 50%. The bearing temperature during operation is therefore significantly lower. Bearings of the toroidal crowned design are available for a bore diameter of, or larger than, d = 170 mm ➤*434*|.

9

Contact geometry of roller end face/rib face – modified roller end faces

① *Cylindrical roller with inner ring*
② *Detail (representation not to scale)*
③ *End of roller*
④ *Rib*



Load ratio F_a/F_r

Ratio $F_a/F_r \leqq 0{,}4$ or $0{,}6$

The bearings can support axial loads on one side by means of the ribs on the inner and/or outer ring ➤418| 10. In order to ensure problem-free running (tilting of the rollers is prevented), they must always be subjected to radial load at the same time as axial load. The ratio F_a/F_r must not exceed the value 0,4. For bearings with toroidal roller ends (TB design), values up to 0,6 are permissible.

Continuous axial loading without simultaneous radial loading is not permissible.

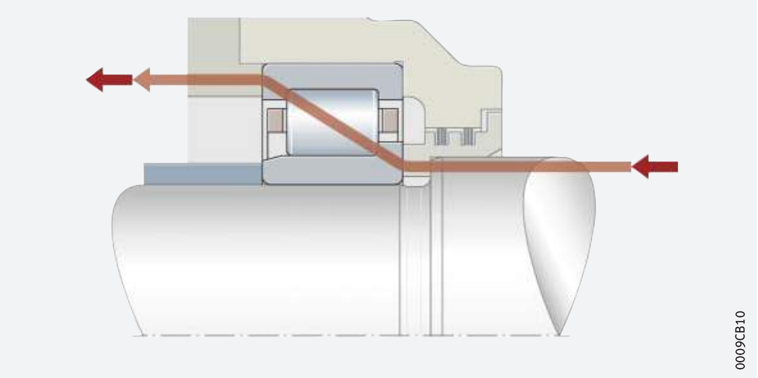
Permissible axial load

Influencing factors on the axial load carrying capacity

Axial loads are supported by the bearing ribs and the roller end faces ➤414| 4. The axial load carrying capacity of the bearing is therefore essentially dependent on:

- the size of the sliding surfaces between the ribs and the end faces of the rolling elements
- the sliding velocity at the ribs
- the lubrication of the contact surfaces
- tilting of the bearing
- friction.

10
Force flow under axial load – semi-locating bearing NJ



Calculation of permissible axial load – cylindrical rollers with conventional roller ends

Bearings with standard roller ends

The permissible axial load $F_{a\,per}$ can be calculated from the hydrodynamic load carrying capacity of the contact ➤418| 1.

1
Permissible axial load – bearings of standard design

$$F_{a\,per} = k_S \cdot k_B \cdot d_M^{1,54} \cdot n^{-0,6} \leqq F_{a\,max}$$

Legend

$F_{a\,per}$	N	Permissible continuous axial load. In order to prevent unacceptably high temperatures in the bearing, $F_{a\,per}$ must not be exceeded
$F_{a\,max}$	N	Maximum continuous axial load in relation to rib fracture. In order to prevent unacceptably high pressures at the contact surfaces, $F_{a\,max}$ must not be exceeded
k_S	–	Factor as a function of lubrication method ➤419| 1. The factor takes into consideration the lubrication method used for the bearing. The better the lubrication and, in particular, the heat dissipation, the higher the permissible axial load
k_B	–	Factor as a function of bearing series ➤419| 2
d_M	mm	Mean bearing diameter $d_M = (D + d)/2$ ➤434|
n	min^{-1}	Operating speed.

1
Factor k_S

Lubrication method	Factor k_S	
	from	to
Minimal heat dissipation, drip feed oil lubrication, oil mist lubrication, low operating viscosity ($\nu < 0{,}5 \cdot \nu_1$)	7,5	10
Poor heat dissipation, oil sump lubrication, oil spray lubrication, low oil flow	10	15
Good heat dissipation, recirculating oil lubrication (pressurised oil lubrication)	12	18
Very good heat dissipation, recirculating oil lubrication with oil cooling, high operating viscosity ($\nu > 2 \cdot \nu_1$)	16	24

The precondition for these k_S values is an operating viscosity of the lubricant of at least the reference viscosity ν_1 in accordance with DIN ISO 281:2010.

Doped lubricating oils should be used, such as CLP (DIN 51517) and HLP (DIN 51524) of ISO VG grades 32 to 460, as well as ATF oils (DIN 51502) and transmission oils (DIN 51512) of SAE viscosity grades 75W to 140W.

2
Bearing factor k_B

Series	Factor k_B
NJ2..-E, NJ22..-E, NUP2..-E, NUP22..-E	15
NJ3..-E, NJ23..-E, NUP3..-E, NUP23..-E	20
NJ4	22

Calculation of permissible axial load – cylindrical rollers with toroidal roller ends

Higher axial loads possible

For bearings with toroidal roller ends, the permissible axial loads are 50% higher ➤419| ƒ 2.

ƒ 2
Permissible axial load – bearings of TB design

$$F_{a\,per} = 1{,}5 \cdot k_S \cdot k_B \cdot d_M^{\,1{,}54} \cdot n^{-0{,}6} \leqq F_{a\,max}$$

Calculation of maximum permissible axial load

For bearings with rollers of the standard or TB design, the maximum permissible axial load $F_{a\,max}$ ➤419| ƒ 3 is calculated from the rib strength and the security against wear. This must not be exceeded, even if $F_{a\,per}$ gives higher values ➤419| ƒ 4.

ƒ 3
Maximum axial load – bearings of standard and TB design

$$F_{a\,max} = 0{,}075 \cdot k_B \cdot d_M^{\,2{,}1}$$

ƒ 4
Permissible axial load

$$F_{a\,per} \leqq F_{a\,max}$$

Axial load under shaft deflection

Permissible axial load under shaft deflection of up to 2′

Under considerable shaft deflection, the shaft shoulder presses against the inner ring rib. In combination with the active axial load, this can lead to high alternating loading of the inner ring ribs. Under a shaft deflection of up to 2′, the permissible axial load can be estimated ➤419| ƒ 5.

If more severe tilting is present, a separate strength analysis is required. In this case, please contact Schaeffler.

ƒ 5
Axial load under misalignment

$$F_{as} = 20 \cdot d_M^{\,1{,}42}$$

Legend

F_{as}	N	Permissible axial load under misalignment.

1.3 Compensation of angular misalignments

Angular deviations are misalignments between the inner and outer ring

The possible misalignment between the inner ring and outer ring is influenced by the internal bearing construction, the operating clearance, the forces acting on the bearing etc. Due to these complex relationships, it is not possible to give generally valid absolute values here. However, misalignments (angular deviations) between the inner ring and outer ring will generally always have an effect on the running noise and the operating life of the bearings.

Permissible tilting

The permissible guide values at which, based on experience, there is no significant reduction in operating life are as follows:

- 4′ for series 10, 19, 2, 3, 4
- 3′ for series 22, 23.

Scope of values

The values apply to:

- bearing arrangements with static misalignment (consistent position of the shaft and housing axis)
- bearings that are not required to perform an axial guidance function
- bearings subjected to small loads (with $C_{0r}/P \geqq 5$).

Checking by means of the calculation program BEARINX is recommended in all cases. If there is any uncertainty regarding possible misalignment, please consult Schaeffler.

1.4 Lubrication

Oil or grease lubrication

Single row cylindrical roller bearings with cage are not greased. They must be lubricated with oil or grease.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

1.5 Sealing

Provide seals in the adjacent construction

The bearings are not sealed; i. e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

1.6 Speeds

Limiting speeds and reference speeds in the product tables

The product tables give two speeds for most bearings ➤434:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

Reference speeds

$n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

1.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

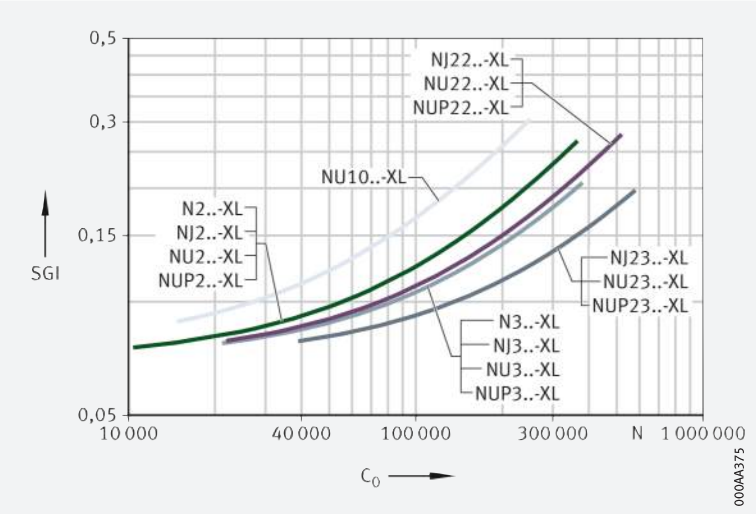
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

11
Schaeffler Noise Index for single row cylindrical roller bearings with cage

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and cylindrical rollers
- the cage
- the lubricant.

Possible operating temperatures of single row cylindrical roller bearings ➤422|▦3.

▦3
Permissible temperature ranges

Operating temperature	Single row cylindrical roller bearings	
	with polyamide cage PA66	with brass or sheet steel cage
🌡	−30 °C to +120 °C	−30 °C to +150 °C For continuous operating temperatures higher than +120 °C, please contact us

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

The right cage for any purpose

Standard materials are plastic, brass and steel

Approximately two-thirds of Schaeffler cylindrical roller bearings are supplied with cages. For standard applications, the cage materials used essentially are plastic, brass and sheet steel. A large number of cage types and sizes are designed using these three materials. As a result, the right bearing – in accordance with the operating conditions – is always available. For cylindrical roller bearings standardised in accordance with DIN 5412, there are four standard cages available for selection. A summary of the various cage characteristics and their suitability for certain applications is shown in ➤423|▦4.

Plastic cage TVP2

The highly versatile plastic cage TVP2 is the standard cage for bearings up to a medium bearing diameter ➤423|▦5. In comparison with metal cages, it has a range of advantages: low mass, low running noises due to good damping, high elasticity, good tribological characteristics with steel rolling elements and very good emergency running characteristics. This cage is thus a good choice for applications that allow the use of a plastic cage. Due to their wide-ranging positive characteristics, such plastic cages are now in use in many millions of bearings and applications.

Two-piece solid brass cage M1

A classic design of brass cage is the two-piece, riveted-bar brass cage M1 ➤423|▦5. It comprises a so-called comb cage and a cage cover. The cage parts are joined by means of hot riveting, where the rivet pin is integrated in the cage comb.

One-piece, milled brass cage MPAX/MPBX

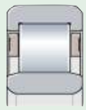
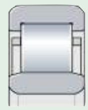
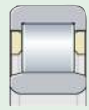
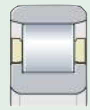
The brass cage MPAX or MPBX is intended for demanding conditions, such as the high speeds and radial accelerations occurring in planetary gear bearing arrangements ➤423|▦4. The optimised pocket geometry and the minimised mass allow a lower running temperature than comparable brass cages. The cages differ in the type of rib guidance. Cage MPAX is guided on the outer ring rib and cage MPBX is guided on the inner ring rib.

Sheet steel cage JP3

For applications that require increased temperature resistance, good lubrication and high geometrical stability of the cage, a bearing with a sheet steel cage is often the most economical solution ➤423|▦4. With the aid of highly developed manufacturing technologies, the geometry of the crosspieces and thus the running contact of the rollers on the cage bars is significantly improved. This goes hand in hand with a favourable surface structure, which has a positive influence on lubricant film formation.

▦4
Cage, cage characteristics, suitability

+++ = extremely suitable
+ = suitable
– = less suitable

Criteria	Cage				
	TVP2	M1	JP3	MPAX	MPBX
					
Large number of rolling elements	+	+	+	+	+
High radial cage rigidity	–	+++	+	+++	+++
Low mass	+++	–	+	–	–
Good emergency running (damage case)	–	+++	+	+++	+++
Low noise	+++	+	+	+	+
High guidance normal acceleration	+	+	+	+++	+++
Strong vibrations	+	+	+	+++	+++
Relubrication facility	–	–	+++	+	+
Grease/oil compatibility	–	+	+++	+	+
Application temperatures > 120 °C	–	+	+++	+	+
Large temperature fluctuations	–	+	+++	+	+

Solid cages made from brass and polyamide PA66 are used as standard

Standard cages are shown in ➤423|▦5. The cage design is dependent on the bearing series and the bore code. Other cage designs are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦5
Cage, cage suffix, bore code

Bearing series	Solid cage made from polyamide PA66	Solid brass cage
	TVP2	M1
	standard	standard
	Bore code	
NU10	–	from 05
NU19	–	from 92
NU2..-E, NJ2..-E, NUP2..-E	up to 26	from 28
NU3..-E, NJ3..-E, NUP3..-E	up to 28	from 30
NU4, NJ4	–	all
NU22..-E, NJ22..-E	up to 26	from 28
NU23..-E, NJ23..-E	up to 22	from 24
N2..-E	up to 20, 22 to 26	21, from 28
N3..-E	up to 16	from 17
NUP22..-E	up to 26	from 28
NUP23..-E	up to 22	from 24

1.10 Internal clearance

Radial internal clearance

The standard is CN

Cylindrical roller bearings with cage are manufactured as standard with the radial internal clearance CN (normal) ➤424|6. CN is not stated in the designation.

Certain sizes are also available by agreement with the larger internal clearance C3, C4 and C5 ➤424|6.

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤424|6. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

6
Radial internal clearance of single row cylindrical roller bearings with cage

Nominal bore diameter d mm		Radial internal clearance							
		CN (Group N) µm		C3 (Group 3) µm		C4 (Group 4) µm		C5 (Group 5) µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	20	45	35	60	50	75	65	90
24	30	20	45	35	60	50	75	70	95
30	40	25	50	45	70	60	85	80	105
40	50	30	60	50	80	70	100	98	125
50	65	40	70	60	90	80	110	110	140
65	80	40	75	65	100	90	125	130	165
80	100	50	85	75	110	105	140	155	190
100	120	50	90	85	125	125	165	180	220
120	140	60	105	100	145	145	190	200	245
140	160	70	120	115	165	165	215	225	275
160	180	75	125	120	170	170	220	250	300
180	200	90	145	140	195	195	250	275	330
200	225	105	165	160	220	220	280	305	365
225	250	110	175	170	235	235	300	330	395
250	280	125	195	190	260	260	330	370	440
280	315	130	205	200	275	275	350	410	485
315	355	145	225	225	305	305	385	455	535
355	400	190	280	280	370	370	460	510	600
400	450	210	310	310	410	410	510	565	665
450	500	220	330	330	440	440	550	625	735
500	560	240	360	360	480	480	600	690	810
560	630	260	380	380	500	500	620	780	900
630	710	285	425	425	565	565	705	865	1005

1.11 Dimensions, tolerances

Dimension standards

The main dimensions of cylindrical roller bearings correspond to ISO 15:2017 (DIN 616:2000 and DIN 5412-1:2005).

The main dimensions of L-section rings HJ correspond to ISO 246:1995 (DIN 5412-1:2005).

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤*135*|*7.11*. Nominal value of chamfer dimension ➤*434*|.

Tolerances

The dimensional tolerances of cylindrical roller bearings correspond to the tolerance class Normal, the running tolerance to the tolerance class 6 in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ➤*124*|.

1.12 Suffixes

For a description of the suffixes used in this chapter ➤*425*| *7* and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

7
Suffixes and corresponding descriptions

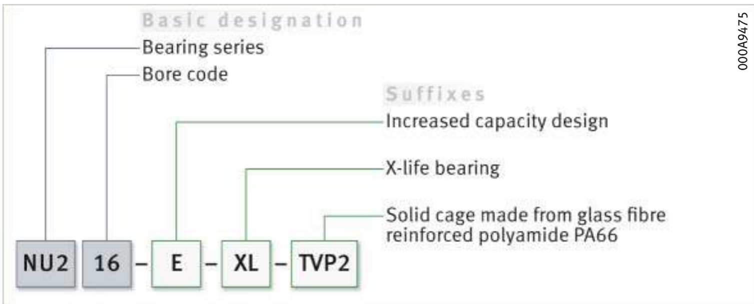
Suffix	Description of suffix	
C3	Radial internal clearance C3 (larger than normal)	Available by agreement
C4	Radial internal clearance C4 (larger than C3)	
C5	Radial internal clearance C5 (larger than C4)	
E	Increased capacity design	Standard
EX	Increased capacity design, design modified in accordance with standard (parts from these bearings must not be interchanged with parts from bearings of the same size of the previous design E)	
JP3	Sheet steel window cage, single-piece, roller-guided	Available by agreement
J30P	Black oxide coated (Durotect B)	
MPAX	Solid brass cage, single-piece, rib-guided on outer ring	
MPBX	Solid brass cage, single-piece, rib-guided on inner ring	
M1	Solid brass cage, two-piece, roller-guided	Standard
M1A	Solid brass cage, two-piece, rib-guided on outer ring	Available by agreement
M1B	Solid brass cage, two-piece, rib-guided on inner ring	
TB	Bearing with increased axial load carrying capacity (toroidal crowned design)	Standard, dependent on bearing size
TVP2	Solid window cage made from glass fibre reinforced polyamide PA66	Standard
XL	X-life bearing	

1.13 Structure of bearing designation

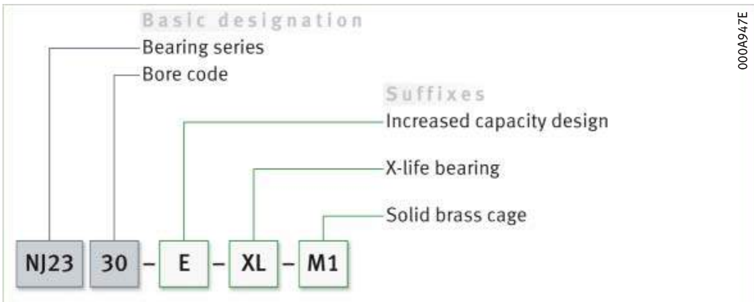
✎ Examples of composition of bearing designation

The designation of bearings follows a set model. Examples ➤426|⊡12 to ➤426|⊡14. The composition of designations is subject to DIN 623-1 ➤102|⊡10.

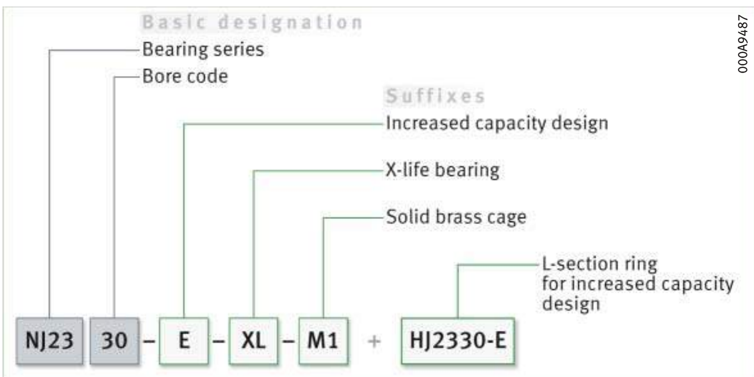
⊡12
Single row cylindrical roller bearing with cage – bearing with non-locating bearing function: designation structure



⊡13
Single row cylindrical roller bearing with cage – bearing with semi-locating bearing function: designation structure



⊡14
Single row cylindrical roller bearing with cage, type NJ with L-section ring – bearing with locating bearing function: designation structure



1.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

Cylindrical roller bearings with non-locating bearing function

✎ $P = F_r$

Non-locating bearings can only support radial loads. For these bearings ➤426|ƒ6.

ƒ6
Equivalent dynamic load

$$P = F_r$$

Cylindrical roller bearings with semi-locating or locating bearing function

P is a substitute force for combined load and various load cases

If the condition described above is not met, i. e. if, in addition to the radial force F_r, there is also an axial force F_a, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

$F_a/F_r \leqq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factors e and Y ➤427|ƒ 7 and ➤427|ƒ 8.

ƒ 7
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r$$

ƒ 8
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}92 \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load
e, Y	–	Factors ➤427|▦ 8.

▦ 8
Factors e and Y

Bearing series	Calculation factors	
	e	Y
NJ2, NUP2, NJ3, NUP3, NJ4	0,2	0,6
NJ22, NUP22, NJ23, NUP23	0,3	0,4

Equivalent static bearing load

$P_0 = F_{0r}$

For cylindrical roller bearings subjected to static load ➤427|ƒ 9.

ƒ 9
Equivalent static load

$$P_0 = F_{0r}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}	N	Largest radial load present (maximum load).

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤427|ƒ 10.

ƒ 10
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

1.15 Minimum load

In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/60$ is necessary during continuous operation

In order that no slippage occurs between the contact partners, the cylindrical roller bearings must be constantly subjected to a sufficiently high radial load. For continuous operation, experience shows that a minimum radial load of the order of $P > C_{0r}/60$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

1.16 Design of bearing arrangements

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤429|▦9 to ➤430|▦11.

Radial location

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

! If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158|▦7.

Axial location

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings, retaining rings, adapter and withdrawal sleeves etc., are fundamentally suitable ➤430|⌕15.

Dimensional, geometrical and running accuracy of cylindrical seats

✎ A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used.
For cylindrical roller bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and in the housing seat to a minimum of IT7; with tolerance class 6, the shaft seat should correspond to a minimum of IT5 and the housing seat to a minimum of IT6. Guide values for the geometrical and positional tolerances of the bearing seating surfaces ➤429|▦9, tolerances t_1 to t_3 in accordance with ➤168|⌕11. Numerical values for IT grades ➤429|▦10.

9
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class to ISO 492	Bearing tolerance class to DIN 620	Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades): Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	
6	P6	Shaft	IT5	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	
		Housing	IT6	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	

10
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm					
over	**10**	**18**	**30**	**50**	**80**	**120**
incl.	**18**	**30**	**50**	**80**	**120**	**180**
	Values in µm					
IT3	3	4	4	5	6	8
IT4	5	6	7	8	10	12
IT5	8	9	11	13	15	18
IT6	11	13	16	19	22	25
IT7	18	21	25	30	35	40

continued ▼

10
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm					
over	**180**	**250**	**315**	**400**	**500**	**630**
incl.	**250**	**315**	**400**	**500**	**630**	**800**
	Values in µm					
IT3	10	12	13	15	16	18
IT4	14	16	18	20	22	25
IT5	20	23	25	27	32	36
IT6	29	32	36	40	44	50
IT7	46	52	57	63	70	80

continued ▲

Roughness of cylindrical bearing seating surfaces

Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤430|11.

11
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4
500	1 250	3,2[1]	1,6	1,6	0,8

1) For the mounting of bearings using the hydraulic method, a value Ra = 1,6 µm must not be exceeded.

Mounting dimensions for the contact surfaces of bearing rings

The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. The transition from the bearing seat to the abutment shoulder must be designed with rounding to DIN 5418:1993 or an undercut to DIN 509:2006. Proven mounting dimensions for the radii and diameters of abutment shoulders are given in the product tables ➤430|15 and ➤434|. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

Rib support in axially loaded bearings

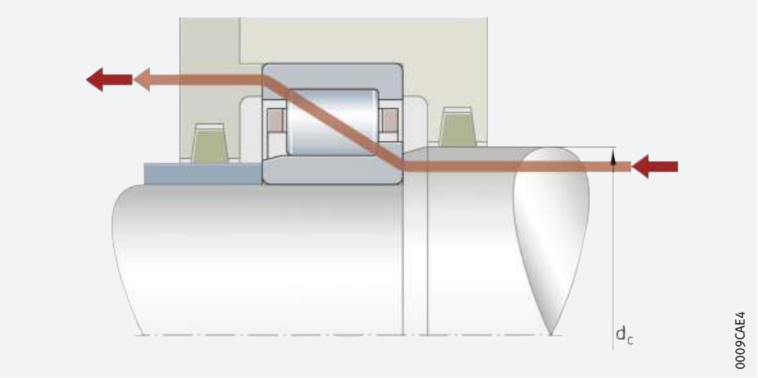
Ribs under axial load must be supported over their entire height and entire circumference. The size and axial runout accuracy of the contact surfaces on the inner ring rib must be observed especially in the case of cylindrical roller bearings subjected to high loads, since these factors also influence the uniformity of the rib load and the running accuracy of the shaft. This means that the ribs may be subjected to damaging alternating stresses even in the case of very small misalignments. If the mounting dimensions indicated in the product tables are observed, the problems described can be reliably avoided ➤434|.

Support in semi-locating bearings

In semi-locating bearings, it is sufficient to support the bearing rings on one side, on the rib supporting the axial load ➤430|15.

15
Support of the inner ring rib – type NJ (semi-locating bearing)

d_c = *recommended height of shaft shoulder with axially loaded rib*
Arrow = *force flow*



1.17 Mounting and dismounting

The mounting and dismounting options for cylindrical roller bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎ Since one bearing ring can be removed, the bearings are easy to mount.

Together with the cage and rollers, the bearing ring with the two rigid ribs forms a ready-to-mount unit. The other bearing ring can be removed. As a result, the bearing parts can be mounted separately from each other ➤*412*|*1.1*. This gives simplified mounting of the bearings, especially when the two bearing rings have a tight fit.

Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤*https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤*https://medias.schaeffler.com*.

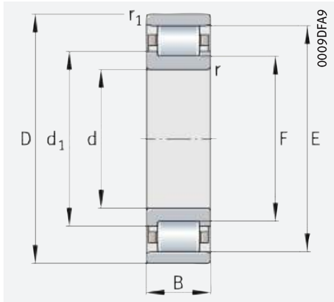
1.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Cylindrical roller bearings with cage

Non-locating bearings



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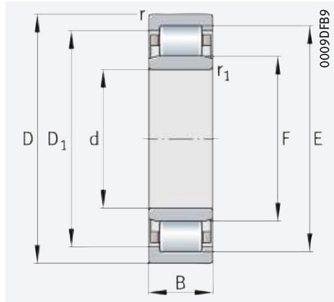
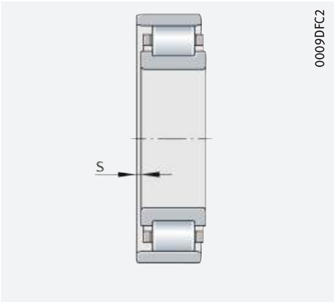


NU

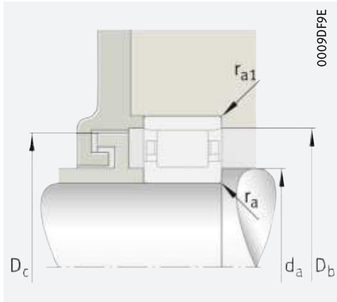
d = 15 – 35 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425|1.12 ➤426|1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
15	35	11	15 100	10 400	1 610	27 000	17 900	0,047	**N202-E-XL-TVP2**
	35	11	15 100	10 400	1 410	27 000	17 900	0,048	**NU202-E-XL-TVP2**
17	40	12	20 800	14 600	2 190	22 900	15 300	0,068	**N203-E-XL-TVP2**
	40	12	20 800	14 600	1 870	22 900	15 300	0,069	**NU203-E-XL-TVP2**
	40	16	28 500	21 900	3 500	22 900	13 200	0,051	**NU2203-E-XL-TVP2**
	47	14	30 000	21 200	2 600	19 600	13 500	0,121	**NU303-E-XL-TVP2**
20	47	14	32 500	24 700	3 900	19 200	12 800	0,112	**N204-E-XL-TVP2**
	47	14	32 500	24 700	2 900	19 200	12 800	0,114	**NU204-E-XL-TVP2**
	47	18	38 500	31 000	5 100	19 200	11 100	0,146	**NU2204-E-XL-TVP2**
	52	15	37 500	27 000	3 100	17 200	11 900	0,153	**NU304-E-XL-TVP2**
	52	21	49 500	39 000	6 200	17 200	9 700	0,215	**NU2304-E-XL-TVP2**
25	47	12	18 500	14 800	1 780	26 000	12 900	0,092	**NU1005-XL-M1**
	52	15	34 500	27 500	4 400	17 200	11 600	0,135	**N205-E-XL-TVP2**
	52	15	34 500	27 500	3 300	17 200	11 600	0,137	**NU205-E-XL-TVP2**
	52	18	41 500	34 500	5 700	17 200	9 600	0,165	**NU2205-E-XL-TVP2**
	62	17	49 000	37 500	5 600	14 400	10 100	0,242	**N305-E-XL-TVP2**
	62	17	49 000	37 500	4 450	14 400	10 100	0,245	**NU305-E-XL-TVP2**
	62	24	67 000	56 000	9 200	14 400	8 200	0,349	**NU2305-E-XL-TVP2**
30	55	13	22 900	19 300	2 410	22 400	11 000	0,134	**NU1006-XL-M1**
	62	16	46 000	37 500	5 400	14 200	9 600	0,205	**N206-E-XL-TVP2**
	62	16	46 000	37 500	4 350	14 200	9 600	0,207	**NU206-E-XL-TVP2**
	62	20	58 000	50 000	7 800	14 200	8 000	0,255	**NU2206-E-XL-TVP2**
	72	19	61 000	48 000	7 700	12 400	8 900	0,366	**N306-E-XL-TVP2**
	72	19	61 000	48 000	6 000	12 400	8 900	0,368	**NU306-E-XL-TVP2**
	72	27	86 000	75 000	13 100	12 400	7 200	0,529	**NU2306-E-XL-TVP2**
	90	23	84 000	65 000	8 300	13 400	8 100	0,858	**NU406-XL-M1**
35	62	14	29 000	26 000	3 200	19 700	9 700	0,177	**NU1007-XL-M1**
	72	17	59 000	50 000	7 600	12 300	8 100	0,301	**N207-E-XL-TVP2**
	72	17	59 000	50 000	6 100	12 300	8 100	0,303	**NU207-E-XL-TVP2**
	72	23	73 000	65 000	10 500	12 300	7 200	0,406	**NU2207-E-XL-TVP2**
	80	21	76 000	63 000	10 600	10 900	7 900	0,486	**N307-E-XL-TVP2**
	80	21	76 000	63 000	8 100	10 900	7 900	0,486	**NU307-E-XL-TVP2**
	80	31	108 000	98 000	17 600	10 900	6 600	0,723	**NU2307-E-XL-TVP2**
	100	25	103 000	83 000	10 600	11 800	7 000	1,14	**NU407-XL-M1**

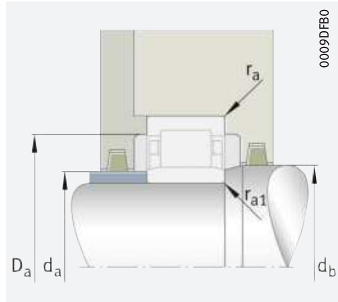
medias ➤ *https://www.schaeffler.de/std/1DA0*



Axial displacement “s”
for N and NU



Mounting dimensions
for N

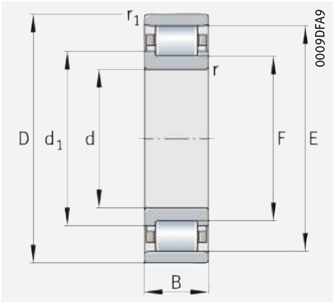


Mounting dimensions
for NU

Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
15	0,6	0,3	0,5	30,3	19,3	–	21,6	17,4	–	–	32,6	31	29	0,6	0,3
	0,6	0,3	1,6	30,3	19,3	28	–	17,4	18,5	20	32,6	–	–	0,6	0,3
17	0,6	0,3	1,2	35,1	22,1	–	24,9	21	–	–	36	36	34	0,6	0,3
	0,6	0,3	1,2	35,1	22,1	32,5	–	21	21,5	23	36	–	–	0,6	0,3
	0,6	0,3	1,7	35,1	22,1	32,5	–	21	21,5	23	36	–	–	0,6	0,3
	1	0,6	1,2	40,2	24,2	37,1	–	21,2	23,5	25	42,8	–	–	1	0,6
20	1	0,6	0,8	41,5	26,5	–	29,7	24	–	–	41	43	40	1	0,6
	1	0,6	0,8	41,5	26,5	38,8	–	24	26	29	41	–	–	1	0,6
	1	0,6	1,8	41,5	26,5	38,8	–	24	26	29	41	–	–	1	0,6
	1,1	0,6	1	45,5	27,5	42,4	–	24	27	30	45	–	–	1	0,6
	1,1	0,6	1,9	45,5	27,5	42,4	–	24	27	30	45	–	–	1	0,6
25	0,6	0,3	2,4	41,5	30,5	39,3	–	27	30	32	44	–	–	0,6	0,3
	1	0,6	1,3	46,5	31,5	–	34,7	29	–	–	46	48	45	1	0,6
	1	0,6	1,2	46,5	31,5	43,8	–	29	31	34	46	–	–	1	0,6
	1	0,6	1,7	46,5	31,5	43,8	–	29	31	34	46	–	–	1	0,5
	1,1	1,1	1,4	54	34	–	38,1	32	–	–	55	55	53	1	1
	1,1	1,1	1,5	54	34	50,7	–	32	33	37	55	–	–	1	1
	1,1	1,1	1,9	54	34	50,7	–	32	33	37	55	–	–	1	1
30	1	0,6	2,4	48,5	36,5	46,1	–	33	35	38	50	–	–	1	0,6
	1	0,6	1,4	55,5	37,5	–	41,1	34	–	–	56	57	54	1	0,6
	1	0,6	1,5	55,5	37,5	52,5	–	34	37	40	56	–	–	1	0,6
	1	0,6	1,6	55,5	37,5	52,5	–	34	37	40	56	–	–	1	0,6
	1,1	1,1	0,6	62,5	40,5	–	45	37	–	–	65	64	61	1	1
	1,1	1,1	1,2	62,5	40,5	59,2	–	37	40	44	65	–	–	1	1
	1,1	1,1	2,2	62,5	40,5	59,2	–	37	40	44	65	–	–	1	1
	1,5	1,5	2,3	73	45	68,4	–	41	44	47	79	–	–	1,5	1,5
35	1	0,6	2,6	55	42	52,4	–	38	41	44	57	–	–	1	0,6
	1,1	0,6	0,7	64	44	–	48	39	–	–	65	65	63	1	0,6
	1,1	0,6	0,7	64	44	61	–	39	43	46	65	–	–	1	0,6
	1,1	0,6	2,2	64	44	61	–	39	43	46	65	–	–	1	0,6
	1,5	1,1	0,6	70,2	46,2	–	51	42	–	–	71	71	69	1,5	1
	1,5	1,1	0,6	70,2	46,2	66,6	–	42	45	48	71	–	–	1,5	1
	1,5	1,1	3	70,2	46,2	66,6	–	42	45	48	71	–	–	1,5	1
	1,5	1,5	2,6	83	53	78,2	–	46	52	55	89	–	–	1,5	1,5

Cylindrical roller bearings with cage

Non-locating bearings



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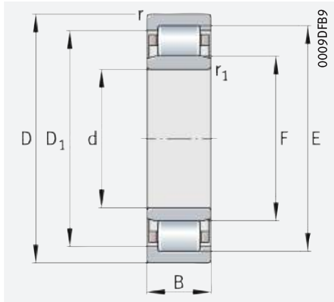
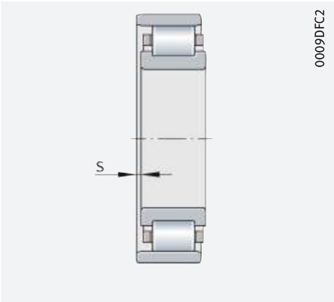


NU

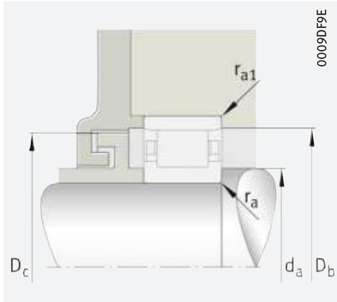
d = 40 – 55 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425|1.12 ➤426|1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
40	68	15	33 500	30 500	3 800	17 700	8 900	0,216	**NU1008-XL-M1**
	80	18	63 000	53 000	8 400	10 900	7 500	0,358	**N208-E-XL-TVP2**
	80	18	63 000	53 000	6 600	10 900	7 500	0,379	**NU208-E-XL-TVP2**
	80	23	83 000	75 000	12 700	10 900	6 300	0,492	**NU2208-E-XL-TVP2**
	90	23	96 000	79 000	13 600	9 500	7 100	0,656	**N308-E-XL-TVP2**
	90	23	96 000	79 000	10 200	9 500	7 100	0,659	**NU308-E-XL-TVP2**
	90	33	132 000	119 000	21 600	9 500	5 800	0,958	**NU2308-E-XL-TVP2**
	110	27	119 000	95 000	12 400	10 500	6 500	1,47	**NU408-XL-M1**
45	75	16	40 000	37 500	4 750	16 000	8 100	0,277	**NU1009-XL-M1**
	85	19	72 000	63 000	10 300	10 200	7 000	0,434	**N209-E-XL-TVP2**
	85	19	72 000	63 000	8 100	10 200	7 000	0,434	**NU209-E-XL-TVP2**
	85	23	87 000	82 000	13 900	10 200	5 800	0,532	**NU2209-E-XL-TVP2**
	100	25	116 000	99 000	17 300	8 500	6 400	0,891	**N309-E-XL-TVP2**
	100	25	116 000	99 000	13 200	8 500	6 400	0,893	**NU309-E-XL-TVP2**
	100	36	163 000	154 000	28 000	8 500	5 200	1,3	**NU2309-E-XL-TVP2**
	120	29	143 000	119 000	15 600	9 600	5 900	1,87	**NU409-XL-M1**
50	80	16	42 500	41 500	5 300	15 000	7 400	0,305	**NU1010-XL-M1**
	90	20	75 000	69 000	11 200	9 700	6 600	0,488	**N210-E-XL-TVP2**
	90	20	75 000	69 000	8 800	9 700	6 600	0,487	**NU210-E-XL-TVP2**
	90	23	92 000	88 000	15 000	9 700	5 300	0,573	**NU2210-E-XL-TVP2**
	110	27	128 000	110 000	20 100	7 800	6 100	1,16	**N310-E-XL-TVP2**
	110	27	131 000	114 000	15 300	7 800	6 000	1,16	**NU310-E-XL-TVP2**
	110	40	193 000	187 000	35 000	7 800	4 900	1,75	**NU2310-E-XL-TVP2**
	130	31	175 000	148 000	19 800	8 600	5 300	2,33	**NU410-XL-M1**
55	90	18	49 500	50 000	6 600	13 500	6 900	0,446	**NU1011-XL-M1**
	100	21	99 000	95 000	16 100	8 700	5 800	0,668	**N211-E-XL-TVP2**
	100	21	99 000	95 000	12 700	8 700	5 800	0,665	**NU211-E-XL-TVP2**
	100	25	117 000	118 000	20 700	8 700	4 700	0,796	**NU2211-E-XL-TVP2**
	120	29	159 000	139 000	25 500	7 000	5 500	1,48	**N311-E-XL-TVP2**
	120	29	159 000	139 000	19 000	7 000	5 500	1,48	**NU311-E-XL-TVP2**
	120	43	235 000	230 000	43 500	7 000	4 500	2,23	**NU2311-E-XL-TVP2**
	140	33	187 000	164 000	21 900	8 200	5 100	2,83	**NU411-XL-M1**

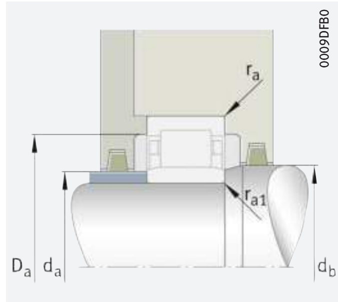
medias ➤ *https://www.schaeffler.de/std/1DA1*



Axial displacement “s”
for N and NU



Mounting dimensions
for N

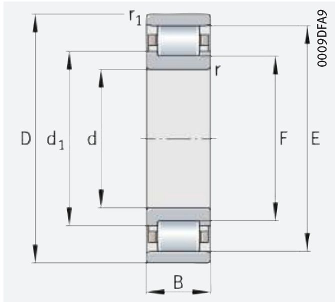


Mounting dimensions
for NU

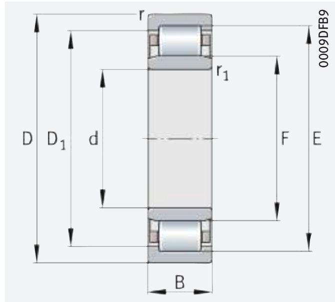
Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
40	1	0,6	2	61	47	58,2	–	43	46	49	63	–	–	1	0,6
	1,1	1,1	1	71,5	49,5	–	54	47	–	–	73	73	70	1	1
	1,1	1,1	1	71,5	49,5	68,3	–	47	49	52	73	–	–	1	1
	1,1	1,1	1,5	71,5	49,5	68,3	–	47	49	52	73	–	–	1	1
	1,5	1,5	1,2	80	52	–	57,6	49	–	–	81	81	79	1,5	1,5
	1,5	1,5	1,3	80	52	75,9	–	49	51	55	81	–	–	1,5	1,5
	1,5	1,5	2,7	80	52	75,9	–	49	51	55	81	–	–	1,5	1,5
	2	2	2,8	92	58	86,4	–	53	57	60	97	–	–	2	2
45	1	0,6	2,5	67,5	52,5	64,5	–	48	52	54	70	–	–	1	0,6
	1,1	1,1	1	76,5	54,5	–	59	52	–	–	78	78	75	1	1
	1,1	1,1	1	76,5	54,5	73,3	–	52	54	57	78	–	–	1	1
	1,1	1,1	1,5	76,5	54,5	73,3	–	52	54	57	78	–	–	1	1
	1,5	1,5	1	88,5	58,5	–	64,4	54	–	–	91	90	87	1,5	1,5
	1,5	1,5	1	88,5	58,5	84,1	–	54	57	60	91	–	–	1,5	1,5
	1,5	1,5	2,5	88,5	58,5	84,1	–	54	57	60	91	–	–	1,5	1,5
	2	2	2,9	100,5	64,5	94,6	–	58	63	66	107	–	–	2	2
50	1	0,6	2,1	72,5	57,5	69,5	–	53	57	59	75	–	–	1	0,6
	1,1	1,1	1,3	81,5	59,5	–	64	57	–	–	83	83	80	1	1
	1,1	1,1	1,3	81,5	59,5	78,3	–	57	58	62	83	–	–	1	1
	1,1	1,1	1,3	81,5	59,5	78,3	–	57	58	62	83	–	–	1	1
	2	2	1,7	97	65	–	71,3	61	–	–	99	98	96	2	2
	2	2	1,7	97	65	92,5	–	61	63	67	99	–	–	2	2
	2	2	3,2	97	65	92,5	–	61	63	67	99	–	–	2	2
	2,1	2,1	3	110,8	70,8	104,3	–	64	69	73	116	–	–	2	2
55	1,1	1	2,4	80,5	64,5	77,3	–	60	63	66	84	–	–	1,1	1
	1,5	1,1	0,8	90	66	–	70,8	62	–	–	91	91	89	1,5	1
	1,5	1,1	0,8	90	66	86,6	–	62	65	68	91	–	–	1,5	1
	1,5	1,1	1,3	90	66	86,6	–	62	65	68	91	–	–	1,5	1
	2	2	1,8	106,5	70,5	–	77,5	66	–	–	109	108	105	2	2
	2	2	1,8	106,5	70,5	101,4	–	66	69	72	109	–	–	2	2
	2	2	3,3	106,5	70,5	101,4	–	66	69	72	109	–	–	2	2
	2,1	2,1	3,3	117,2	77,2	110,7	–	69	76	79	126	–	–	2	2

Cylindrical roller bearings with cage

Non-locating bearings



N

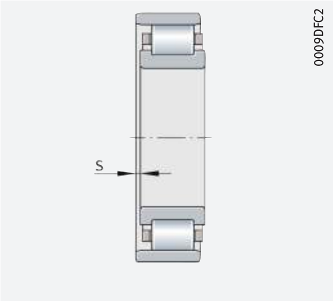


NU

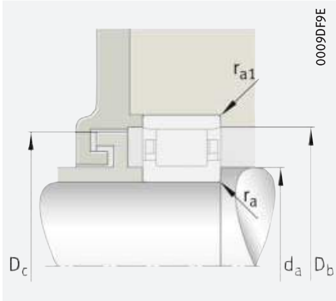
d = 60 – 75 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425 | 1.12 ➤426 | 1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
60	95	18	52 000	55 000	7 200	12 800	6 400	0,48	**NU1012-XL-M1**
	110	22	112 000	103 000	13 900	7 700	5 300	0,824	**NU212-E-XL-TVP2**
	110	22	112 000	103 000	17 800	7 700	5 300	0,827	**N212-E-XL-TVP2**
	110	28	152 000	153 000	27 500	7 700	4 300	1,08	**NU2212-E-XL-TVP2**
	130	31	177 000	157 000	28 500	6 500	5 200	1,84	**N312-E-XL-TVP2**
	130	31	177 000	157 000	21 400	6 500	5 200	1,85	**NU312-E-XL-TVP2**
	130	46	265 000	260 000	50 000	6 500	4 250	2,78	**NU2312-E-XL-TVP2**
	150	35	211 000	184 000	24 300	7 500	4 800	3,41	**NU412-XL-M1**
65	100	18	53 000	58 000	7 600	12 200	5 900	0,507	**NU1013-XL-M1**
	120	23	128 000	120 000	20 800	7 100	4 900	1,05	**N213-E-XL-TVP2**
	120	23	128 000	120 000	16 400	7 100	4 900	1,04	**NU213-E-XL-TVP2**
	120	31	177 000	182 000	33 500	7 100	4 100	1,43	**NU2213-E-XL-TVP2**
	140	33	214 000	191 000	34 500	5 900	4 800	2,28	**N313-E-XL-TVP2**
	140	33	214 000	191 000	25 500	5 900	4 800	2,28	**NU313-E-XL-TVP2**
	140	48	295 000	285 000	54 000	5 900	4 000	3,32	**NU2313-E-XL-TVP2**
	160	37	230 000	203 000	26 500	7 000	4 600	4,08	**NU413-XL-M1**
70	110	20	77 000	81 000	10 200	10 700	5 500	0,706	**NU1014-XL-M1**
	125	24	141 000	138 000	24 300	6 800	4 650	1,16	**N214-E-XL-TVP2**
	125	24	141 000	138 000	19 000	6 800	4 650	1,15	**NU214-E-XL-TVP2**
	125	31	185 000	195 000	35 500	6 800	3 850	1,52	**NU2214-E-XL-TVP2**
	150	35	242 000	222 000	39 500	5 500	4 500	2,79	**N314-E-XL-TVP2**
	150	35	242 000	222 000	30 000	5 500	4 500	2,79	**NU314-E-XL-TVP2**
	150	51	325 000	325 000	60 000	5 500	3 800	4,02	**NU2314-E-XL-TVP2**
	180	42	285 000	255 000	32 500	6 200	4 250	5,97	**NU414-XL-M1**
75	115	20	78 000	85 000	10 700	10 300	5 200	0,737	**NU1015-XL-M1**
	130	25	155 000	157 000	27 500	6 500	4 400	1,29	**N215-E-XL-TVP2**
	130	25	155 000	157 000	21 700	6 500	4 400	1,27	**NU215-E-XL-TVP2**
	130	31	192 000	208 000	38 000	6 500	3 600	1,6	**NU2215-E-XL-TVP2**
	160	37	285 000	265 000	46 500	5 100	4 150	3,34	**N315-E-XL-TVP2**
	160	37	285 000	265 000	34 500	5 100	4 150	3,33	**NU315-E-XL-TVP2**
	160	55	390 000	395 000	72 000	5 100	3 550	4,95	**NU2315-E-XL-TVP2**
	190	45	325 000	295 000	37 000	5 800	4 100	7,09	**NU415-XL-M1**

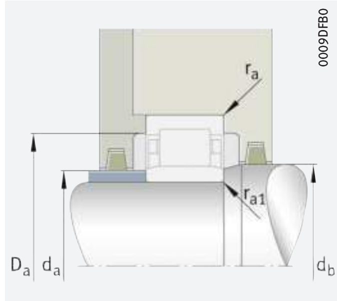
medias ➤ *https://www.schaeffler.de/std/1DA2*



Axial displacement "s"
for N and NU



Mounting dimensions
for N

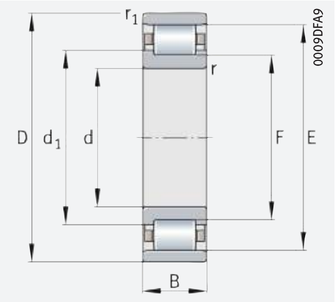


Mounting dimensions
for NU

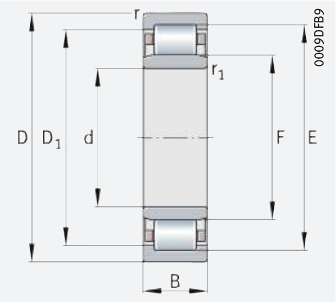
Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
60	1,1	1	2,4	85,5	69,5	–	82,3	65	68	71	89	–	–	1,1	1
	1,5	1,5	1,6	100	72	–	96,1	69	71	75	101	–	–	1,5	1,5
	1,5	1,5	1,6	100	72	77,6	–	69	–	–	101	101	99	1,5	1,5
	1,5	1,5	1,6	100	72	–	96,1	69	71	75	101	–	–	1,5	1,5
	2,1	2,1	1,9	115	77	84,4	–	72	–	–	118	116	114	2,1	2,1
	2,1	2,1	1,8	115	77	–	109,6	72	75	79	118	–	–	2,1	2,1
	2,1	2,1	3,5	115	77	–	109,6	72	75	79	118	–	–	2,1	2,1
	2,1	2,1	3,4	127	83	–	119,5	74	82	85	136	–	–	2	2
65	1,1	1	3,3	90,5	74,5	87,3	–	70	73	76	94	–	–	1,1	1
	1,5	1,5	1,4	108,5	78,5	–	84,4	74	–	–	111	110	107	1,5	1,5
	1,5	1,5	1,4	108,5	78,5	104,3	–	74	77	81	111	–	–	1,5	1,5
	1,5	1,5	1,9	108,5	78,5	104,3	–	74	77	81	111	–	–	1,5	1,5
	2,1	2,1	1,4	124,5	82,5	–	90,5	77	–	–	128	126	123	2,1	2,1
	2,1	2,1	1,5	124,5	82,5	118,6	–	77	81	85	128	–	–	2,1	2,1
	2,1	2,1	4	124,5	82,5	118,6	–	77	81	85	128	–	–	2,1	2,1
	2,1	2,1	3,5	135,3	89,3	127,7	–	79	88	91	146	–	–	2	2
70	1,1	1	2,5	100	80	96	–	75	78	82	104	–	–	1	1
	1,5	1,5	1,2	113,5	83,5	–	89,4	79	–	–	116	115	112	1,5	1,5
	1,5	1,5	1,2	113,5	83,5	109,4	–	79	82	86	116	–	–	1,5	1,5
	1,5	1,5	1,6	113,5	83,5	109,4	–	79	82	86	116	–	–	1,5	1,5
	2,1	2,1	1,6	133	89	–	97,4	82	–	–	138	135	131	2,1	2,1
	2,1	2,1	1,7	133	89	126,8	–	82	87	92	138	–	–	2,1	2,1
	2,1	2,1	4,7	133	89	126,8	–	82	87	92	138	–	–	2,1	2,1
	3	3	4	152	100	142,7	–	86	99	102	164	–	–	2,5	2,5
75	1,1	1	2,5	105	85	101,7	–	80	83	87	109	–	–	1,1	1
	1,5	1,5	1,1	118,5	88,5	–	94,4	84	–	–	121	120	117	1,5	1,5
	1,5	1,5	1,2	118,5	88,5	114,4	–	84	87	90	121	–	–	1,5	1,5
	1,5	1,5	1,6	118,5	88,5	114,4	–	84	87	90	121	–	–	1,5	1,5
	2,1	2,1	1,1	143	95	–	104,1	87	–	–	148	145	141	2,1	2,1
	2,1	2,1	1,2	143	95	136,2	–	87	93	97	148	–	–	2,1	2,1
	2,1	2,1	4,2	143	95	136,2	–	87	93	97	148	–	–	2,1	2,1
	3	3	4,5	160,5	104,5	150,7	–	91	103	107	174	–	–	2,5	2,5

Cylindrical roller bearings with cage

Non-locating bearings



N

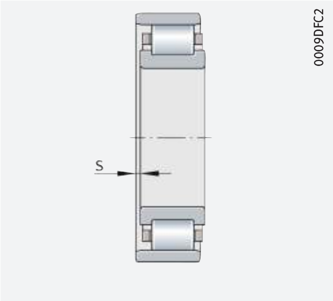


NU

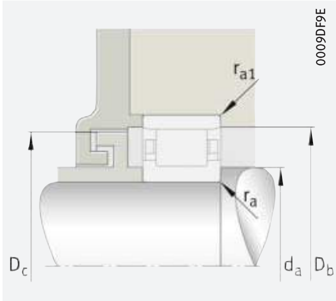
d = 80 – 95 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425 | 1.12 ➤426 | 1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
80	125	22	91 000	99 000	12 900	9 400	5 000	0,99	**NU1016-XL-M1**
	140	26	166 000	168 000	29 000	6 100	4 200	1,55	**N216-E-XL-TVP2**
	140	26	166 000	168 000	22 600	6 100	4 200	1,55	**NU216-E-XL-TVP2**
	140	33	221 000	244 000	43 500	6 100	3 400	2,01	**NU2216-E-XL-TVP2**
	170	39	300 000	275 000	49 500	4 800	4 100	4,12	**N316-E-XL-TVP2**
	170	39	300 000	275 000	37 000	4 800	4 100	3,96	**NU316-E-XL-TVP2**
	170	58	420 000	425 000	79 000	4 800	3 450	5,89	**NU2316-E-XL-TVP2**
	200	48	395 000	365 000	46 000	5 400	3 750	8,37	**NU416-XL-M1**
85	130	22	93 000	103 000	13 400	9 000	4 750	1,04	**NU1017-XL-M1**
	150	28	194 000	194 000	33 500	5 600	4 000	1,92	**N217-E-XL-TVP2**
	150	28	194 000	194 000	26 000	5 600	4 000	1,91	**NU217-E-XL-TVP2**
	150	36	255 000	275 000	49 000	5 600	3 300	2,5	**NU2217-E-XL-TVP2**
	180	41	340 000	325 000	57 000	5 900	3 800	5,3	**N317-E-XL-M1**
	180	41	320 000	300 000	39 500	4 550	3 900	4,62	**NU317-E-XL-TVP2**
	180	60	435 000	445 000	81 000	4 550	3 300	6,72	**NU2317-E-XL-TVP2**
	210	52	420 000	385 000	48 000	5 200	3 850	9,85	**NU417-XL-M1**
90	140	24	111 000	124 000	16 200	8 400	4 550	1,36	**NU1018-XL-M1**
	160	30	215 000	217 000	37 000	5 200	3 900	2,37	**N218-E-XL-TVP2**
	160	30	215 000	217 000	28 500	5 200	3 900	2,36	**NU218-E-XL-TVP2**
	160	40	285 000	315 000	56 000	5 200	3 250	3,17	**NU2218-E-XL-TVP2**
	190	43	370 000	350 000	59 000	5 500	3 650	6,19	**N318-E-XL-M1**
	190	43	370 000	350 000	44 500	4 250	3 650	5,39	**NU318-E-XL-TVP2**
	190	64	510 000	530 000	93 000	4 250	3 000	8,04	**NU2318-E-XL-TVP2**
	225	54	465 000	425 000	53 000	4 800	3 500	11,8	**NU418-XL-M1**
95	145	24	113 000	130 000	16 800	8 100	4 350	1,42	**NU1019-XL-M1**
	170	32	260 000	265 000	44 500	4 850	3 650	2,89	**N219-E-XL-TVP2**
	170	32	260 000	265 000	34 500	4 850	3 650	2,88	**NU219-E-XL-TVP2**
	170	43	340 000	370 000	64 000	4 850	3 050	3,9	**NU2219-E-XL-TVP2**
	200	45	390 000	380 000	64 000	5 300	3 550	7,12	**N319-E-XL-M1**
	200	45	390 000	380 000	48 000	4 050	3 550	6,32	**NU319-E-XL-TVP2**
	200	67	540 000	580 000	100 000	4 050	2 800	9,4	**NU2319-E-XL-TVP2**
	240	55	495 000	470 000	57 000	4 550	3 200	13,9	**NU419-XL-M1**

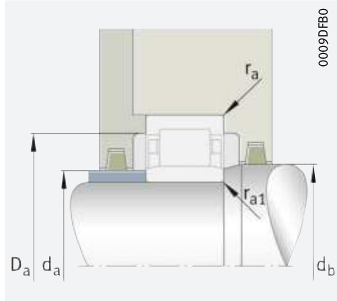
medias ➤ *https://www.schaeffler.de/std/1DA3*



Axial displacement "s"
for N and NU



Mounting dimensions
for N

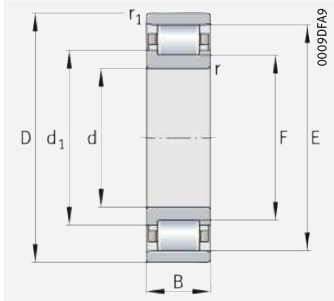


Mounting dimensions
for NU

Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
80	1,1	1	2,7	113,5	91,5	109,8	–	85	90	94	119	–	–	1	1
	2	2	1,2	127,3	95,3	–	101,5	91	–	–	129	129	126	2	2
	2	2	1,3	127,3	95,3	122,9	–	91	94	97	129	–	–	2	2
	2	2	1,3	127,3	95,3	122,9	–	91	94	97	129	–	–	2	2
	2,1	2,1	0,6	151	101	–	110,4	92	–	–	158	153	149	2,1	2,1
	2,1	2,1	0,7	151	101	143,9	–	92	99	105	158	–	–	2,1	2,1
	2,1	2,1	3,7	151	101	143,9	–	92	99	105	158	–	–	2,1	2,1
	3	3	4,6	170	110	159,7	–	96	109	112	184	–	–	2,5	2,5
85	1,1	1	4	118,5	96,5	114,8	–	90	95	99	124	–	–	1	1
	2	2	0,7	136,5	100,5	–	107,5	96	–	–	139	138	135	2	2
	2	2	0,8	136,5	100,5	131,5	–	96	99	104	139	–	–	2	2
	2	2	1,3	136,5	100,5	131,5	–	96	99	104	139	–	–	2	2
	3	3	1,1	160	108	–	117,8	99	–	–	166	162	158	2,5	2,5
	3	3	1,3	160	108	152,7	–	99	106	110	166	–	–	2,5	2,5
	3	3	4,7	160	108	152,7	–	99	106	110	166	–	–	2,5	2,5
	4	4	5,2	177	113	165,7	–	105	111	115	190	–	–	3	3
90	1,5	1,1	3	127	103	122,9	–	96	101	106	133	–	–	1,5	1
	2	2	1,4	145	107	–	114,3	101	–	–	149	147	143	2	2
	2	2	1,5	145	107	139,7	–	101	105	109	149	–	–	2	2
	2	2	2,5	145	107	139,7	–	101	105	109	149	–	–	2	2
	3	3	1,3	169,5	113,5	–	124	104	–	–	176	171	168	2,5	2,5
	3	3	1,5	169,5	113,5	161,6	–	104	111	117	176	–	–	2,5	2,5
	3	3	5	169,5	113,5	161,6	–	104	111	117	176	–	–	2,5	2,5
	4	4	5	191,5	123,5	179,7	–	110	122	125	205	–	–	3	3
95	1,5	1,1	3,1	132	108	127,9	–	101	106	111	138	–	–	1,5	1
	2,1	2,1	0,6	154,5	112,5	–	120,5	107	–	–	158	156	153	2,1	2,1
	2,1	2,1	0,7	154,5	112,5	148,6	–	107	111	116	158	–	–	2,1	2,1
	2,1	2,1	2,2	154,5	112,5	148,6	–	107	111	116	158	–	–	2,1	2,1
	3	3	1,4	177,5	121,5	–	132	109	–	–	186	179	176	2,5	2,5
	3	3	1,4	177,5	121,5	169,6	–	109	119	124	186	–	–	2,5	2,5
	3	3	5,6	177,5	121,5	169,6	–	109	119	124	186	–	–	2,5	2,5
	4	4	5,2	201,5	133,5	189,7	–	115	132	136	220	–	–	3	3

Cylindrical roller bearings with cage

Non-locating bearings



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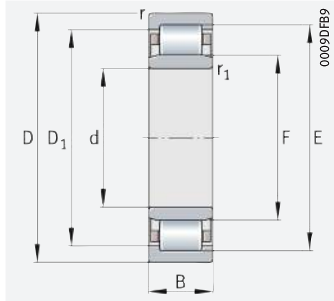
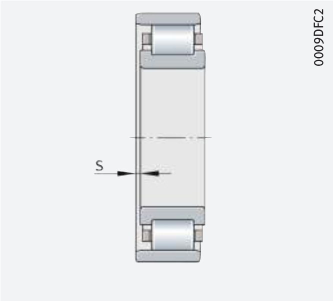


NU

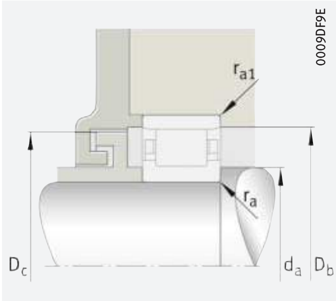
d = 100 – 130 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425|1.12 ➤426|1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
100	150	24	116 000	135 000	17 300	7 800	4 150	1,46	**NU1020-XL-M1**
	180	34	295 000	305 000	51 000	4 550	3 450	3,5	**N220-E-XL-TVP2**
	180	34	295 000	305 000	39 500	4 550	3 450	3,49	**NU220-E-XL-TVP2**
	180	46	395 000	445 000	77 000	4 550	2 900	4,77	**NU2220-E-XL-TVP2**
	215	47	450 000	425 000	71 000	4 850	3 350	8,75	**N320-E-XL-M1**
	215	47	450 000	425 000	53 000	3 700	3 350	7,67	**NU320-E-XL-TVP2**
	215	73	680 000	720 000	124 000	3 700	2 500	12,1	**NU2320-E-XL-TVP2**
	250	58	550 000	530 000	63 000	4 350	2 950	15,8	**NU420-XL-M1**
105	160	26	132 000	154 000	19 500	7 300	4 050	1,84	**NU1021-XL-M1**
	190	36	310 000	320 000	53 000	5 600	3 400	4,63	**N221-E-XL-M1**
	190	36	310 000	320 000	40 500	4 350	3 400	4,08	**NU221-E-XL-TVP2**
	260	60	610 000	590 000	70 000	4 150	2 750	17,7	**NU421-XL-M1**
110	170	28	167 000	191 000	24 400	6 700	3 850	2,31	**NU1022-XL-M1**
	200	38	345 000	365 000	46 000	4 100	3 250	4,84	**NU222-E-XL-TVP2**
	200	38	345 000	365 000	59 000	4 100	3 250	4,85	**N222-E-XL-TVP2**
	200	53	455 000	520 000	87 000	4 100	2 750	6,76	**NU2222-E-XL-TVP2**
	240	50	495 000	475 000	58 000	3 350	3 050	10,3	**NU322-E-XL-TVP2**
	240	50	520 000	510 000	85 000	4 350	2 950	11,7	**N322-E-XL-M1**
	240	80	750 000	800 000	137 000	3 350	2 290	16,6	**NU2322-E-XL-TVP2**
	280	65	680 000	660 000	78 000	3 850	2 550	22,4	**NU422-XL-M1**
120	180	28	175 000	208 000	26 000	6 400	3 550	2,47	**NU1024-XL-M1**
	215	40	390 000	415 000	68 000	3 750	3 050	5,67	**N224-E-XL-TVP2**
	215	40	390 000	415 000	52 000	3 750	3 050	5,8	**NU224-E-XL-TVP2**
	215	58	530 000	610 000	104 000	3 750	2 500	8,38	**NU2224-E-XL-TVP2**
	260	55	610 000	600 000	71 000	3 050	2 650	13,3	**NU324-E-XL-TVP2**
	260	55	610 000	600 000	95 000	3 950	2 650	15,3	**N324-E-XL-M1**
	260	86	930 000	1 010 000	167 000	3 950	1 980	23,5	**NU2324-E-XL-M1**
	310	72	850 000	840 000	97 000	3 450	2 200	30,8	**NU424-XL-M1**
130	200	33	212 000	250 000	31 500	5 700	3 500	3,74	**NU1026-XL-M1**
	230	40	425 000	445 000	54 000	3 500	2 800	6,5	**NU226-E-XL-TVP2**
	230	40	425 000	445 000	70 000	3 500	2 800	6,51	**N226-E-XL-TVP2**
	230	64	620 000	730 000	119 000	3 500	2 280	10,4	**NU2226-E-XL-TVP2**
	280	58	680 000	670 000	79 000	2 850	2 430	16,2	**NU326-E-XL-TVP2**
	280	58	720 000	720 000	113 000	3 700	2 340	18,4	**N326-E-XL-M1**
	280	93	1 080 000	1 220 000	197 000	3 700	1 750	28,8	**NU2326-E-XL-M1**

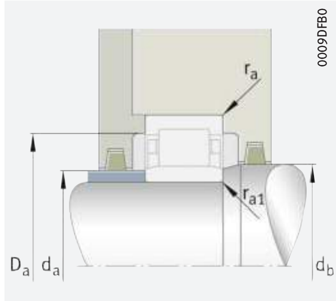
medias ➤ *https://www.schaeffler.de/std/1DA4*



Axial displacement "s"
for N and NU



Mounting dimensions
for N

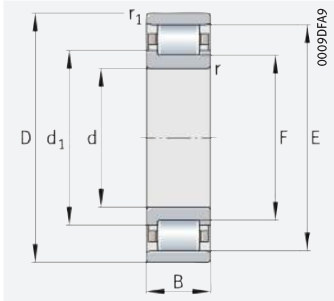


Mounting dimensions
for NU

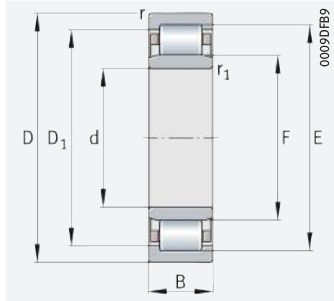
Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
100	1,5	1,1	2,9	137	113	132,9	–	106	111	116	143	–	–	1,5	1
	2,1	2,1	1,4	163	119	–	127,3	112	–	–	168	165	161	2,1	2,1
	2,1	2,1	1,5	163	119	156,9	–	112	117	122	168	–	–	2,1	2,1
	2,1	2,1	2,5	163	119	156,9	–	112	117	122	168	–	–	2,1	2,1
	3	3	1,2	191,5	127,5	–	139,4	114	–	–	201	193	190	2,5	2,5
	3	3	1,2	191,5	127,5	182	–	114	125	132	201	–	–	2,5	2,5
	3	3	4,2	191,5	127,5	182	–	114	125	132	201	–	–	2,5	2,5
	4	4	5,7	211	139	198,2	–	120	137	141	230	–	–	3	3
105	2	1,1	4,5	145,5	119,5	141	–	111	118	122	151	–	–	2	1
	2,1	2,1	1,2	171,5	125,5	–	134,5	117	–	–	178	173	170	2,1	2,1
	2,1	2,1	1,3	171,5	125,5	165,1	–	117	123	128	178	–	–	2,1	2,1
	4	4	5,7	220,5	144,5	207,4	–	125	143	147	240	–	–	3	3
110	2	1,1	3,2	155	125	–	149,7	116	124	128	161	–	–	2	1
	2,1	2,1	1,5	180,5	132,5	–	173,8	122	130	135	188	–	–	2,1	2,1
	2,1	2,1	1,4	180,5	132,5	141,6	–	122	–	–	188	182	179	2	2
	2,1	2,1	4	180,5	132,5	–	173,8	122	130	135	188	–	–	2,1	2,1
	3	3	1,3	211	143	–	200,9	124	140	145	226	–	–	2,5	2,5
	3	3	1,3	211	143	155,6	–	124	–	–	226	213	209	2,5	2,5
	3	3	5,8	211	143	–	200,9	124	140	145	226	–	–	2,5	2,5
	4	4	6,2	235	155	–	220,9	130	153	157	260	–	–	3	3
120	2	1,1	3,2	165	135	–	159,7	126	134	138	171	–	–	2	1
	2,1	2,1	1,4	195,5	143,5	153,2	–	132	–	–	203	197	194	2,1	2,1
	2,1	2,1	1,4	195,5	143,5	–	187,8	132	141	146	203	–	–	2,1	2,1
	2,1	2,1	4,5	195,5	143,5	–	187,8	132	141	146	203	–	–	2,1	2,1
	3	3	3,5	230	154	–	218,7	134	151	156	246	–	–	2,5	2,5
	3	3	3,5	230	154	168,7	–	134	–	–	246	232	228	2,5	2,5
	3	3	7,2	230	154	–	218,7	134	151	156	246	–	–	2,5	2,5
	5	5	6,9	260	170	–	243,9	144	168	172	286	–	–	4	4
130	2	1,1	3,9	182	148	–	175,9	136	146	151	191	–	–	2	1
	3	3	1,2	209,5	153,5	–	201,2	144	151	158	216	–	–	2,5	2,5
	3	3	1,2	209,5	153,5	164	–	144	–	–	216	212	207	2,5	2,5
	3	3	5,2	209,5	153,5	–	201,2	144	151	158	216	–	–	2,5	2,5
	4	4	3,5	247	167	–	235,2	147	164	169	263	–	–	3	3
	4	4	3,5	247	167	181,7	–	147	–	–	263	249	245	3	3
	4	4	8,1	247	167	–	235,2	147	164	169	263	–	–	3	3

Cylindrical roller bearings with cage

Non-locating bearings



N

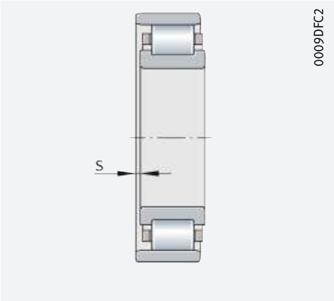


NU

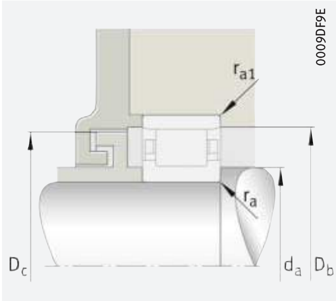
d = 140 – 180 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425 | 1.12 ➤426 | 1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
140	210	33	216 000	265 000	32 500	5 400	3 250	3,94	**NU1028-XL-M1**
	250	42	460 000	510 000	77 000	4 250	2 600	9,3	**N228-E-XL-M1**
	250	42	460 000	510 000	60 000	4 250	2 600	9,31	**NU228-E-XL-M1**
	250	68	670 000	830 000	132 000	4 250	2 050	14,5	**NU2228-E-XL-M1**
	300	62	790 000	800 000	124 000	3 450	2 170	22,5	**N328-E-XL-M1**
	300	62	790 000	800 000	92 000	2 650	2 170	20,1	**NU328-E-XL-TVP2**
	300	102	1 210 000	1 390 000	220 000	3 450	1 620	36	**NU2328-E-XL-M1**
150	225	35	248 000	310 000	38 000	5 100	3 100	4,93	**NU1030-XL-M1**
	270	45	520 000	590 000	89 000	3 950	2 350	11,8	**N230-E-XL-M1**
	270	45	520 000	590 000	68 000	3 950	2 350	11,9	**NU230-E-XL-M1**
	270	73	780 000	970 000	153 000	3 950	1 850	18,6	**NU2230-E-XL-M1**
	320	65	900 000	930 000	138 000	3 200	1 940	26,9	**N330-E-XL-M1**
	320	65	900 000	930 000	105 000	3 200	1 940	27	**NU330-E-XL-M1**
	320	108	1 380 000	1 600 000	247 000	3 200	1 460	43,4	**NU2330-E-XL-M1**
160	240	38	290 000	355 000	43 000	4 650	3 000	5,92	**NU1032-XL-M1**
	290	48	590 000	670 000	101 000	3 650	2 160	14,7	**N232-E-XL-M1**
	290	48	590 000	670 000	79 000	3 650	2 160	14,7	**NU232-E-XL-M1**
	290	80	940 000	1 170 000	186 000	3 600	1 660	23,7	**NU2232-E-XL-M1**
	340	68	860 000	1 060 000	128 000	3 000	1 770	32,6	**N332-E-M1**
	340	68	860 000	1 060 000	92 000	3 000	1 770	31,8	**NU332-E-M1**
	340	114	1 300 000	1 800 000	227 000	3 000	1 350	51,5	**NU2332-E-M1**
170	260	42	350 000	435 000	51 000	4 300	2 750	8,03	**NU1034-XL-M1**
	310	52	700 000	780 000	116 000	3 350	1 970	18	**N234-E-XL-M1**
	310	52	700 000	780 000	91 000	3 350	1 970	18,1	**NU234-E-XL-M1**
	310	86	1 130 000	1 400 000	215 000	3 300	1 470	29,4	**NU2234-E-XL-M1**
	360	72	960 000	1 210 000	138 000	2 800	1 610	37,9	**N334-E-TB-M1**
	360	72	960 000	1 210 000	95 000	2 800	1 610	38	**NU334-E-TB-M1**
	360	120	1 490 000	2 070 000	228 000	2 800	1 210	61,4	**NU2334-EX-TB-M1**
180	280	46	425 000	520 000	62 000	3 900	2 550	10,5	**NU1036-XL-M1**
	320	52	730 000	830 000	122 000	3 250	1 850	18,9	**N236-E-XL-M1**
	320	52	730 000	830 000	95 000	3 250	1 850	18,9	**NU236-E-XL-M1**
	320	86	1 180 000	1 490 000	226 000	3 200	1 380	30,7	**NU2236-E-XL-M1**
	380	75	1 040 000	1 320 000	100 000	2 650	1 500	43,9	**NU336-E-TB-M1**
	380	126	1 680 000	2 330 000	255 000	2 600	1 120	71,8	**NU2336-EX-TB-M1**

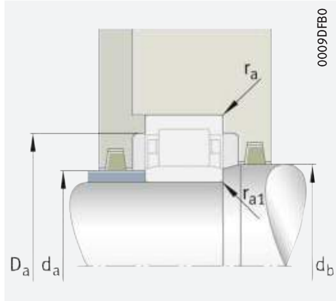
medias ➤ *https://www.schaeffler.de/std/1DA5*



*Axial displacement "s"
for N and NU*



*Mounting dimensions
for N*

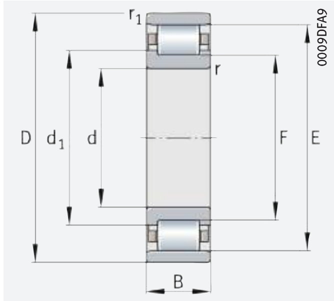


*Mounting dimensions
for NU*

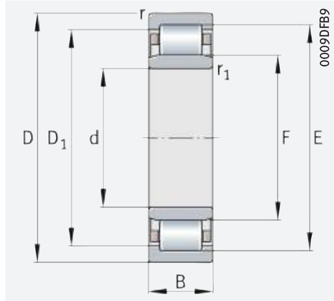
Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
140	2	1,1	3,8	192	158	185,9	–	146	156	161	201	–	–	2	1
	3	3	3,8	225	169	–	179,4	154	–	–	236	227	223	2,5	2,5
	3	3	3,8	225	169	216,7	–	154	166	171	236	–	–	2,5	2,5
	3	3	7	225	169	216,7	–	154	166	171	236	–	–	2,5	2,5
	4	4	5,2	264	180	–	195,4	157	–	–	283	266	262	3	3
	4	4	5,2	264	180	251,7	–	157	176	182	283	–	–	3	3
	4	4	9,2	264	180	251,7	–	157	176	182	283	–	–	3	3
150	2,1	1,5	4,2	205,5	169,5	199	–	158	167	173	215	–	–	2,1	1,5
	3	3	4	242	182	–	193,1	164	–	–	256	244	240	2,5	2,5
	3	3	4	242	182	233,2	–	164	179	184	256	–	–	2,5	2,5
	3	3	7,5	242	182	233,2	–	164	179	184	256	–	–	2,5	2,5
	4	4	5,5	283	193	–	209,5	167	–	–	303	285	281	3	3
	4	4	5,5	283	193	269,8	–	167	190	195	303	–	–	3	3
	4	4	9,7	283	193	269,8	–	167	190	195	303	–	–	3	3
160	2,1	1,5	4,3	220	180	212,9	–	168	178	184	230	–	–	2,1	1,5
	3	3	4,1	259	195	–	206,8	174	–	–	276	261	257	2,5	2,5
	3	3	4,1	259	195	249,6	–	174	192	197	276	–	–	2,5	2,5
	3	3	7,2	261	193	251,1	–	174	192	197	276	–	–	2,5	2,5
	4	4	5,5	300	204	–	221,6	177	–	–	323	302	298	3	3
	4	4	5,6	300	204	286	–	177	200	211	323	–	–	3	3
	4	4	9,9	300	204	286	–	177	200	211	323	–	–	3	3
170	2,1	2,1	4,8	237	193	229,1	–	180	190	197	250	–	–	2,1	2,1
	4	4	4,3	279	207	–	218,4	187	–	–	293	281	277	3	3
	4	4	4,3	279	207	268,5	–	187	204	211	293	–	–	3	3
	4	4	7,2	281	205	269,9	–	187	204	211	293	–	–	3	3
	4	4	5,9	318	218	–	238	187	–	–	343	320	316	3	3
	4	4	6	318	218	298	–	187	215	221	343	–	–	3	3
	4	4	10,2	320	216	299,2	–	187	214	218	343	–	–	3	3
180	2,1	2,1	5	255	205	245,9	–	190	203	209	270	–	–	2,1	2,1
	4	4	4,7	289	217	–	230,2	197	–	–	303	292	286	3	3
	4	4	4,7	289	217	278,6	–	197	214	221	303	–	–	3	3
	4	4	7,2	291	215	280	–	197	214	221	303	–	–	3	3
	4	4	6,1	335	231	314,2	–	197	228	234	363	–	–	3	3
	4	4	10,5	339	227	316,6	–	197	225	229	363	–	–	3	3

Cylindrical roller bearings with cage

Non-locating bearings



N

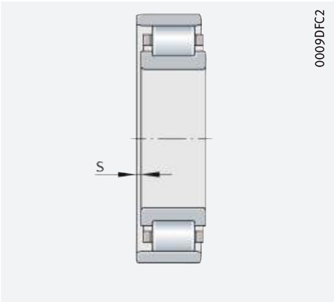


NU

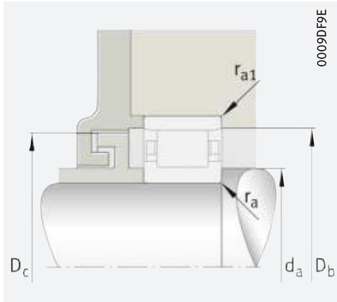
d = 190 – 280 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425|1.12 ➤426|1.13 X-life ➤415
			N	N	N	min^{-1}	min^{-1}	≈ kg	
190	290	46	435 000	550 000	64 000	3 800	2 410	10,9	**NU1038-XL-M1**
	340	55	680 000	930 000	111 000	3 050	1 720	22,8	**N238-E-M1**
	340	55	680 000	930 000	81 000	3 050	1 720	22,8	**NU238-E-M1**
	340	92	1 090 000	1 650 000	202 000	3 000	1 290	37,1	**NU2238-E-M1**
	400	78	1 120 000	1 440 000	107 000	2 550	1 400	50,6	**NU338-E-TB-M1**
	400	132	1 890 000	2 650 000	290 000	2 440	1 010	83,1	**NU2338-EX-TB-M1**
200	310	51	470 000	600 000	70 000	3 550	2 310	14,1	**NU1040-XL-M1**
	360	58	750 000	1 040 000	121 000	2 900	1 600	27,2	**N240-E-M1**
	360	58	750 000	1 040 000	90 000	2 900	1 600	27,2	**NU240-E-M1**
	360	98	1 220 000	1 880 000	227 000	2 850	1 180	44,7	**NU2240-E-M1**
	420	80	1 180 000	1 520 000	114 000	2 410	1 320	57,3	**NU340-E-TB-M1**
	420	138	2 040 000	2 900 000	310 000	2 330	940	95,6	**NU2340-EX-TB-M1**
220	340	56	510 000	770 000	68 000	3 150	2 040	20,5	**NU1044-M1**
	400	65	950 000	1 330 000	104 000	2 600	1 380	38,1	**NU244-E-M1**
	400	108	1 630 000	2 370 000	250 000	2 440	1 000	61,6	**NU2244-EX-TB-M1**
	460	88	1 440 000	1 890 000	134 000	2 170	1 140	75,5	**NU344-E-TB-M1**
	460	145	2 350 000	3 350 000	345 000	2 110	830	121	**NU2344-EX-TB-M1**
240	360	56	540 000	840 000	73 000	3 000	1 850	19,9	**NU1048-M1**
	440	72	1 160 000	1 650 000	172 000	2 320	1 210	51,5	**N248-E-TB-M1**
	440	72	1 140 000	1 610 000	122 000	2 320	1 220	51,8	**NU248-E-TB-M1**
	440	120	1 850 000	2 800 000	290 000	2 250	900	82,8	**NU2248-EX-TB-M1**
	500	95	1 720 000	2 280 000	158 000	1 980	1 000	95,7	**NU348-E-TB-M1**
	500	155	2 600 000	3 750 000	370 000	1 940	750	151	**NU2348-EX-TB-M1**
260	400	65	650 000	1 010 000	88 000	2 700	1 690	29,7	**NU1052-M1**
	480	80	1 350 000	1 890 000	139 000	2 100	1 110	68,4	**NU252-E-TB-M1**
	480	130	2 180 000	3 350 000	345 000	2 060	780	109	**NU2252-E-TB-M1**
	540	102	1 910 000	2 600 000	182 000	1 840	900	121	**NU352-E-TB-M1**
	540	165	3 100 000	4 500 000	445 000	1 780	660	189	**NU2352-EX-TB-M1**
280	420	65	680 000	1 100 000	94 000	2 550	1 550	31,4	**NU1056-M1**
	500	80	1 400 000	2 020 000	147 000	2 020	1 020	72,1	**NU256-E-TB-M1**
	500	130	2 270 000	3 600 000	365 000	1 980	720	114	**NU2256-E-TB-M1**
	580	108	2 180 000	3 050 000	200 000	1 700	790	147	**NU356-E-TB-M1**
	580	175	3 500 000	5 200 000	495 000	1 640	590	234	**NU2356-EX-TB-M1**

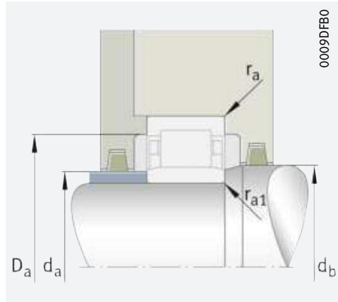
medias ➤ *https://www.schaeffler.de/std/1DA6*



Axial displacement "s" for N and NU



Mounting dimensions for N

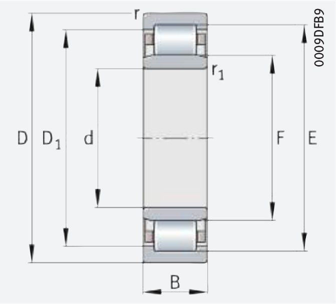


Mounting dimensions for NU

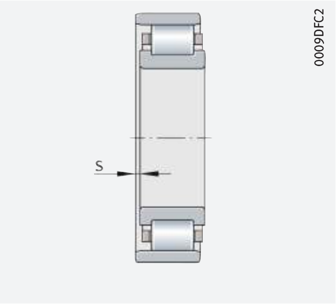
Dimensions								Mounting dimensions							
d	r	r_1	s	E	F	D_1	d_1	d_a		d_b	D_a	D_b	D_c	r_a	r_{a1}
	min.	min.				≈	≈	min.	max.	min.	max.	min.	max.	max.	max.
190	2,1	2,1	5	265	215	255,9	–	200	213	219	280	–	–	2,1	2,1
	4	4	4,7	306	230	–	244	207	–	–	323	309	303	3	3
	4	4	4,7	306	230	295	–	207	227	234	323	–	–	3	3
	4	4	8	308	228	296,4	–	207	227	234	323	–	–	3	3
	5	5	6,3	353	245	331,4	–	210	242	248	380	–	–	4	4
	5	5	11	360	240	336	–	210	237,8	242,2	380	–	–	4	4
200	2,1	2,1	8,3	281	229	271,5	–	210	226	233	300	–	–	2,1	2,1
	4	4	4,8	323	243	–	257,6	217	–	–	343	326	320	3	3
	4	4	4,8	323	243	311,5	–	217	240	247	343	–	–	3	3
	4	4	8,2	325	241	312,9	–	217	240	247	343	–	–	3	3
	5	5	6,3	370	258	347,6	–	220	255	261	400	–	–	4	4
	5	5	11,3	377	253	352,2	–	220	250,7	255,3	400	–	–	4	4
220	3	3	6,2	310	250	298,9	–	232	248	254	328	–	–	2,5	2,5
	4	4	5,5	358	268	344,9	–	237	265	271	383	–	–	3	3
	4	4	8,4	367	259	345,4	–	237	256,7	261,3	383	–	–	3	3
	5	5	7	406	282	381,2	–	240	279	285	440	–	–	4	4
	5	5	11,9	413	277	385,8	–	240	274,7	279,3	440	–	–	4	4
240	3	3	6,4	330	270	318,9	–	252	268	275	348	–	–	2,5	2,5
	4	4	6	393	293	–	313	257	–	–	423	396	390	3	3
	4	4	6	393	293	373	–	257	290	296	423	–	–	3	3
	4	4	10,2	399	287	376,6	–	257	284,5	289,5	423	–	–	3	3
	5	5	7,4	442	306	414,8	–	260	303	309	480	–	–	4	4
	5	5	13,3	447	303	418,2	–	260	300,5	305,5	480	–	–	4	4
260	4	4	7,2	364	296	351,3	–	275	292	300	385	–	–	3	3
	5	5	6,2	429	317	406,6	–	280	314	320	460	–	–	4	4
	5	5	10,5	433	313	409	–	280	310	316	460	–	–	4	4
	6	6	10	477	337	449	–	286	334,3	339,7	514	–	–	5	5
	6	6	13,7	484	324	452	–	286	321,3	326,7	514	–	–	5	5
280	4	4	7,2	384	316	371,3	–	295	312	321	405	–	–	3	3
	5	5	6,3	449	337	426,6	–	300	334	340	480	–	–	4	4
	5	5	10,5	453	333	429	–	300	330	336	480	–	–	4	4
	6	6	8,7	512	362	482	–	306	359	366	554	–	–	5	5
	6	6	13,8	521	351	487	–	306	348	354	554	–	–	5	5

Cylindrical roller bearings with cage

Non-locating bearings



NU

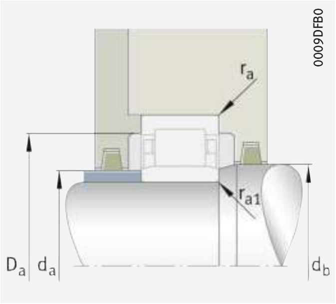


Axial displacement "s" for NU

d = 300 – 710 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤425|1.12 ➤426|1.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
300	460	74	900 000	1 430 000	119 000	2 290	1 390	44,6	**NU1060-M1**
	540	85	1 600 000	2 330 000	166 000	1 860	920	90,4	**NU260-E-TB-M1**
	540	140	2 700 000	4 100 000	410 000	1 780	650	143	**NU2260-EX-TB-M1**
320	480	74	910 000	1 490 000	122 000	2 200	1 300	46,9	**NU1064-M1**
	580	92	1 810 000	2 700 000	185 000	1 730	830	113	**NU264-EX-TB-M1**
	580	150	3 150 000	4 900 000	460 000	1 650	570	180	**NU2264-EX-TB-M1**
340	520	82	1 120 000	1 830 000	146 000	2 010	1 190	63,2	**NU1068-M1**
360	540	82	1 150 000	1 910 000	151 000	1 940	1 110	65,9	**NU1072-M1**
	650	170	3 600 000	5 800 000	530 000	1 490	510	254	**NU2272-E-TB-M1**
380	560	82	1 170 000	1 990 000	156 000	1 880	1 050	69,1	**NU1076-M1**
	680	175	4 050 000	6 700 000	610 000	1 420	450	288	**NU2276-E-TB-M1**
400	600	90	1 380 000	2 330 000	174 000	1 730	980	90,1	**NU1080-TB-M1**
420	620	90	1 410 000	2 430 000	180 000	1 680	920	92,9	**NU1084-TB-M1**
440	650	94	1 560 000	2 750 000	197 000	1 600	860	107	**NU1088-TB-M1**
460	620	74	1 020 000	1 970 000	153 000	1 770	860	63,1	**NU1992-M1**
	680	100	1 680 000	2 950 000	212 000	1 530	830	125	**NU1092-TB-M1**
480	650	78	1 150 000	2 250 000	175 000	1 680	810	74,2	**NU1996-M1**
	700	100	1 720 000	3 100 000	220 000	1 490	780	129	**NU1096-TB-M1**
500	720	100	1 750 000	3 200 000	227 000	1 450	750	133	**NU10/500-TB-M1**
560	750	85	1 460 000	2 950 000	222 000	1 450	660	105	**NU19/560-M1**
	820	115	2 700 000	5 100 000	325 000	1 250	590	213	**NU10/560-TB-M1**
600	800	90	1 960 000	3 900 000	265 000	1 300	570	125,3	**NU19/600-E-TB-M1**
670	900	103	2 040 000	4 250 000	290 000	1 190	530	186	**NU19/670-TB-M1**
710	950	106	2 230 000	4 750 000	325 000	1 130	485	213	**NU19/710-TB-M1**

medias ➤ *https://www.schaeffler.de/std/1DA7*

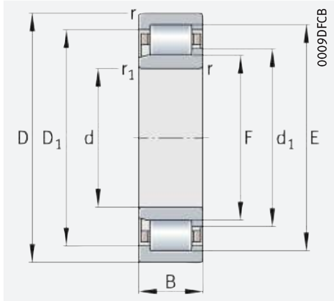


Mounting dimensions for NU

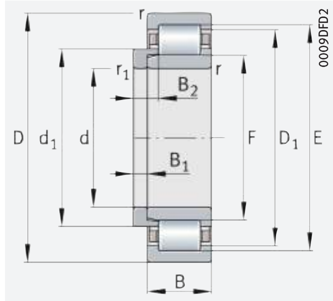
Dimensions							Mounting dimensions					
d	r	r_1	s	E	F	D_1	d_a		d_b	D_a	r_a	r_{a1}
	min.	min.				≈	min.	max.	min.	max.	max.	max.
300	4	4	7,9	420	340	405,2	315	336	345	445	3	3
	5	5	6,9	484	364	460	320	359	367	520	4	4
	5	5	12,2	495	355	467	320	352	358	520	4	4
320	4	4	11,5	440	360	425,1	335	356	365	465	3	3
	5	5	7,5	520	392	494,4	340	388,5	395,5	560	4	4
	5	5	11,9	530	380	500	340	376,5	383,5	560	4	4
340	5	5	12,5	475	385	458,2	357	381	390	503	4	4
360	5	5	12,5	495	405	478,1	377	400	410	523	4	4
	6	6	15	588	428	556	386	424	432	624	5	5
380	5	5	9	515	425	498,1	397	420	430	543	4	4
	6	6	13,8	615	451	582,2	406	446	456	654	5	5
400	5	5	9,5	550	450	530	417	445	455	583	4	4
420	5	5	9,6	570	470	550	437	465	475	603	4	4
440	6	6	9,8	597	493	576,2	463	488	498	627	5	5
460	4	4	8,4	578	502	562,8	475	498	506	605	3	3
	6	6	11,2	624	516	602,4	483	510	522	657	5	5
480	5	5	6,8	605	525	589	497	521	529	633	4	4
	6	6	10,7	644	536	622,4	503	530	542	677	5	5
500	6	6	10,7	664	556	642,4	523	550	562	697	5	5
560	5	5	9,6	700	610	682	577	606	614	733	4	4
	6	6	9,8	754	626	728,4	583	620	632	797	5	5
600	5	5	9,9	748	652	735,4	617	647	657	783	4	4
670	6	6	11,3	839	731	817	693	726	736	877	5	5
710	6	6	9,3	886	774	863,6	733	769	779	927	5	5

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

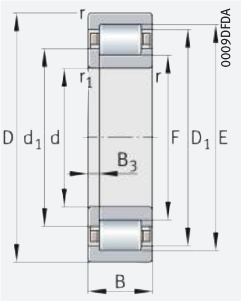


NJ and HJ
Locating bearings

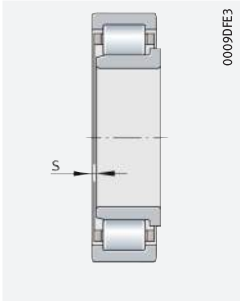
d = 15 – 20 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bear-ing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
15	35	11	15 100	10 400	1 600	27 000	17 900	0,049	–	**NJ202-E-XL-TVP2**	–
	35	11	15 100	10 400	1 600	27 000	17 900	0,049	0,005	**NJ202-E-XL-TVP2**	**HJ202-E**
17	40	12	20 800	14 600	2 180	22 900	15 300	0,07	–	**NJ203-E-XL-TVP2**	–
	40	12	20 800	14 600	2 180	22 900	15 300	0,07	0,008	**NJ203-E-XL-TVP2**	**HJ203-E**
	40	12	20 800	14 600	2 190	22 900	15 300	0,073	–	**NUP203-E-XL-TVP2**	**–**
	40	16	28 500	21 900	3 450	22 900	13 200	0,053	–	**NJ2203-E-XL-TVP2**	–
	40	16	28 500	21 900	3 450	22 900	13 200	0,053	0,008	**NJ2203-E-XL-TVP2**	**HJ2203-E**
	40	16	28 500	21 900	3 500	22 900	13 200	0,055	–	**NUP2203-E-XL-TVP2**	**–**
	47	14	30 000	21 200	3 350	19 600	13 500	0,124	–	**NJ303-E-XL-TVP2**	–
	47	14	30 000	21 200	3 350	19 600	13 500	0,124	0,014	**NJ303-E-XL-TVP2**	**HJ303-E**
	47	14	30 000	21 200	3 350	19 600	13 500	0,142	–	**NUP303-E-XL-TVP2**	**–**
20	47	14	32 500	24 700	3 900	19 200	12 800	0,117	–	**NJ204-E-XL-TVP2**	–
	47	14	32 500	24 700	3 900	19 200	12 800	0,117	0,011	**NJ204-E-XL-TVP2**	**HJ204-E**
	47	14	32 500	24 700	3 900	19 200	12 800	0,119	–	**NUP204-E-XL-TVP2**	**–**
	47	18	38 500	31 000	5 100	19 200	11 100	0,15	–	**NJ2204-E-XL-TVP2**	–
	47	18	38 500	31 000	5 100	19 200	11 100	0,15	0,012	**NJ2204-E-XL-TVP2**	**HJ2204-E**
	47	18	38 500	31 000	5 100	19 200	11 100	0,154	–	**NUP2204-E-XL-TVP2**	**–**
	52	15	37 500	27 000	3 850	17 200	11 900	0,156	–	**NJ304-E-XL-TVP2**	–
	52	15	37 500	27 000	3 850	17 200	11 900	0,156	0,017	**NJ304-E-XL-TVP2**	**HJ304-E**
	52	15	37 500	27 000	3 850	17 200	11 900	0,16	–	**NUP304-E-XL-TVP2**	**–**
	52	21	49 500	39 000	6 100	17 200	9 700	0,219	–	**NJ2304-E-XL-TVP2**	–
	52	21	49 500	39 000	6 100	17 200	9 700	0,219	0,019	**NJ2304-E-XL-TVP2**	**HJ2304-E**
	52	21	49 500	39 000	6 200	17 200	9 700	0,224	–	**NUP2304-E-XL-TVP2**	**–**

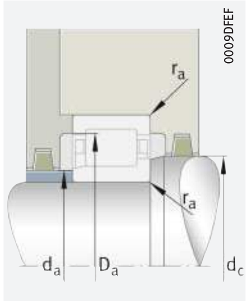
medias ➤ *https://www.schaeffler.de/std/1DA8*



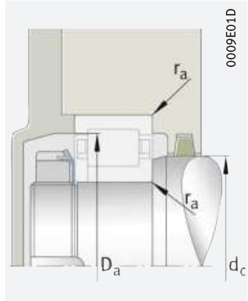
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



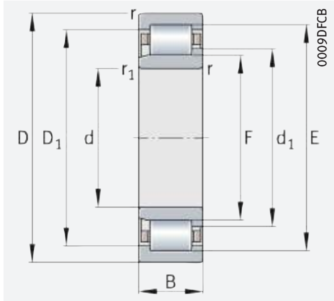
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
15	0,6	0,3	1,6	30,3	19,3	28	21,6	–	–	–	17,4	18,5	22	32,6	0,6
	0,6	0,3	–	30,3	19,3	28	21,6	2,5	5	–	17,4	–	22	32,6	0,6
17	0,6	0,3	1,2	35,1	22,1	32,5	24,7	–	–	–	21	21,5	28	36	0,6
	0,6	0,3	–	35,1	22,1	32,5	24,7	3	5,5	–	21	–	28	36	0,6
	0,6	0,3	–	35,1	22,1	32,5	24,7	–	–	2,5	21	–	28	36	0,6
	0,6	0,3	1,7	35,1	22,1	32,5	24,7	–	–	–	21	21,5	26	36	0,6
	0,6	0,3	–	35,1	22,1	32,5	24,7	3	6	–	21	–	26	36	0,6
	0,6	0,6	–	35,1	22,1	32,5	24,7	–	–	3	21	–	26	36	0,6
	1	0,6	1,2	40,2	24,2	37,1	27,6	–	–	–	21,2	23,5	28	42,8	1
	1	0,6	–	40,2	24,2	37,1	27,6	4	6,5	–	21,2	–	28	42,8	1
	1	0,6	–	40,2	24,2	37,1	27,6	–	–	2,5	21,2	–	28	42,8	1
20	1	0,6	1	41,5	26,5	38,8	29,7	–	–	–	24	26	32	41	1
	1	0,6	–	41,5	26,5	38,8	29,7	3	5,5	–	24	–	32	41	1
	1	0,6	–	41,5	26,5	38,8	29,7	–	–	2,5	24	–	32	41	1
	1	0,6	1,8	41,5	26,5	38,8	29,7	–	–	–	24	26	32	41	1
	1	0,6	–	41,5	26,5	38,8	29,7	3	6,5	–	24	–	32	41	1
	1	0,6	–	41,5	26,5	38,8	29,7	–	–	3,5	24	–	32	41	1
	1,1	0,6	1	45,5	27,5	42,4	31,3	–	–	–	24	27	33	45	1
	1,1	0,6	–	45,5	27,5	42,4	31,3	4	6,5	–	24	–	33	45	1
	1,1	0,6	–	45,5	27,5	42,4	31,3	–	–	2,5	24	–	33	45	1
	1,1	0,6	1,9	45,5	27,5	42,4	31,3	–	–	–	24	27	33	45	1
	1,1	0,6	–	45,5	27,5	42,4	31,3	4	7,5	–	24	–	33	45	1
	1,1	0,6	–	45,5	27,5	42,4	31,3	–	–	3,5	24	–	33	45	1

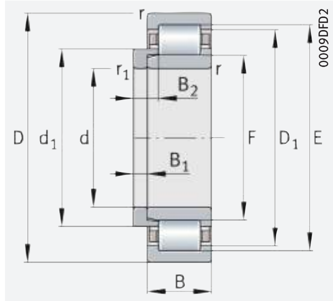
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

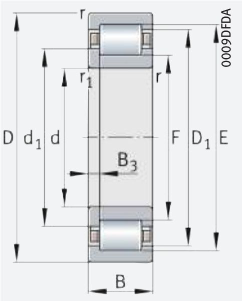


NJ and HJ
Locating bearings

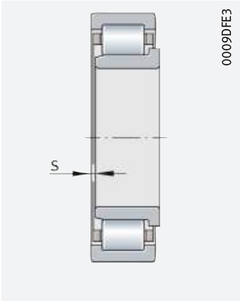
d = 25 – 30 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bear-ing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
25	52	15	34 500	27 500	4 350	17 200	11 600	0,14	–	**NJ205-E-XL-TVP2**	–
	52	15	34 500	27 500	4 350	17 200	11 600	0,14	0,014	**NJ205-E-XL-TVP2**	**HJ205-E**
	52	15	34 500	27 500	4 400	17 200	11 600	0,145	–	**NUP205-E-XL-TVP2**	–
	52	18	41 500	34 500	5 700	17 200	9 600	0,17	–	**NJ2205-E-XL-TVP2**	–
	52	18	41 500	34 500	5 700	17 200	9 600	0,17	0,015	**NJ2205-E-XL-TVP2**	**HJ2205-E**
	52	18	41 500	34 500	5 700	17 200	9 600	0,174	–	**NUP2205-E-XL-TVP2**	–
	62	17	49 000	37 500	5 600	14 400	10 100	0,25	–	**NJ305-E-XL-TVP2**	–
	62	17	49 000	37 500	5 600	14 400	10 100	0,25	0,025	**NJ305-E-XL-TVP2**	**HJ305-E**
	62	17	49 000	37 500	5 600	14 400	10 100	0,256	–	**NUP305-E-XL-TVP2**	–
	62	24	66 000	54 000	9 200	14 400	8 300	0,356	–	**NJ2305-E-XL-TVP2**	–
	62	24	66 000	54 000	9 200	14 400	8 300	0,356	0,027	**NJ2305-E-XL-TVP2**	**HJ2305-E**
	62	24	67 000	56 000	9 200	14 400	8 200	0,364	–	**NUP2305-E-XL-TVP2**	–
30	62	16	46 000	37 500	5 400	14 200	9 600	0,213	–	**NJ206-E-XL-TVP2**	–
	62	16	46 000	37 500	5 400	14 200	9 600	0,213	0,024	**NJ206-E-XL-TVP2**	**HJ206-E**
	62	16	46 000	37 500	5 400	14 200	9 600	0,219	–	**NUP206-E-XL-TVP2**	–
	62	20	58 000	50 000	7 800	14 200	8 000	0,261	–	**NJ2206-E-XL-TVP2**	–
	62	20	58 000	50 000	7 800	14 200	8 000	0,261	0,025	**NJ2206-E-XL-TVP2**	**HJ2206-E**
	62	20	58 000	50 000	7 800	14 200	8 000	0,268	–	**NUP2206-E-XL-TVP2**	–
	72	19	61 000	48 000	7 700	12 400	8 900	0,376	–	**NJ306-E-XL-TVP2**	–
	72	19	61 000	48 000	7 700	12 400	8 900	0,376	0,042	**NJ306-E-XL-TVP2**	**HJ306-E**
	72	19	61 000	48 000	7 700	12 400	8 900	0,385	–	**NUP306-E-XL-TVP2**	–
	72	27	86 000	75 000	13 100	12 400	7 200	0,54	–	**NJ2306-E-XL-TVP2**	–
	72	27	86 000	75 000	13 100	12 400	7 200	0,54	0,044	**NJ2306-E-XL-TVP2**	**HJ2306-E**
	72	27	86 000	75 000	13 100	12 400	7 200	0,551	–	**NUP2306-E-XL-TVP2**	–
	90	23	84 000	65 000	11 000	13 400	8 100	0,872	–	**NJ406-XL-M1**	–
	90	23	84 000	65 000	11 000	13 400	8 100	0,872	0,082	**NJ406-XL-M1**	**HJ406**

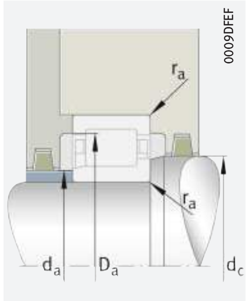
medias ➤ *https://www.schaeffler.de/std/1DA9*



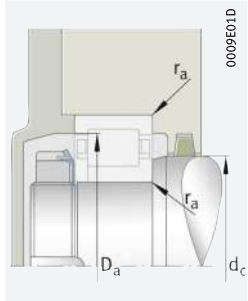
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



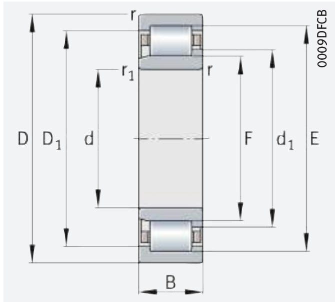
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
25	1	0,6	1,2	46,5	31,5	43,8	34,7	–	–	–	29	31	37	46	1
	1	0,6	–	46,5	31,5	43,8	34,7	3	6	–	29	–	37	46	1
	1	0,6	–	46,5	31,5	43,8	34,7	–	–	3	29	–	37	46	1
	1	0,6	1,7	46,5	31,5	43,8	34,7	–	–	–	29	31	37	46	1
	1	0,6	–	46,5	31,5	43,8	34,7	3	6,5	–	29	–	37	46	1
	1	0,6	–	46,5	31,5	43,8	34,7	–	–	3,5	29	–	37	46	1
	1,1	1,1	1,5	54	34	50,7	38,1	–	–	–	32	33	40	55	1
	1,1	1,1	–	54	34	50,7	38,1	4	7	–	32	–	40	55	1
	1,1	1,1	–	54	34	50,7	38,1	–	–	3	32	–	40	55	1
	1,1	1,1	1,9	54	34	50,7	38,1	–	–	–	32	33	40	55	1
	1,1	1,1	–	54	34	50,7	38,1	4	8	–	32	–	40	55	1
	1,1	1,1	–	54	34	50,7	38,1	–	–	4	32	–	40	55	1
30	1	0,6	1,5	55,5	37,5	52,5	41,1	–	–	–	34	37	44	56	1
	1	0,6	–	55,5	37,5	52,5	41,1	4	7	–	34	–	44	56	1
	1	0,6	–	55,5	37,5	52,5	41,1	–	–	3	34	–	44	56	1
	1	0,6	1,6	55,5	37,5	52,5	41,3	–	–	–	34	37	44	56	1
	1	0,6	–	55,5	37,5	52,5	41,3	4	7,5	–	34	–	44	56	1
	1	0,6	–	55,5	37,5	52,5	41,3	–	–	3,5	34	–	44	56	1
	1,1	1,1	1,2	62,5	40,5	59,2	45	–	–	–	37	40	48	65	1
	1,1	1,1	–	62,5	40,5	59,2	45	5	8,5	–	37	–	48	65	1
	1,1	1,1	–	62,5	40,5	59,2	45	–	–	3,5	37	–	48	65	1
	1,1	1,1	2,2	62,5	40,5	59,2	45	–	–	–	37	40	48	65	1
	1,1	1,1	–	62,5	40,5	59,2	45	5	9,5	–	37	–	48	65	1
	1,1	1,1	–	62,5	40,5	59,2	45	–	–	4,5	37	–	48	65	1
	1,5	1,5	2,3	73	45	68,4	50,3	–	–	–	41	44	52	79	1,5
	1,5	1,5	–	73	45	68,4	50,3	7	11,5	–	41	–	52	79	1,5

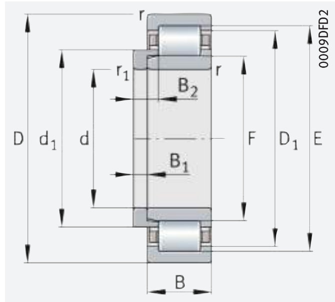
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

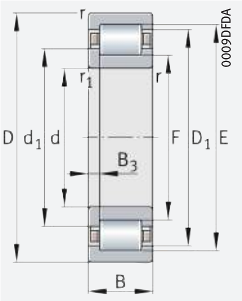


NJ and HJ
Locating bearings

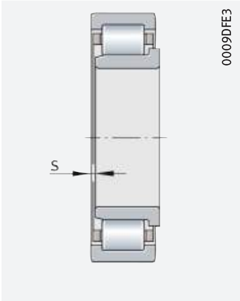
d = 35 – 40 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425 | 1.12 ➤426 | 1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
35	72	17	59 000	50 000	7 600	12 300	8 100	0,309	–	**NJ207-E-XL-TVP2**	–
	72	17	59 000	50 000	7 600	12 300	8 100	0,309	0,032	**NJ207-E-XL-TVP2**	**HJ207-E**
	72	17	59 000	50 000	7 600	12 300	8 100	0,317	–	**NUP207-E-XL-TVP2**	–
	72	23	73 000	65 000	10 500	12 300	7 200	0,416	–	**NJ2207-E-XL-TVP2**	–
	72	23	73 000	65 000	10 500	12 300	7 200	0,416	0,035	**NJ2207-E-XL-TVP2**	**HJ2207-E**
	72	23	73 000	65 000	10 500	12 300	7 200	0,427	–	**NUP2207-E-XL-TVP2**	–
	80	21	76 000	63 000	10 600	10 900	7 900	0,496	–	**NJ307-E-XL-TVP2**	–
	80	21	76 000	63 000	10 600	10 900	7 900	0,496	0,06	**NJ307-E-XL-TVP2**	**HJ307-E**
	80	21	76 000	63 000	10 600	10 900	7 900	0,506	–	**NUP307-E-XL-TVP2**	–
	80	31	108 000	98 000	17 500	10 900	6 600	0,736	–	**NJ2307-E-XL-TVP2**	–
	80	31	108 000	98 000	17 500	10 900	6 600	0,736	0,063	**NJ2307-E-XL-TVP2**	**HJ2307-E**
	80	31	108 000	98 000	17 600	10 900	6 600	0,751	–	**NUP2307-E-XL-TVP2**	–
	100	25	103 000	83 000	14 300	11 800	7 000	1,16	–	**NJ407-XL-M1**	–
	100	25	103 000	83 000	14 300	11 800	7 000	1,16	0,127	**NJ407-XL-M1**	**HJ407**
40	80	18	63 000	53 000	8 300	10 900	7 500	0,389	–	**NJ208-E-XL-TVP2**	–
	80	18	63 000	53 000	8 300	10 900	7 500	0,389	0,049	**NJ208-E-XL-TVP2**	**HJ208-E**
	80	18	63 000	53 000	8 400	10 900	7 500	0,399	–	**NUP208-E-XL-TVP2**	–
	80	23	83 000	75 000	12 700	10 900	6 300	0,504	–	**NJ2208-E-XL-TVP2**	–
	80	23	83 000	75 000	12 700	10 900	6 300	0,504	0,05	**NJ2208-E-XL-TVP2**	**HJ2208-E**
	80	23	83 000	75 000	12 700	10 900	6 300	0,518	–	**NUP2208-E-XL-TVP2**	–
	90	23	96 000	79 000	13 500	9 500	7 100	0,674	–	**NJ308-E-XL-TVP2**	–
	90	23	96 000	79 000	13 500	9 500	7 100	0,674	0,087	**NJ308-E-XL-TVP2**	**HJ308-E**
	90	23	96 000	79 000	13 600	9 500	7 100	0,688	–	**NUP308-E-XL-TVP2**	–
	90	33	132 000	119 000	21 600	9 500	5 800	0,978	–	**NJ2308-E-XL-TVP2**	–
	90	33	132 000	119 000	21 600	9 500	5 800	0,978	0,091	**NJ2308-E-XL-TVP2**	**HJ2308-E**
	90	33	132 000	119 000	21 600	9 500	5 800	0,999	–	**NUP2308-E-XL-TVP2**	–
	110	27	119 000	95 000	16 800	10 500	6 500	1,5	–	**NJ408-XL-M1**	–
	110	27	119 000	95 000	16 800	10 500	6 500	1,5	0,148	**NJ408-XL-M1**	**HJ408**

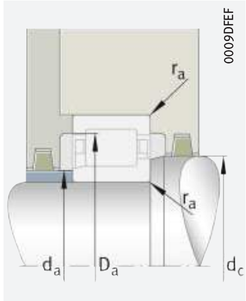
medias ➤ *https://www.schaeffler.de/std/1DAA*



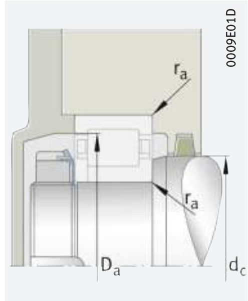
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



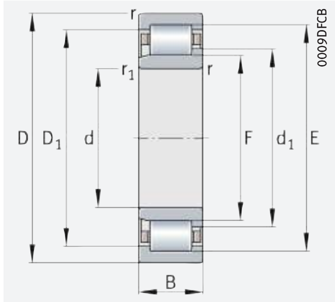
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
35	1,1	0,6	0,7	64	44	61	48	–	–	–	39	43	50	65	1
	1,1	0,6	–	64	44	61	48	4	7	–	39	–	50	65	1
	1,1	0,6	–	64	44	61	48	–	–	3	39	–	50	65	1
	1,1	0,6	2,2	64	44	61	48	–	–	–	39	43	50	65	1
	1,1	0,6	–	64	44	61	48	4	8,5	–	39	–	50	65	1
	1,1	0,6	–	64	44	61	48	–	–	4,5	39	–	50	65	1
	1,5	1,1	0,6	70,2	46,2	66,6	51	–	–	–	42	45	53	71	1,5
	1,5	1,1	–	70,2	46,2	66,6	51	6	9,5	–	42	–	53	71	1,5
	1,5	1,1	–	70,2	46,2	66,6	51	–	–	3,5	42	–	53	71	1,5
	1,5	1,1	2,1	70,2	46,2	66,6	51	–	–	–	42	45	53	71	1,5
	1,5	1,1	–	70,2	46,2	66,6	51	6	11	–	42	–	53	71	1,5
	1,5	1,5	–	70,2	46,2	66,6	51	–	–	5	42	–	53	71	1,5
	1,5	1,5	2,6	83	53	78,2	58,8	–	–	–	46	52	61	89	1,5
	1,5	1,5	–	83	53	78,2	58,8	8	13	–	46	–	61	89	1,5
40	1,1	1,1	1	71,5	49,5	68,3	54	–	–	–	47	49	56	73	1
	1,1	1,1	–	71,5	49,5	68,3	54	5	8,5	–	47	–	56	73	1
	1,1	1,1	–	71,5	49,5	68,3	54	–	–	3,5	47	–	56	73	1
	1,1	1,1	1,5	71,5	49,5	68,3	54	–	–	–	47	49	56	73	1
	1,1	1,1	–	71,5	49,5	68,3	54	5	9	–	47	–	56	73	1
	1,1	1,1	–	71,5	49,5	68,3	54	–	–	4	47	–	56	73	1
	1,5	1,5	1,3	80	52	75,9	57,6	–	–	–	49	51	60	81	1,5
	1,5	1,5	–	80	52	75,9	57,6	7	11	–	49	–	60	81	1,5
	1,5	1,5	–	80	52	75,9	57,6	–	–	4	49	–	60	81	1,5
	1,5	1,5	2,7	80	52	75,9	57,6	–	–	–	49	51	60	81	1,5
	1,5	1,5	–	80	52	75,9	57,6	7	12,5	–	49	–	60	81	1,5
	1,5	1,5	–	80	52	75,9	57,6	–	–	5,5	49	–	60	81	1,5
	2	2	2,8	92	58	86,4	64,6	–	–	–	53	57	67	97	2
	2	2	–	92	58	86,4	64,6	8	13	–	53	–	67	97	2

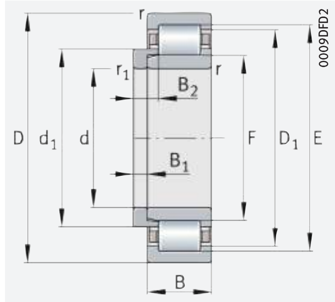
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

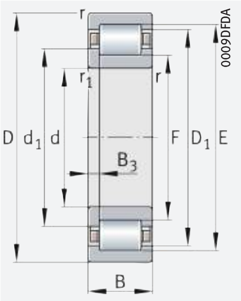


NJ and HJ
Locating bearings

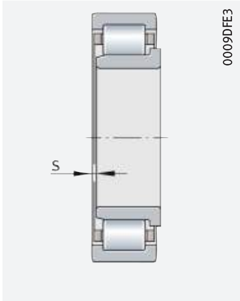
d = 45 – 50 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
45	85	19	72 000	63 000	10 300	10 200	7 000	0,445	–	**NJ209-E-XL-TVP2**	–
	85	19	72 000	63 000	10 300	10 200	7 000	0,445	0,054	**NJ209-E-XL-TVP2**	**HJ209-E**
	85	19	72 000	63 000	10 300	10 200	7 000	0,457	–	**NUP209-E-XL-TVP2**	–
	85	23	87 000	82 000	13 900	10 200	5 800	0,544	–	**NJ2209-E-XL-TVP2**	–
	85	23	87 000	82 000	13 900	10 200	5 800	0,544	0,055	**NJ2209-E-XL-TVP2**	**HJ2209-E**
	85	23	87 000	82 000	13 900	10 200	5 800	0,559	–	**NUP2209-E-XL-TVP2**	–
	100	25	116 000	99 000	17 200	8 500	6 400	0,913	–	**NJ309-E-XL-TVP2**	–
	100	25	116 000	99 000	17 200	8 500	6 400	0,913	0,109	**NJ309-E-XL-TVP2**	**HJ309-E**
	100	25	116 000	99 000	17 300	8 500	6 400	0,937	–	**NUP309-E-XL-TVP2**	–
	100	36	163 000	154 000	28 000	8 500	5 200	1,33	–	**NJ2309-E-XL-TVP2**	–
	100	36	163 000	154 000	28 000	8 500	5 200	1,33	0,115	**NJ2309-E-XL-TVP2**	**HJ2309-E**
	100	36	163 000	154 000	28 000	8 500	5 200	1,36	–	**NUP2309-E-XL-TVP2**	–
	120	29	143 000	119 000	21 400	9 600	5 900	1,9	–	**NJ409-XL-M1**	–
	120	29	143 000	119 000	21 400	9 600	5 900	1,9	0,181	**NJ409-XL-M1**	**HJ409**
50	90	20	75 000	69 000	11 100	9 700	6 600	0,503	–	**NJ210-E-XL-TVP2**	–
	90	20	75 000	69 000	11 100	9 700	6 600	0,503	0,06	**NJ210-E-XL-TVP2**	**HJ210-E**
	90	20	75 000	69 000	11 200	9 700	6 600	0,517	–	**NUP210-E-XL-TVP2**	–
	90	23	92 000	88 000	15 000	9 700	5 300	0,586	–	**NJ2210-E-XL-TVP2**	–
	90	23	92 000	88 000	15 000	9 700	5 300	0,586	0,06	**NJ2210-E-XL-TVP2**	**HJ210-E**
	90	23	92 000	88 000	15 000	9 700	5 300	0,597	–	**NUP2210-E-XL-TVP2**	–
	110	27	131 000	114 000	20 100	7 800	6 000	1,19	–	**NJ310-E-XL-TVP2**	–
	110	27	131 000	114 000	20 100	7 800	6 000	1,19	0,149	**NJ310-E-XL-TVP2**	**HJ310-E**
	110	27	131 000	114 000	20 100	7 800	6 000	1,21	–	**NUP310-E-XL-TVP2**	–
	110	40	193 000	187 000	34 500	7 800	4 900	1,77	–	**NJ2310-E-XL-TVP2**	–
	110	40	193 000	187 000	34 500	7 800	4 900	1,77	0,156	**NJ2310-E-XL-TVP2**	**HJ2310-E**
	110	40	193 000	187 000	34 500	7 800	4 900	1,82	–	**NUP2310-E-XL-TVP2**	–
	130	31	175 000	148 000	27 000	8 600	5 300	2,36	–	**NJ410-XL-M1**	–
	130	31	175 000	148 000	27 000	8 600	5 300	2,36	0,238	**NJ410-XL-M1**	**HJ410**

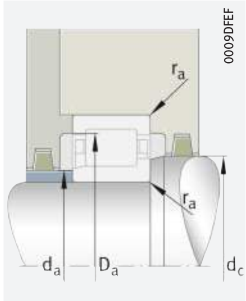
medias *➤ https://www.schaeffler.de/std/1DAB*



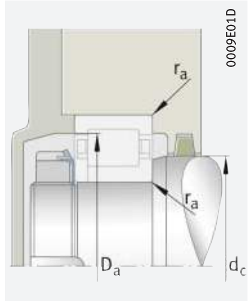
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



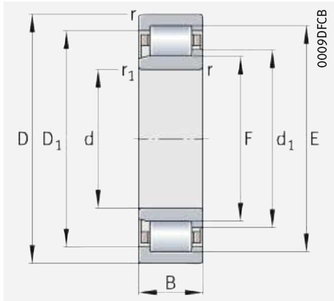
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
45	1,1	1,1	1,9	76,5	54,5	73,3	59	–	–	–	52	54	61	78	1
	1,1	1,1	–	76,5	54,5	73,3	59	5	8,5	–	52	–	61	78	1
	1,1	1,1	–	76,5	54,5	73,3	59	–	–	3,5	52	–	61	78	1
	1,1	1,1	1,5	76,5	54,5	73,3	59	–	–	–	52	54	61	78	1
	1,1	1,1	–	76,5	54,5	73,3	59	5	9	–	52	–	61	78	1
	1,1	1,1	–	76,5	54,5	73,3	59	–	–	4	52	–	61	78	1
	1,5	1,5	1	88,5	58,5	84,1	64,4	–	–	–	54	57	66	91	1,5
	1,5	1,5	–	88,5	58,5	84,1	64,4	7	11,5	–	54	–	66	91	1,5
	1,5	1,5	–	88,5	58,5	84,1	64,4	–	–	4,5	54	–	66	91	1,5
	1,5	1,5	2,5	88,5	58,5	84,1	64,4	–	–	–	54	57	66	91	1,5
	1,5	1,5	–	88,5	58,5	84,1	64,4	7	13	–	54	–	66	91	1,5
	1,5	1,5	–	88,5	58,5	84,1	64,4	–	–	6	54	–	66	91	1,5
	2	2	2,9	100,5	64,5	94,6	71,6	–	–	–	58	63	74	107	2
	2	2	–	100,5	64,5	94,6	71,6	8	13,5	–	58	–	74	107	2
50	1,1	1,1	1,3	81,5	59,5	78,3	64	–	–	–	57	58	67	83	1
	1,1	1,1	–	81,5	59,5	78,3	64	5	9	–	57	–	67	83	1
	1,1	1,1	–	81,5	59,5	78,3	64	–	–	4	57	–	67	83	1
	1,1	1,1	1,3	81,5	59,5	78,3	64	–	–	–	57	58	67	83	1
	1,1	1,1	–	81,5	59,5	78,3	64	5	9	–	57	–	67	83	1
	1,1	1,1	–	81,5	59,5	78,3	64	–	–	4	57	–	67	83	1
	2	2	1,7	97	65	92,5	71,3	–	–	–	61	63	73	99	2
	2	2	–	97	65	92,5	71,3	8	13	–	61	–	73	99	2
	2	2	–	97	65	92,5	71,3	–	–	5	61	–	73	99	2
	2	2	4,2	97	65	92,5	71,3	–	–	–	61	63	73	99	2
	2	2	–	97	65	92,5	71,3	8	14,5	–	61	–	73	99	2
	2	2	–	97	65	92,5	71,3	–	–	6,5	61	–	73	99	2
	2,1	2,1	3	110,8	70,8	104,3	78,6	–	–	–	64	69	81	116	2
	2,1	2,1	–	110,8	70,8	104,3	78,6	9	14,5	–	64	–	81	116	2

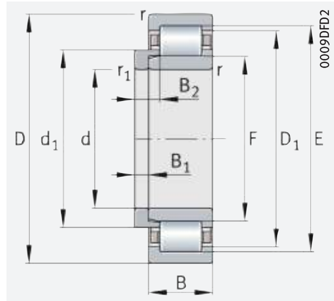
1) Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

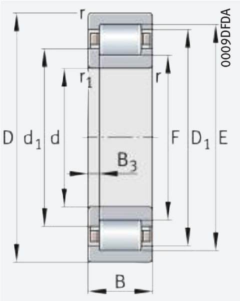


NJ and HJ
Locating bearings

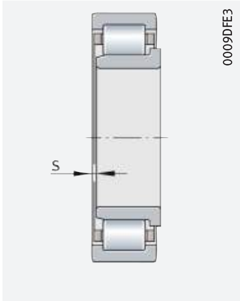
d = 55 – 60 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	Bearing	L-section ring	Bearing	L-section ring
			N	N	N	min^{-1}	min^{-1}	≈ kg	≈ kg		
55	100	21	99 000	95 000	16 100	8 700	5 800	0,679	–	**NJ211-E-XL-TVP2**	–
	100	21	99 000	95 000	16 100	8 700	5 800	0,679	0,087	**NJ211-E-XL-TVP2**	**HJ211-E**
	100	21	99 000	95 000	16 100	8 700	5 800	0,693	–	**NUP211-E-XL-TVP2**	**–**
	100	25	117 000	118 000	20 600	8 700	4 700	0,812	–	**NJ2211-E-XL-TVP2**	–
	100	25	117 000	118 000	20 600	8 700	4 700	0,812	0,087	**NJ2211-E-XL-TVP2**	**HJ2211-E**
	100	25	117 000	118 000	20 600	8 700	4 700	0,828	–	**NUP2211-E-XL-TVP2**	**–**
	120	29	159 000	139 000	25 000	7 000	5 500	1,51	–	**NJ311-E-XL-TVP2**	–
	120	29	159 000	139 000	25 000	7 000	5 500	1,51	0,192	**NJ311-E-XL-TVP2**	**HJ311-E**
	120	29	159 000	139 000	25 500	7 000	5 500	1,54	–	**NUP311-E-XL-TVP2**	**–**
	120	43	235 000	230 000	43 500	7 000	4 500	2,27	–	**NJ2311-E-XL-TVP2**	–
	120	43	235 000	230 000	43 500	7 000	4 500	2,27	0,2	**NJ2311-E-XL-TVP2**	**HJ2311-E**
	120	43	235 000	230 000	43 000	7 000	4 500	2,31	–	**NUP2311-E-XL-TVP2**	**–**
	140	33	187 000	164 000	30 000	8 200	5 100	2,88	–	**NJ411-XL-M1**	–
	140	33	187 000	164 000	30 000	8 200	5 100	2,88	0,302	**NJ411-XL-M1**	**HJ411**
60	110	22	112 000	103 000	17 700	7 700	5 300	0,845	–	**NJ212-E-XL-TVP2**	–
	110	22	112 000	103 000	17 700	7 700	5 300	0,845	0,106	**NJ212-E-XL-TVP2**	**HJ212-E**
	110	22	112 000	103 000	17 800	7 700	5 300	0,865	–	**NUP212-E-XL-TVP2**	**–**
	110	28	152 000	153 000	27 500	7 700	4 300	1,1	–	**NJ2212-E-XL-TVP2**	–
	110	28	152 000	153 000	27 500	7 700	4 300	1,1	0,106	**NJ2212-E-XL-TVP2**	**HJ212-E**
	110	28	152 000	153 000	27 500	7 700	4 300	1,12	–	**NUP2212-E-XL-TVP2**	**–**
	130	31	177 000	157 000	28 500	6 500	5 200	1,89	–	**NJ312-E-XL-TVP2**	–
	130	31	177 000	157 000	28 500	6 500	5 200	1,89	0,229	**NJ312-E-XL-TVP2**	**HJ312-E**
	130	31	177 000	157 000	28 500	6 500	5 200	1,93	–	**NUP312-E-XL-TVP2**	**–**
	130	46	265 000	260 000	49 500	6 500	4 250	2,83	–	**NJ2312-E-XL-TVP2**	–
	130	46	265 000	260 000	49 500	6 500	4 250	2,83	0,238	**NJ2312-E-XL-TVP2**	**HJ2312-E**
	130	46	265 000	260 000	49 500	6 500	4 250	2,88	–	**NUP2312-E-XL-TVP2**	**–**
	150	35	211 000	184 000	33 000	7 500	4 800	3,47	–	**NJ412-XL-M1**	–
	150	35	211 000	184 000	33 000	7 500	4 800	3,47	0,347	**NJ412-XL-M1**	**HJ412**

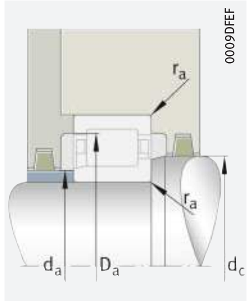
medias ➤ *https://www.schaeffler.de/std/1DAC*



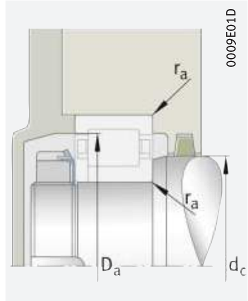
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



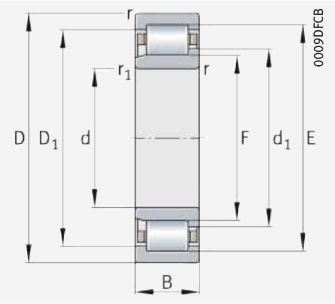
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1)]	max.	min.	max.[1)]	max.
55	1,5	1,1	0,8	90	66	86,6	70,8	–	–	–	62	65	73	91	1,5
	1,5	1,1	–	90	66	86,6	70,8	6	9,5	–	62	–	73	91	1,5
	1,5	1,1	–	90	66	86,6	70,8	–	–	3,5	62	–	73	91	1,5
	1,5	1,1	1,3	90	66	86,6	70,8	–	–	–	62	65	73	91	1,5
	1,5	1,1	–	90	66	86,6	70,8	6	10	–	62	–	73	91	1,5
	1,5	1,1	–	90	66	86,6	70,8	–	–	4	62	–	73	91	1,5
	2	2	1,8	106,5	70,5	101,4	77,5	–	–	–	66	69	80	109	2
	2	2	–	106,5	70,5	101,4	77,5	9	14	–	66	–	80	109	2
	2	2	–	106,5	70,5	101,4	77,5	–	–	5	66	–	80	109	2
	2	2	3,3	106,5	70,5	101,4	77,5	–	–	–	66	69	80	109	2
	2	2	–	106,5	70,5	101,4	77,5	9	15,5	–	66	–	80	109	2
	2	2	–	106,5	70,5	101,4	77,5	–	–	6,5	66	–	80	109	2
	2,1	2,1	3,3	117,2	77,2	110,7	85	–	–	–	69	76	87	126	2,1
	2,1	2,1	–	117,2	77,2	110,7	85	10	16,5	–	69	–	87	126	2,1
60	1,5	1,5	1,6	100	72	96,1	77,6	–	–	–	69	71	80	101	1,5
	1,5	1,5	–	100	72	96,1	77,6	6	10	–	69	–	80	101	1,5
	1,5	1,5	–	100	72	96,1	77,6	–	–	4	69	–	80	101	1,5
	1,5	1,5	1,6	100	72	96,1	77,6	–	–	–	69	71	80	101	1,5
	1,5	1,5	–	100	72	96,1	77,6	6	10	–	69	–	80	101	1,5
	1,5	1,5	–	100	72	96,1	77,6	–	–	4	69	–	80	101	1,5
	2,1	2,1	1,8	115	77	109,6	84,4	–	–	–	72	75	86	118	2,1
	2,1	2,1	–	115	77	109,6	84,4	9	14,5	–	72	–	86	118	2,1
	2,1	2,1	–	115	77	109,6	84,4	–	–	5,5	72	–	86	118	2,1
	2,1	2,1	3,5	115	77	109,6	84,4	–	–	–	72	75	86	118	2,1
	2,1	2,1	–	115	77	109,6	84,4	9	16	–	72	–	86	118	2,1
	2,1	2,1	–	115	77	109,6	84,4	–	–	7	72	–	86	118	2,1
	2,1	2,1	3,4	127	83	119,5	91,6	–	–	–	74	82	94	136	2
	2,1	2,1	–	127	83	119,5	91,6	10	16,5	–	74	–	94	136	2

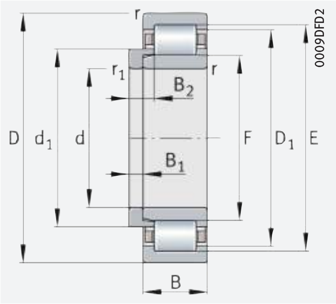
[1)] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

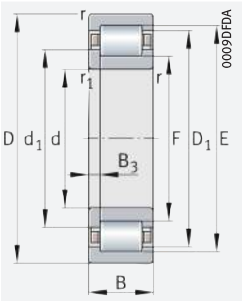


NJ and HJ
Locating bearings

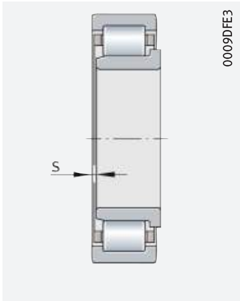
d = 65 – 70 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
65	120	23	128 000	120 000	20 700	7 100	4 900	1,06	–	**NJ213-E-XL-TVP2**	–
	120	23	128 000	120 000	20 700	7 100	4 900	1,06	0,127	**NJ213-E-XL-TVP2**	**HJ213-E**
	120	23	128 000	120 000	20 800	7 100	4 900	1,09	–	**NUP213-E-XL-TVP2**	**–**
	120	31	177 000	182 000	33 000	7 100	4 100	1,46	–	**NJ2213-E-XL-TVP2**	–
	120	31	177 000	182 000	33 000	7 100	4 100	1,46	0,13	**NJ2213-E-XL-TVP2**	**HJ2213-E**
	120	31	177 000	182 000	33 000	7 100	4 100	1,54	–	**NUP2213-E-XL-TVP2**	**–**
	140	33	214 000	191 000	34 500	5 900	4 800	2,32	–	**NJ313-E-XL-TVP2**	–
	140	33	214 000	191 000	34 500	5 900	4 800	2,32	0,285	**NJ313-E-XL-TVP2**	**HJ313-E**
	140	33	214 000	191 000	34 500	5 900	4 800	2,37	–	**NUP313-E-XL-TVP2**	**–**
	140	48	295 000	285 000	53 000	5 900	4 000	3,38	–	**NJ2313-E-XL-TVP2**	–
	140	48	295 000	285 000	53 000	5 900	4 000	3,38	0,303	**NJ2313-E-XL-TVP2**	**HJ2313-E**
	140	48	295 000	285 000	53 000	5 900	4 000	3,45	–	**NUP2313-E-XL-TVP2**	**–**
	160	37	230 000	203 000	36 000	7 000	4 600	4,15	–	**NJ413-XL-M1**	–
	160	37	230 000	203 000	36 000	7 000	4 600	4,15	0,432	**NJ413-XL-M1**	**HJ413**
70	125	24	141 000	138 000	24 100	6 800	4 650	1,18	–	**NJ214-E-XL-TVP2**	–
	125	24	141 000	138 000	24 100	6 800	4 650	1,18	0,155	**NJ214-E-XL-TVP2**	**HJ214-E**
	125	24	141 000	138 000	24 300	6 800	4 650	1,2	–	**NUP214-E-XL-TVP2**	**–**
	125	31	185 000	195 000	35 500	6 800	3 850	1,54	–	**NJ2214-E-XL-TVP2**	–
	125	31	185 000	195 000	35 500	6 800	3 850	1,54	0,157	**NJ2214-E-XL-TVP2**	**HJ2214-E**
	125	31	185 000	195 000	35 500	6 800	3 850	1,58	–	**NUP2214-E-XL-TVP2**	**–**
	150	35	242 000	222 000	39 500	5 500	4 500	2,84	–	**NJ314-E-XL-TVP2**	–
	150	35	242 000	222 000	39 500	5 500	4 500	2,84	0,328	**NJ314-E-XL-TVP2**	**HJ314-E**
	150	35	242 000	222 000	39 500	5 500	4 500	2,89	–	**NUP314-E-XL-TVP2**	**–**
	150	51	325 000	325 000	59 000	5 500	3 800	4,1	–	**NJ2314-E-XL-TVP2**	–
	150	51	325 000	325 000	59 000	5 500	3 800	4,1	0,352	**NJ2314-E-XL-TVP2**	**HJ2314-E**
	150	51	325 000	325 000	59 000	5 500	3 800	4,18	–	**NUP2314-E-XL-TVP2**	**–**
	180	42	285 000	255 000	45 000	6 200	4 250	6,07	–	**NJ414-XL-M1**	–
	180	42	285 000	255 000	45 000	6 200	4 250	6,07	0,63	**NJ414-XL-M1**	**HJ414**

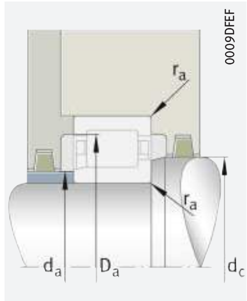
medias ➤ *https://www.schaeffler.de/std/1DAD*



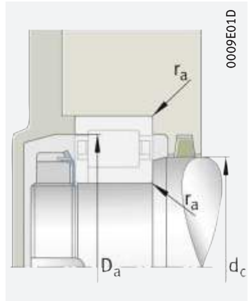
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



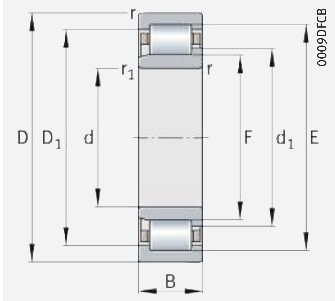
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
65	1,5	1,5	1,4	108,5	78,5	104,3	84,4	–	–	–	74	77	87	111	1,5
	1,5	1,5	–	108,5	78,5	104,3	84,4	6	10	–	74	–	87	111	1,5
	1,5	1,5	–	108,5	78,5	104,3	84,4	–	–	4	74	–	87	111	1,5
	1,5	1,5	1,9	108,5	78,5	104,3	84,4	–	–	–	74	77	87	111	1,5
	1,5	1,5	–	108,5	78,5	104,3	84,4	6	10,5	–	74	–	87	111	1,5
	1,5	1,5	–	108,5	78,5	104,3	84,4	–	–	4,5	74	–	87	111	1,5
	2,1	2,1	1,5	124,5	82,5	118,6	90,5	–	–	–	77	81	93	128	2,1
	2,1	2,1	–	124,5	82,5	118,6	90,5	10	15,5	–	77	–	93	128	2,1
	2,1	2,1	–	124,5	82,5	118,6	90,5	–	–	5,5	77	–	93	128	2,1
	2,1	2,1	4	124,5	82,5	118,6	90,5	–	–	–	77	81	93	128	2,1
	2,1	2,1	–	124,5	82,5	118,6	90,5	10	18	–	77	–	93	128	2,1
	2,1	2,1	–	124,5	82,5	118,6	90,5	–	–	8	77	–	93	128	2,1
	2,1	2,1	3,5	135,3	89,3	127,7	98,3	–	–	–	79	88	100	146	2,1
	2,1	2,1	–	135,3	89,3	127,7	98,3	11	18	–	79	–	100	146	2,1
70	1,5	1,5	1,2	113,5	83,5	109,4	89,4	–	–	–	79	82	92	116	1,5
	1,5	1,5	–	113,5	83,5	109,4	89,4	7	11	–	79	–	92	116	1,5
	1,5	1,5	–	113,5	83,5	109,4	89,4	–	–	4	79	–	92	116	1,5
	1,5	1,5	1,6	113,5	83,5	109,4	89,4	–	–	–	79	–	92	116	1,5
	1,5	1,5	–	113,5	83,5	109,4	89,4	7	11,5	–	79	–	92	116	1,5
	1,5	1,5	–	113,5	83,5	109,4	89,4	–	–	4,5	79	–	92	116	1,5
	2,1	2,1	1,7	133	89	126,8	97,4	–	–	–	82	87	100	138	2,1
	2,1	2,1	–	133	89	126,8	97,4	10	15,5	–	82	–	100	138	2,1
	2,1	2,1	–	133	89	126,8	97,4	–	–	5,5	82	–	100	138	2,1
	2,1	2,1	4,7	133	89	126,8	97,4	–	–	–	82	87	100	138	2,1
	2,1	2,1	–	133	89	126,8	97,4	10	18,5	–	82	–	100	138	2,1
	2,1	2,1	–	133	89	126,8	97,4	–	–	8,5	82	–	100	138	2,1
	3	3	4	152	100	142,7	110,3	–	–	–	86	99	112	164	2,5
	3	3	–	152	100	142,7	110,3	12	20	–	86	–	112	164	2,5

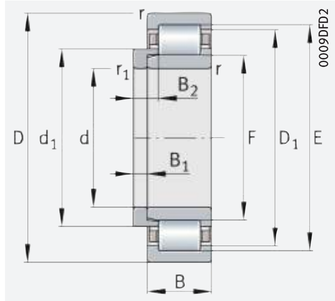
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing



NJ and HJ
Locating bearings

d = 75 – 80 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bear-ing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
75	130	25	155 000	157 000	27 500	6 500	4 400	1,3	–	**NJ215-E-XL-TVP2**	–
	130	25	155 000	157 000	27 500	6 500	4 400	1,3	0,164	**NJ215-E-XL-TVP2**	**HJ215-E**
	130	25	155 000	157 000	27 500	6 500	4 400	1,33	–	**NUP215-E-XL-TVP2**	**–**
	130	31	192 000	208 000	37 500	6 500	3 600	1,64	–	**NJ2215-E-XL-TVP2**	–
	130	31	192 000	208 000	37 500	6 500	3 600	1,64	0,165	**NJ2215-E-XL-TVP2**	**HJ2215-E**
	130	31	192 000	208 000	37 500	6 500	3 600	1,67	–	**NUP2215-E-XL-TVP2**	**–**
	160	37	285 000	265 000	46 500	5 100	4 150	3,39	–	**NJ315-E-XL-TVP2**	–
	160	37	285 000	265 000	46 500	5 100	4 150	3,39	0,407	**NJ315-E-XL-TVP2**	**HJ315-E**
	160	37	285 000	265 000	46 500	5 100	4 150	3,45	–	**NUP315-E-XL-TVP2**	**–**
	160	55	390 000	395 000	71 000	5 100	3 550	5,04	–	**NJ2315-E-XL-TVP2**	–
	160	55	390 000	395 000	71 000	5 100	3 550	5,04	0,436	**NJ2315-E-XL-TVP2**	**HJ2315-E**
	160	55	390 000	395 000	71 000	5 100	3 550	5,14	–	**NUP2315-E-XL-TVP2**	**–**
	190	45	325 000	295 000	50 000	5 800	4 100	7,21	–	**NJ415-XL-M1**	–
	190	45	325 000	295 000	50 000	5 800	4 100	7,21	0,737	**NJ415-XL-M1**	**HJ415**
80	140	26	166 000	168 000	29 000	6 100	4 200	1,58	–	**NJ216-E-XL-TVP2**	–
	140	26	166 000	168 000	29 000	6 100	4 200	1,58	0,22	**NJ216-E-XL-TVP2**	**HJ216-E**
	140	26	166 000	168 000	29 000	6 100	4 200	1,62	–	**NUP216-E-XL-TVP2**	**–**
	140	33	221 000	244 000	43 500	6 100	3 400	2,04	–	**NJ2216-E-XL-TVP2**	–
	140	33	221 000	244 000	43 500	6 100	3 400	2,04	0,22	**NJ2216-E-XL-TVP2**	**HJ216-E**
	140	33	221 000	244 000	43 500	6 100	3 400	2,08	–	**NUP2216-E-XL-TVP2**	**–**
	170	39	300 000	275 000	49 500	4 800	4 100	4,03	–	**NJ316-E-XL-TVP2**	–
	170	39	300 000	275 000	49 500	4 800	4 100	4,03	0,456	**NJ316-E-XL-TVP2**	**HJ316-E**
	170	39	300 000	275 000	49 500	4 800	4 100	4,11	–	**NUP316-E-XL-TVP2**	**–**
	170	58	420 000	425 000	78 000	4 800	3 450	6	–	**NJ2316-E-XL-TVP2**	–
	170	58	420 000	425 000	78 000	4 800	3 450	6	0,488	**NJ2316-E-XL-TVP2**	**HJ2316-E**
	170	58	420 000	425 000	78 000	4 800	3 450	6,11	–	**NUP2316-E-XL-TVP2**	**–**
	200	48	395 000	365 000	63 000	5 400	3 750	8,52	–	**NJ416-XL-M1**	–
	200	48	395 000	365 000	63 000	5 400	3 750	8,52	0,808	**NJ416-XL-M1**	**HJ416**

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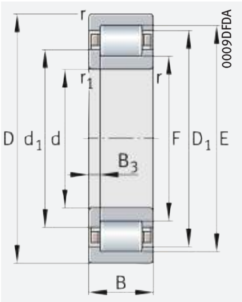
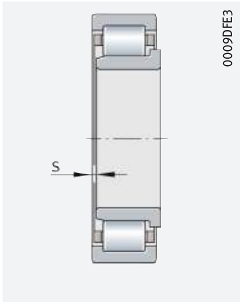
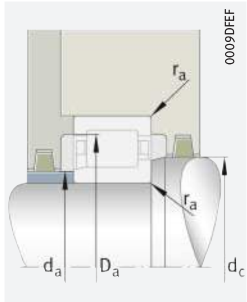


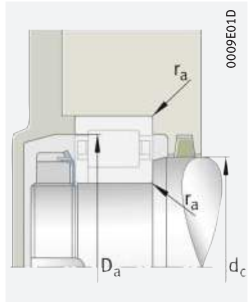
NUP
Locating bearing



Axial displacement “s”
for NJ



Mounting dimensions
for NJ



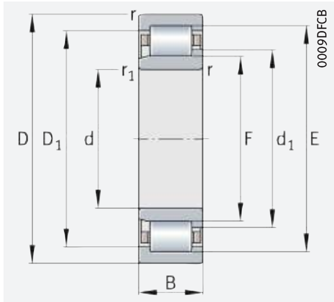
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
75	1,5	1,5	1,2	118,5	88,5	114,4	94,4	–	–	–	84	87	96	121	1,5
	1,5	1,5	–	118,5	88,5	114,4	94,4	7	11	–	84	–	96	121	1,5
	1,5	1,5	–	118,5	88,5	114,4	94,4	–	–	4	84	–	96	121	1,5
	1,5	1,5	1,6	118,5	88,5	114,4	94,4	–	–	–	84	87	96	121	1,5
	1,5	1,5	–	118,5	88,5	114,4	94,4	7	11,5	–	84	–	96	121	1,5
	1,5	1,5	–	118,5	88,5	114,4	94,4	–	–	4,5	84	–	96	121	1,5
	2,1	2,1	1,2	143	95	136,2	104,1	–	–	–	87	93	106	148	2,1
	2,1	2,1	–	143	95	136,2	104,1	11	16,5	–	87	–	106	148	2,1
	2,1	2,1	–	143	95	136,2	104,1	–	–	5,5	87	–	106	148	2,1
	2,1	2,1	4,2	143	95	136,2	104,1	–	–	–	87	93	106	148	2,1
	2,1	2,1	–	143	95	136,2	104,1	11	19,5	–	87	–	106	148	2,1
	2,1	2,1	–	143	95	136,2	104,1	–	–	8,5	87	–	106	148	2,1
	3	3	4,5	160,5	104,5	150,7	115,8	–	–	–	91	103	118	174	2,5
	3	3	–	160,5	104,5	150,7	115,8	13	21,5	–	91	–	118	174	2,5
80	2	2	1,3	127,3	95,3	122,9	101,5	–	–	–	91	94	104	129	2
	2	2	–	127,3	95,3	122,9	101,5	8	12,5	–	91	–	104	129	2
	2	2	–	127,3	95,3	122,9	101,5	–	–	4,5	91	–	104	129	2
	2	2	1,3	127,3	95,3	122,9	101,5	–	–	–	91	94	104	129	2
	2	2	–	127,3	95,3	122,9	101,5	8	12,5	–	91	–	104	129	2
	2	2	–	127,3	95,3	122,9	101,5	–	–	4,5	91	–	104	129	2
	2,1	2,1	0,7	151	101	143,9	110,4	–	–	–	92	99	114	158	2,1
	2,1	2,1	–	151	101	143,9	110,4	11	17	–	92	–	114	158	2,1
	2,1	2,1	–	151	101	143,9	110,4	–	–	6	92	–	114	158	2,1
	2,1	2,1	3,7	151	101	143,9	110,4	–	–	–	92	99	114	158	2,1
	2,1	2,1	–	151	101	143,9	110,4	11	20	–	92	–	114	158	2,1
	2,1	2,1	–	151	101	143,9	110,4	–	–	9	92	–	114	158	2,1
	3	3	4,6	170	110	159,7	121,8	–	–	–	96	109	124	184	2,5
	3	3	–	170	110	159,7	121,8	13	22	–	96	–	124	184	2,5

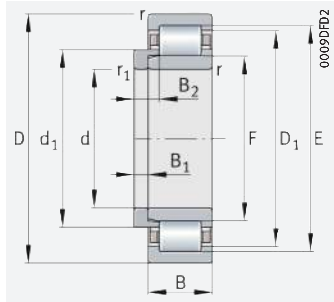
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing



NJ and HJ
Locating bearings

d = 85 – 90 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bear-ing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
85	150	28	194 000	194 000	33 500	5 600	4 000	1,95	–	**NJ217-E-XL-TVP2**	–
	150	28	194 000	194 000	33 500	5 600	4 000	1,95	0,247	**NJ217-E-XL-TVP2**	**HJ217-E**
	150	28	194 000	194 000	33 500	5 600	4 000	2,08	–	**NUP217-E-XL-TVP2**	**–**
	150	36	255 000	275 000	48 500	5 600	3 300	2,55	–	**NJ2217-E-XL-TVP2**	–
	150	36	255 000	275 000	48 500	5 600	3 300	2,55	0,249	**NJ2217-E-XL-TVP2**	**HJ2217-E**
	150	36	255 000	275 000	48 500	5 600	3 300	2,6	–	**NUP2217-E-XL-TVP2**	**–**
	180	41	320 000	300 000	53 000	4 550	3 900	4,71	–	**NJ317-E-XL-TVP2**	–
	180	41	320 000	300 000	53 000	4 550	3 900	4,71	0,566	**NJ317-E-XL-TVP2**	**HJ317-E**
	180	41	320 000	300 000	53 000	4 550	3 900	4,8	–	**NUP317-E-XL-TVP2**	**–**
	180	60	435 000	445 000	80 000	4 550	3 300	6,85	–	**NJ2317-E-XL-TVP2**	–
	180	60	435 000	445 000	80 000	4 550	3 300	6,85	0,606	**NJ2317-E-XL-TVP2**	**HJ2317-E**
	180	60	435 000	445 000	80 000	4 550	3 300	6,99	–	**NUP2317-E-XL-TVP2**	**–**
	210	52	420 000	385 000	66 000	5 200	3 850	10	–	**NJ417-XL-M1**	–
	210	52	420 000	385 000	66 000	5 200	3 850	10	0,901	**NJ417-XL-M1**	**HJ417**
90	160	30	215 000	217 000	37 000	5 200	3 900	2,41	–	**NJ218-E-XL-TVP2**	–
	160	30	215 000	217 000	37 000	5 200	3 900	2,41	0,317	**NJ218-E-XL-TVP2**	**HJ218-E**
	160	30	215 000	217 000	37 000	5 200	3 900	2,46	–	**NUP218-E-XL-TVP2**	**–**
	160	40	285 000	315 000	55 000	5 200	3 250	3,23	–	**NJ2218-E-XL-TVP2**	–
	160	40	285 000	315 000	55 000	5 200	3 250	3,23	0,323	**NJ2218-E-XL-TVP2**	**HJ2218-E**
	160	40	285 000	315 000	55 000	5 200	3 250	3,29	–	**NUP2218-E-XL-TVP2**	**–**
	190	43	370 000	350 000	59 000	4 250	3 650	5,49	–	**NJ318-E-XL-TVP2**	–
	190	43	370 000	350 000	59 000	4 250	3 650	5,49	0,623	**NJ318-E-XL-TVP2**	**HJ318-E**
	190	43	370 000	350 000	59 000	4 250	3 650	5,59	–	**NUP318-E-XL-TVP2**	**–**
	190	64	510 000	530 000	92 000	4 250	3 000	8,19	–	**NJ2318-E-XL-TVP2**	–
	190	64	510 000	530 000	92 000	4 250	3 000	8,19	0,669	**NJ2318-E-XL-TVP2**	**HJ2318-E**
	190	64	510 000	530 000	92 000	4 250	3 000	8,35	–	**NUP2318-E-XL-TVP2**	**–**
	225	54	465 000	425 000	73 000	4 800	3 500	11,8	–	**NJ418-XL-M1**	–
	225	54	465 000	425 000	73 000	4 800	3 500	11,8	1,1	**NJ418-XL-M1**	**HJ418**

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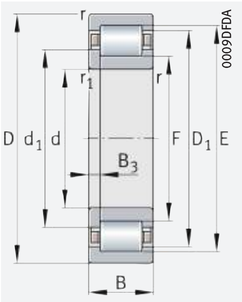
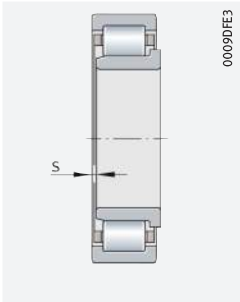
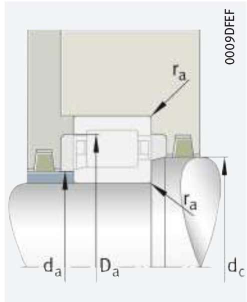


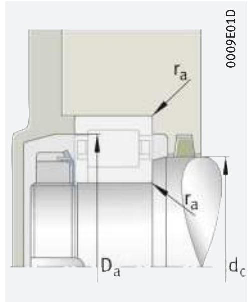
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



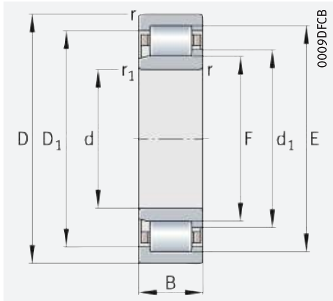
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1)]	max.	min.	max.[1)]	max.
85	2	2	0,8	136,5	100,5	131,5	107,5	–	–	–	96	99	110	139	2
	2	2	–	136,5	100,5	131,5	107,5	8	12,5	–	96	–	110	139	2
	2	2	–	136,5	100,5	131,5	107,5	–	–	4,5	96	–	110	139	2
	2	2	1,3	136,5	100,5	131,5	107,5	–	–	–	96	99	110	139	2
	2	2	–	136,5	100,5	131,5	107,5	8	13	–	96	–	110	139	2
	2	2	–	136,5	100,5	131,5	107,5	–	–	5	96	–	110	139	2
	3	3	1,3	160	108	152,7	117,8	–	–	–	99	106	119	166	2,5
	3	3	–	160	108	152,7	117,8	12	18,5	–	99	–	119	166	2,5
	3	3	–	160	108	152,7	117,8	–	–	6,5	99	–	119	166	2,5
	3	3	4,7	160	108	152,7	117,8	–	–	–	99	106	119	166	2,5
	3	3	–	160	108	152,7	117,8	12	22	–	99	–	119	166	2,5
	3	3	–	160	108	152,7	117,8	–	–	10	99	–	119	166	2,5
	4	4	5,2	177	113	165,7	125,8	–	–	–	105	111	128	190	3
	4	4	–	177	113	165,7	125,8	14	24	–	105	–	128	190	3
90	2	2	1,5	145	107	139,7	114,3	–	–	–	101	105	116	149	2
	2	2	–	145	107	139,7	114,3	9	14	–	101	–	116	149	2
	2	2	–	145	107	139,7	114,3	–	–	5	101	–	116	149	2
	2	2	2,5	145	107	139,7	114,3	–	–	–	101	105	116	149	2
	2	2	–	145	107	139,7	114,3	9	15	–	101	–	116	149	2
	2	2	–	145	107	139,7	114,3	–	–	6	101	–	116	149	2
	3	3	1,5	169,5	113,5	161,6	124	–	–	–	104	111	127	176	2,5
	3	3	–	169,5	113,5	161,6	124	12	18,5	–	104	–	127	176	2,5
	3	3	–	169,5	113,5	161,6	124	–	–	6,5	104	–	127	176	2,5
	3	3	5	169,5	113,5	161,6	124	–	–	–	104	111	127	176	2,5
	3	3	–	169,5	113,5	161,6	124	12	22	–	104	–	127	176	2,5
	3	3	–	169,5	113,5	161,6	124	–	–	10	104	–	127	176	2,5
	4	4	5	191,5	123,5	179,7	136,8	–	–	–	110	122	139	205	3
	4	4	–	191,5	123,5	179,7	136,8	14	24	–	110	–	139	205	3

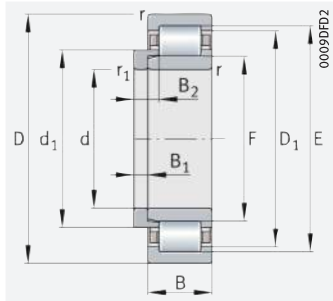
1) Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

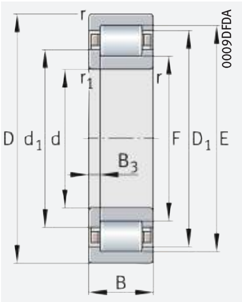


NJ and HJ
Locating bearings

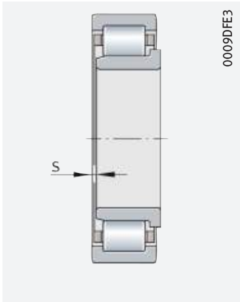
d = 95 – 105 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425 | 1.12 ➤426 | 1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
95	170	32	260 000	265 000	44 000	4 850	3 650	2,94	–	**NJ219-E-XL-TVP2**	–
	170	32	260 000	265 000	44 000	4 850	3 650	2,94	0,352	**NJ219-E-XL-TVP2**	**HJ219-E**
	170	32	260 000	265 000	44 500	4 850	3 650	2,99	–	**NUP219-E-XL-TVP2**	–
	170	43	340 000	370 000	64 000	4 850	3 050	3,98	–	**NJ2219-E-XL-TVP2**	–
	170	43	340 000	370 000	64 000	4 850	3 050	3,98	0,366	**NJ2219-E-XL-TVP2**	**HJ2219-E**
	170	43	340 000	370 000	64 000	4 850	3 050	4,05	–	**NUP2219-E-XL-TVP2**	–
	200	45	390 000	380 000	64 000	4 050	3 550	6,44	–	**NJ319-E-XL-TVP2**	–
	200	45	390 000	380 000	64 000	4 050	3 550	6,44	0,777	**NJ319-E-XL-TVP2**	**HJ319-E**
	200	45	390 000	380 000	64 000	4 050	3 550	6,56	–	**NUP319-E-XL-TVP2**	–
	200	67	540 000	580 000	99 000	4 050	2 800	9,58	–	**NJ2319-E-XL-TVP2**	–
	200	67	540 000	580 000	99 000	4 050	2 800	9,58	0,83	**NJ2319-E-XL-TVP2**	**HJ2319-E**
	200	67	540 000	580 000	99 000	4 050	2 800	9,77	–	**NUP2319-E-XL-TVP2**	–
	240	55	495 000	470 000	79 000	4 550	3 200	14,1	–	**NJ419-XL-M1**	–
	240	55	495 000	470 000	79 000	4 550	3 200	14,1	1,36	**NJ419-XL-M1**	**HJ419**
100	180	34	295 000	305 000	51 000	4 550	3 450	3,55	–	**NJ220-E-XL-TVP2**	–
	180	34	295 000	305 000	51 000	4 550	3 450	3,55	0,436	**NJ220-E-XL-TVP2**	**HJ220-E**
	180	34	295 000	305 000	51 000	4 550	3 450	3,61	–	**NUP220-E-XL-TVP2**	–
	180	46	395 000	445 000	76 000	4 550	2 900	4,85	–	**NJ2220-E-XL-TVP2**	–
	180	46	395 000	445 000	76 000	4 550	2 900	4,85	0,446	**NJ2220-E-XL-TVP2**	**HJ2220-E**
	180	46	395 000	445 000	76 000	4 550	2 900	4,92	–	**NUP2220-E-XL-TVP2**	–
	215	47	450 000	425 000	71 000	3 700	3 350	7,82	–	**NJ320-E-XL-TVP2**	–
	215	47	450 000	425 000	71 000	3 700	3 350	7,82	0,883	**NJ320-E-XL-TVP2**	**HJ320-E**
	215	47	450 000	425 000	71 000	3 700	3 350	7,96	–	**NUP320-E-XL-TVP2**	–
	215	73	680 000	720 000	123 000	3 700	2 500	12,3	–	**NJ2320-E-XL-TVP2**	–
	215	73	680 000	720 000	123 000	3 700	2 500	12,3	0,934	**NJ2320-E-XL-TVP2**	**HJ2320-E**
	215	73	680 000	720 000	123 000	3 700	2 500	12,5	–	**NUP2320-E-XL-TVP2**	–
	250	58	550 000	530 000	86 000	4 350	2 950	16,1	–	**NJ420-XL-M1**	–
	250	58	550 000	530 000	86 000	4 350	2 950	16,1	1,55	**NJ420-XL-M1**	**HJ420**
105	190	36	310 000	320 000	53 000	4 350	3 400	4,17	–	**NJ221-E-XL-TVP2**	–
	190	36	310 000	320 000	53 000	4 350	3 400	4,17	0,51	**NJ221-E-XL-TVP2**	**HJ221-E**
	190	36	310 000	320 000	53 000	4 350	3 400	4,26	–	**NUP221-E-XL-TVP2**	–
	260	60	610 000	590 000	96 000	4 150	2 750	18	–	**NJ421-XL-M1**	–
	260	60	610 000	590 000	96 000	4 150	2 750	18	1,65	**NJ421-XL-M1**	**HJ421**

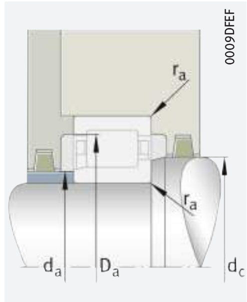
medias ➤ *https://www.schaeffler.de/std/1DB0*



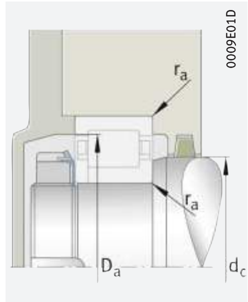
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



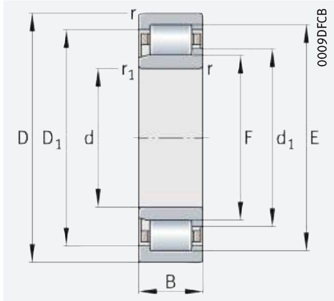
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
95	2,1	2,1	0,7	154,5	112,5	148,6	120,5	–	–	–	107	111	123	158	2,1
	2,1	2,1	–	154,5	112,5	148,6	120,5	9	14	–	107	–	123	158	2,1
	2,1	2,1	–	154,5	112,5	148,6	120,5	–	–	5	107	–	123	158	2,1
	2,1	2,1	2,2	154,5	112,5	148,6	120,5	–	–	–	107	111	123	158	2,1
	2,1	2,1	–	154,5	112,5	148,6	120,5	9	15,5	–	107	–	123	158	2,1
	2,1	2,1	–	154,5	112,5	148,6	120,5	–	–	6,5	107	–	123	158	2,1
	3	3	1,4	177,5	121,5	169,6	132	–	–	–	109	119	134	186	2,5
	3	3	–	177,5	121,5	169,6	132	13	20,5	–	109	–	134	186	2,5
	3	3	–	177,5	121,5	169,6	132	–	–	7,5	109	–	134	186	2,5
	3	3	5,6	177,5	121,5	169,6	132	–	–	–	109	119	134	186	2,5
	3	3	–	177,5	121,5	169,6	132	13	24,5	–	109	–	134	186	2,5
	3	3	–	177,5	121,5	169,6	132	–	–	11,5	109	–	134	186	2,5
	4	4	5,2	201,5	133,5	189,7	146,8	–	–	–	115	132	149	220	3
	4	4	–	201,5	133,5	189,7	146,8	15	25,5	–	115	–	149	220	3
100	2,1	2,1	1,5	163	119	156,9	127,3	–	–	–	112	117	130	168	2,1
	2,1	2,1	–	163	119	156,9	127,3	10	15	–	112	–	130	168	2,1
	2,1	2,1	–	163	119	156,9	127,3	–	–	5	112	–	130	168	2,1
	2,1	2,1	3	163	119	156,9	127,3	–	–	–	112	117	130	168	2,1
	2,1	2,1	–	163	119	156,9	127,3	10	16	–	112	–	130	168	2,1
	2,1	2,1	–	163	119	156,9	127,3	–	–	6	112	–	130	168	2,1
	3	3	1,2	191,5	127,5	182	139,4	–	–	–	114	125	143	201	2,5
	3	3	–	191,5	127,5	182	139,4	13	20,5	–	114	–	143	201	2,5
	3	3	–	191,5	127,5	182	139,4	–	–	7,5	114	–	143	201	2,5
	3	3	4,2	191,5	127,5	182	139,4	–	–	–	114	125	143	201	2,5
	3	3	–	191,5	127,5	182	139,4	13	23,5	–	114	–	143	201	2,5
	3	3	–	191,5	127,5	182	139,4	–	–	10,5	114	–	143	201	2,5
	4	4	5,7	211	139	198,2	152,8	–	–	–	120	137	156	230	3
	4	4	–	211	139	198,2	152,8	16	27	–	120	–	156	230	3
105	2,1	2,1	1,3	171,5	125,5	165,1	134,5	–	–	–	117	123	137	178	2,1
	2,1	2,1	–	171,5	125,5	165,1	134,5	10	16	–	117	–	137	178	2,1
	2,1	2,1	–	171,5	125,5	165,1	134,5	–	–	6	117	–	137	178	2,1
	4	4	5,7	220,5	144,5	207,4	158,8	–	–	–	125	143	162	240	3
	4	4	–	220,5	144,5	207,4	158,8	16	27	–	125	–	162	240	3

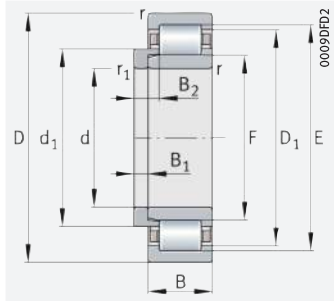
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

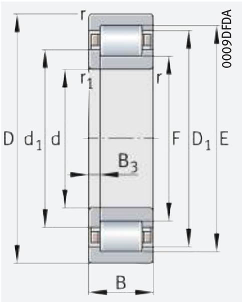


NJ and HJ
Locating bearings

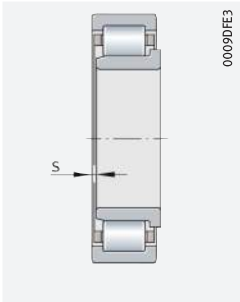
d = 110 – 120 mm

Main dimensions d	D	B	Basic load ratings dyn. C_r N	stat. C_{0r} N	Fatigue limit load C_{ur} N	Limiting speed n_G min^{-1}	Speed rating $n_{\vartheta r}$ min^{-1}	Mass m Bear-ing ≈ kg	L-section ring ≈ kg	Designation ➤425|1.12 ➤426|1.13 X-life ➤415 Bearing	L-section ring
110	200	38	345 000	365 000	59 000	4 100	3 250	4,93	–	**NJ222-E-XL-TVP2**	–
	200	38	345 000	365 000	59 000	4 100	3 250	4,93	0,616	**NJ222-E-XL-TVP2**	**HJ222-E**
	200	38	345 000	365 000	59 000	4 100	3 250	5,02	–	**NUP222-E-XL-TVP2**	–
	200	53	455 000	520 000	86 000	4 100	2 750	6,89	–	**NJ2222-E-XL-TVP2**	–
	200	53	455 000	520 000	86 000	4 100	2 750	6,89	0,647	**NJ2222-E-XL-TVP2**	**HJ2222-E**
	200	53	455 000	520 000	86 000	4 100	2 750	7,02	–	**NUP2222-E-XL-TVP2**	–
	240	50	495 000	475 000	79 000	3 350	3 050	10,3	–	**NJ322-E-XL-TVP2**	–
	240	50	495 000	475 000	79 000	3 350	3 050	10,3	1,21	**NJ322-E-XL-TVP2**	**HJ322-E**
	240	50	495 000	475 000	79 000	3 350	3 050	10,7	–	**NUP322-E-XL-TVP2**	–
	240	80	750 000	800 000	136 000	3 350	2 290	16,9	–	**NJ2322-E-XL-TVP2**	–
	240	80	750 000	800 000	136 000	3 350	2 290	16,9	1,3	**NJ2322-E-XL-TVP2**	**HJ2322-E**
	240	80	750 000	800 000	135 000	3 350	2 290	17,2	–	**NUP2322-E-XL-TVP2**	–
	280	65	680 000	660 000	105 000	3 850	2 550	22,8	–	**NJ422-XL-M1**	–
	280	65	680 000	660 000	105 000	3 850	2 550	22,8	2,1	**NJ422-XL-M1**	**HJ422**
120	215	40	390 000	415 000	68 000	3 750	3 050	5,91	–	**NJ224-E-XL-TVP2**	–
	215	40	390 000	415 000	68 000	3 750	3 050	5,91	0,707	**NJ224-E-XL-TVP2**	**HJ224-E**
	215	40	390 000	415 000	68 000	3 750	3 050	6,02	–	**NUP224-E-XL-TVP2**	–
	215	58	530 000	610 000	103 000	3 750	2 500	8,54	–	**NJ2224-E-XL-TVP2**	–
	215	58	530 000	610 000	103 000	3 750	2 500	8,54	0,75	**NJ2224-E-XL-TVP2**	**HJ2224-E**
	215	58	530 000	610 000	102 000	3 750	2 500	8,7	–	**NUP2224-E-XL-TVP2**	–
	260	55	610 000	600 000	96 000	3 050	2 650	13,5	–	**NJ324-E-XL-TVP2**	–
	260	55	610 000	600 000	96 000	3 050	2 650	13,5	1,41	**NJ324-E-XL-TVP2**	**HJ324-E**
	260	55	610 000	600 000	95 000	3 050	2 650	13,8	–	**NUP324-E-XL-TVP2**	–
	260	86	930 000	1 010 000	166 000	3 950	1 980	23,8	–	**NJ2324-E-XL-M1**	–
	260	86	930 000	1 010 000	166 000	3 950	1 980	23,8	1,49	**NJ2324-E-XL-M1**	**HJ2324-E**
	260	86	930 000	1 010 000	165 000	3 950	1 980	24,1	–	**NUP2324-E-XL-M1**	–
	310	72	850 000	840 000	129 000	3 450	2 200	31,3	–	**NJ424-XL-M1**	–
	310	72	850 000	840 000	129 000	3 450	2 200	31,3	2,61	**NJ424-XL-M1**	**HJ424**

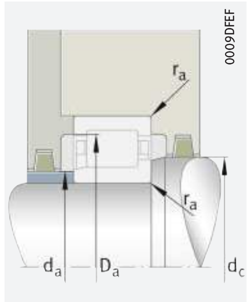
medias ➤ *https://www.schaeffler.de/std/1DB1*



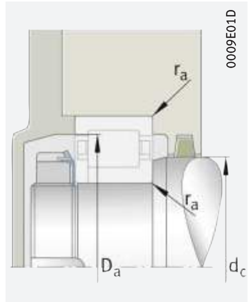
NUP
Locating bearing



Axial displacement “s”
for NJ



Mounting dimensions
for NJ



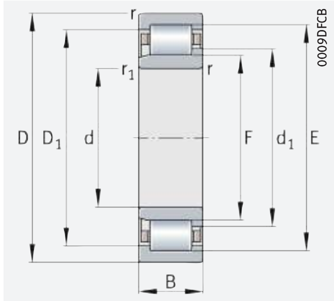
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
110	2,1	2,1	1,5	180,5	132,5	173,8	141,6	–	–	–	122	130	144	188	2,1
	2,1	2,1	–	180,5	132,5	173,8	141,6	11	17	–	122	–	144	188	2,1
	2,1	2,1	–	180,5	132,5	173,8	141,6	–	–	6	122	–	144	188	2,1
	2,1	2,1	4	180,5	132,5	173,8	141,6	–	–	–	122	130	144	188	2,1
	2,1	2,1	–	180,5	132,5	173,8	141,6	11	19,5	–	122	–	144	188	2,1
	2,1	2,1	–	180,5	132,5	173,8	141,6	–	–	8,5	122	–	144	188	2,1
	3	3	1,3	211	143	200,9	155,6	–	–	–	124	140	158	226	2,5
	3	3	–	211	143	200,9	155,6	14	22	–	124	–	158	226	2,5
	3	3	–	211	143	200,9	155,6	–	–	8	124	–	158	226	2,5
	3	3	5,8	211	143	200,9	155,6	–	–	–	124	140	158	226	2,5
	3	3	–	211	143	200,9	155,6	14	26,5	–	124	–	158	226	2,5
	3	3	–	211	143	200,9	155,6	–	–	12,5	124	–	158	226	2,5
	4	4	6,2	235	155	220,9	170,3	–	–	–	130	153	173	260	3
	4	4	–	235	155	220,9	170,3	17	29,5	–	130	–	173	260	3
120	2,1	2,1	1,4	195,5	143,5	187,8	153,2	–	–	–	132	141	156	203	2,1
	2,1	2,1	–	195,5	143,5	187,8	153,2	11	17	–	132	–	156	203	2,1
	2,1	2,1	–	195,5	143,5	187,8	153,2	–	–	6	132	–	156	203	2,1
	2,1	2,1	4,5	195,5	143,5	187,8	153,2	–	–	–	132	141	156	203	2,1
	2,1	2,1	–	195,5	143,5	187,8	153,2	11	20	–	132	–	156	203	2,1
	2,1	2,1	–	195,5	143,5	187,8	153,2	–	–	9	132	–	156	203	2,1
	3	3	3,5	230	154	218,7	168,1	–	–	–	134	151	171	246	2,5
	3	3	–	230	154	218,7	168,1	14	22,5	–	134	–	171	246	2,5
	3	3	–	230	154	218,7	168,1	–	–	8,5	134	–	171	246	2,5
	3	3	7,2	230	154	218,7	168,1	–	–	–	134	151	171	246	2,5
	3	3	–	230	154	218,7	168,1	14	26	–	134	–	171	246	2,5
	3	3	–	230	154	218,7	168,1	–	–	12	134	–	171	246	2,5
	5	5	6,9	260	170	243,9	187,3	–	–	–	144	168	190	286	4
	5	5	–	260	170	243,9	187,3	17	30,5	–	144	–	190	286	4

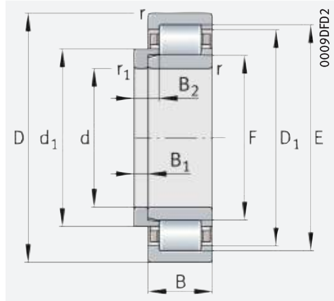
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

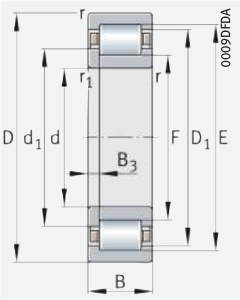


NJ and HJ
Locating bearings

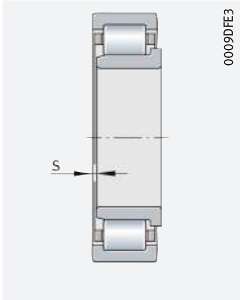
d = 130 – 140 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
130	230	40	425 000	445 000	70 000	3 500	2 800	6,63	–	**NJ226-E-XL-TVP2**	–
	230	40	425 000	445 000	70 000	3 500	2 800	6,63	0,78	**NJ226-E-XL-TVP2**	**HJ226-E**
	230	40	425 000	445 000	70 000	3 500	2 800	6,74	–	**NUP226-E-XL-TVP2**	–
	230	64	620 000	730 000	118 000	3 500	2 280	10,6	–	**NJ2226-E-XL-TVP2**	–
	230	64	620 000	730 000	118 000	3 500	2 280	10,6	0,849	**NJ2226-E-XL-TVP2**	**HJ2226-E**
	230	64	620 000	730 000	118 000	3 500	2 280	10,8	–	**NUP2226-E-XL-TVP2**	–
	280	58	680 000	670 000	105 000	2 850	2 430	16,5	–	**NJ326-E-XL-TVP2**	–
	280	58	680 000	670 000	105 000	2 850	2 430	16,5	1,64	**NJ326-E-XL-TVP2**	**HJ326-E**
	280	58	680 000	670 000	105 000	2 850	2 430	16,7	–	**NUP326-E-XL-TVP2**	–
	280	93	1 080 000	1 220 000	195 000	3 700	1 750	29,2	–	**NJ2326-E-XL-M1**	–
	280	93	1 080 000	1 220 000	195 000	3 700	1 750	29,2	1,77	**NJ2326-E-XL-M1**	**HJ2326-E**
	280	93	1 080 000	1 220 000	194 000	3 700	1 750	29,7	–	**NUP2326-E-XL-M1**	–
140	250	42	460 000	510 000	78 000	4 250	2 600	9,46	–	**NJ228-E-XL-M1**	–
	250	42	460 000	510 000	78 000	4 250	2 600	9,46	0,986	**NJ228-E-XL-M1**	**HJ228-E**
	250	42	460 000	510 000	77 000	4 250	2 600	9,61	–	**NUP228-E-XL-M1**	–
	250	68	670 000	830 000	131 000	4 250	2 050	14,7	–	**NJ2228-E-XL-M1**	–
	250	68	670 000	830 000	131 000	4 250	2 050	14,7	1,08	**NJ2228-E-XL-M1**	**HJ2228-E**
	250	68	670 000	830 000	131 000	4 250	2 050	16,8	–	**NUP2228-E-XL-M1**	–
	300	62	790 000	800 000	124 000	2 650	2 170	20,5	–	**NJ328-E-XL-TVP2**	–
	300	62	790 000	800 000	124 000	2 650	2 170	20,5	2,03	**NJ328-E-XL-TVP2**	**HJ328-E**
	300	62	790 000	800 000	124 000	2 650	2 170	20,8	–	**NUP328-E-XL-TVP2**	–
	300	102	1 210 000	1 390 000	219 000	3 450	1 620	36,6	–	**NJ2328-E-XL-M1**	–
	300	102	1 210 000	1 390 000	219 000	3 450	1 620	36,6	2,2	**NJ2328-E-XL-M1**	**HJ2328-E**
	300	102	1 210 000	1 390 000	217 000	3 450	1 620	37,1	–	**NUP2328-E-XL-M1**	–

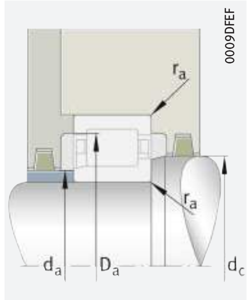
medias ➤ *https://www.schaeffler.de/std/1DB2*



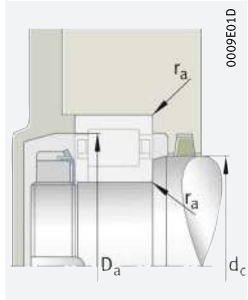
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



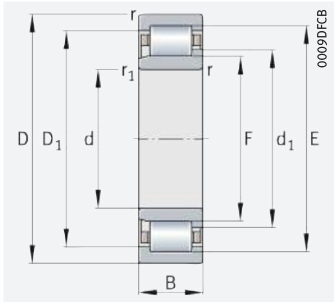
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
130	3	3	1,2	209,5	153,5	201,2	164	–	–	–	144	151	168	216	2,5
	3	3	–	209,5	153,5	201,2	164	11	17	–	144	–	168	216	2,5
	3	3	–	209,5	153,5	201,2	164	–	–	6	144	–	168	216	2,5
	3	3	5,2	209,5	153,5	201,2	164	–	–	–	144	151	168	216	2,5
	3	3	–	209,5	153,5	201,2	164	11	21	–	144	–	168	216	2,5
	3	3	–	209,5	153,5	201,2	164	–	–	10	144	–	168	216	2,5
	4	4	3,5	247	167	235,2	181,7	–	–	–	147	164	184	263	3
	4	4	–	247	167	235,2	181,7	14	23	–	147	–	184	263	3
	4	4	–	247	167	235,2	181,7	–	–	9	147	–	184	263	3
	4	4	8,1	247	167	235,2	181,7	–	–	–	147	164	184	263	3
	4	4	–	247	167	235,2	181,7	14	28	–	147	–	184	263	3
	4	4	–	247	167	235,2	181,7	–	–	14	147	–	184	263	3
140	3	3	3,8	225	169	216,7	179,4	–	–	–	154	166	182	236	2,5
	3	3	–	225	169	216,7	179,4	11	18	–	154	–	182	236	2,5
	3	3	–	225	169	216,7	179,4	–	–	7	154	–	182	236	2,5
	3	3	7	225	169	216,7	179,4	–	–	–	154	166	182	236	2,5
	3	3	–	225	169	216,7	179,4	11	23	–	154	–	182	236	2,5
	3	3	–	225	169	216,7	179,4	–	–	12	154	–	182	236	2,5
	4	4	5,2	264	180	251,7	195,4	–	–	–	157	176	198	283	3
	4	4	–	264	180	251,7	195,4	15	25	–	157	–	198	283	3
	4	4	–	264	180	251,7	195,4	–	–	10	157	–	198	283	3
	4	4	9,2	264	180	251,7	195,4	–	–	–	157	176	198	283	3
	4	4	–	264	180	251,7	195,4	15	31	–	157	–	198	283	3
	4	4	–	264	180	251,7	195,4	–	–	16	157	–	198	283	3

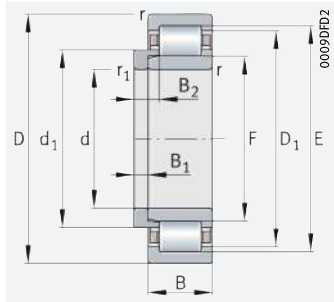
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

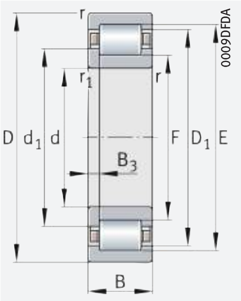


NJ and HJ
Locating bearings

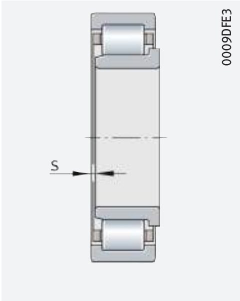
d = 150 – 170 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425 | 1.12 ➤426 | 1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
150	270	45	520 000	590 000	89 000	3 950	2 350	12	–	**NJ230-E-XL-M1**	–
	270	45	520 000	590 000	89 000	3 950	2 350	12	1,26	**NJ230-E-XL-M1**	**HJ230-E**
	270	45	520 000	590 000	89 000	3 950	2 350	12,2	–	**NUP230-E-XL-M1**	–
	270	73	780 000	970 000	152 000	3 950	1 850	18,9	–	**NJ2230-E-XL-M1**	–
	270	73	780 000	970 000	152 000	3 950	1 850	18,9	1,36	**NJ2230-E-XL-M1**	**HJ2230-E**
	270	73	780 000	970 000	152 000	3 950	1 850	19,2	–	**NUP2230-E-XL-M1**	–
	320	65	900 000	930 000	139 000	3 200	1 940	27,4	–	**NJ330-E-XL-M1**	–
	320	65	900 000	930 000	139 000	3 200	1 940	27,4	2,33	**NJ330-E-XL-M1**	**HJ330-E**
	320	65	900 000	930 000	138 000	3 200	1 940	27,8	–	**NUP330-E-XL-M1**	–
	320	108	1 380 000	1 600 000	246 000	3 200	1 460	44,1	–	**NJ2330-E-XL-M1**	–
	320	108	1 380 000	1 600 000	246 000	3 200	1 460	44,1	2,55	**NJ2330-E-XL-M1**	**HJ2330-E**
	320	108	1 380 000	1 600 000	245 000	3 200	1 460	44,8	–	**NUP2330-E-XL-M1**	–
160	290	48	590 000	670 000	101 000	3 650	2 160	14,9	–	**NJ232-E-XL-M1**	–
	290	48	590 000	670 000	101 000	3 650	2 160	14,9	1,47	**NJ232-E-XL-M1**	**HJ232-E**
	290	48	590 000	670 000	101 000	3 650	2 160	15,2	–	**NUP232-E-XL-M1**	–
	290	80	940 000	1 170 000	184 000	3 600	1 660	24,1	–	**NJ2232-E-XL-M1**	–
	290	80	940 000	1 170 000	184 000	3 600	1 660	24,1	1,56	**NJ2232-E-XL-M1**	**HJ2232-E**
	290	80	940 000	1 170 000	183 000	3 600	1 660	24,5	–	**NUP2232-E-XL-M1**	–
	340	68	860 000	1 060 000	128 000	3 000	1 770	32,3	–	**NJ332-E-M1**	–
	340	68	860 000	1 060 000	128 000	3 000	1 770	32,3	2,58	**NJ332-E-M1**	**HJ332-E**
	340	114	1 300 000	1 800 000	225 000	3 000	1 350	52,3	–	**NJ2332-E-M1**	–
	340	114	1 300 000	1 800 000	225 000	3 000	1 350	52,3	2,85	**NJ2332-E-M1**	**HJ2332-E**
170	310	52	700 000	780 000	117 000	3 350	1 970	18,4	–	**NJ234-E-XL-M1**	–
	310	52	700 000	780 000	117 000	3 350	1 970	18,4	1,58	**NJ234-E-XL-M1**	**HJ234-E**
	310	52	700 000	780 000	116 000	3 350	1 970	18,6	–	**NUP234-E-XL-M1**	–
	310	86	1 130 000	1 400 000	213 000	3 300	1 470	29,8	–	**NJ2234-E-XL-M1**	–
	310	86	1 130 000	1 400 000	213 000	3 300	1 470	29,8	1,78	**NJ2234-E-XL-M1**	**HJ2234-E**
	310	86	1 130 000	1 400 000	212 000	3 300	1 470	30,2	–	**NUP2234-E-XL-M1**	–
	360	72	960 000	1 210 000	138 000	2 800	1 610	38,6	–	**NJ334-E-TB-M1**	–
	360	72	960 000	1 210 000	138 000	2 800	1 610	38,6	3,21	**NJ334-E-TB-M1**	**HJ334-E**
	360	120	1 490 000	2 070 000	227 000	2 800	1 210	62,3	–	**NJ2334-EX-TB-M1**	–
	360	120	1 490 000	2 070 000	227 000	2 800	1 210	62,3	3,53	**NJ2334-EX-TB-M1**	**HJ2334-E**

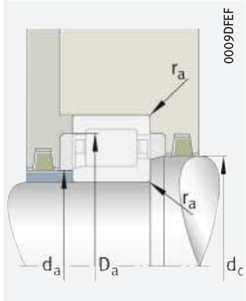
medias ➤ *https://www.schaeffler.de/std/1DB3*



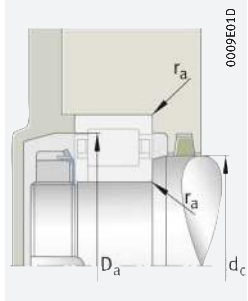
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



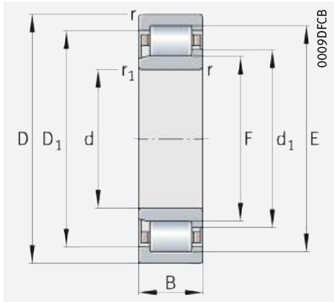
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
150	3	3	4	242	182	233,2	193,1	–	–	–	164	179	196	256	2,5
	3	3	–	242	182	233,2	193,1	12	19,5	–	164	–	196	256	2,5
	3	3	–	242	182	233,2	193,1	–	–	7,5	164	–	196	256	2,5
	3	3	7,5	242	182	233,2	193,1	–	–	–	164	179	196	256	2,5
	3	3	–	242	182	233,2	193,1	12	24,5	–	164	–	196	256	2,5
	3	3	–	242	182	233,2	193,1	–	–	12,5	164	–	196	256	2,5
	4	4	5,5	283	193	269,8	209,5	–	–	–	167	190	213	303	3
	4	4	–	283	193	269,8	209,5	15	25	–	167	–	213	303	3
	4	4	–	283	193	269,8	209,5	–	–	10	167	–	213	303	3
	4	4	9,7	283	193	269,8	209,5	–	–	–	167	190	213	303	3
	4	4	–	283	193	269,8	209,5	15	31,5	–	167	–	213	303	3
	4	4	–	283	193	269,8	209,5	–	–	16,5	167	–	213	303	3
160	3	3	4,1	259	195	249,6	206,8	–	–	–	174	192	210	276	2,5
	3	3	–	259	195	249,6	206,8	12	20	–	174	–	210	276	2,5
	3	3	–	259	195	249,6	206,8	–	–	8	174	–	210	276	2,5
	3	3	7,2	261	193	251,1	205,5	–	–	–	174	192	210	276	2,5
	3	3	–	261	193	251,1	205,5	12	24,5	–	174	–	210	276	2,5
	3	3	–	261	193	251,1	205,5	–	–	12,5	174	–	210	276	2,5
	4	4	5,6	300	204	286	221,6	–	–	–	177	200	228	323	3
	4	4	–	300	204	286	221,6	15	25	–	177	–	228	323	3
	4	4	9,9	300	204	286	221,6	–	–	–	177	200	228	323	3
	4	4	–	300	204	286	221,6	15	32	–	177	–	228	323	3
170	4	4	4,3	279	207	268,5	218,4	–	–	–	187	204	223	293	3
	4	4	–	279	207	268,5	218,4	12	20	–	187	–	223	293	3
	4	4	–	279	207	268,5	218,4	–	–	8	187	–	223	293	3
	4	4	7,2	281	205	269,9	219	–	–	–	187	204	223	293	3
	4	4	–	281	205	269,9	219	12	24	–	187	–	223	293	3
	4	4	–	281	205	269,9	219	–	–	12	187	–	223	293	3
	4	4	6	–	218	298	238	–	–	–	187	215	240	343	3
	4	4	–	–	218	298	238	16	27	–	187	–	240	343	3
	4	4	10,2	–	216	299,2	236,8	–	–	–	187	214	238,3	343	3
	4	4	–	–	216	299,2	236,8	16	33,5	–	187	–	238,3	343	3

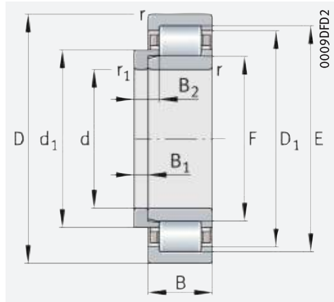
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

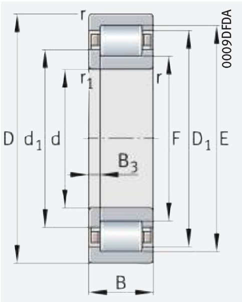


NJ and HJ
Locating bearings

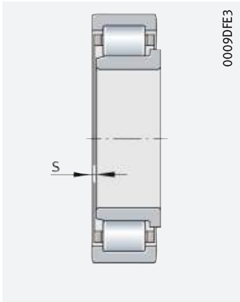
d = 180 – 200 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425 | 1.12 ➤426 | 1.13 X-life ➤415	
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	L-section ring ≈ kg	Bearing	L-section ring
180	320	52	730 000	830 000	122 000	3 250	1 850	19,2	–	**NJ236-E-XL-M1**	–
	320	52	730 000	830 000	122 000	3 250	1 850	19,2	1,76	**NJ236-E-XL-M1**	**HJ236-E**
	320	52	730 000	830 000	122 000	3 250	1 850	17,3	–	**NUP236-E-XL-M1**	**–**
	320	86	1 180 000	1 490 000	225 000	3 200	1 380	31,1	–	**NJ2236-E-XL-M1**	–
	320	86	1 180 000	1 490 000	225 000	3 200	1 380	31,1	1,87	**NJ2236-E-XL-M1**	**HJ2236-E**
	320	86	1 180 000	1 490 000	223 000	3 200	1 380	31,6	–	**NUP2236-E-XL-M1**	**–**
	380	75	1 040 000	1 320 000	143 000	2 650	1 500	44,6	–	**NJ336-E-TB-M1**	–
	380	75	1 040 000	1 320 000	143 000	2 650	1 500	44,6	3,77	**NJ336-E-TB-M1**	**HJ336-E**
	380	126	1 680 000	2 330 000	255 000	2 600	1 120	72,9	–	**NJ2336-EX-TB-M1**	–
	380	126	1 680 000	2 330 000	255 000	2 600	1 120	72,9	4,05	**NJ2336-EX-TB-M1**	**HJ2336-E**
190	340	55	680 000	930 000	111 000	3 050	1 720	23,2	–	**NJ238-E-M1**	–
	340	55	680 000	930 000	111 000	3 050	1 720	23,2	2,17	**NJ238-E-M1**	**HJ238-E**
	340	55	680 000	930 000	111 000	3 050	1 720	23,5	–	**NUP238-E-M1**	**–**
	340	92	1 090 000	1 650 000	201 000	3 000	1 290	37,7	–	**NJ2238-E-M1**	–
	340	92	1 090 000	1 650 000	201 000	3 000	1 290	37,7	2,31	**NJ2238-E-M1**	**HJ2238-E**
	400	132	1 890 000	2 650 000	285 000	2 440	1 010	84,4	–	**NJ2338-EX-TB-M1**	–
	400	132	1 890 000	2 650 000	285 000	2 440	1 010	84,4	4,8	**NJ2338-EX-TB-M1**	**HJ2338-E**
200	360	58	750 000	1 040 000	122 000	2 900	1 600	27,5	–	**NJ240-E-M1**	–
	360	58	750 000	1 040 000	122 000	2 900	1 600	27,5	2,62	**NJ240-E-M1**	**HJ240-E**
	360	58	750 000	1 040 000	121 000	2 900	1 600	28	–	**NUP240-E-M1**	**–**
	360	98	1 220 000	1 880 000	225 000	2 850	1 180	45,3	–	**NJ2240-E-M1**	–
	360	98	1 220 000	1 880 000	225 000	2 850	1 180	45,3	2,78	**NJ2240-E-M1**	**HJ2240-E**
	420	80	1 180 000	1 520 000	162 000	2 410	1 320	58,1	–	**NJ340-E-TB-M1**	–
	420	80	1 180 000	1 520 000	162 000	2 410	1 320	58,1	4,94	**NJ340-E-TB-M1**	**HJ340-E**
	420	138	2 040 000	2 900 000	310 000	2 330	940	97,2	–	**NJ2340-EX-TB-M1**	–
	420	138	2 040 000	2 900 000	310 000	2 330	940	97,2	5,28	**NJ2340-EX-TB-M1**	**HJ2340-E**

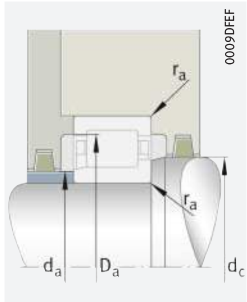
medias ➤ *https://www.schaeffler.de/std/1DB4*



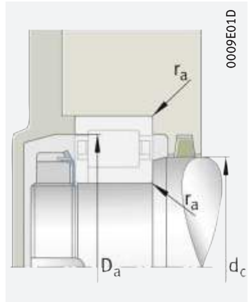
NUP
Locating bearing



Axial displacement "s"
for NJ



Mounting dimensions
for NJ



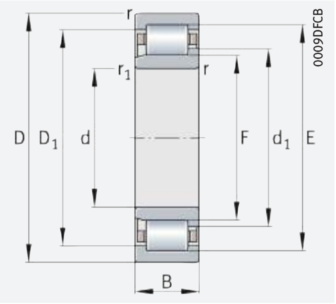
Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
180	4	4	4,7	289	217	278,6	230,2	–	–	–	197	214	233	303	3
	4	4	–	289	217	278,6	230,2	12	20	–	197	–	233	303	3
	4	4	–	289	217	278,6	230,2	–	–	8	197	–	233	303	3
	4	4	7,2	291	215	280	229	–	–	–	197	214	233	303	3
	4	4	–	291	215	280	229	12	24	–	197	–	233	303	3
	4	4	–	291	215	280	229	–	–	12	197	–	233	303	3
	4	4	6,1	–	231	314,2	251,8	–	–	–	197	228	254	363	3
	4	4	–	–	231	314,2	251,8	17	28,5	–	197	–	254	363	3
	4	4	10,5	–	227	316,6	249,4	–	–	–	197	225	250,6	363	3
	4	4	–	–	227	316,6	249,4	17	35	–	197	–	250,6	363	3
190	4	4	4,7	306	230	295	244	–	–	–	207	227	247	323	3
	4	4	–	306	230	295	244	13	21,5	–	207	–	247	323	3
	4	4	–	306	230	295	244	–	–	8,5	207	–	247	323	3
	4	4	8	308	228	296,4	242,7	–	–	–	207	227	247	323	3
	4	4	–	308	228	296,4	242,7	13	26,5	–	207	–	247	323	3
	5	5	11	–	240	336	264	–	–	–	210	237,8	265,3	380	4
	5	5	–	–	240	336	264	18	36,5	–	210	–	265,3	380	4
200	4	4	4,8	323	243	311,5	257,6	–	–	–	217	240	261	343	3
	4	4	–	323	243	311,5	257,6	14	23	–	217	–	261	343	3
	4	4	–	323	243	311,5	257,6	–	–	9	217	–	261	343	3
	4	4	8,2	325	241	312,9	256,3	–	–	–	217	240	261	343	3
	4	4	–	325	241	312,9	256,3	14	28	–	217	–	261	343	3
	5	5	6,3	–	258	347,6	280,4	–	–	–	220	255	282	400	4
	5	5	–	–	258	347,6	280,4	18	30	–	220	–	282	400	4
	5	5	11,3	–	253	352,2	277,8	–	–	–	220	250,7	279	400	4
	5	5	–	–	253	352,2	277,8	18	37	–	220	–	279	400	4

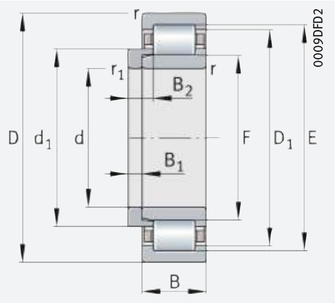
[1] Under axial load, observe the dimensions D_1 and d_1.

Cylindrical roller bearings with cage

Semi-locating bearings, locating bearings



NJ
Semi-locating bearing

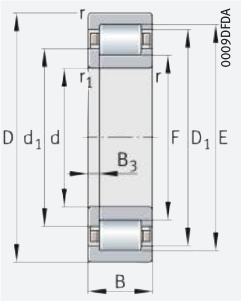


NJ and HJ
Locating bearings

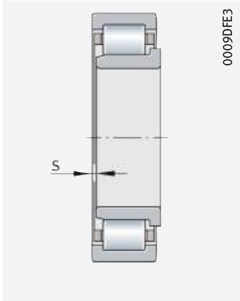
d = 220 – 280 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass m		Designation ➤425|1.12 ➤426|1.13	
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	Bear-ing	L-section ring	Bearing	L-section ring
			N	N	N	min^{-1}	min^{-1}	≈ kg	≈ kg		
220	400	65	950 000	1 330 000	150 000	2 600	1 380	38,7	–	**NJ244-E-M1**	–
	400	65	950 000	1 330 000	150 000	2 600	1 380	38,7	3,55	**NJ244-E-M1**	**HJ244-E**
	400	65	950 000	1 330 000	150 000	2 600	1 380	39,3	–	**NUP244-E-M1**	–
	400	108	1 630 000	2 370 000	250 000	2 440	1 000	63,4	–	**NUP2244-EX-TB-M1**	–
	460	145	2 350 000	3 350 000	345 000	2 110	830	124	–	**NUP2344-EX-TB-M1**	–
240	440	72	1 140 000	1 610 000	171 000	2 320	1 220	52,5	–	**NJ248-E-TB-M1**	–
	440	72	1 140 000	1 610 000	171 000	2 320	1 220	52,5	4,6	**NJ248-E-TB-M1**	**HJ248-E**
	500	95	1 720 000	2 280 000	234 000	1 980	1 000	97	–	**NJ348-E-TB-M1**	–
	500	95	1 720 000	2 280 000	234 000	1 980	1 000	97	8,3	**NJ348-E-TB-M1**	**HJ348-E**
260	480	80	1 350 000	1 890 000	192 000	2 100	1 110	69,4	–	**NJ252-E-TB-M1**	–
	480	80	1 350 000	1 890 000	192 000	2 100	1 110	69,4	5,92	**NJ252-E-TB-M1**	**HJ252-E**
280	580	108	2 180 000	3 050 000	290 000	1 700	790	149	–	**NJ356-E-TB-M1**	–
	580	108	2 180 000	3 050 000	290 000	1 700	790	149	13,7	**NJ356-E-TB-M1**	**HJ356-E**

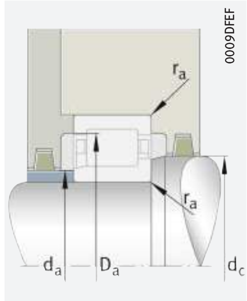
medias ➤ *https://www.schaeffler.de/std/1DB5*



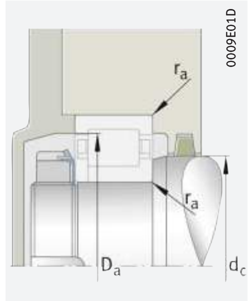
NUP
Locating bearing



Axial displacement “s”
for NJ



Mounting dimensions
for NJ



Mounting dimensions
for NUP

Dimensions											Mounting dimensions				
d	r	r_1	s	E	F	D_1	d_1	B_1	B_2	B_3	d_a		d_c	D_a	r_a
	min.	min.				≈	≈				min.[1]	max.	min.	max.[1]	max.
220	4	4	5,5	358	268	344,9	285,2	–	–	–	237	265	288	383	3
	4	4	–	358	268	344,9	285,2	15	25	–	237	–	288	383	3
	4	4	–	358	268	344,9	285,2	–	–	10	237	–	288	383	3
	4	4	–	367	259	345,4	280,6	–	–	14	237	–	282,3	383	3
	5	5	–	413	277	385,8	304,2	–	–	20	240	–	305,1	440	4
240	4	4	6	–	293	373	313	–	–	–	257	290	315	423	3
	4	4	–	–	293	373	313	16	27	–	257	–	315	423	3
	5	5	7,4	–	306	414,8	333,2	–	–	–	260	303	335	480	4
	5	5	–	–	306	414,8	333,2	22	35,5	–	260	–	335	480	4
260	5	5	6,2	–	317	406,6	339,7	–	–	–	280	314	341	460	4
	5	5	–	–	317	406,6	339,7	18	30	–	280	–	341	460	4
280	6	6	8,7	–	362	482	392	–	–	–	306	359	393,4	554	5
	6	6	–	–	362	482	392	26	42,5	–	306	–	393,4	554	5

[1] Under axial load, observe the dimensions D_1 and d_1.

2 Cylindrical roller bearings with disc cage or with spacers

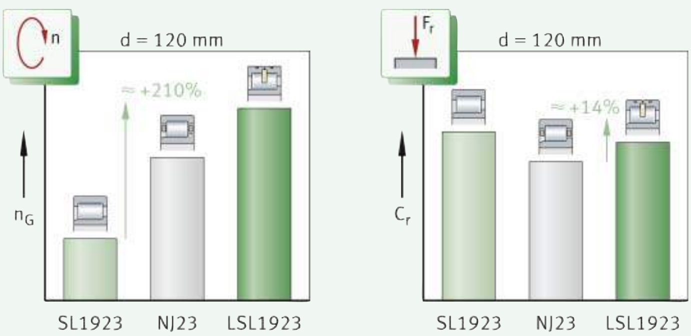
Cylindrical roller bearings with disc cage/with spacers are suitable where:

- bearing arrangements are subjected to very high radial loads and higher speeds occur ➤*480*|*2.2*, ➤*484*|*2.6*
- high dynamic inertia forces are present
- not only high radial forces but also axial loads from one direction must be supported by the bearing position (semi-locating bearing function) ➤*480*|*2.2*
- high shock loads occur
- thermally stable conditions are required in the bearing even at higher speeds
- the cages are subjected to high dynamic inertia forces; e.g. in vibratory machinery
- axial displacements of the shaft relative to the housing must be compensated without constraint in the bearing
- the bearings should be separable for easier mounting; in vibratory machinery, for example, the bearing ring with circumferential load as well as the ring with point load should have a tight fit ➤*478*|*2.1*, ➤*492*|*2.17*.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*410*.

1
Cylindrical roller bearing with full complement bearing/standard cage/disc cage, comparison of speed and load carrying capacity

n_G = *limiting speed*
C_r = *basic dynamic load rating*
SL1923 = *full complement cylindrical roller bearing*
NJ23 = *cylindrical roller bearing with standard cage*
LSL1923 = *cylindrical roller bearing with disc cage*



2.1 Bearing design

Design variants

These cylindrical roller bearings are available as:

- type LSL1923 (bearing with disc cage) ➤*479*|*2*
- type ZSL1923 (bearing with spacers) ➤*479*|*3*
- special design for vibratory machinery ➤*480*
- X-life bearings ➤*480*.

Basic design – standard range

✎ LSL1923 and ZSL1923 correspond to dimension series 23

Cylindrical roller bearings with disc cage or with spacers are part of the group of radial roller bearings and correspond to dimension series 23. These single row bearings comprise radially split outer rings, removable inner rings, disc cages or spacers and cylindrical rollers. The rollers have profiled ends, i.e. they have a slight lateral curvature towards the ends. This modified line contact between the rolling elements and raceways prevents damaging edge stresses ➤413|⊕2.
For mounting of the bearings, the inner ring can be removed.

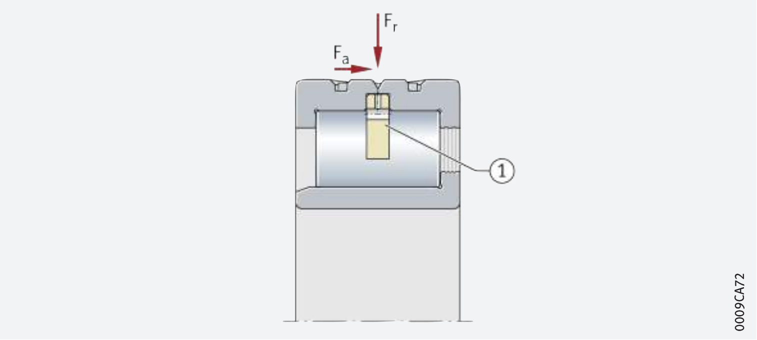
Series LSL1923 – bearings with disc cage

✎ Bearings with semi-locating bearing function

Cylindrical roller bearings LSL1923 have two rigid ribs on the outer ring and one rigid rib on the inner ring. An externally-guided flat brass disc cage prevents the rolling elements from coming into contact with each other during rolling ➤479|⊕2 and ➤486|2.9. The disc cage has pockets in which the rolling elements run. The rollers are guided between the ribs on the outer ring. The outer ring is axially split and held together by fasteners. Due to their design configuration, the bearings permit axial displacements of the shaft relative to the housing in one direction. In the opposite direction, they act as locating bearings. The maximum axial displacement s is given in the product tables.

⊕2
Cylindrical roller bearing with disc cage

F_r = radial load
F_a = axial load
① Brass disc cage



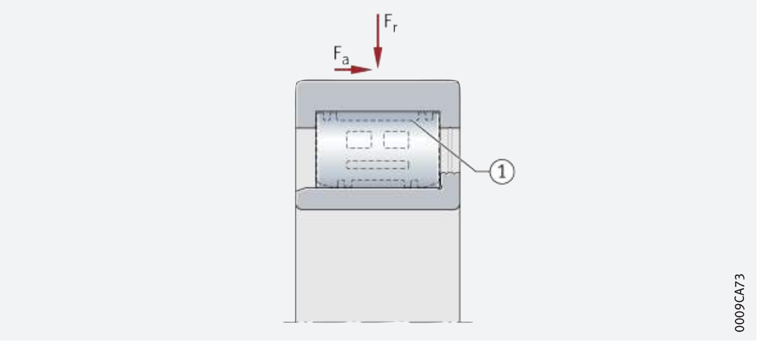
Series ZSL1923 – bearings with spacers

✎ Bearings with semi-locating bearing function

In the case of cylindrical roller bearings ZSL1923, plastic spacers prevent the rollers from coming into contact with each other during rolling ➤479|⊕3 and ➤486|2.9. The spacers are guided axially between the ribs on the outer ring. They are designed such that the rolling element set is self-retaining, so the outer ring with the rolling element set and the inner ring can be mounted separately from each other. Due to their design configuration, the bearings permit axial displacements of the shaft relative to the housing in one direction. In the opposite direction, they act as locating bearings. The maximum axial displacement s is given in the product tables.

⊕3
Cylindrical roller bearing with spacers

F_r = radial load
F_a = axial load
① Plastic spacers



Special design of bearings LSL and ZSL for vibratory machinery

In addition to high basic dynamic load ratings C_r (and thus long rating life values), bearings for vibratory machinery must also be able to compensate or support considerable shaft tilting due to load or misalignment.
The cylindrical roller bearings LSL and ZSL are therefore also available by agreement in the BIR design ➤488|▦4. In these bearings, the inner ring raceway is ground slightly spherical.

X-life premium quality

X-life

Many sizes of the bearings are also available as X-life bearings. These bearings exhibit considerably higher performance than comparable standard cylindrical roller bearings. This is achieved, for example, through the modified internal construction, the optimised contact geometry between the rollers and raceways, better surface quality and the optimised roller guidance and lubricant film formation.

✎ Increased customer benefits due to X-life

These technical enhancements offer a range of advantages, such as:
- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings
- a higher fatigue limit load
- lower heat generation in the bearing
- lower lubricant consumption and therefore longer maintenance intervals if relubrication is carried out
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

✎ Interchangeable with comparable standard bearings

Since X-life cylindrical roller bearings have the same dimensions as the corresponding standard bearings, the latter can be replaced without any problems by the higher-performance X-life bearings. The major advantages of X-life can therefore also be used for existing bearing arrangements with standard bearings.

✎ Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

✎ Suffix XL

X-life cylindrical roller bearings include the suffix XL in the designation ➤488|2.12 and ➤494|▦.

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤10.

2.2 Load carrying capacity

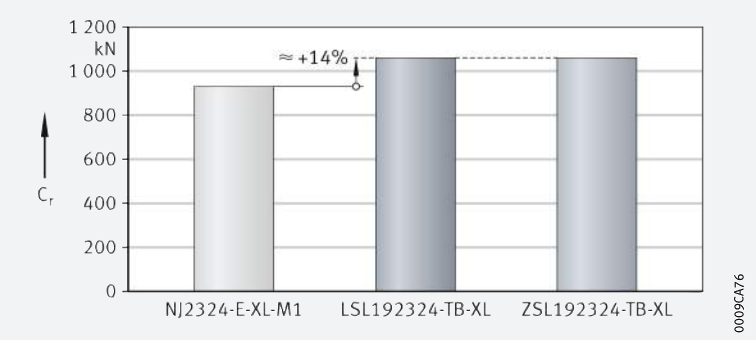
✎ Designed for high radial loads

Cylindrical roller bearings LSL and ZSL are used as semi-locating bearings. These bearings can support not only high radial forces but also axial loads in one direction; i.e. they can guide the shaft axially in one direction. Furthermore, they can withstand high shock loads, vibrations and accelerations.

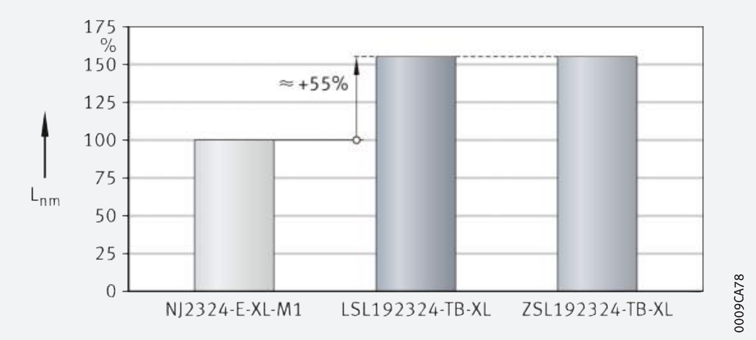
✎ Higher basic dynamic load ratings lead to an increase in basic rating life

Due to the internal construction, the bearings can acommodate more rolling elements than conventional cylindrical roller bearings. As a result, there is a significant increase in the basic dynamic and static load rating and thus the basic rating life compared with conventional cylindrical roller bearings. ➤481|4 shows a comparison of the basic dynamic load rating C_r between a cylindrical roller bearing NJ2324 with a conventional cage, a bearing with a disc cage and a bearing with spacers. The advantage in basic dynamic load rating of approx. 14% gives an increase in the basic rating life of approx. 55% ➤481|5.

4
Comparison of basic dynamic load ratings – conventional cylindrical roller bearing NJ2324 with LSL192324 and ZSL192324



5
Comparison of basic percentage rating life – conventional cylindrical roller bearing NJ2324 with LSL192324 and ZSL192324



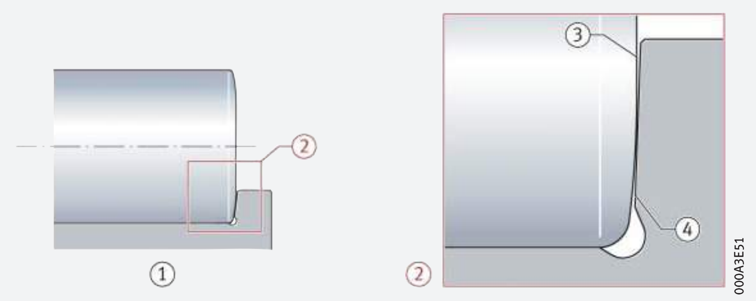
Higher axial load carrying capacity of bearings with toroidal crowned roller end face

✎ Neither wear nor fatigue occurs on the rib contact running and roller end faces

In the case of cylindrical roller bearings with toroidal crowned rollers (TB design), the axial load carrying capacity has been significantly improved with the aid of new calculation and manufacturing methods. A special curvature of the roller end faces facilitates optimum contact conditions between the rollers and ribs ➤481| 6. As a result, the axial contact pressures on the rib are significantly minimised and a lubricant film capable of supporting higher loads is formed. Under standard operating conditions, this completely eliminates wear and fatigue at the rib contact running and roller end faces. In addition, the frictional torque is reduced by up to 50%. The bearing temperature during operation is therefore significantly lower. Bearings of the toroidal crowned design are available for a bore diameter of, or larger than, d = 90 mm ➤494|.

6
Contact geometry of roller end face/rib face – modified roller end faces

1. *Cylindrical roller with inner ring*
2. *Detail (representation not to scale)*
3. *End of roller*
4. *Rib*



Load ratio F_a/F_r

✎ Ratio $F_a/F_r \leqq 0{,}4$ or 0,6

The bearings can support axial loads on one side by means of the ribs on the inner and outer ring ➤482| 7. In order to ensure problem-free running (tilting of the rollers is prevented), they must always be subjected to radial load at the same time as axial load. The ratio F_a/F_r must not exceed the value 0,4. For bearings with toroidal crowned roller ends (TB design), values up to 0,6 are permissible.

! Continuous axial loading without simultaneous radial loading is not permissible.

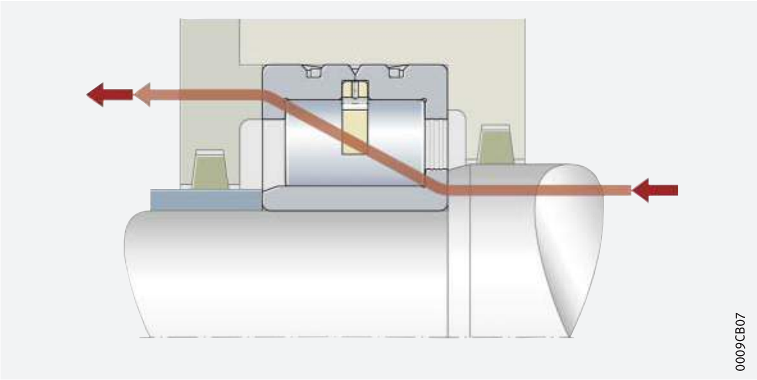
Permissible axial load

Influencing factors on the axial load carrying capacity

Axial loads are supported by the bearing ribs and the roller end faces ➤*482*| *7* and ➤*492*| *13*. The axial load carrying capacity of the bearing is therefore essentially dependent on:

- the size of the sliding surfaces between the ribs and the end faces of the rolling elements
- the sliding velocity at the ribs
- the lubrication of the contact surfaces
- tilting of the bearing
- friction.

7
Force flow under axial load – semi-locating bearing LSL1923



Calculation of permissible axial load – cylindrical rollers with conventional roller ends

Bearings with standard roller ends

The permissible axial load $F_{a\ per}$ can be calculated from the hydrodynamic load carrying capacity of the contact ➤*482*| *1*.

1
Permissible axial load – bearings of standard design

$$F_{a\ per} = k_S \cdot k_B \cdot d_M^{1,54} \cdot n^{-0,6} \leqq F_{a\ max}$$

Legend

$F_{a\ per}$	N	Permissible continuous axial load. In order to prevent unacceptably high temperatures in the bearing, $F_{a\ per}$ must not be exceeded
$F_{a\ max}$	N	Maximum continuous axial load in relation to rib fracture. In order to prevent unacceptably high pressures at the contact surfaces, $F_{a\ max}$ must not be exceeded
k_S	–	Factor as a function of lubrication method ➤*482*| *1*. The factor takes into consideration the lubrication method used for the bearing. The better the lubrication and, in particular, the heat dissipation, the higher the permissible axial load
k_B	–	Factor as a function of the bearing series, $k_B = 28$
d_M	mm	Mean bearing diameter $d_M = (D + d)/2$ ➤*494*|
n	min^{-1}	Operating speed.

1
Factor k_S

Lubrication method	Factor k_S	
	from	up to
Minimal heat dissipation, drip feed oil lubrication, oil mist lubrication, low operating viscosity ($\nu < 0,5 \cdot \nu_1$)	7,5	10
Poor heat dissipation, oil sump lubrication, oil spray lubrication, low oil flow	10	15
Good heat dissipation, recirculating oil lubrication (pressurised oil lubrication)	12	18
Very good heat dissipation, recirculating oil lubrication with oil cooling, high operating viscosity ($\nu > 2 \cdot \nu_1$)	16	24

The precondition for these k_S values is an operating viscosity of the lubricant of at least the reference viscosity ν_1 in accordance with DIN ISO 281:2010.

Doped lubricating oils should be used, such as CLP (DIN 51517) and HLP (DIN 51524) of ISO VG grades 32 to 460, as well as ATF oils (DIN 51502) and transmission oils (DIN 51512) of SAE viscosity grades 75W to 140W.

Calculation of permissible axial load – cylindrical rollers with toroidal roller ends

✎ Higher axial loads possible

For bearings with toroidal roller ends, the permissible axial loads are 50% higher ➤483| 2.

2
Permissible axial load – bearings of TB design

$$F_{a\,per} = 1{,}5 \cdot k_S \cdot k_B \cdot d_M^{\,1{,}54} \cdot n^{-0{,}6} \leqq F_{a\,max}$$

Calculation of maximum permissible axial load

For bearings with rollers of the standard or TB design, the maximum permissible axial load $F_{a\,max}$ ➤483| 3 is calculated from the rib strength and the security against wear. This must not be exceeded, even if $F_{a\,per}$ gives higher values ➤483| 4.

3
Maximum axial load – bearings of standard and TB design

$$F_{a\,max} = 0{,}075 \cdot k_B \cdot d_M^{\,2{,}1}$$

4
Permissible axial load

$$F_{a\,per} \leqq F_{a\,max}$$

Axial load under shaft deflection

✎ Permissible axial load under shaft deflection of up to 2′

Under considerable shaft deflection, the shaft shoulder presses against the inner ring rib. In combination with the active axial load, this can lead to high alternating loading of the inner ring ribs. Under a shaft deflection of up to 2′, the permissible axial load can be estimated ➤483| 5.

If more severe tilting is present, a separate strength analysis is required. In this case, please contact Schaeffler.

5
Axial load under misalignment

$$F_{as} = 20 \cdot d_M^{\,1{,}42}$$

Legend

F_{as}	N	Permissible axial load under misalignment.

2.3 Compensation of angular misalignments

✎ Angular deviations are misalignments between the inner and outer ring

The permissible misalignment between the inner ring and outer ring is influenced by the internal bearing construction, the operating clearance, the forces acting on the bearings etc. Due to these complex relationships, it is not possible to give generally valid absolute values here.
However, misalignments (angular deviations) between the inner ring and outer ring will generally always have an effect on the running noise and the operating life of the bearings.

✎ Permissible tilting

The permissible guide value at which, based on experience, there is no significant reduction in operating life is 3′.

✎ *Scope of value*

The value applies to:

- bearing arrangements with static misalignment (consistent position of the shaft and housing axis)
- bearings that are not required to perform an axial guidance function
- bearings subjected to small loads (with $C_{0r}/P \geqq 5$).

Checking by means of the calculation program BEARINX is recommended in all cases. If there is any uncertainty regarding possible misalignment, please consult Schaeffler.

2.4 Lubrication

✎ *Oil or grease lubrication is possible*

The cylindrical roller bearings are not greased. They must be lubricated with oil or grease.

✎ *Pay attention to the compatibility of the lubricant with plastic*

When using bearings with plastic spacers, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

✎ *Observe oil change intervals*

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

2.5 Sealing

✎ *Provide seals in the adjacent construction*

The bearings are not sealed, i.e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

2.6 Speeds

✎ *Limiting speeds and reference speeds in the product tables*

The product tables give two speeds for most bearings ➤*494*|:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤*64*.

Reference speeds

✎ *$n_{\vartheta r}$ is used to calculate n_ϑ*

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤*64*.

2.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

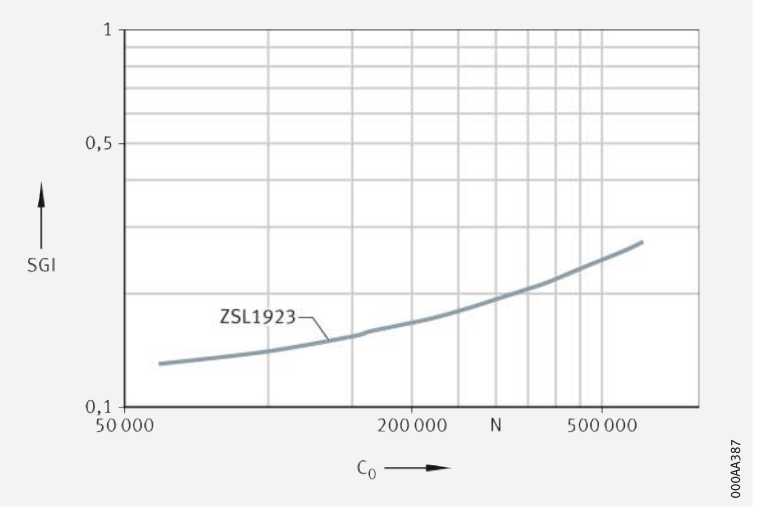
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

8
Schaeffler Noise Index for cylindrical roller bearings with spacers

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



2.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and cylindrical rollers
- the cage (disc cage or spacers)
- the lubricant.

Possible operating temperatures of bearings ➤486| 2.

2
Permissible temperature ranges

Operating temperature	Cylindrical roller bearings with disc cage or with spacers
	−30 °C to +120 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

2.9 Cages

Bearings with a disc cage or spacers are suitable for applications with high dynamic inertia forces

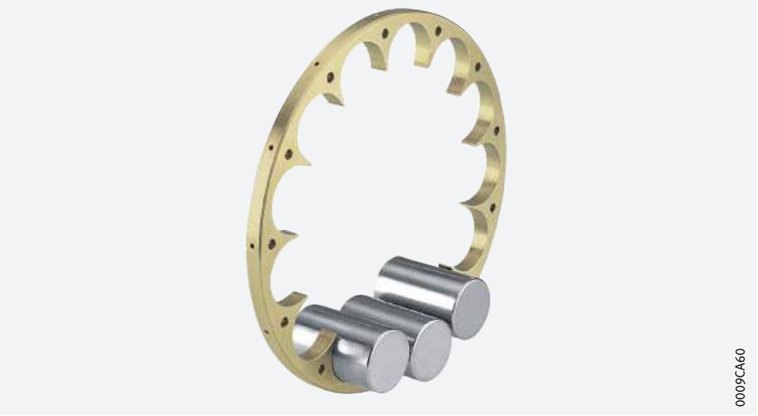
In addition to the actual task of a bearing cage, which is to hold rolling elements apart from each other, a cage designed for vibrations (e.g. for use in vibratory machinery) must be able to support, on a fatigue-resistant basis, principally the inertia forces that act on the cage due to its own mass, as well as the inertia forces of the rolling elements that act directly on the cage pockets. Since these applications also call for very high basic load ratings, conventional cages can only support this requirement under very limited conditions. As a result, bearings with a brass disc cage or plastic spacers have been developed, which constitute a transition from full complement bearings to conventional cage bearings.

Disc cage

Rolling elements are held by the cage

This cage is designed as a flat disc ➤486| 9. Facing towards the inside diameter are rolling element pockets that support the rolling elements. The cage inside diameter is extended downwards to below the pitch circle line. This gives retention of the rolling elements, i.e. the inner ring can be mounted separately from the rest of the bearing. Facing the outside diameter, the disc cage is seated concentrically between the ribs in a slot in the outer ring.

9
Rollers and solid brass disc cage



Spacers

✎ Lower bearing frictional torque due to the geometry of the spacers

The plastic spacers were developed specially for the series ZSL1923 ➤487|10. They are designed such that the rolling element set is self-retaining, i.e. the bearing and inner ring can be mounted separately from each other.

10
Rollers and plastic spacers

2.10 Internal clearance

Radial internal clearance

✎ The standard is CN

As standard, cylindrical roller bearings with disc cage or with spacers have the radial internal clearance CN (normal) ➤487|3. CN is not stated in the designation.

When used in vibratory machinery, both bearing rings have a tight fit. As a result, and due to the temperature differential between the inner ring and outer ring, the internal clearance C4 is generally necessary. As standard, bearings for vibratory machinery therefore have this internal clearance group.

Certain sizes are also available by agreement with the larger internal clearance C3, C4 and C5 ➤487|3.

DIN ISO

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤487|3. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

3
Radial internal clearance of cylindrical roller bearings with disc cage or with spacers

Nominal bore diameter d mm		Radial internal clearance CN (Group N) µm		C3 (Group 3) µm		C4 (Group 4) µm		C5 (Group 5) µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	20	45	35	60	50	75	65	90
24	30	20	45	35	60	50	75	70	95
30	40	25	50	45	70	60	85	80	105
40	50	30	60	50	80	70	100	95	125
50	65	40	70	60	90	80	110	110	140
65	80	40	75	65	100	90	125	130	165
80	100	50	85	75	110	105	140	155	190
100	120	50	90	85	125	125	165	180	200
120	140	60	105	100	145	145	190	200	245
140	160	70	120	115	165	165	215	225	275
160	180	75	125	120	170	170	220	250	300
180	200	90	145	140	195	195	250	275	330
200	225	105	165	160	220	220	280	305	365
225	250	110	175	170	235	235	300	330	395
250	280	125	195	190	260	260	330	370	440
280	315	130	205	200	275	275	350	410	485

2.11 Dimensions, tolerances

Dimension standards

The main dimensions of cylindrical roller bearings correspond to ISO 15:2017 (DIN 616:2000 and DIN 5412-1:2005).

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤*135*|*7.11*. Nominal value of chamfer dimension ➤*494*|▦.

Tolerances

The dimensional and running tolerances correspond to the tolerance class Normal in accordance with ISO 492:2014.
Tolerance values in accordance with ISO 492 ➤*122*|▦*8*.

2.12 Suffixes

For a description of the suffixes used in this chapter ➤*488*|▦*4* and ***medias*** interchange ➤ *https://www.schaeffler.de/std/1D52*.

▦*4*
Suffixes and corresponding descriptions

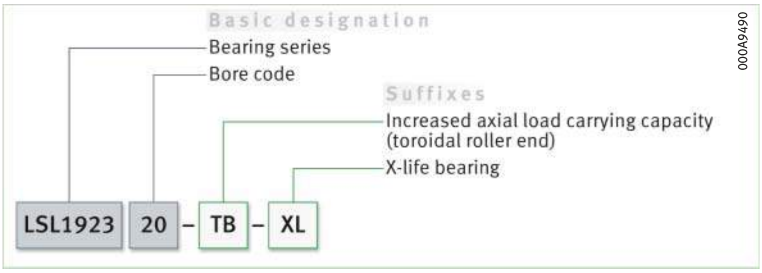
Suffix	Description of suffix	
BIR	Inner ring raceway ground slightly spherical	Available by agreement
BR	Black oxide coated	
C3	Radial internal clearance C3 (larger than normal)	
C4	Radial internal clearance C4 (larger than C3)	
C5	Radial internal clearance C5 (larger than C4)	
TB	Bearing with increased axial load carrying capacity	Standard dependent on bearing size
XL	X-life bearing	

2.13 Structure of bearing designation

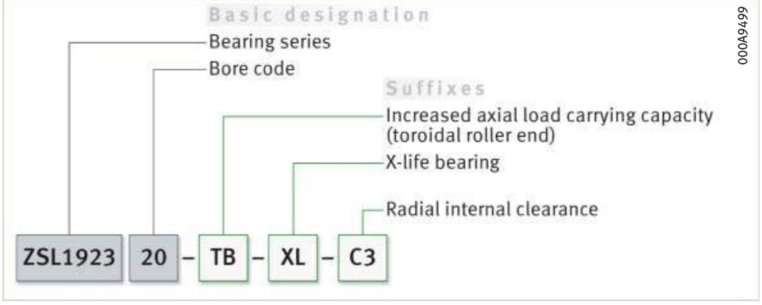
Examples of composition of bearing designation

The designation of bearings follows a set model. Examples ➤*488*|*11* and ➤*488*|*12*. The composition of designations is subject to DIN 623-1 ➤*102*|*10*.

11
Cylindrical roller bearing with disc cage: designation structure



12
Cylindrical roller bearing with spacers, internal clearance C3: designation structure



2.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

Cylindrical roller bearings with non-locating bearing function

✎ $P = F_r$

Non-locating bearings can only support radial loads. For these bearings ➤*489*|ƒ*6*.

ƒ6
Equivalent dynamic load

$$P = F_r$$

Cylindrical roller bearings with semi-locating or locating bearing function

✎ P is a substitute force for combined load and various load cases

If the condition described above is not met, i.e. if, in addition to the radial force F_r, there is also an axial force F_a, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ $F_a/F_r \leqq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factors e and Y ➤*489*|ƒ*7* and ➤*489*|ƒ*8*.

ƒ7
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r$$

ƒ8
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}92 \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load
e	–	Factor, e = 0,3
Y	–	Factor, Y = 0,4.

Equivalent static bearing load

✎ $P_0 = F_{0r}$

For cylindrical roller bearings subjected to static load ➤*489*|ƒ*9*.

ƒ9
Equivalent static load

$$P_0 = F_{0r}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}	N	Largest radial load present (maximum load).

Static load safety factor

✎ $S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤*489*|ƒ*10*.

ƒ10
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

2.15 Minimum load

✎ In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/60$ is necessary during continuous operation

In order that no slippage occurs between the contact partners, the cylindrical roller bearings must be constantly subjected to a sufficiently high radial load. For continuous operation, experience shows that a minimum radial load of the order of $P > C_{0r}/60$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

2.16 Design of bearing arrangements

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤491|▦5 to ➤491|▦7.

Radial location

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158|▦7.

Axial location

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings, retaining rings, adapter and withdrawal sleeves etc., are fundamentally suitable; example ➤492|⊡13.

Dimensional, geometrical and running accuracy of cylindrical bearing seats

✎ A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For cylindrical roller bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7. Guide values for the geometrical and positional tolerances of the bearing seating surfaces ➤491|▦5, tolerances t_1 to t_3 in accordance with ➤168|11. Numerical values for IT grades ➤491|▦6.

▦ **5**

Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	

▦ **6**

Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm						
	over **18** incl. **30**	over **30** incl. **50**	over **50** incl. **80**	over **80** incl. **120**	over **120** incl. **180**	over **180** incl. **250**	over **250** incl. **315**
	Values in μm						
IT4	6	7	8	10	12	14	16
IT5	9	11	13	15	18	20	23
IT6	13	16	19	22	25	29	32
IT7	21	25	30	35	40	46	52

Roughness of cylindrical bearing seating surfaces

✎ Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤491|▦7.

▦ **7**

Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax μm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Mounting dimensions for the contact surfaces of bearing rings

✎ The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. The transition from the bearing seat to the abutment shoulder must be designed with rounding to DIN 5418:1993 or an undercut to DIN 509:2006. Proven mounting dimensions for the radii and diameters of abutment shoulders are given in the product tables ➤*494*| and ➤*492*| *13*. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

✎ Rib support in axially loaded bearings

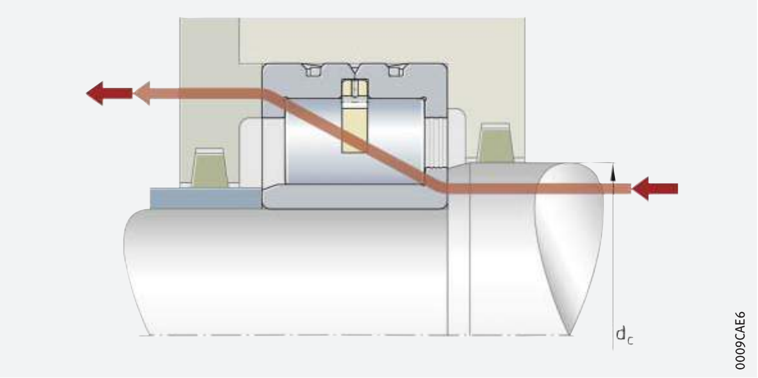
Ribs under axial load must be supported over their entire height and entire circumference. The size and axial runout accuracy of the contact surfaces on the inner ring rib must be observed especially in the case of cylindrical roller bearings subjected to high loads, since these factors also influence the uniformity of the rib load and the running accuracy of the shaft. This means that the ribs may be subjected to damaging alternating stresses even in the case of very small misalignments.
If the mounting dimensions indicated in the product tables are observed, the problems described can be reliably avoided ➤*492*| *13* and ➤*494*|.

✎ Support in semi-locating bearings

In semi-locating bearings, it is sufficient to support the bearing rings on one side, on the rib supporting the axial load ➤*492*| *13*.

13
Support of the inner ring rib – bearing with disc cage LSL 1923 (semi-locating bearing)

d_c = *recommended height of shaft shoulder with axially loaded rib*
Arrow = *force flow*



2.17 Mounting and dismounting

The mounting and dismounting options for cylindrical roller bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎ As the bearings are not self-retaining, they are easy to mount

The cylindrical roller bearings LSL 1923 and ZSL 1923 are not self-retaining. As a result, the bearing parts can be mounted separately from each other ➤*478*|*2.1*. This gives simplified mounting of the bearings, especially when the two bearing rings have a tight fit.

Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤ *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

2.18 Legal notice regarding data freshness

✎ *The further development of products may also result in technical changes to catalogue products*

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

§

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

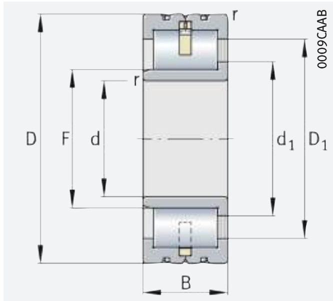
2.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

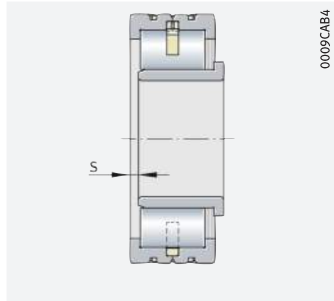
- Determining the bearing size ➤ *34*
- Rigidity ➤ *54*
- Friction and increases in temperature ➤ *56*
- Speeds ➤ *64*
- Bearing data ➤ *97*
- Lubrication ➤ *70*
- Sealing ➤ *182*
- Design of bearing arrangements ➤ *139*
- Mounting and dismounting ➤ *191*.

Cylindrical roller bearings with disc cage

Semi-locating bearings



LSL 1923

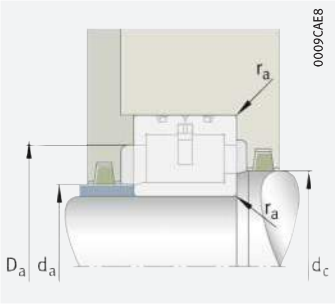


Axial displacement "s"

d = 80 – 300 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤488|2.12 ➤488|2.13 X-life ➤480
			N	N	N	min^{-1}	min^{-1}	≈ kg	
80	170	58	420 000	495 000	75 000	8 500	4 600	6,1	**LSL192316**
85	180	60	445 000	520 000	75 000	8 000	4 350	7,3	**LSL192317**
90	190	64	590 000	610 000	108 000	7 500	4 050	8,6	**LSL192318-TB-XL**
95	200	67	610 000	660 000	116 000	7 000	3 750	10	**LSL192319-TB-XL**
100	215	73	750 000	790 000	137 000	6 600	3 450	12,8	**LSL192320-TB-XL**
110	240	80	880 000	930 000	156 000	5 800	3 000	17,3	**LSL192322-TB-XL**
120	260	86	1 060 000	1 140 000	186 000	5 300	2 650	22	**LSL192324-TB-XL**
130	280	93	1 190 000	1 280 000	206 000	4 900	2 450	27,2	**LSL192326-TB-XL**
140	300	102	1 340 000	1 460 000	230 000	4 600	2 300	34	**LSL192328-TB-XL**
150	320	108	1 410 000	1 760 000	200 000	4 250	2 020	40,7	**LSL192330-TB**
160	340	114	1 600 000	2 010 000	223 000	3 900	1 820	48,1	**LSL192332-TB**
170	360	120	1 740 000	2 210 000	244 000	3 750	1 760	57,5	**LSL192334-TB**
180	380	126	1 840 000	2 430 000	265 000	3 500	1 620	67,4	**LSL192336-TB**
190	400	132	2 100 000	2 750 000	295 000	3 400	1 540	78,1	**LSL192338-TB**
200	420	138	2 340 000	3 050 000	320 000	3 200	1 420	89,3	**LSL192340-TB**
220	460	145	2 500 000	3 200 000	330 000	2 850	1 270	108	**LSL192344-TB**
240	500	155	2 750 000	3 550 000	355 000	2 700	1 220	138,6	**LSL192348-TB**
260	540	165	3 350 000	4 350 000	425 000	2 380	1 010	168	**LSL192352-TB**
280	580	175	3 700 000	4 850 000	460 000	2 250	950	206,6	**LSL192356-TB**
300	620	185	4 150 000	5 500 000	520 000	2 130	890	253	**LSL192360-TB**

medias ➤ *https://www.schaeffler.de/std/1E73*

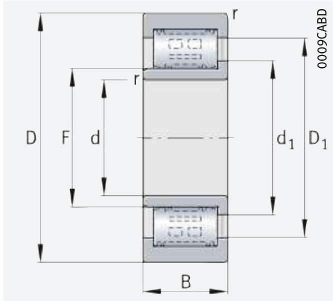


Mounting dimensions

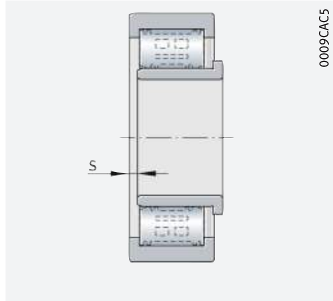
Dimensions						Mounting dimensions			
d	r min.	s	F	d_1 ≈	D_1 ≈	d_a	d_c	D_a	r_a max.
80	2,1	3,5	94	104,5	134,8	94	104,5	134,5	2,1
85	3	4	100	111,3	143,9	100	111,5	143,5	3
90	3	4	105,3	117,2	152,5	105	117,5	152,5	3
95	3	4	114,7	126,6	161	114,5	127	161	3
100	3	4	119,3	132,7	172	119	133	172	3
110	3	5	135,5	150,7	193,1	135,5	151	193	3
120	3	5	147,4	164,2	213,1	147	164,5	213	3
130	4	5	157,9	176	227,9	157,5	176	227,5	4
140	4	7	168,5	187,5	243,2	168	187,5	243	4
150	4	7	182,5	203,3	263,9	182	203,5	263,5	4
160	4	7	196,4	219	284,8	196	219	284,5	4
170	4	7	230,6	226,6	295,4	230,5	227	295	4
180	4	7	221,6	245	313,3	221,5	245	313	4
190	5	7	224,4	250	325,5	224	250	325,5	5
200	5	7	238,5	265,7	345,9	238	266	345,5	5
220	5	7	266,7	297	385,9	266,5	297	385,5	5
240	5	10	280,6	312,5	406,1	280,5	312,5	406	5
260	6	10	315,6	351,6	457,2	315,5	352	457	6
280	6	12	333,1	371	485	333	371	485	6
300	7,5	12	350,9	390,9	508,5	350,5	391	508,5	7,5

Cylindrical roller bearings with spacers

Semi-locating bearings



ZSL 1923

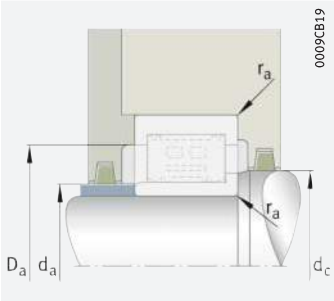


Axial displacement "s"

d = 25 – 120 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	dyn. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤488|2.12 ➤488|2.13 X-life ➤480
			N	N	N	min^{-1}	min^{-1}	≈ kg	
25	62	24	60 000	54 000	7 000	17 100	10 000	0,36	**ZSL192305**
30	72	27	83 000	80 000	10 800	14 400	8 500	0,55	**ZSL192306**
35	80	31	105 000	101 000	15 100	12 300	7 500	0,72	**ZSL192307**
40	90	33	141 000	142 000	21 300	10 600	6 300	1	**ZSL192308**
45	100	36	151 000	157 000	23 700	9 900	6 300	1,34	**ZSL192309**
50	110	40	193 000	199 000	30 000	8 900	5 800	1,76	**ZSL192310**
55	120	43	224 000	231 000	36 000	8 000	5 400	2,22	**ZSL192311**
60	130	46	240 000	255 000	40 000	7 400	5 200	2,82	**ZSL192312**
65	140	48	295 000	320 000	50 000	6 700	4 600	3,44	**ZSL192313**
70	150	51	325 000	355 000	55 000	6 400	4 600	4,27	**ZSL192314**
75	160	55	385 000	435 000	65 000	5 900	4 200	5,2	**ZSL192315**
80	170	58	450 000	520 000	75 000	5 500	3 850	6,2	**ZSL192316**
85	180	60	480 000	570 000	81 000	5 100	3 600	7,23	**ZSL192317**
90	190	64	590 000	610 000	108 000	5 100	3 750	8,7	**ZSL192318-TB-XL**
95	200	67	620 000	660 000	116 000	4 750	3 450	10	**ZSL192319-TB-XL**
100	215	73	750 000	790 000	137 000	4 450	3 200	12,7	**ZSL192320-TB-XL**
110	240	80	890 000	900 000	148 000	3 850	2 700	16,5	**ZSL192322-TB-XL**
120	260	86	1 060 000	1 140 000	186 000	3 600	2 400	21,9	**ZSL192324-TB-XL**

medias ➤ *https://www.schaeffler.de/std/1E74*



Mounting dimensions

Dimensions						Mounting dimensions			
d	r min.	s	F	d_1 ≈	D_1 ≈	d_a	d_c	D_a	r_a max.
25	1,1	2	31,7	36,7	47,5	31,5	37	47,5	1,1
30	1,1	2	38,3	43,5	56	38	43,5	56	1,1
35	1,5	2	44,7	50,7	65,8	44,5	51	65,5	1,5
40	1,5	2	51,1	57,5	75,2	51	57,5	75	1,5
45	1,5	3	56,1	62,5	80,3	56	62,5	80	1,5
50	2	3	60,7	68,3	89,7	60,5	68,5	89,5	2
55	2	3	67,1	75,5	99,3	67	75,5	99	2
60	2,1	3	73,6	82	105,8	73,5	82	105,5	2,1
65	2,1	3,5	80,7	90	116,5	80,5	90	116,5	2,1
70	2,1	3,5	84,1	93,5	121,6	84	93,5	121,5	2,1
75	2,1	3,5	91,2	101,6	131,9	91	102	131,5	2,1
80	2,1	3,5	98,2	109,5	142,1	98	109,5	142	2,1
85	3	4	107	118,5	150,9	107	118,5	150,5	3
90	3	4	105,3	117,5	152,5	105	117,5	152,5	3
95	3	4	114,7	126,6	161,9	114,5	127	161,5	3
100	3	4	119,3	132,7	172,8	119	133	172,5	3
110	3	5	134,3	151,1	199,9	134	151,5	199,5	3
120	3	5	147,4	164,2	213,1	147	164,5	213	3

3 Single row full complement cylindrical roller bearings

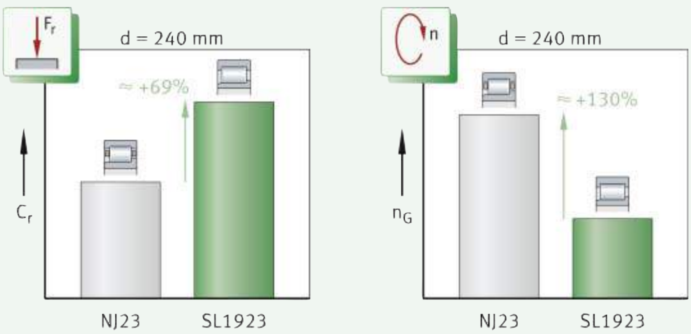
Single row full complement cylindrical roller bearings are suitable where:

- bearing arrangements are subjected to particularly high radial loads ➤*501*|*3.2*
- not only very high radial forces but also high axial loads from one direction must be supported by the bearing position (semi-locating bearing function) ➤*501*|*3.2*
- bearing arrangements operating under the conditions described above must have very high rigidity
- axial displacements of the shaft relative to the housing must be compensated without constraint in the bearing ➤*498*|*3.1*
- very high radial loads occur at lower speeds, i.e. the bearings do not need to achieve speeds as high as those of cylindrical roller bearings with cage ➤*504*|*3.6* and ➤*514*|▦
- particularly space-saving designs are required despite very high load
- the bearings should be separable (not self-retaining) for easier mounting ➤*498*|*3.1*.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*410*.

Figure 1
Cylindrical roller bearing with cage/full complement bearing, comparison of speed and load carrying capacity

C_r = *basic dynamic load rating*
n_G = *limiting speed*



3.1 Bearing design

Design variants

Single row full complement cylindrical roller bearings are available as:

- series SL1818, SL1829, SL1830, SL1822 (semi-locating bearings) ➤*499*|*Figure 2*
- series SL1923 (semi-locating bearings) ➤*499*|*Figure 3*
- X-life bearings ➤*500*.

In addition to the bearings described here, Schaeffler supplies single row full complement cylindrical roller bearings in other types, series and dimensions. These products are described in some cases in special publications. If necessary, please contact Schaeffler. Larger catalogue bearings ➤ *GL 1*.

Bearings of basic design – standard range

Key features

Single row full complement cylindrical roller bearings are part of the group of radial roller bearings. These bearings comprise solid outer rings, inner rings and full complement rolling element sets. Due to the absence of a cage, the bearing can accommodate the largest possible number of rolling elements. The rollers have profiled ends, i. e. they have a slight lateral curvature towards the ends. This modified line contact between the rolling elements and raceways prevents damaging edge stresses ➤413 | 2. The series SL1923 is self-retaining. Certain sizes are also available in an increased capacity design ➤514 | . These bearings have the suffix E ➤507 | 6.

Series SL1818, SL1829, SL1830, SL1822

Bearings with semi-locating bearing function

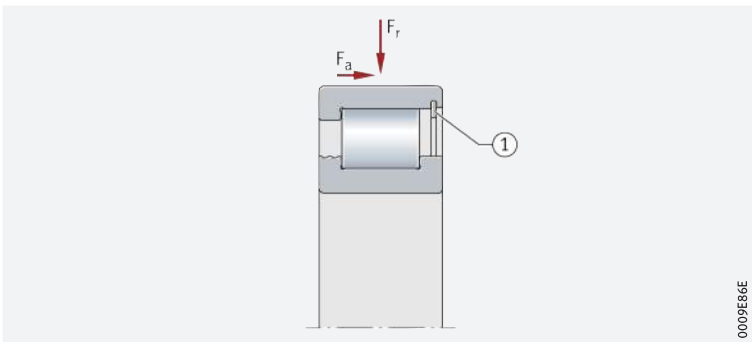
In these bearings, the outer ring has one rigid rib and the inner ring has two rigid ribs ➤499 | 2. As a result, axial displacements of the shaft relative to the housing can be compensated within certain limits. The maximum axial displacement s is given in the product tables. Since the axial motion occurs without constraint in the bearing itself, this is practically free from friction with a rotating bearing. Cylindrical roller bearings of this design are used as semi-locating bearings, i. e. they can guide the shaft axially in one direction, while they act in the opposite direction as non-locating bearings ➤501 | 3.2.

! The bearings are held together in handling and mounting by a transport and mounting retaining device on the outer ring ➤499 | 2.
This retaining device remains in the bearing even after mounting and must not be subjected to axial load.

2
Single row full complement cylindrical roller bearing – semi-locating bearing

F_r = radial load
F_a = axial load

① Transport and mounting retaining device



Series SL1923

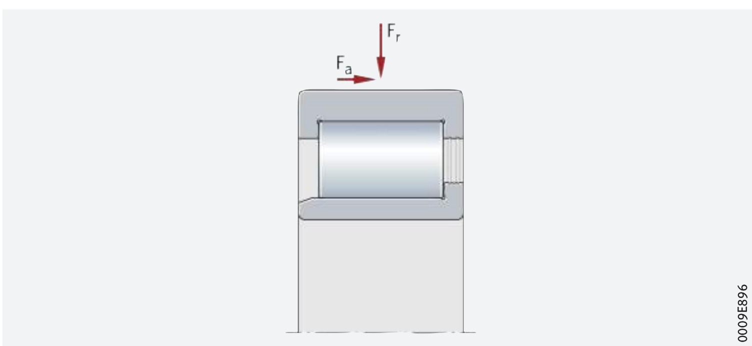
Bearings with semi-locating bearing function

Cylindrical roller bearings of this design have two rigid ribs on the outer ring and a self-retaining rolling element set, while the inner ring has only one rigid rib ➤499 | 3. As a result, the inner ring can be removed from the bearing. This gives easier mounting of the cylindrical roller bearings.

The bearings are used as semi-locating bearings, i. e. they can guide the shaft axially in one direction ➤501 | 3.2 and permit axial displacements in the bearing between the shaft and housing in one direction. The maximum axial displacement s is given in the product tables.

3
Single row full complement cylindrical roller bearing

F_r = radial load
F_a = axial load

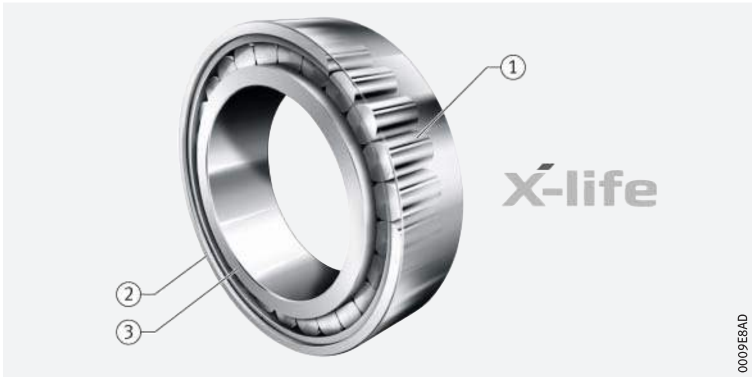


X-life premium quality

Many sizes are available as X-life bearings ➤500|⊡4. These bearings exhibit considerably higher performance than comparable standard cylindrical roller bearings. This is achieved, for example, through the modified internal construction, the optimised contact geometry between the rollers and raceways, better surface quality and the optimised roller guidance and lubricant film formation.

⊡4
Single row full complement cylindrical roller bearing in X-life design

① *Cylindrical roller, honed*
② *Outer ring, honed*
③ *Inner ring, honed*



Advantages

✎ Increased customer benefits due to X-life

These technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings
- a higher fatigue limit load
- lower heat generation in the bearing
- lower lubricant consumption and therefore longer maintenance intervals if relubrication is carried out
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

✎ Interchangeable with comparable standard bearings

Since the single row full complement X-life cylindrical roller bearings have the same dimensions as the corresponding standard bearings, the latter can be replaced without any problems by the higher-performance X-life bearings. The major advantages of X-life can therefore also be used for existing bearing arrangements with standard bearings.

✎ Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

✎ Suffix XL

X-life cylindrical roller bearings include the suffix XL in the designation ➤507|3.12 and ➤514|▦.

Areas of application

Due to their special technical features, single row full complement X-life cylindrical roller bearings are highly suitable, for example, for bearing arrangements in:

- heavy industry (steel production)
- power transmission (gearbox engineering)
- processing machines and construction machinery
- wind turbines (gearbox applications).

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤10.

3.2 Load carrying capacity

✎ *Designed for very high radial loads*

Due to the absence of a cage, the bearing can accommodate the largest possible number of rolling elements. As a result, full complement cylindrical roller bearings have very high radial load carrying capacity.

Higher axial load carrying capacity of bearings with toroidal crowned roller end face

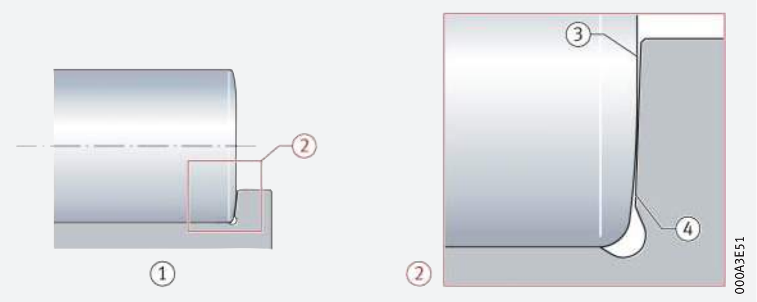
✎ *Neither wear nor material fatigue occurs on the rib contact running and roller end faces*

In the case of cylindrical roller bearings with toroidal crowned rollers (TB design), the axial load carrying capacity has been significantly improved with the aid of new calculation and manufacturing methods. A special curvature of the roller end faces facilitates optimum contact conditions between the rollers and ribs ➤*501*|*5*. As a result, the axial contact pressures on the rib are significantly minimised and a lubricant film capable of supporting higher loads is formed. Under standard operating conditions, this completely eliminates wear and fatigue at the rib contact running and roller end faces. In addition, the axial frictional torque is reduced by up to 50%. The bearing temperature during operation is therefore significantly lower. Available bearings of toroidal crowned design ➤*501*|*1*.

5

Contact geometry of roller end face/rib face – modified roller end faces

① *Cylindrical roller with inner ring*
② *Detail (representation not to scale)*
③ *End of roller*
④ *Rib*



1

Single row full complement cylindrical roller bearings with toroidal crowned roller ends available by agreement

Series	Bore diameter d mm from
SL1818	460
SL1822	140
SL1829	300
SL1830	180
SL1923	90

Load ratio F_a/F_r

✎ *Ratio $F_a/F_r \leqq 0,4$ or $0,6$*

The bearings can support axial loads on one side by means of the ribs on the inner and outer ring ➤*502*|*6*. In order to ensure problem-free running (tilting of the rollers is prevented), they must always be subjected to radial load at the same time as axial load. The ratio F_a/F_r must not exceed the value 0,4. For bearings with toroidal crowned roller ends (TB design), values up to 0,6 are permissible.

! Continuous axial loading without simultaneous radial loading is not permissible.

Permissible axial load

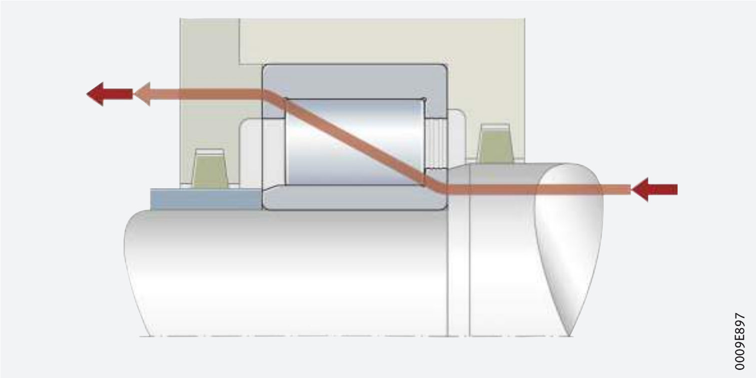
Influencing factors on the axial load carrying capacity

Axial loads are supported by the bearing ribs and the roller end faces ➤502|6. The axial load carrying capacity of the bearing is therefore essentially dependent on:

- the size of the sliding surfaces between the ribs and the end faces of the rolling elements
- the sliding velocity at the ribs
- the lubrication of the contact surfaces
- tilting of the bearing
- friction.

6

Force flow under axial load – semi-locating bearing SL1923



Calculation of permissible axial load – cylindrical rollers with conventional roller ends

Bearings with standard roller ends

The permissible axial load $F_{a\,per}$ can be calculated from the hydrodynamic load carrying capacity of the contact ➤502|1.

1

Permissible axial load – bearings of standard design

$$F_{a\,per} = k_S \cdot k_B \cdot d_M^{\,1{,}54} \cdot n^{-0{,}6} \leq F_{a\,max}$$

Legend

$F_{a\,per}$	N	Permissible continuous axial load. In order to prevent unacceptably high temperatures in the bearing, $F_{a\,per}$ must not be exceeded
$F_{a\,max}$	N	Maximum continuous axial load in relation to rib fracture. In order to prevent unacceptably high pressures at the contact surfaces, $F_{a\,max}$ must not be exceeded
k_S	–	Factor as a function of lubrication method ➤502|2. The factor takes into consideration the lubrication method used for the bearing. The better the lubrication and, in particular, the heat dissipation, the higher the permissible axial load
k_B	–	Factor as a function of the bearing series ➤503|3
d_M	mm	Mean bearing diameter $d_M = (D + d)/2$ ➤514|
n	min^{-1}	Operating speed.

2

Factor k_S

Lubrication method	Factor k_S	
	from	up to
Minimal heat dissipation, drip feed oil lubrication, oil mist lubrication, low operating viscosity ($\nu < 0{,}5 \cdot \nu_1$)	7,5	10
Poor heat dissipation, oil sump lubrication, oil spray lubrication, low oil flow	10	15
Good heat dissipation, recirculating oil lubrication (pressurised oil lubrication)	12	18
Very good heat dissipation, recirculating oil lubrication with oil cooling, high operating viscosity ($\nu > 2 \cdot \nu_1$)	16	24

The precondition for these k_S values is an operating viscosity of the lubricant of at least the reference viscosity ν_1 in accordance with DIN ISO 281:2010.

Doped lubricating oils should be used, such as CLP (DIN 51517) and HLP (DIN 51524) of ISO VG grades 32 to 460, as well as ATF oils (DIN 51502) and transmission oils (DIN 51512) of SAE viscosity grades 75W to 140W.

3
Bearing factor k_B

Series	k_B
SL1818	4,5
SL1829	11
SL1830	17
SL1822	20
SL1923	30

Calculation of permissible axial load – cylindrical rollers with toroidal crowned roller ends

For bearings with toroidal roller ends, the permissible axial loads are 50% higher ➤503 | 2.

2
Permissible axial load – bearings of TB design

$$F_{a\,per} = 1{,}5 \cdot k_S \cdot k_B \cdot d_M^{1{,}54} \cdot n^{-0{,}6} \leq F_{a\,max}$$

Calculation of maximum permissible axial load

The maximum permissible axial load $F_{a\,max}$ ➤503 | 3 is calculated from the rib strength and security against wear. This must not be exceeded, even if $F_{a\,per}$ gives higher values ➤503 | 4.

3
Maximum axial load – bearings of standard and TB design

$$F_{a\,max} = 0{,}075 \cdot k_B \cdot d_M^{2{,}1}$$

4
Permissible axial load

$$F_{a\,per} \leq F_{a\,max}$$

Axial load under shaft deflection

Permissible axial load under shaft deflection of up to 2′

Under considerable shaft deflection, the shaft shoulder presses against the inner ring rib. In combination with the active axial load, this can lead to high alternating loading of the inner ring ribs. Under a shaft deflection of up to 2′, the permissible axial load can be estimated ➤503 | 5.

If more severe tilting is present, a separate strength analysis is required. In this case, please contact Schaeffler.

5
Axial load under misalignment

$$F_{as} = 20 \cdot d_M^{1{,}42}$$

Legend

F_{as}	N	Permissible axial load under misalignment.

3.3 Compensation of angular misalignments

Angular deviations are misalignments between the inner and outer ring

The possible misalignment between the inner ring and outer ring is influenced by the internal bearing construction, the operating clearance, the forces acting on the bearing etc. Due to these complex relationships, it is not possible to give generally valid absolute values here. However, misalignments (angular deviations) between the inner ring and outer ring will generally always have an effect on the running noise and the operating life of the bearings.

Permissible tilting

The permissible guide values at which, based on experience, there is no significant reduction in operating life are as follows:

- 4′ for series SL1818
- 3′ for series SL1923, SL1822, SL1829, SL1830.

✎ Scope of values

The stated values apply to:

- bearing arrangements with static misalignment (consistent position of the shaft and housing axis)
- bearings that are not required to perform an axial guidance function
- bearings subjected to small loads (with $C_{0r}/P \geqq 5$).

Checking by means of the calculation program BEARINX is recommended in all cases. If there is any uncertainty regarding possible misalignment, please consult Schaeffler.

3.4 Lubrication

✎ Oil or grease lubrication is possible

The cylindrical roller bearings are not greased. They must be lubricated with oil or grease.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

✎ Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

3.5 Sealing

✎ Provide seals in the adjacent construction

The bearings are not sealed, i. e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

3.6 Speeds

✎ Limiting speeds and reference speeds in the product tables

The product tables give two speeds for most bearings ➤*514*|:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

✎ Lower speed capacity than bearings with cage

Due to the kinematic conditions, however, bearings without cage do not achieve the high speeds that are possible when using bearings with cage.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤*64*.

Reference speeds

✎ $n_{\vartheta r}$ is used to calculate n_{ϑ}

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_{ϑ} ➤*64*.

3.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

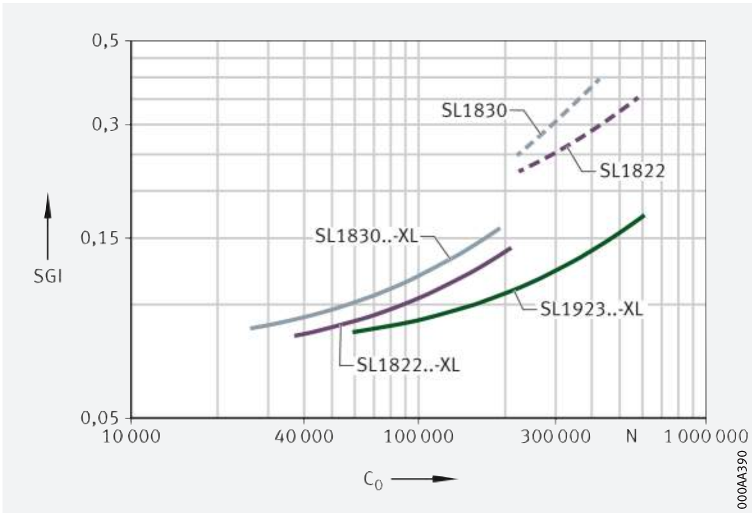
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

7
Schaeffler Noise Index for single row full complement cylindrical roller bearings

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



3.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and cylindrical rollers
- the cage
- the lubricant.

Possible operating temperatures of single row cylindrical roller bearings ➤*505*|*4*.

4
Permissible temperature ranges

Operating temperature	Single row full complement cylindrical roller bearings
	−30 °C to +120 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

3.9 Cages

Full complement cylindrical roller bearings do not have a cage for guidance and separation of the rolling elements. The cylindrical rollers are guided by the ribs on the bearing rings.

3.10 Internal clearance

Radial internal clearance

The standard is CN

Single row full complement cylindrical roller bearings are manufactured as standard with the radial internal clearance CN (normal) ➤506|▦5. CN is not stated in the designation.

Certain sizes are also available by agreement with the larger internal clearance C3, C4 and C5 ➤506|▦5.

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤506|▦5. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

▦5
Radial internal clearance of single row full complement cylindrical roller bearings

Nominal bore diameter d mm		Radial internal clearance							
		CN (Group N) µm		C3 (Group 3) µm		C4 (Group 4) µm		C5 (Group 5) µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	20	45	35	60	50	75	65	90
24	30	20	45	35	60	50	75	70	95
30	40	25	50	45	70	60	85	80	105
40	50	30	60	50	80	70	100	95	125
50	65	40	70	60	90	80	110	110	140
65	80	40	75	65	100	90	125	130	165
80	100	50	85	75	110	105	140	155	190
100	120	50	90	85	125	125	165	180	220
120	140	60	105	100	145	145	190	200	245
140	160	70	120	115	165	165	215	225	275
160	180	75	125	120	170	170	220	250	300
180	200	90	145	140	195	195	250	275	330
200	225	105	165	160	220	220	280	305	365
225	250	110	175	170	235	235	300	330	395
250	280	125	195	190	260	260	330	370	440
280	315	130	205	200	275	275	350	410	485
315	355	145	225	225	305	305	385	455	535
355	400	190	280	280	370	370	460	510	600
400	450	210	310	310	410	410	510	565	665
450	500	220	330	330	440	440	550	625	735

3.11 Dimensions, tolerances

Dimension standards

The main dimensions of cylindrical roller bearings correspond to ISO 15:2017 (DIN 616:2000 and DIN 5412-1:2005).

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤135|7.11.
Nominal value of chamfer dimension ➤514|▦.

Tolerances

The dimensional and running tolerances of the cylindrical roller bearings correspond to the tolerance class Normal in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ➤122|▦8.

3.12 Suffixes

For a description of the suffixes used in this chapter ➤507|▦6 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦6
Suffixes and corresponding descriptions

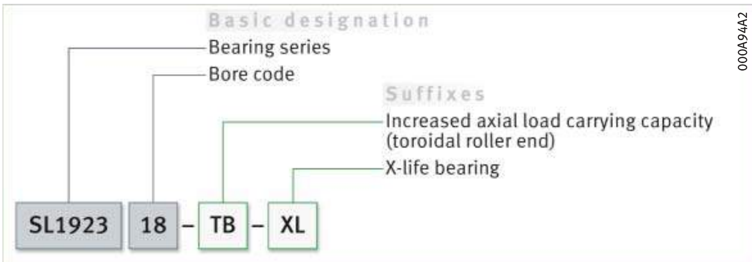
Suffix	Description of suffix	
BR	Black oxide coated	Available by agreement
C3	Radial internal clearance C3 (larger than normal)	
C4	Radial internal clearance C4 (larger than C3)	
C5	Radial internal clearance C5 (larger than C4)	
E	Increased capacity design	Standard, dependent on bore code and bearing series; others available by agreement
TB	Bearing with increased axial load carrying capacity	
XL	X-life bearing	

3.13 Structure of bearing designation

✎ Example of composition of bearing designation

The designation of bearings follows a set model. Example ➤507|8. The composition of designations is subject to DIN 623-1 ➤102|10.

8
Single row full complement cylindrical roller bearing (semi-locating bearing): designation structure



3.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

Cylindrical roller bearings with semi-locating bearing function

✎ P is a substitute force for combined load and various load cases

If the condition described above is not met, i.e. if, in addition to the radial force F_r, there is also an axial force F_a, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ $F_a/F_r \leqq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factors e and Y ➤507|6 and ➤508|7.

6
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r$$

7
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}92 \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load
e, Y	–	Factors ➤508 | 7.

7
Factors e and Y

Bearing series	Calculation factors	
	e	Y
SL1818	0,2	0,6
SL1923, SL1822, SL1829, SL1830	0,3	0,4

Equivalent static bearing load

$P_0 = F_{0r}$

For cylindrical roller bearings subjected to static load ➤508 | 8.

8
Equivalent static load

$$P_0 = F_{0r}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}	N	Largest radial load present (maximum load).

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤508 | 9.

9
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

3.15 Minimum load

In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/60$ is necessary during continuous operation

In order that no slippage occurs between the contact partners, the cylindrical roller bearings must be constantly subjected to a sufficiently high radial load. For continuous operation, experience shows that a minimum radial load of the order of $P > C_{0r}/60$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

3.16 Design of bearing arrangements

Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤509 | 8 to ➤510 | 10.

Radial location

For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158|▦7.

Axial location

The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings, retaining rings, adapter and withdrawal sleeves etc., are fundamentally suitable; example ➤511|9.

Dimensional, geometrical and running accuracy of cylindrical seats

A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For cylindrical roller bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7. Guide values for the geometrical and positional tolerances of the bearing seating surfaces ➤509|▦8, tolerances t_1 to t_3 in accordance with ➤168|11. Numerical values for IT grades ➤510|▦9.

▦8
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	

9
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm								
	over **18**	**30**	**50**	**80**	**120**	**180**	**250**	**315**	**400**
	incl. **30**	**50**	**80**	**120**	**180**	**250**	**315**	**400**	**500**
	Values in μm								
IT4	6	7	8	10	12	14	16	18	20
IT5	9	11	13	15	18	20	23	25	27
IT6	13	16	19	22	25	29	32	36	40
IT7	21	25	30	35	40	46	52	57	63

Roughness of cylindrical bearing seating surfaces

Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤*510*| *10*.

10
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax μm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Mounting dimensions for the contact surfaces of bearing rings

The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. The transition from the bearing seat to the abutment shoulder must be designed with rounding to DIN 5418:1993 or an undercut to DIN 509:2006. Proven mounting dimensions for the radii and diameters of abutment shoulders are given in the product tables ➤*514*| and ➤*511*| *9*. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

Rib support in axially loaded bearings

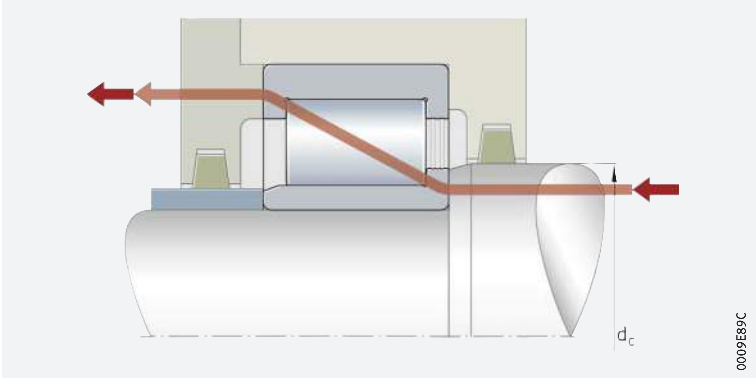
Ribs under axial load must be supported over their entire height and entire circumference ➤*511*| *9*. The size and axial runout accuracy of the contact surfaces on the inner ring rib must be observed especially in the case of cylindrical roller bearings subjected to high loads, since these factors also influence the uniformity of the rib load and the running accuracy of the shaft. This means that the ribs may be subjected to damaging alternating stresses even in the case of very small misalignments. If the mounting dimensions indicated in the product tables are observed, the problems described can be reliably avoided ➤*514*|.

Support in semi-locating bearings

In semi-locating bearings, it is sufficient to support the bearing rings on one side, on the rib supporting the axial load ➤*511*| *9*.

9
Support of the inner ring rib – series SL1923 (semi-locating bearing)

d_c = *recommended height of shaft shoulder with axially loaded rib*
Arrow = *force flow*



3.17 Mounting and dismounting

The mounting and dismounting options for cylindrical roller bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

Schaeffler Mounting Handbook

Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤ *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

3.18 Legal notice regarding data freshness

The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

§

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

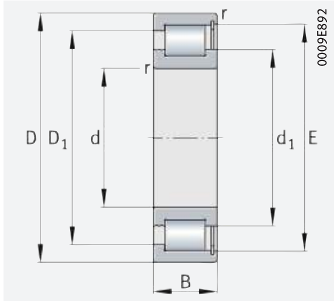
3.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

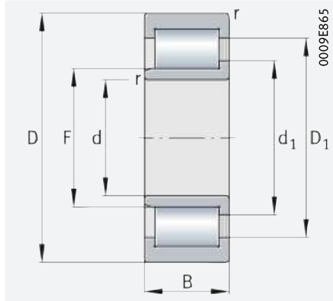
- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*182*
- Design of bearing arrangements ➤*139*
- Mounting and dismounting ➤*191*.

Single row full complement cylindrical roller bearings

Semi-locating bearings



SL1829, SL1830, SL1822



SL1923

d = 20 – 65 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤507|3.12 ➤507|3.13 X-life ➤500
			N	N	N	min^{-1}	min^{-1}	≈ kg	
20	42	16	30 500	26 000	4 450	11 400	7 500	0,11	**SL183004-XL**
	47	18	45 500	37 000	6 100	10 400	6 500	0,16	**SL182204-XL**
25	47	16	35 000	32 000	5 500	9 500	6 000	0,12	**SL183005-XL**
	52	18	51 000	44 500	7 400	9 000	5 500	0,18	**SL182205-XL**
	62	24	73 000	59 000	9 400	8 100	4 800	0,37	**SL192305-XL**
30	55	19	45 000	42 000	7 500	8 100	5 600	0,2	**SL183006-XL**
	62	20	70 000	64 000	10 200	7 400	4 550	0,3	**SL182206-XL**
	72	27	100 000	87 000	14 500	6 800	4 050	0,56	**SL192306-XL**
35	62	20	55 000	53 000	9 400	7 100	4 950	0,26	**SL183007-XL**
	72	23	88 000	78 000	12 700	6 400	4 250	0,44	**SL182207-XL**
	80	31	126 000	110 000	20 200	5 800	3 600	0,74	**SL192307-XL**
40	68	21	66 000	67 000	11 200	6 300	4 350	0,31	**SL183008-XL**
	80	23	97 000	91 000	14 900	5 600	3 650	0,55	**SL182208-XL**
	90	33	170 000	153 000	28 500	5 000	3 050	1,01	**SL192308-XL**
45	75	23	70 000	74 000	12 500	5 800	4 200	0,4	**SL183009-XL**
	85	23	101 000	98 000	16 000	5 300	3 450	0,59	**SL182209-XL**
	100	36	181 000	164 000	30 500	4 600	3 000	1,37	**SL192309-XL**
50	80	23	88 000	94 000	15 100	5 300	3 700	0,43	**SL183010-XL**
	90	23	109 000	111 000	18 100	4 750	3 000	0,64	**SL182210-XL**
	110	40	232 000	215 000	40 500	4 200	2 800	1,81	**SL192310-XL**
55	90	26	120 000	136 000	22 600	4 550	3 100	0,64	**SL183011-XL**
	100	25	140 000	148 000	25 000	4 350	2 700	0,87	**SL182211-XL**
	120	43	270 000	250 000	48 000	3 750	2 550	2,28	**SL192311-XL**
60	85	16	63 000	76 000	13 700	4 700	2 900	0,29	**SL182912-XL**
	95	26	123 000	143 000	23 700	4 350	3 000	0,69	**SL183012-XL**
	110	28	169 000	176 000	32 500	3 900	2 550	1,18	**SL182212-XL**
	130	46	285 000	275 000	53 000	3 500	2 480	2,88	**SL192312-XL**
65	90	16	67 000	84 000	15 100	4 250	2 550	0,31	**SL182913-XL**
	100	26	130 000	157 000	26 000	4 000	2 700	0,73	**SL183013-XL**
	120	31	198 000	210 000	39 000	3 650	2 480	1,57	**SL182213-XL**
	140	48	350 000	345 000	66 000	3 200	2 180	3,52	**SL192313-XL**

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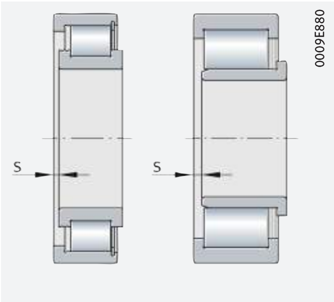
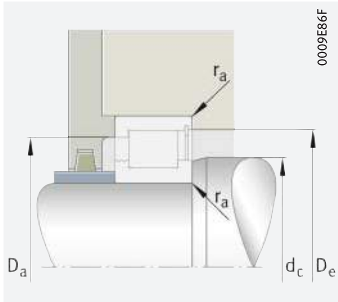
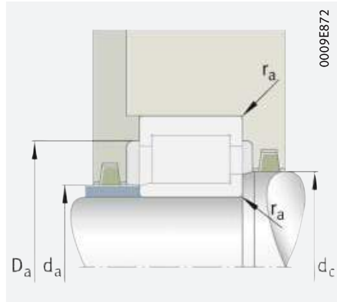


Axial displacement "s"



Mounting dimensions for SL1829, SL1830, SL1822

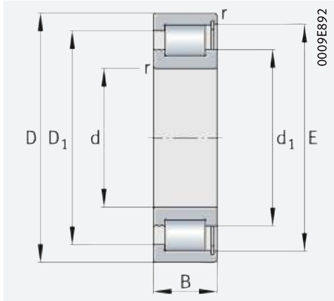


Mounting dimensions for SL1923

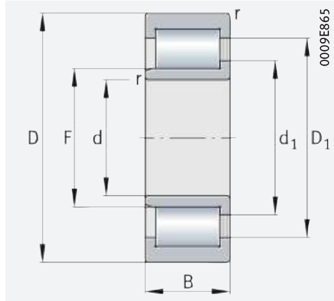
Dimensions							Mounting dimensions				
d	r min.	s	F	d_1 ≈	D_1 ≈	E	d_a	d_c	D_a	D_e	r_a max.
20	0,6	1,5	–	28,8	32,8	36,8	–	28,5	32,5	36,5	0,6
	1	1	–	30,3	36,9	41,5	–	30	36,5	41	1
25	0,6	1,5	–	34,6	38,5	42,5	–	34,5	38,5	42,5	0,6
	1	1	–	35,5	41,9	46,5	–	35,5	41,5	46,5	1
	1,1	2	31,7	36,7	47,5	–	31,5	36,5	47,5	–	1,1
30	1	2	–	40	45,4	49,6	–	40	45	49,5	1
	1	1	–	42	50,6	55,2	–	42	50,5	55	1
	1,1	2	38,3	43,5	56	–	38	43,5	56	–	1,1
35	1	2	–	44,9	51,3	55,5	–	44,5	51	55,5	1
	1,1	1	–	47	59,3	64	–	47	59	63,5	1,1
	1,5	2	44,7	50,7	65,8	–	44,5	50,5	65,5	–	1,5
40	1	2	–	50,5	57,1	61,7	–	50,5	57	61,5	1
	1,1	1	–	54	66,3	70,9	–	54	66	70,5	1,1
	1,5	2	51,1	57,5	75,2	–	51	57,5	75	–	1,5
45	1	2	–	55,3	62,2	66,9	–	55	62	66,5	1
	1,1	1	–	57,5	69,8	74,4	–	57,5	69,5	74	1,1
	1,5	3	56,1	62,5	80,3	–	56	62,5	80	–	1,5
50	1	2	–	59,1	67,7	72,3	–	59	67,5	72	1
	1,1	1	–	64,4	76,7	81,4	–	64	76,5	81	1,1
	2	3	60,7	68,3	89,7	–	60,5	68	89,5	–	2
55	1,1	2	–	68,5	78,8	83,5	–	68,5	78,5	83,5	1,1
	1,5	1	–	70	84,1	88,8	–	70	84	88,5	1,5
	2	3	67,1	75,5	99,3	–	67	75,5	99	–	2
60	1	1	–	69	74,4	78,6	–	69	74	78,5	1
	1,1	2	–	71,7	82,1	86,7	–	71,5	82	86,5	1,1
	1,5	1,5	–	76,8	93,9	99,2	–	76,5	93,5	99	1,5
	2,1	3	73,6	82	105,8	–	73,5	82	105,5	–	2,1
65	1	1	–	75,7	81	85,2	–	75,5	81	85	1
	1,1	2	–	78,1	88,4	93,1	–	78	88	93	1,1
	1,5	1,5	–	82,3	100,7	106,3	–	82	100,5	106	1,5
	2,1	3,5	80,7	90	116,5	–	80,5	90	116,5	–	2,1

Single row full complement cylindrical roller bearings

Semi-locating bearings



SL1829, SL1830, SL1822

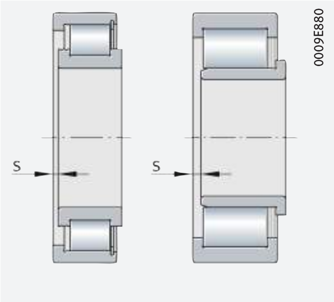


SL1923

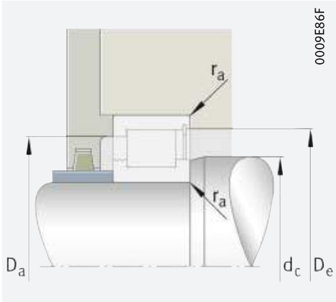
d = 70 – 110 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤507 | 3.12 ➤507 | 3.13 X-life ➤500
			N	N	N	min^{-1}	min^{-1}	≈ kg	
70	100	19	88 000	111 000	18 800	3 950	2 550	0,49	**SL182914-XL**
	110	30	153 000	174 000	29 500	3 750	2 800	1,02	**SL183014-XL**
	125	31	181 000	223 000	33 500	3 450	2 340	1,66	**SL182214**
	150	51	385 000	385 000	72 000	3 050	2 170	4,33	**SL192314-XL**
75	105	19	91 000	119 000	20 100	3 700	2 370	0,52	**SL182915-XL**
	115	30	162 000	192 000	32 500	3 450	2 490	1,06	**SL183015-XL**
	130	31	187 000	236 000	35 500	3 250	2 210	1,75	**SL182215**
	160	55	460 000	465 000	87 000	2 800	2 000	5,3	**SL192315-XL**
80	110	19	94 000	126 000	21 400	3 500	2 220	0,55	**SL182916-XL**
	125	34	170 000	220 000	33 000	3 200	2 470	1,43	**SL183016**
	140	33	223 000	280 000	41 000	3 000	2 040	2,15	**SL182216**
	170	58	540 000	560 000	100 000	2 600	1 820	6,32	**SL192316-XL**
85	120	22	118 000	159 000	25 500	3 300	2 200	0,81	**SL182917-XL**
	130	34	175 000	231 000	34 000	3 050	2 360	1,51	**SL183017**
	150	36	255 000	320 000	46 500	2 850	2 000	2,74	**SL182217**
	180	60	570 000	610 000	107 000	2 410	1 710	7,34	**SL192317-XL**
90	125	22	122 000	169 000	26 500	3 100	2 050	0,84	**SL182918-XL**
	140	37	205 000	275 000	40 000	2 850	2 240	1,97	**SL183018**
	160	40	285 000	365 000	53 000	2 700	1 990	3,48	**SL182218**
	190	64	620 000	650 000	116 000	2 400	1 760	8,83	**SL192318-TB-XL**
95	130	22	132 000	177 000	27 500	2 950	1 940	0,86	**SL182919-XL**
	170	43	330 000	425 000	61 000	2 420	1 780	4,17	**SL182219**
	200	67	650 000	710 000	124 000	2 240	1 620	10,2	**SL192319-TB-XL**
100	140	24	152 000	203 000	31 500	2 750	1 870	1,14	**SL182920-XL**
	150	37	216 000	300 000	43 000	2 600	2 040	2,15	**SL183020**
	180	46	390 000	510 000	73 000	2 300	1 700	5,13	**SL182220**
	215	73	790 000	850 000	148 000	2 110	1 490	13	**SL192320-TB-XL-BR**
110	150	24	155 000	213 000	34 000	2 500	1 710	1,23	**SL182922-XL**
	170	45	280 000	385 000	55 000	2 350	2 010	3,5	**SL183022**
	200	53	450 000	580 000	81 000	2 130	1 720	7,24	**SL182222**
	240	80	950 000	970 000	160 000	1 820	1 270	17	**SL192322-TB-XL-BR**

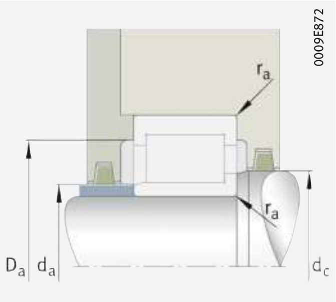
medias ➤ *https://www.schaeffler.de/std/1DFC*



Axial displacement “s”



Mounting dimensions for SL1829, SL1830, SL1822

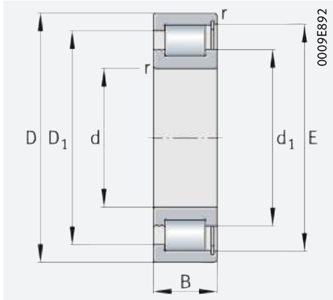


Mounting dimensions for SL1923

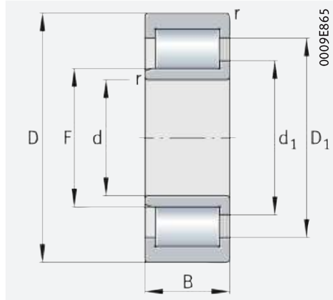
Dimensions							Mounting dimensions				
d	r	s	F	d_1	D_1	E	d_a	d_c	D_a	D_e	r_a
	min.			≈	≈						max.
70	1	1	–	81,2	87,8	92,3	–	81	87,5	92	1
	1,1	3	–	81,5	95,6	100,3	–	81,5	95,5	100	1,1
	1,5	1,5	–	87	105,2	111,5	–	87	105	111	1,5
	2,1	3,5	84,1	93,5	121,6	–	84	93,5	121,5	–	2,1
75	1	1	–	86,3	92,8	97,4	–	86	92,5	97	1
	1,1	3	–	89	103,2	107,9	–	89	103	107,5	1,1
	1,5	1,5	–	91,8	110	116,2	–	91,5	110	116	1,5
	2,1	3,5	91,2	101,6	131,5	–	91	101,5	131,5	–	2,1
80	1	1	–	91,4	98	102,5	–	91	98	102,5	1
	1,1	4	–	95	111,7	117,4	–	95	111,5	117	1,1
	2	1,5	–	98,6	119,3	126,3	–	98,5	119	126	2
	2,1	3,5	98,2	109,5	142,1	–	98	109,5	142	–	2,1
85	1,1	1	–	96,4	105	109,6	–	96	105	109,5	1,1
	1,1	4	–	99,4	116,1	122	–	99	116	121,5	1,1
	2	1,5	–	104,4	126,3	133,8	–	104	126	133,5	2
	3	4	107	118,2	150,9	–	107	118	150,5	–	3
90	1,1	1	–	102	110,7	115,8	–	102	110,5	115,5	1,1
	1,5	4	–	106,1	124,5	130,1	–	106	124,5	130	1,5
	2	2,5	–	110,2	133,3	141,2	–	110	133	141	2
	3	4	105,3	117,5	152,5	–	105	117,5	152,5	–	3
95	1,1	1	–	106,7	117	122,3	–	106,5	117	122	1,1
	2,1	2,5	–	122	147,3	156	–	122	147	155,5	2,1
	3	4	114,7	126,6	161,9	–	114,5	126,5	161,5	–	3
100	1,1	1,5	–	113,4	125,7	131	–	113	125,5	130,5	1,1
	1,5	4	–	115,7	134	140,2	–	115,5	134	140	1,5
	2,1	2,5	–	127,5	154,3	163,4	–	127,5	154	163	2,1
	3	4	119,3	132,7	172,8	–	119	132,5	172,5	–	3
110	1,1	1,5	–	124	136,2	141,5	–	124	136	141,5	1,1
	2	5,5	–	127,3	149,3	156,7	–	127	149	156,5	2
	2,1	4	–	137	168	177,6	–	137	168	177,5	2,1
	3	5	134,3	151,1	199,9	–	134	151	199,5	–	3

Single row full complement cylindrical roller bearings

Semi-locating bearings



SL1829, SL1830, SL1822

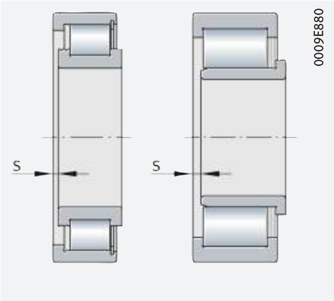


SL1923

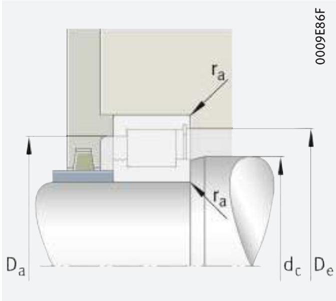
d = 120 – 190 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤507 | 3.12 ➤507 | 3.13 X-life ➤500
			N	N	N	min^{-1}	min^{-1}	≈ kg	
120	165	27	199 000	285 000	45 500	2 290	1 590	1,73	**SL182924-XL**
	180	46	295 000	425 000	58 000	2 160	1 840	3,8	**SL183024**
	215	58	530 000	720 000	99 000	1 930	1 500	9,08	**SL182224**
	260	86	1 130 000	1 230 000	200 000	1 690	1 120	22,3	**SL192324-TB-XL-BR**
130	180	30	238 000	350 000	54 000	2 110	1 500	2,33	**SL182926-XL**
	200	52	425 000	600 000	82 000	1 990	1 660	5,65	**SL183026**
	230	64	620 000	850 000	113 000	1 790	1 360	11,25	**SL182226**
	280	93	1 260 000	1 380 000	222 000	1 570	1 040	27,95	**SL192326-TB-XL-BR**
140	190	30	260 000	375 000	60 000	1 950	1 370	2,42	**SL182928-XL**
	210	53	450 000	660 000	88 000	1 820	1 470	6,04	**SL183028**
	250	68	720 000	1 000 000	132 000	1 660	1 230	14,47	**SL182228**
	300	102	1 410 000	1 570 000	248 000	1 470	970	34,9	**SL192328-TB-XL-BR**
150	210	36	340 000	480 000	77 000	1 790	1 360	3,77	**SL182930-XL**
	225	56	475 000	700 000	91 000	1 740	1 430	7,33	**SL183030**
	270	73	820 000	1 160 000	151 000	1 560	1 130	18,43	**SL182230**
	320	108	1 490 000	1 900 000	231 000	1 350	840	42,1	**SL192330-TB-BR**
160	220	36	350 000	510 000	80 000	1 680	1 270	4	**SL182932-XL**
	240	60	540 000	800 000	103 000	1 600	1 280	8,8	**SL183032**
	290	80	1 020 000	1 470 000	184 000	1 370	920	23	**SL182232**
	340	114	1 690 000	2 170 000	240 000	1 250	760	49,7	**SL192332-TB-BR**
170	230	36	365 000	540 000	84 000	1 590	1 190	4,3	**SL182934-XL**
	260	67	700 000	1 050 000	133 000	1 480	1 120	12,2	**SL183034**
	310	86	1 140 000	1 660 000	205 000	1 300	870	28,65	**SL182234**
	360	120	1 830 000	2 380 000	265 000	1 200	730	59,2	**SL192334-TB-BR**
180	250	42	455 000	680 000	104 000	1 500	1 150	6,2	**SL182936-XL**
	280	74	810 000	1 240 000	155 000	1 370	1 020	16,1	**SL183036**
	320	86	1 180 000	1 760 000	214 000	1 230	800	29,8	**SL182236**
	380	126	1 940 000	2 600 000	280 000	1 120	670	69,1	**SL192336-TB-BR**
190	260	42	510 000	770 000	117 000	1 420	1 030	6,5	**SL182938-XL**
	290	75	830 000	1 300 000	160 000	1 320	970	17	**SL183038**
	340	92	1 300 000	1 900 000	229 000	1 170	770	35,65	**SL182238**
	400	132	2 220 000	2 950 000	315 000	1 090	630	80,3	**SL192338-TB-BR**

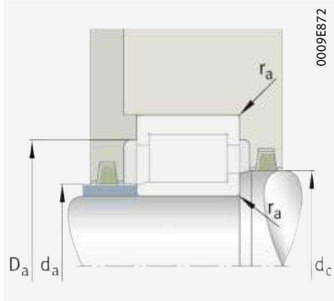
medias ➤ *https://www.schaeffler.de/std/1DFD*



Axial displacement "s"



Mounting dimensions for SL1829, SL1830, SL1822

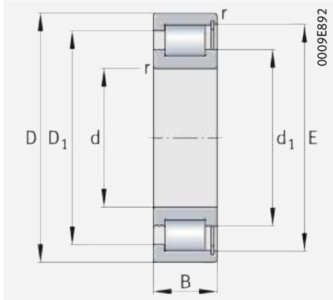


Mounting dimensions for SL1923

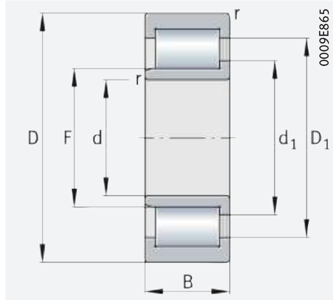
Dimensions							Mounting dimensions				
d	r min.	s	F	d_1 ≈	D_1 ≈	E	d_a	d_c	D_a	D_e	r_a max.
120	1,1	1,5	–	134,8	149	154,3	–	134,5	149	154	1,1
	2	5,5	–	138,8	160,7	168,2	–	138,5	160,5	168	2
	2,1	4	–	150,7	183	192,9	–	150,5	183	192,5	2,1
	3	5	147,4	164,2	213,1	–	147	164	213	–	3
130	1,5	2	–	146	161,1	167,2	–	146	161	167	1,5
	2	5,5	–	148,6	175,5	184,4	–	148,5	175,5	184	2
	3	5	–	162,3	197	207,8	–	162	197	207,5	3
	4	5	157,9	176	227,9	–	157,5	176	227,5	–	4
140	1,5	2	–	157	174	180	–	157	174	180	1,5
	2	5,5	–	162,2	189,5	198,4	–	162	189,5	198	2
	3	5	–	173,9	211,1	222,6	–	173,5	211	222,5	3
	4	7	168,4	187,8	243,4	–	168	187,5	243	–	4
150	2	2,5	–	169	189,6	196,8	–	169	189,5	196,5	2
	2,1	7	–	170	198	207,5	–	170	198	207	2,1
	3	6	–	185,5	225,2	237,4	–	185,5	225	237	3
	4	7	182,5	203,3	263,5	–	182	203	263,5	–	4
160	2	2,5	–	179,7	200,5	207,6	–	179,5	200,5	207,5	2
	2,1	7	–	184,8	215,8	225,5	–	184,5	215,5	225	2,1
	3	6	–	208,7	253,4	267,1	–	208,5	253	267	3
	4	7	196,4	219	284,4	–	196	219	284	–	4
170	2	2,5	–	190,6	211,3	218,5	–	190,5	211	218	2
	2,1	7	–	198,1	232,7	243,6	–	198	232,5	243,5	2,1
	4	7	–	220,3	267,4	281,9	–	220	267	281,5	4
	4	7	203,6	226,6	295	–	203,5	226,5	295	–	4
180	2	2,5	–	200,7	224	231,9	–	200,5	224	231,5	2
	2,1	7	–	212,2	249,4	261	–	212	249	261	2,1
	4	7	–	232,4	279,5	294	–	232	279,5	294	4
	4	7	221,6	245	312,9	–	221,5	245	312,5	–	4
190	2	2	–	211,5	238,5	244,2	–	211,5	238,5	244	2
	2,1	9	–	221,8	259	270,6	–	221,5	259	270,5	2,1
	4	9	–	243,5	295,5	311,5	–	243,5	295,5	311,5	4
	5	7	224,4	250	326,8	–	224	250	326,5	–	5

Single row full complement cylindrical roller bearings

Semi-locating bearings



SL1818, SL1829, SL1830, SL1822

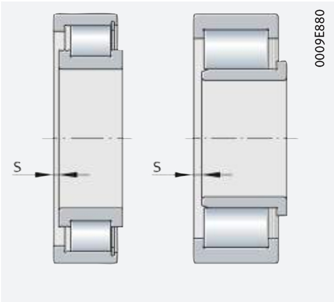


SL1923

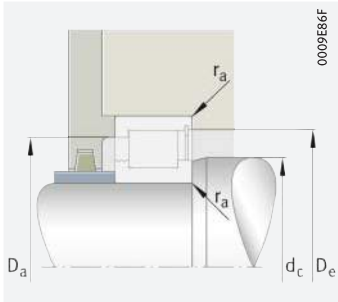
d = 200 – 360 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤507 | 3.12 ➤507 | 3.13 X-life ➤500
			N	N	N	min^{-1}	min^{-1}	≈ kg	
200	250	24	178 000	320 000	33 500	1 420	1 040	2,57	**SL181840**
	280	48	610 000	940 000	140 000	1 320	950	9,1	**SL182940-XL**
	310	82	950 000	1 510 000	184 000	1 230	890	21,8	**SL183040**
	360	98	1 410 000	2 010 000	242 000	1 150	770	43,12	**SL182240**
	420	138	2 470 000	3 300 000	345 000	1 020	570	92,1	**SL192340-TB-BR**
220	270	24	187 000	350 000	36 000	1 290	940	2,8	**SL181844**
	300	48	650 000	1 030 000	150 000	1 210	840	9,9	**SL182944-XL**
	340	90	1 150 000	1 820 000	215 000	1 140	800	28,4	**SL183044**
	460	145	2 650 000	3 450 000	355 000	910	520	111,2	**SL192344-TB-BR**
240	300	28	265 000	490 000	54 000	1 160	870	4,29	**SL181848-E**
	320	48	600 000	1 120 000	130 000	1 120	750	10,6	**SL182948**
	360	92	1 210 000	1 990 000	230 000	1 040	720	30,9	**SL183048**
	500	155	2 900 000	3 800 000	385 000	860	500	142,3	**SL192348-TB-BR**
260	320	28	275 000	530 000	57 000	1 080	790	4,61	**SL181852-E**
	360	60	780 000	1 450 000	166 000	1 020	690	18,5	**SL182952**
	400	104	1 600 000	2 500 000	285 000	940	620	44,5	**SL183052-TB**
	540	165	3 550 000	4 700 000	460 000	760	410	173,2	**SL192352-TB-BR**
280	350	33	355 000	670 000	73 000	990	730	6,89	**SL181856-E**
	380	60	910 000	1 710 000	190 000	940	590	19,7	**SL182956-TB**
	420	106	1 650 000	2 650 000	295 000	900	590	48	**SL183056-TB**
300	380	38	455 000	840 000	90 000	920	680	9,79	**SL181860-E**
	420	72	1 170 000	2 200 000	242 000	870	540	31,2	**SL182960-TB**
	460	118	2 020 000	3 300 000	330 000	800	500	66,6	**SL183060-TB**
320	400	38	470 000	900 000	94 000	870	620	10,36	**SL181864-E**
	440	72	1 210 000	2 340 000	255 000	820	495	32,9	**SL182964-TB**
	480	121	2 080 000	3 450 000	345 000	770	480	71,7	**SL183064-TB**
340	420	38	485 000	960 000	98 000	810	570	10,93	**SL181868-E**
	460	72	1 250 000	2 470 000	265 000	770	460	34,7	**SL182968-TB**
	520	133	2 490 000	4 150 000	395 000	710	430	95,8	**SL183068-TB**
360	440	38	500 000	1 010 000	102 000	770	530	11,49	**SL181872-E**
	480	72	1 280 000	2 600 000	275 000	730	430	36,4	**SL182972-TB**
	540	134	2 550 000	4 350 000	410 000	680	405	101	**SL183072-TB**

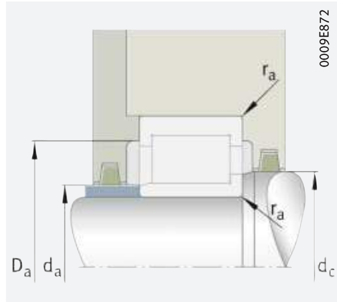
medias ➤ *https://www.schaeffler.de/std/1DFE*



Axial displacement "s"



Mounting dimensions for SL1818, SL1829, SL1830, SL1822

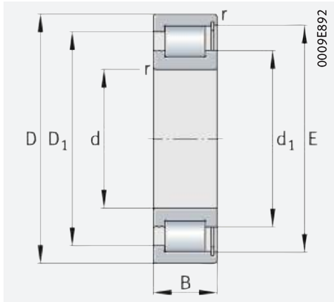


Mounting dimensions for SL1923

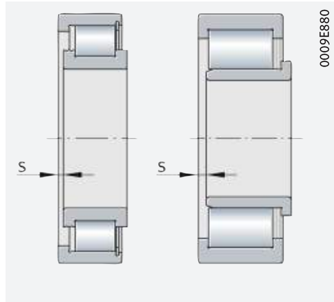
Dimensions							Mounting dimensions				
d	r	s	F	d_1	D_1	E	d_a	d_c	D_a	D_e	r_a
	min.			≈	≈						max.
200	1,5	2	–	216,6	231,6	237,6	–	216,5	231,5	237,5	1,5
	2,1	3	–	225,5	252,4	261,6	–	225,5	252	261,5	2,1
	2,1	9	–	236,6	276,2	288,6	–	236,5	276	288,5	2,1
	4	9	–	246,6	302,4	319,4	–	246,5	302	319	4
	5	7	238,5	265,7	347,2	–	238	265,5	347	–	5
220	1,5	2	–	237,3	252,3	258,5	–	237	252	258,5	1,5
	2,1	3	–	246,3	273,2	282,5	–	246	273	282	2,1
	3	9	–	254,6	299,2	312	–	254,5	299	312	3
	5	7	266,7	297	388,3	–	266,5	297	388	–	5
240	2	2	–	260,5	281	287,5	–	260,5	281	287,5	2
	2,1	3	–	267,5	294,4	303,7	–	267,5	294	303,5	2,1
	3	11	–	277,5	322,1	336	–	277,5	322	336	3
	5	10	280,6	312,5	408,5	–	280,5	312,5	408,5	–	5
260	2	2	–	281	301,5	308	–	281	301,5	308	2
	2,1	5	–	291,5	323,4	333,7	–	291,5	323	333,5	2,1
	4	11	–	304	358,4	376	–	304	358	375,5	4
	6	10	315,6	351,6	459,6	–	315,5	351,5	459,5	–	6
280	2	2,5	–	304	327	335	–	304	327	335	2
	2,1	3,5	–	314	348,5	359,5	–	314	348,5	359,5	2,1
	4	11	–	319,5	372,9	390,3	–	319,5	372,5	390	4
300	2,1	3	–	323,5	350,5	360	–	323,5	350,5	360	2,1
	3	5	–	338	376,9	389,5	–	338	376,5	389	3
	4	14	–	353,6	415,6	434,9	–	353,5	415,5	434,5	4
320	2,1	3	–	344,5	371,5	381	–	344,5	371,5	381	2,1
	3	5	–	358,5	397,4	409,9	–	358,5	397	409,5	3
	4	14	–	369,5	430,1	449,5	–	369,5	430	449,5	4
340	2,1	3	–	365,5	392,5	402,2	–	365,5	392,5	402	2,1
	3	5	–	379	418,7	430,2	–	379	418,5	430	3
	5	16	–	396,1	463,9	485,7	–	396	463,5	485,5	5
360	2,1	3	–	387	413,5	423,5	–	387	413,5	423,5	2,1
	3	5	–	399,5	438,6	450,6	–	399,5	438,5	450,5	3
	5	16	–	414	481,6	503,5	–	414	481,5	503	5

Single row full complement cylindrical roller bearings

Semi-locating bearings



SL1818, SL1829, SL1830

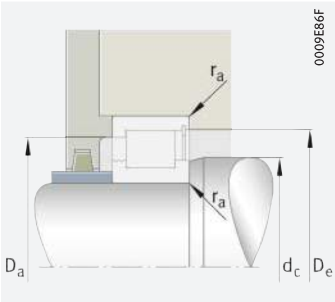


Axial displacement "s"

d = 380 – 500 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤507|3.12 ➤507|3.13
			N	N	N	min^{-1}	min^{-1}	≈ kg	
380	480	46	650 000	1 290 000	131 000	710	490	18,87	**SL181876-E**
	520	82	1 660 000	3 300 000	340 000	680	380	52,1	**SL182976-TB**
	560	135	2 600 000	4 450 000	425 000	660	390	106	**SL183076-TB**
400	500	46	660 000	1 340 000	135 000	680	470	19,81	**SL181880-E**
	540	82	1 710 000	3 500 000	355 000	650	350	54,3	**SL182980-TB**
	600	148	3 050 000	5 400 000	510 000	610	345	140	**SL183080-TB**
420	520	46	680 000	1 420 000	141 000	650	430	20,6	**SL181884-E**
	560	82	1 730 000	3 600 000	365 000	630	340	56,9	**SL182984-TB**
440	540	46	700 000	1 470 000	145 000	620	415	21,54	**SL181888-E**
	600	95	2 090 000	4 100 000	410 000	590	325	78,1	**SL182988-TB**
460	580	56	940 000	1 890 000	186 000	580	385	33,21	**SL181892-E-TB**
	620	95	2 130 000	4 250 000	420 000	570	310	81,1	**SL182992-TB**
480	600	56	960 000	1 970 000	192 000	560	365	34,53	**SL181896-E-TB**
	650	100	2 390 000	4 800 000	470 000	530	280	94,7	**SL182996-TB**
500	620	56	980 000	2 050 000	197 000	540	345	35,73	**SL1818/500-E-TB**
	670	100	2 430 000	4 950 000	480 000	520	270	98,3	**SL1829/500-TB**

medias ➤ *https://www.schaeffler.de/std/1DFF*



Mounting dimensions
for SL1818, SL1829, SL1830

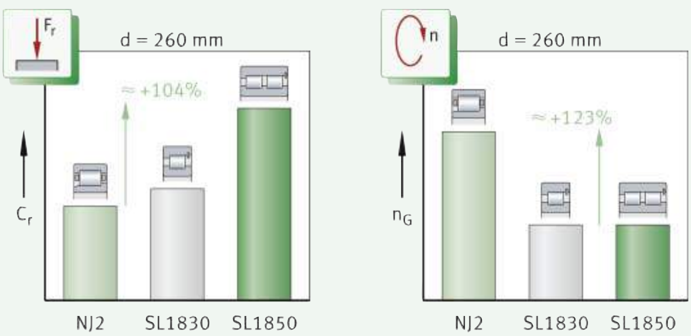
Dimensions						Mounting dimensions				
d	r min.	s	d_1 ≈	D_1 ≈	E	d_a	d_c	D_a	D_e	r_a max.
380	2,1	4	415,5	448	459	–	415,5	448	459	2,1
	4	5	426	472,1	486,7	–	426	472	486,5	4
	5	16	431,7	499,5	521,3	–	431,5	499,5	521	5
400	2,1	4	432	464,5	475,5	–	432	464,5	475,5	2,1
	4	5	450	496,1	510,9	–	450	496	510,5	4
	5	18	462,5	535,1	558,5	–	462,5	535	558,5	5
420	2,1	4	457	489,5	500	–	457	489,5	500	2,1
	4	5	462	509	523	–	462	509	522,5	4
440	2,1	4	473,5	506	517	–	473,5	506	517	2,1
	4	7	490	544,6	562	–	490	544,5	562	4
460	3	5	501,5	540	554	–	501,5	540	554	3
	4	7	504	559,6	576,3	–	504	559,5	576	4
480	3	5	522	560	574,5	–	522	560	574,5	3
	5	7	538	596,6	614,8	–	538	596,5	614,5	5
500	3	5	542	580,5	594,5	–	542	580,5	594,5	3
	5	7	553	612,7	630	–	553	612,5	630	5

4 Double row full complement cylindrical roller bearings

Double row full complement cylindrical roller bearings are suitable where:

- bearing arrangements are subjected to particularly high radial loads ➤528|4.2
- not only particularly high radial forces but also high axial loads from one or both directions must be supported by the bearing position (semi-locating or locating bearing function) ➤528|4.2
- bearing arrangements must have very high rigidity
- Axial displacements of the shaft relative to the housing must be aompensated without constraint in the bearing (in the case of bearings with a non-locating or semi-locating bearing function) ➤524|4.1
- very high radial loads occur at lower speeds, i.e. the bearings do not need to achieve speeds as high as those of cylindrical roller bearings with cage ➤531|4.6 and ➤542|
- space-saving designs are required despite very high load
- the bearings should be separable for easier mounting (bearings with non-locating bearing function) ➤524|4.1 and ➤540|4.17.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤410.



1
Cylindrical roller bearing with cage/single row full complement bearing, double row full complement bearing, comparison of speed and load carrying capacity

C_r = *basic dynamic load rating*
n_G = *limiting speed*

4.1 Bearing design

Design variants

The standard range of double row full complement cylindrical roller bearings comprises:

- series SL0248 and SL0249 (non-locating bearings) ➤525| 2
- series SL1850 (semi-locating bearings) ➤526| 3
- series SL0148 and SL0149 (locating bearings) ➤526| 4
- series SL0450 and SL04 (cylindrical roller bearings with annular slots – rope sheave bearings) ➤527| 5
- X-life bearings ➤527.

In addition to the bearings described here, Schaeffler supplies double row full complement cylindrical roller bearings in other types, series and dimensions. These products are described in some cases in special publications. If necessary, please contact Schaeffler. Larger catalogue bearings ➤ *GL 1*.

Bearings of basic design – standard range

Key features

Double row full complement cylindrical roller bearings are part of the group of radial roller bearings. These bearings comprise solid outer rings, inner rings and full complement rolling element sets. Due to the absence of a cage, the bearing can accommodate the largest possible number of rolling elements. The rollers have profiled ends, i.e. they have a slight lateral curvature towards the ends. This modified line contact between the rolling elements and raceways prevents damaging edge stresses ➤*413*|*2*. Bearings in the standard range differ essentially in the arrangement of the ribs on the inner ring and outer ring. Depending on the design, they are used as non-locating bearings, semi-locating bearings or locating bearings.

Series SL0248, SL0249

Bearings with non-locating bearing function

In bearings of these series, the inner ring has three rigid ribs, while the outer ring is without ribs ➤*525*|*2*.
As a result, axial displacements of the shaft relative to the housing can be compensated within certain limits. During rotational motion, length compensation occurs without constraint in the bearing between the rollers and the raceway without ribs and is therefore practically free from friction. The maximum axial displacement s is given in the product tables. The bearings are used as non-locating bearings, i.e. they cannot guide the shaft axially in either direction ➤*528*|*4.2*. The series SL0248 and SL0249 are not self-retaining (the outer ring without ribs can be removed from the bearing). As a result, the bearing parts (the inner ring with the rolling element set and the outer ring) can be mounted separately from each other. This gives easier mounting of the bearings ➤*540*|*4.17*.

According to DIN 5412-9:1982, which has now been withdrawn, the bearings have the following designation:

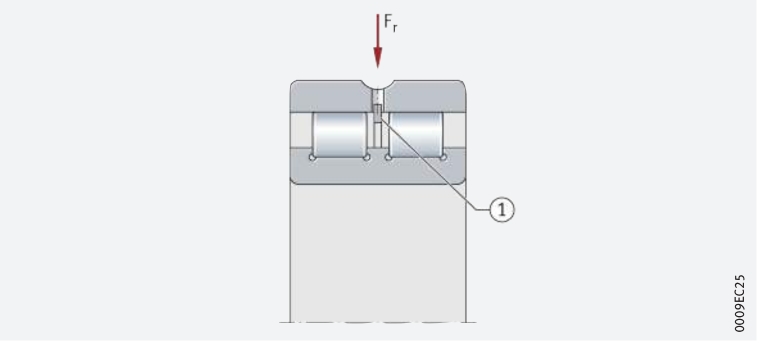
- SL0248: NNCL48..V
- SL0249: NNCL49..V

The bearings are held together in handling and mounting by a transport and mounting retaining device on the outer ring ➤*525*|*2*.
This retaining device remains in the bearing even after mounting and must not be subjected to axial load.

2
Double row full complement cylindrical roller bearing – non-locating bearing

F_r = *radial load*

① *Transport and mounting retaining device*



Series SL1850

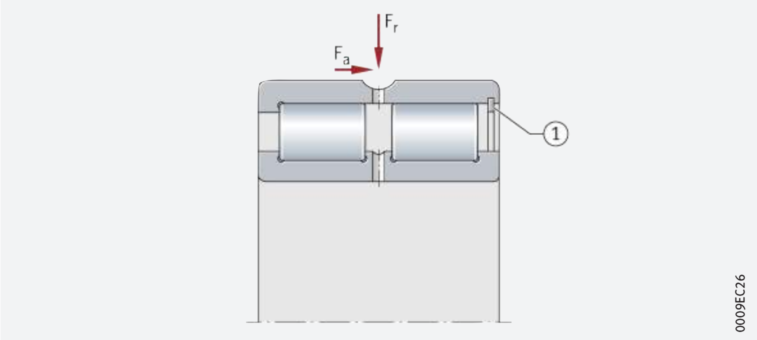
Bearings with semi-locating bearing function

Bearings of series SL1850 (dimension series 50) have three rigid ribs on the inner ring and one rigid rib on the outer ring ➤*526*|*3*. In these cylindrical roller bearings, axial displacements of the shaft relative to the housing are possible in one direction only. The maximum axial displacement s is given in the product tables ➤*542*|. The bearings are used as semi-locating bearings, i.e. they can guide the shaft axially in one direction ➤*528*|*4.2*.

The bearings are held together in handling and mounting by a transport and mounting retaining device on the outer ring ➤526|Fig. 3.
This retaining device remains in the bearing even after mounting and must not be subjected to axial load.

Fig. 3
Double row full complement cylindrical roller bearing – semi-locating bearing

F_r = radial load
F_a = axial load
① Transport and mounting retaining device



Series SL0148, SL0149

Bearings with locating bearing function

In these bearings, the inner ring has three rigid ribs and the outer ring has two rigid ribs ➤526|Fig. 4. Axial displacements between the shaft and housing are not possible. The bearings are used as locating bearings, i.e. they can guide the shaft axially in both directions ➤528|4.2.

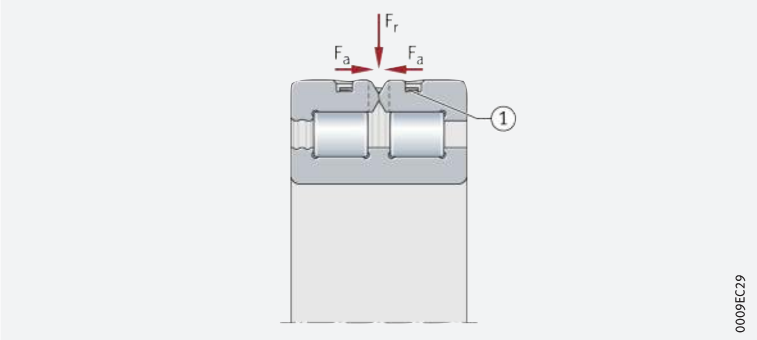
According to DIN 5412-9:1982, which has now been withdrawn, the bearings have the following designation:

- SL0148: NNC48..V
- SL0149: NNC49..V.

The split outer ring is held together by a transport and mounting retaining device ➤526|Fig. 4. This retaining device remains in the bearing even after mounting and must not be subjected to axial load.

Fig. 4
Double row full complement cylindrical roller bearing – locating bearing

F_r = radial load
F_a = axial load
① Retaining ring



Series SL0450..-PP and SL04..-PP – cylindrical roller bearings with annular slots

Bearings with locating bearing function, particularly suitable for the support of rope sheaves

These bearings comprise solid outer rings without ribs, inner rings with three ribs, rib-guided rolling element sets and sealing rings ➤527|Fig. 5. The outer rings have annular slots for retaining rings. The inner rings are axially split, 1 mm wider than the outer rings and held together by a sheet metal ring. They are used as locating bearings (but can support only slight axial loads) and are used in preference for the support of rope sheaves.

Light series and dimension series 50

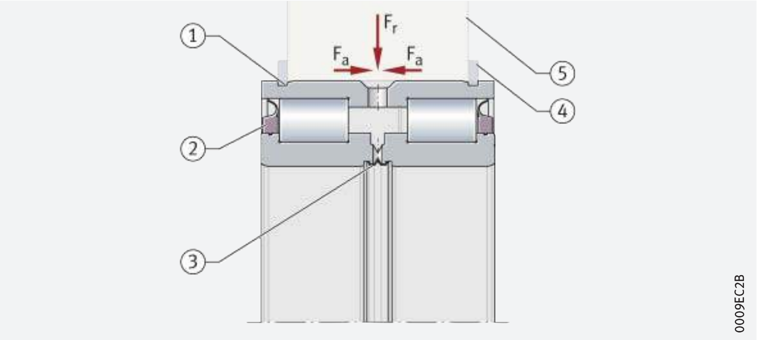
Cylindrical roller bearings with annular slots are available as a light series SL04..-PP and in the dimension series 50 as SL0450..-PP. The latter has a higher load carrying capacity than the light series ➤550|Table.

Extensive information on rope sheave bearing arrangements is given in the Technical Product Information TPI 237. This publication can be requested from Schaeffler.

5
Double row full complement cylindrical roller bearing with annular slots – locating bearing

F_r = *radial load*
F_a = *axial load*

① *Slots in outer ring*
② *Sealing rings*
③ *Sheet metal ring*
④ *Retaining rings*
⑤ *Rope sheave*



X-life premium quality

Double row full complement cylindrical roller bearings of series SL1850 are available in many sizes as X-life bearings ➤*542*|. These bearings exhibit considerably higher performance than comparable standard cylindrical roller bearings. This is achieved, for example, through the modified internal construction, the optimised contact geometry between the rollers and raceways, the better surface quality and the optimised roller guidance and lubricant film formation.

Advantages

Increased customer benefits due to X-life

These technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings
- a higher fatigue limit load
- lower heat generation in the bearing
- lower lubricant consumption and therefore longer maintenance intervals if relubrication is carried out
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

Interchangeable with comparable standard bearings

Since X-life cylindrical roller bearings have the same dimensions as the corresponding standard bearings, the latter can be replaced without any problems by the higher-performance X-life bearings. The major advantages of X-life can therefore also be used for existing bearing arrangements with standard bearings.

Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

Suffix XL

X-life cylindrical roller bearings include the suffix XL in the designation ➤*534*|*4.12* and ➤*542*|.

Areas of application

Due to their special technical features, double row full complement X-life cylindrical roller bearings are highly suitable, for example, for bearing arrangements in:

- heavy industry (steel production)
- power transmission (gearbox engineering)
- processing machines and construction machinery
- wind turbines (gearbox applications).

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤*10*.

4.2 Load carrying capacity

Designed for very high radial loads

Depending on the type, double row full complement cylindrical roller bearings can support not only very high radial forces but also high axial loads on one or both sides:

- The series SL0248 and SL0249 must only be subjected to radial load
- The series SL1850 can support radial loads as well as axial loads on one side
- The series SL0148 and SL0149 can support radial loads as well as axial loads on both sides
- The series SL0450..-PP and SL04..50-PP can support radial loads and are suitable for the support of moderate axial loads from both directions.

Higher axial load carrying capacity of bearings with toroidal crowned roller end face

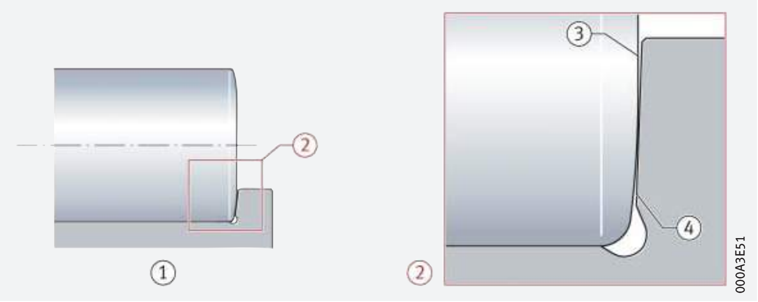
Neither wear nor material fatigue occurs on the rib contact running and roller end faces

In the case of cylindrical roller bearings with toroidal crowned rollers (TB design), the axial load carrying capacity has been significantly improved with the aid of new calculation and manufacturing methods. A special curvature of the roller end faces facilitates optimum contact conditions between the rollers and ribs ➤528 | 6. As a result, the axial contact pressures on the rib are significantly minimised and a lubricant film capable of supporting higher loads is formed. Under standard operating conditions, this completely eliminates wear and fatigue at the rib contact running and roller end faces. In addition, the axial frictional torque is reduced by up to 50%. The bearing temperature during operation is therefore significantly lower. Bearings of toroidal crowned design ➤542 |.

By agreement, bearings of series SL1850 are available starting from a bore diameter d = 180 mm in the TB design.

6
Contact geometry of roller end face/rib face – modified roller end faces

1. *Cylindrical roller with inner ring*
2. *Detail (representation not to scale)*
3. *End of roller*
4. *Rib*



Load ratio F_a/F_r

Ratio $F_a/F_r \leqq 0,4$ or $0,6$

The bearings can support axial loads on one side by means of the ribs on the inner and outer ring ➤529 | 7. In order to ensure problem-free running (tilting of the rollers is prevented), they must always be subjected to radial load at the same time as axial load. The ratio F_a/F_r must not exceed the value 0,4. For bearings with toroidal crowned roller ends (TB design), values up to 0,6 are permissible.

Continuous axial loading without simultaneous radial loading is not permissible.

Permissible axial load

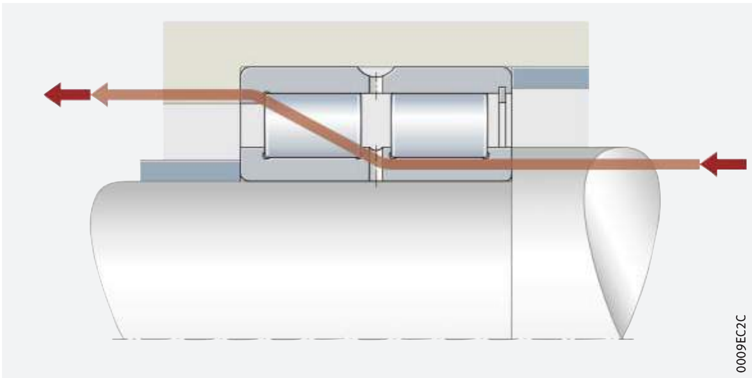
Influencing factors on the axial load carrying capacity

Axial loads are supported by the bearing ribs and the roller end faces ➤529|7. The axial load carrying capacity of the bearing is therefore essentially dependent on:

- the size of the sliding surfaces between the ribs and the end faces of the rolling elements
- the sliding velocity at the ribs
- the lubrication of the contact surfaces
- tilting of the bearing
- friction.

7

Force flow under axial load – semi-locating bearing SL1850



Calculation of permissible axial load – cylindrical rollers with conventional roller ends

Bearings with standard roller ends

The permissible axial load $F_{a\ per}$ can be calculated from the hydrodynamic load carrying capacity of the contact ➤529|1.

1

Permissible axial load – bearings of standard design

$$F_{a\,per} = k_S \cdot k_B \cdot d_M^{\,1,54} \cdot n^{-0,6} \leqq F_{a\,max}$$

Legend

$F_{a\ per}$	N	Permissible continuous axial load. In order to prevent unacceptably high temperatures in the bearing, $F_{a\ per}$ must not be exceeded
$F_{a\ max}$	N	Maximum continuous axial load in relation to rib fracture. In order to prevent unacceptably high pressures at the contact surfaces, $F_{a\ max}$ must not be exceeded
k_S	–	Factor as a function of lubrication method ➤529|1. The factor takes into consideration the lubrication method used for the bearing. The better the lubrication and, in particular, the heat dissipation, the higher the permissible axial load
k_B	–	Factor as a function of bearing series ➤530|2
d_M	mm	Mean bearing diameter $d_M = (D + d)/2$ ➤542|
n	min^{-1}	Operating speed.

1

Factor k_S

Lubrication method	Factor k_S	
	from	up to
Standard greasing, no heat dissipation by the lubricant	1,5	3
Minimal heat dissipation, drip feed oil lubrication, oil mist lubrication, low operating viscosity ($\nu < 0,5 \cdot \nu_1$)	7,5	10
Poor heat dissipation, oil sump lubrication, oil spray lubrication, low oil flow	10	15
Good heat dissipation, recirculating oil lubrication (pressurised oil lubrication)	12	18
Very good heat dissipation, recirculating oil lubrication with oil cooling, high operating viscosity ($\nu > 2 \cdot \nu_1$)	16	24

! The precondition for these k_S values is an operating viscosity of the lubricant of at least the reference viscosity ν_1 in accordance with DIN ISO 281:2010.

Doped lubricating oils should be used, such as CLP (DIN 51517) and HLP (DIN 51524) of ISO VG grades 32 to 460, as well as ATF oils (DIN 51502) and transmission oils (DIN 51512) of SAE viscosity grades 75W to 140W.

2
Bearing factor k_B

Series	k_B
SL0148	4,5
SL0149	11
SL1850	17
SL0450	17
SL04	10

Calculation of permissible axial load – cylindrical rollers with toroidal roller ends

For bearings with toroidal roller ends, the permissible axial loads are 50% higher ➤530| 2.

2
Permissible axial load – bearings of TB design

$$F_{a\,per} = 1{,}5 \cdot k_S \cdot k_B \cdot d_M^{\;1{,}54} \cdot n^{-0{,}6} \leqq F_{a\,max}$$

Calculation of maximum permissible axial load

For bearings with rollers of the standard or TB design, the maximum permissible axial load $F_{a\,max}$ ➤530| 3 is calculated from the rib strength and the security against wear. This must not be exceeded, even if $F_{a\,per}$ gives higher values ➤530| 4.

3
Maximum axial load – bearings of standard and TB design

$$F_{a\,max} = 0{,}075 \cdot k_B \cdot d_M^{\;2{,}1}$$

4
Permissible axial load

$$F_{a\,per} \leqq F_{a\,max}$$

Axial load carrying capacity of cylindrical roller bearings with annular slots (rope sheave bearings)

For cylindrical roller bearings with annular slots in the outer ring, the calculations of $F_{a\,per}$ and $F_{a\,max}$ cannot be used. For the axial load carrying capacity of these bearings, please consult Schaeffler.

4.3 Compensation of angular misalignments

The bearings do not permit any misalignments between the inner and outer ring, i.e. the bearing positions must be well aligned.

4.4 Lubrication

✎ Oil or grease lubrication is possible

The cylindrical roller bearings are not greased. They must be lubricated with oil or grease. The bearings can be lubricated via the end faces of the outer ring as well as via a lubrication groove and lubrication holes in the outer ring.

Cylindrical roller bearings with annular slots (rope sheave bearings)

✎ The bearings have an initial greasing

These bearings are supplied greased and can be relubricated via the outer ring or inner ring. The grease used is a lithium complex soap grease to GA08. Arcanol LOAD150 ➤70 is suitable for relubrication. The greases named are highly suitable, due to their good moisture resistance and high load carrying capacity, for applications in rope sheaves at low to moderate speeds.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

4.5 Sealing

✎ Provide seals in the adjacent construction

The bearings are not sealed, i. e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

Cylindrical roller bearings with annular slots (rope sheave bearings)

✎ The bearings are sealed on both sides

In the case of these bearings, the rolling element system is protected against contamination and moisture by polyurethane sealing rings on both sides of the bearing. The seals have low friction and are particularly resistant to climate and temperature. Where environmental conditions are particularly critical, sealing of the bearings can be improved further by means of additional seals, such as V rings, in the adjacent construction.

4.6 Speeds

✎ Limiting speeds and reference speeds in the product tables

The product tables give two speeds for most bearings:

- the kinematic limiting speed n_G
- the thermal speed rating n_ϑ.

✎ Lower speed capacity than bearings with cage

Due to the kinematic conditions, full complement cylindrical roller bearings do not achieve the high speeds that are possible when using cylindrical roller bearings with cage.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤*64*.

Reference speeds

✎ $n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤*64*.

✎ Bearings with contact seals

For bearings with contact seals, no reference speeds are defined in accordance with DIN ISO 15312:2004. As a result, only the limiting speed n_G is given in the product tables for these bearings.

4.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

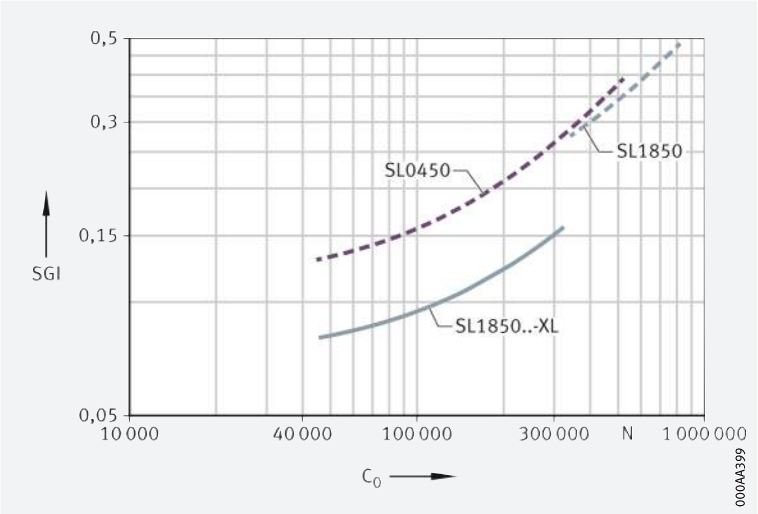
The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

Further information:

- ***medias*** ➤ *https://medias.schaeffler.com*.

8
Schaeffler Noise Index for double row full complement cylindrical roller bearings

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



4.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and cylindrical rollers
- the lubricant
- the seals.

Possible operating temperatures of double row cylindrical roller bearings ➤532|3.

3
Permissible temperature ranges

Operating temperature	Open full complement bearings	Rope sheave bearings
	–30 °C to +120 °C	–20 °C to +80 °C, limited by the lubricant, cage material and seal material –40 °C to +80 °C with greasing by means of GA22

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

4.9 Cages

Full complement cylindrical roller bearings do not have a cage for guidance and separation of the rolling elements. The cylindrical rollers are guided by the ribs on the bearing rings.

4.10 Internal clearance

Radial internal clearance

The standard is CN

Double row full complement cylindrical roller bearings are manufactured as standard with the radial internal clearance CN (normal) ➤533|▦4. CN is not stated in the designation.

Certain sizes are also available by agreement with the larger internal clearance C3, C4 and C5 ➤533|▦4.

The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤533|▦4. They are valid for bearings which are free from load and measurement forces (without elastic deformation).

▦4
Radial internal clearance of double row full complement cylindrical roller bearings

Nominal bore diameter		Radial internal clearance							
d		CN (Group N)		C3 (Group 3)		C4 (Group 4)		C5 (Group 5)	
mm		μm		μm		μm		μm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
–	24	20	45	35	60	50	75	65	90
24	30	20	45	35	60	50	75	70	95
30	40	25	50	45	70	60	85	80	105
40	50	30	60	50	80	70	100	95	125
50	65	40	70	60	90	80	110	110	140
65	80	40	75	65	100	90	125	130	165
80	100	50	85	75	110	105	140	155	190
100	120	50	90	85	125	125	165	180	220
120	140	60	105	100	145	145	190	200	245
140	160	70	120	115	165	165	215	225	275
160	180	75	125	120	170	170	220	250	300
180	200	90	145	140	195	195	250	275	330
200	225	105	165	160	220	220	280	305	365
225	250	110	175	170	235	235	300	330	395
250	280	125	195	190	260	260	330	370	440
280	315	130	205	200	275	275	350	410	485
315	355	145	225	225	305	305	385	455	535
355	400	190	280	280	370	370	460	510	600

Radial internal clearance of cylindrical roller bearings with annular slots (rope sheave bearings)

The correct radial internal clearance is of decisive importance for the correct function of rope sheaves. The radial internal clearance group is dependent on the material of the rope sheave ➤533|▦5.

▦5
Radial internal clearance of cylindrical roller bearings with annular slots for the support of rope sheaves as a function of the material of adjacent parts – recommendation

Nominal bore diameter		Material of rope sheave	
d		Steel	Plastic
mm		Internal clearance group of bearing	
over	incl.		
–	85	CN or C3	C5
85	300	C3	

4.11 Dimensions, tolerances

Dimension standards

DIN ISO

The main dimensions of cylindrical roller bearings correspond to ISO 15:2017 (DIN 616:2000).

Chamfer dimensions

DIN ISO

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤135|7.11. Nominal value of chamfer dimension ➤542|▦.

Tolerances

DIN ISO

The dimensional and running tolerances of the cylindrical roller bearings correspond to the tolerance class Normal in accordance with ISO 492:2014. Tolerance values in accordance with ISO 492 ➤122|▦8.

4.12 Suffixes

For a description of the suffixes used in this chapter ➤534|▦6, cylindrical roller bearings with annular slots ➤534|▦7 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦6
Suffixes and corresponding descriptions, double row full complement cylindrical roller bearings

Suffix	Description of suffix	
BR	Black oxide coated	Available by agreement
C3	Radial internal clearance C3 (larger than normal)	
C4	Radial internal clearance C4 (larger than C3)	
C5	Radial internal clearance C5 (larger than C4)	
TB	Bearing with increased axial load carrying capacity	Standard, dependent on bore code and bearing series
XL	X-life bearing	

▦7
Suffixes and corresponding descriptions, cylindrical roller bearings with annular slots (rope sheave bearings)

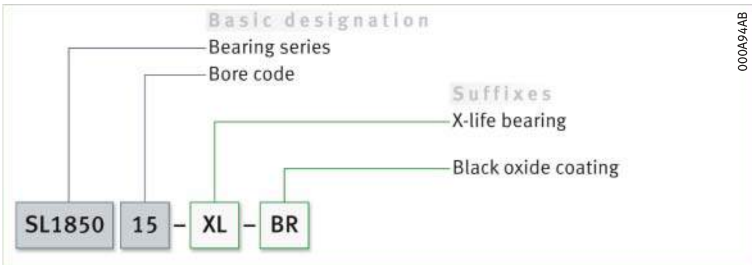
Suffix	Description of suffix	
C3	Radial internal clearance C3 (larger than normal)	Special design, available by agreement
C4	Radial internal clearance C4 (larger than C3)	
C5	Radial internal clearance C5 (larger than C4)	
D	Improved outer ring profile, with an enlarged load-bearing area and optimised edge transitions	Standard
GA22	Bearing greased with lithium soap grease GA22 for expanded temperature range	Special design, available by agreement
P	Contact seal on one side	
PP	Contact seal on both sides	Standard
RR	Corrosion-resistant design, with Corrotect coating	Special design, available by agreement
2NR	Supplied with two loose-packed retaining rings WRE	
2WR	Supplied with two loose-packed retaining rings WR	
–	Without seals	

4.13 Structure of bearing designation

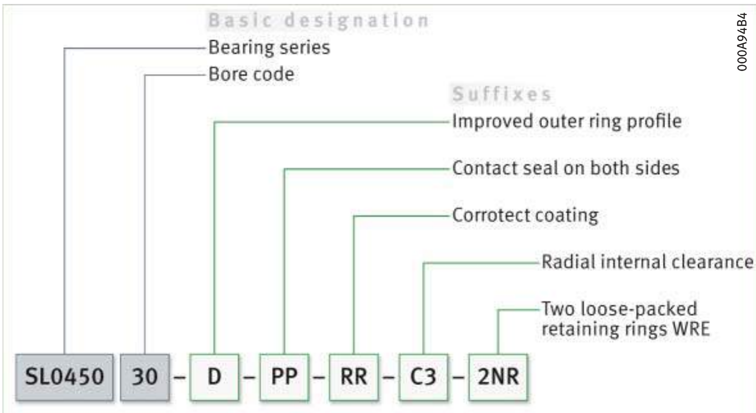
Examples of composition of bearing designation

The designation of bearings follows a set model. Examples are shown in ➤535 | 9 and ➤535 | 10. The composition of designations is subject to DIN 623-1 ➤102 | 10.

9
Double row full complement cylindrical roller bearing (semi-locating bearing): designation structure



10
Double row full complement cylindrical roller bearing (rope sheave bearing): designation structure



4.14 Dimensioning

Equivalent dynamic bearing load

$P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

Bearings with non-locating bearing function and cylindrical roller bearings with annular slots (rope sheave bearings)

$P = F_r$

Non-locating bearings can only support radial loads, rope sheave bearings only have a small axial load carrying capacity. For these bearings ➤535 | 5.

5
Equivalent dynamic load

$$P = F_r$$

Cylindrical roller bearings with semi-locating and locating bearing function

P is a substitute force for combined load and various load cases

If the condition described above is not met, i.e. if, in addition to the radial force F_r, there is also an axial force F_a, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

$F_a/F_r \leqq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factors e and Y ➤536|ƒ6 and ➤536|ƒ7.

ƒ6
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r$$

ƒ7
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}92 \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Axial load
e, Y	–	Factors ➤536|▦8.

▦8
Factors e and Y

Bearing series	Calculation factors	
	e	Y
SL1850	0,2	0,6
SL0148, SL0149	0,24	0,5

Equivalent static bearing load

$P_0 \geqq F_{0r}$

For cylindrical roller bearings subjected to static load ➤536|ƒ8.

ƒ8
Equivalent static load

$$P_0 = F_{0r}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}	N	Largest radial load present (maximum load).

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤536|ƒ9.

ƒ9
Static load safety factor

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

4.15 Minimum load

In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/60$ is necessary during continuous operation

In order that no slippage occurs between the contact partners, the cylindrical roller bearings must be constantly subjected to a sufficiently high radial load. For continuous operation, experience shows that a minimum radial load of the order of $P > C_{0r}/60$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

4.16 Design of bearing arrangements

✎ Support bearing rings over their entire circumference and width

In order to allow full utilisation of the load carrying capacity of the bearings and achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤538|▦9 to ➤539|▦12.

Radial location

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158|▦7.

Radial location of cylindrical roller bearings with annular slots (rope sheave bearings)

✎ The outer ring must have an interference fit to achieve rigid seating

The axial loads occurring cannot be securely transmitted by the retaining rings. Transmission of the loads is only possible if sufficient joint pressure is present. Due to the operating conditions present in rope sheave bearing arrangements, an interference fit between the outer ring and rope sheave is absolutely critical in order to achieve correct bearing function and load transmission. The joint pressure must be between $p_{min} = 2\ N/mm^2$ and $p_{max} = 25\ N/mm^2$. The internal clearance has a considerable influence on bearing function ➤533|▦5.

Axial location

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings, retaining rings, adapter and withdrawal sleeves etc., are fundamentally suitable; example ➤540|⌕12.

Axial location of cylindrical roller bearings with annular slots (rope sheave bearings)

✎ Axial location is carried out by means of retaining rings

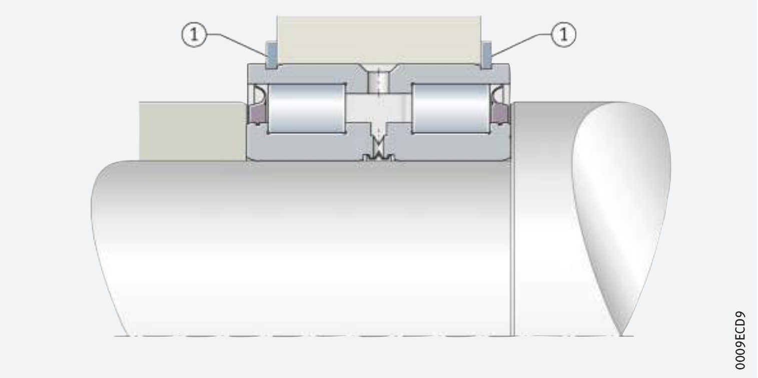
The annular slots allow axial location of the outer rings using retaining rings ➤538|⌕11. Suitable fasteners are WRE rings or rings in accordance with DIN 471. Locating rings are not included in the scope of delivery. The design 2NR is supplied with two retaining rings WRE packed loose. The split inner ring must be axially secured ➤538|⌕11. The fasteners must not be subjected to axial load.

Arrangement of several rope sheaves adjacent to each other

If housing tolerances are present or several rope sheaves are arranged adjacent to each other, axial clearance may occur between the inner rings. This must always be prevented by means of design measures. For example, shims are suitable for this purpose.

11
Cylindrical roller bearing with annular slots (rope sheave bearing) – location of outer ring, support of ribs

① Retaining ring



Dimensional, geometrical and running accuracy of cylindrical bearing seats

A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For cylindrical roller bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7. Guide values for the geometrical and positional tolerances of the bearing seating surfaces ➤*538*|*9*, tolerances t_1 to t_3 in accordance with ➤*168*|*11*. Numerical values for IT grades ➤*538*|*10*.

9
Guide values for the geometrical and positional tolerances of bearing seating surfaces

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
to ISO 492	to DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	

10
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm							
	over **18**	**30**	**50**	**80**	**120**	**180**	**250**	**315**
	incl. **30**	**50**	**80**	**120**	**180**	**250**	**315**	**400**
	Values in μm							
IT4	6	7	8	10	12	14	16	18
IT5	9	11	13	15	18	20	23	25
IT6	13	16	19	22	25	29	32	36
IT7	21	25	30	35	40	46	52	57

Roughness of cylindrical bearing seating surfaces

✎ Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤539|▦11.

▦ **11**
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Bearing seat design (roughness) for cylindrical roller bearings with annular slots (rope sheave bearings)

Recommended roughness values for bearing seating surfaces ➤539|▦12.

▦ **12**
Roughness for bearing seating surfaces on the shaft and in the housing bore for cylindrical roller bearings with annular slots – recommendation

Nominal diameter of bearing seat d (D) mm		Roughness	
over	incl.	Shaft	Housing bore
20	300	Rz 4	Rz 16

Mounting dimensions for the contact surfaces of bearing rings

✎ The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. The transition from the bearing seat to the abutment shoulder must be designed with rounding to DIN 5418:1993 or an undercut to DIN 509:2006. Proven mounting dimensions for the radii and diameters of abutment shoulders are given in the product tables ➤542|▦. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

✎ Rib support in axially loaded bearings

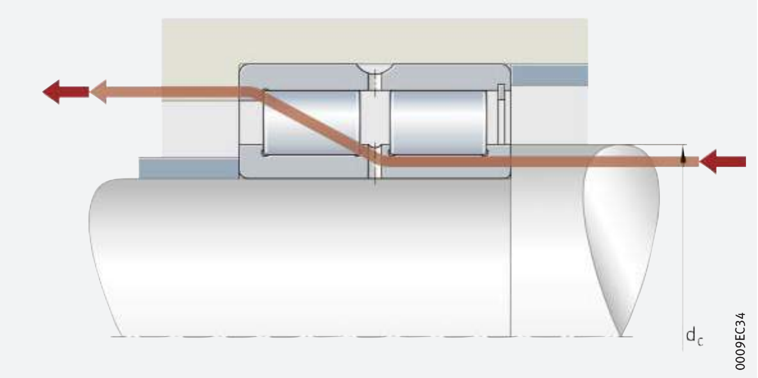
Ribs under axial load must be supported over their entire height and entire circumference ➤542|▦ and ➤540|⊡12. The size and axial runout accuracy of the contact surfaces on the inner ring rib must be observed especially in the case of cylindrical roller bearings subjected to high loads, since these factors also influence the uniformity of the rib load and the running accuracy of the shaft. This means that the ribs may be subjected to damaging alternating stresses even in the case of very small misalignments. If the mounting dimensions indicated in the product tables are observed, the problems described can be reliably avoided ➤542|▦.

Support in semi-locating bearings

In semi-locating bearings, it is sufficient to support the bearing rings on one side, on the rib supporting the axial load ➤540|12.

12
Support of inner ring rib supporting axial load

d_c = *recommended height of shaft shoulder with axially loaded rib*
Arrow = *force flow*



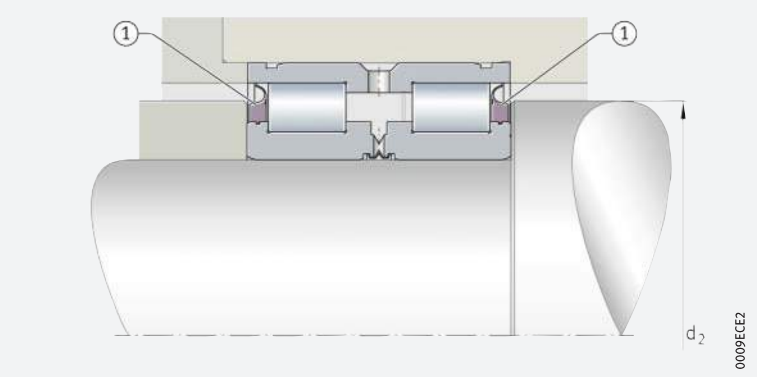
Support of sealing rings in cylindrical roller bearings with annular slots (rope sheave bearings)

Observe the abutment dimension of the sealing rings

The sealing rings must be supported to a sufficient height that they are not pressed out during lubrication of the bearings ➤540|13.
The dimension d_2 in the product tables must be observed ➤550|.

13
Rope sheave bearings – support of sealing rings

d_2 = *abutment dimension*
① *Sealing ring*



4.17 Mounting and dismounting

The mounting and dismounting options for cylindrical roller bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

As the bearings are not self-retaining, they are easy to mount

The series SL0248 and SL0249 are not self-retaining. As a result, the bearing parts (the inner ring with the rolling element set and the outer ring) can be mounted separately from each other ➤524|4.1. This gives simplified mounting of the bearings, especially when the two bearing rings have a tight fit.

Mounting and dismounting of cylindrical roller bearings with annular slots (rope sheave bearings)

During mounting and dismounting of the bearings, the mounting forces must never be directed through the rolling elements, sealing rings or the fasteners on the split bearing ring.

Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤ *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

4.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

§

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

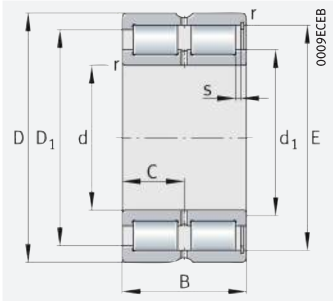
4.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

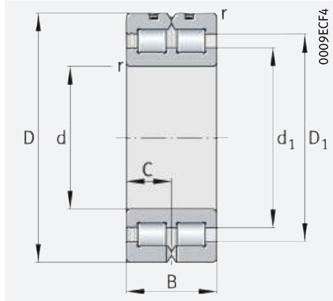
- Determining the bearing size ➤ *34*
- Rigidity ➤ *54*
- Friction and increases in temperature ➤ *56*
- Speeds ➤ *64*
- Bearing data ➤ *97*
- Lubrication ➤ *70*
- Sealing ➤ *182*
- Design of bearing arrangements ➤ *139*
- Mounting and dismounting ➤ *191*.

Double row full complement cylindrical roller bearings

Semi-locating, locating and non-locating bearings



SL1850
Semi-locating bearing

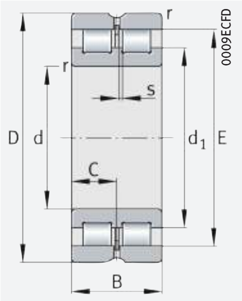


SL0148, SL0149
Locating bearings

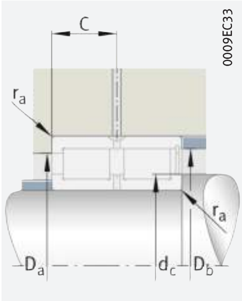
d = 20 – 120 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation ➤534|4.12 ➤535|4.13 X-life ➤527		
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	Semi-locating bearing	Locating bearing	Non-locating bearing
20	42	30	53 000	52 000	8 900	11 400	7 400	0,2	**SL185004-XL**	–	–
25	47	30	60 000	64 000	11 100	9 500	6 000	0,23	**SL185005-XL**	–	–
30	55	34	78 000	84 000	15 000	8 100	5 300	0,35	**SL185006-XL**	–	–
35	62	36	94 000	107 000	18 800	7 100	4 750	0,46	**SL185007-XL**	–	–
40	68	38	113 000	133 000	22 400	6 300	4 200	0,56	**SL185008-XL**	–	–
45	75	40	120 000	148 000	24 900	5 800	3 950	0,71	**SL185009-XL**	–	–
50	80	40	151 000	188 000	30 000	5 300	3 450	0,76	**SL185010-XL**	–	–
55	90	46	206 000	275 000	45 000	4 550	2 900	1,16	**SL185011-XL**	–	–
60	85	25	70 000	121 000	17 300	4 650	2 650	0,49	–	**SL014912**	–
	85	25	70 000	121 000	17 300	4 650	2 650	0,47	–	–	**SL024912**
	95	46	212 000	285 000	47 500	4 350	2 800	1,24	**SL185012-XL**	–	–
65	100	46	223 000	315 000	52 000	4 000	2 500	1,32	**SL185013-XL**	–	–
70	100	30	106 000	185 000	27 000	3 900	2 330	0,78	–	**SL014914**	–
	100	30	106 000	185 000	27 000	3 900	2 330	0,75	–	–	**SL024914**
	110	54	265 000	350 000	59 000	3 750	2 650	1,85	**SL185014-XL**	–	–
75	115	54	275 000	385 000	65 000	3 450	2 370	1,93	**SL185015-XL**	–	–
80	110	30	112 000	206 000	30 000	3 550	2 090	0,88	–	**SL014916**	–
	110	30	112 000	206 000	30 000	3 550	2 090	0,85	–	–	**SL024916**
	125	60	330 000	440 000	81 000	3 200	2 320	2,59	**SL185016-XL**	–	–
85	130	60	300 000	465 000	68 000	3 050	2 210	2,72	**SL185017**	–	–
90	125	35	153 000	290 000	39 000	3 050	1 870	1,35	–	**SL014918**	–
	125	35	153 000	290 000	39 000	3 050	1 870	1,3	–	–	**SL024918**
	140	67	350 000	550 000	80 000	2 850	2 140	3,62	**SL185018**	–	–
100	140	40	191 000	370 000	47 500	2 700	1 720	1,95	–	**SL014920**	–
	140	40	191 000	370 000	47 500	2 700	1 720	1,9	–	–	**SL024920**
	150	67	370 000	600 000	86 000	2 600	1 930	3,94	**SL185020**	–	–
110	150	40	198 000	400 000	50 000	2 500	1 600	2,15	–	**SL014922**	–
	150	40	198 000	400 000	50 000	2 500	1 600	2,1	–	–	**SL024922**
	170	80	485 000	770 000	109 000	2 350	1 730	6,32	**SL185022**	–	–
120	165	45	222 000	440 000	55 000	2 260	1 540	2,95	–	**SL014924**	–
	165	45	222 000	440 000	55 000	2 260	1 540	2,85	–	–	**SL024924**
	180	80	510 000	850 000	117 000	2 160	1 530	6,77	**SL185024**	–	–

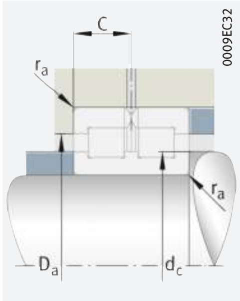
medias ➤ *https://www.schaeffler.de/std/1E43*



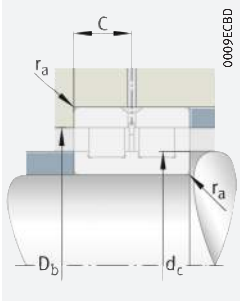
SL0248, SL0249
Non-locating bearings



Mounting dimensions
for semi-locating bearings



Mounting dimensions
for locating bearings

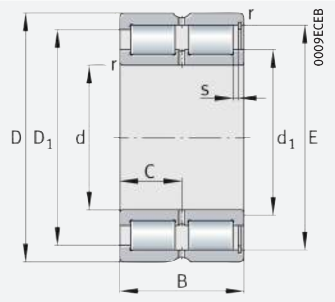


Mounting dimensions
for non-locating bearings

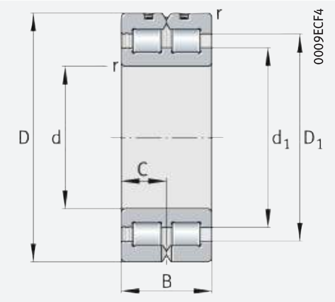
	Designation to DIN 5412	Dimensions						Mounting dimensions			
d		r min.	s	C	d_1 ≈	D_1 ≈	E	d_c	D_a	D_b	r_a max.
20	–	0,6	1	15	28,4	33,3	36,8	28	33,5	36,5	0,6
25	–	0,6	1	15	34,5	39	42,5	34,5	39	42,5	0,6
30	–	1	1,5	17	40	45,3	49,6	40	45,5	49,5	1
35	–	1	1,5	18	44,9	51,2	55,5	44,5	51,5	55,5	1
40	–	1	1,5	19	50,5	57,2	61,7	50,5	57,5	61,5	1
45	–	1	1,5	20	55,3	62,6	66,9	55	63	66,5	1
50	–	1	1,5	20	59,1	67,6	72,3	59	68	72	1
55	–	1,1	1,5	23	68,5	78,7	83,5	68,5	79	83,5	1,1
60	NNC4912V	1	–	12,5	70,3	73,5	–	70	73,5	–	1
	NNCL4912V	1	1	12,5	70,3	–	77,51	70,5	–	77,5	1
	–	1,1	1,5	23	71,7	81,9	86,7	71,5	82	86,5	1,1
65	–	1,1	1,5	23	78,1	88,3	93,1	78	88,5	93	1,1
70	NNC4914V	1	–	15	82,5	87,4	–	82,5	87,5	–	1
	NNCL4914V	1	1	15	82,5	–	91,87	82,5	–	91,5	1
	–	1,1	3	27	81,5	95,7	100,3	81,5	96	100	1,1
75	–	1,1	3	27	89	102,9	107,9	89	103	107,5	1,1
80	NNC4916V	1	–	15	91,4	96,2	–	91	96,5	–	1
	NNCL4916V	1	1	15	91,4	–	100,78	91,5	–	100,5	1
	–	1,1	3,5	30	95	111,7	117,4	95	112	117	1,1
85	–	1,1	3,5	30	99	116,1	122	99	116,5	121,5	1,1
90	NNC4918V	1,1	–	17,5	103,9	110,7	–	103,5	111	–	1,1
	NNCL4918V	1,1	1,5	17,5	103	–	115,2	103	–	115	1,1
	–	1,5	4	33,5	106,1	124,5	130,7	106	124,5	130,5	1,5
100	NNC4920V	1,1	–	20	116,4	125	–	116	125	–	1,1
	NNCL4920V	1,1	2	20	116,4	–	129,6	116,5	–	129,5	1,1
	–	1,5	4	33,5	115,7	134	140,2	115,5	134	140	1,5
110	NNC4922V	1,1	–	20	125	133,6	–	125	134	–	1,1
	NNCL4922V	1,1	2	20	125	–	138,2	125	–	138	1,1
	–	2	5	40	127,3	149,3	156,7	127	149,5	156,5	2
120	NNC4924V	1,1	–	22,5	138,6	148,6	–	138,5	149	–	1,1
	NNCL4924V	1,1	3	22,5	138,6	–	153,55	139	–	153,5	1,1
	–	2	5	40	138,8	160,7	168,2	138,5	161	168	2

Double row full complement cylindrical roller bearings

Semi-locating, locating and non-locating bearings



SL1850
Semi-locating bearing

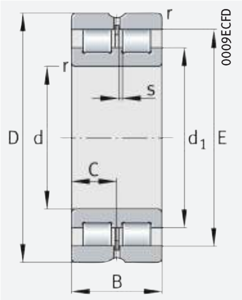


SL0148, SL0149
Locating bearings

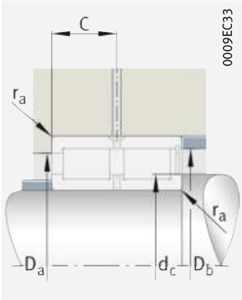
d = 130 – 190 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation ➤534 | 4.12 ➤535 | 4.13		
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	Semi-locating bearing	Locating bearing	Non-locating bearing
130	180	50	260 000	510 000	63 000	2 090	1 500	3,95	–	**SL014926**	–
	180	50	260 000	510 000	63 000	2 090	1 500	3,8	–	–	**SL024926**
	200	95	730 000	1 210 000	164 000	1 990	1 340	10,2	**SL185026**	–	–
140	190	50	270 000	550 000	66 000	1 950	1 370	4,2	–	**SL014928**	–
	190	50	270 000	550 000	66 000	1 950	1 370	4,1	–	–	**SL024928**
	210	95	770 000	1 330 000	177 000	1 820	1 180	11,1	**SL185028**	–	–
150	190	40	231 000	530 000	62 000	1 900	1 270	2,9	–	**SL014830**	–
	190	40	231 000	530 000	62 000	1 900	1 270	2,8	–	–	**SL024830**
	210	60	410 000	820 000	104 000	1 790	1 200	6,65	–	**SL014930**	–
	210	60	410 000	820 000	104 000	1 790	1 200	6,45	–	–	**SL024930**
	225	100	810 000	1 390 000	183 000	1 740	1 150	13,3	**SL185030**	–	–
160	200	40	237 000	560 000	64 000	1 800	1 200	3,1	–	**SL014832**	–
	200	40	237 000	560 000	64 000	1 800	1 200	3	–	–	**SL024832**
	220	60	425 000	880 000	110 000	1 660	1 080	7	–	**SL014932**	–
	220	60	425 000	880 000	110 000	1 660	1 080	6,8	–	–	**SL024932**
	240	109	930 000	1 610 000	207 000	1 600	1 030	12,2	**SL185032**	–	–
170	215	45	260 000	600 000	68 000	1 670	1 180	4,1	–	**SL014834**	–
	215	45	260 000	600 000	68 000	1 670	1 180	3,95	–	–	**SL024834**
	230	60	435 000	930 000	114 000	1 580	1 010	7,35	–	**SL014934**	–
	230	60	435 000	930 000	114 000	1 580	1 010	7,1	–	–	**SL024934**
	260	122	1 200 000	2 110 000	265 000	1 480	900	22,5	**SL185034**	–	–
180	225	45	270 000	640 000	72 000	1 560	1 070	4,3	–	**SL014836**	–
	225	45	270 000	640 000	72 000	1 560	1 070	4,15	–	–	**SL024836**
	250	69	570 000	1 200 000	147 000	1 480	920	10,8	–	**SL014936**	–
	250	69	570 000	1 200 000	147 000	1 480	920	10,5	–	–	**SL024936**
	280	136	1 390 000	2 480 000	310 000	1 370	820	29,9	**SL185036-TB**	–	–
190	240	50	310 000	730 000	81 000	1 480	1 030	5,65	–	**SL014838**	–
	240	50	310 000	730 000	81 000	1 480	1 030	5,45	–	–	**SL024838**
	260	69	580 000	1 270 000	152 000	1 410	860	11,2	–	**SL014938**	
	260	69	580 000	1 270 000	152 000	1 410	860	10,9	–	–	**SL024938**
	290	136	1 430 000	2 600 000	320 000	1 320	770	31,3	**SL185038-TB**	–	–

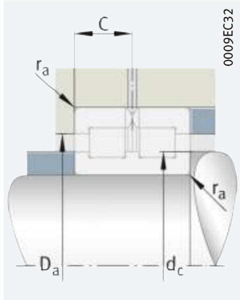
medias ➤ *https://www.schaeffler.de/std/1E44*



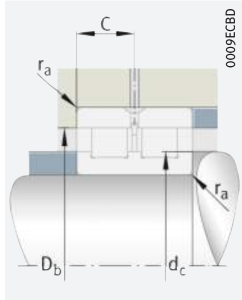
SL0248, SL0249
Non-locating bearings



Mounting dimensions
for semi-locating bearings



Mounting dimensions
for locating bearings

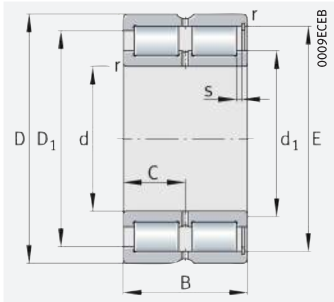


Mounting dimensions
for non-locating bearings

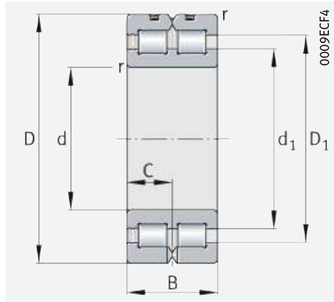
	Designation to DIN 5412	Dimensions						Mounting dimensions			
d		r	s	C	d_1	D_1	E	d_c	D_a	D_b	r_a
		min.			≈	≈					max.
130	NNC4926V	1,5	–	25	148,4	160	–	148	160	–	1,5
	NNCL4926V	1,5	4	25	149,5	–	165,4	149,5	–	165	1,5
	–	2	5	47,5	148,6	175,5	184,4	148,5	175,5	184	2
140	NNC4928V	1,5	–	25	159	170,5	–	159	170,5	–	1,5
	NNCL4928V	1,5	4	25	160	–	175,9	160	–	175,5	1,5
	–	2	5	47,5	162,6	189,5	198,4	162,5	189,5	198	2
150	NNC4830V	1,1	–	20	165,1	174,2	–	165	174,5	–	1,1
	NNCL4830V	1,1	2	20	165,1	–	178,3	165,5	–	178	1,1
	NNC4930V	2	–	30	171,8	187,2	–	171,5	187,5	–	2
	NNCL4930V	2	4	30	171,8	–	192,77	172	–	192,5	2
	–	2	6	50	170	198	207,5	170	198	207	2
160	NNC4832V	1,1	–	20	173,7	182,8	–	173,5	183	–	1,1
	NNCL4832V	1,1	2	20	173,7	–	186,9	174	–	186,5	1,1
	NNC4932V	2	–	30	184,2	200,3	–	184	200,5	–	2
	NNCL4932V	2	4	30	184,2	–	206,16	184,5	–	206	2
	–	2,1	6	54,5	184,8	215,8	224,8	184,5	216	224,5	2,1
170	NNC4834V	1,1	–	22,5	186,3	197	–	186	197	–	1,1
	NNCL4834V	1,1	3	22,5	186,3	–	201,3	186,5	–	201	1,1
	NNC4934V	2	–	30	193,1	209,1	–	193	209,5	–	2
	NNCL4934V	2	4	30	193,1	–	215,08	193,5	–	215	2
	–	2,1	6	61	198	232,7	242,9	198	233	242,5	2,1
180	NNC4836V	1,1	–	22,5	199,1	209,8	–	199	210	–	1,1
	NNCL4836V	1,1	3	22,5	199,1	–	214,1	199,5	–	214	1,1
	NNC4936V	2	–	34,5	204,9	224,1	–	204,5	224,5	–	2
	NNCL4936V	2	4	34,5	204,9	–	230,5	205	–	230,5	2
	–	2,1	8	68	212,2	249,4	260,2	212	249,5	260	2,1
190	NNC4838V	1,5	–	25	207,6	220,7	–	207,5	221	–	1,5
	NNCL4838V	1,5	4	25	207,6	–	225	208	–	225	1,5
	NNC4938V	2	–	34,5	215	234,3	–	215	234,5	–	2
	NNCL4938V	2	4	34,5	215	–	240,7	215	–	240,5	2
	–	2,1	8,2	68	221,8	259	269,8	221,5	259	269,5	2,1

Double row full complement cylindrical roller bearings

Semi-locating, locating and non-locating bearings



SL1850
Semi-locating bearing

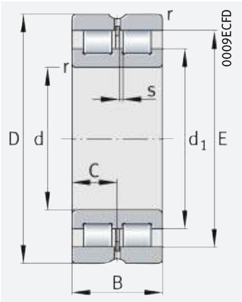


SL0148, SL0149
Locating bearings

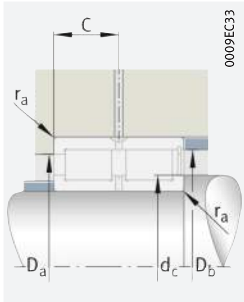
d = 200 – 300 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation ➤*534*|*4.12* ➤*535*|*4.13*		
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	Semi-locating bearing	Locating bearing	Non-locating bearing
			N	N	N	min^{-1}	min^{-1}	≈ kg			
200	250	50	320 000	770 000	84 000	1 410	960	5,9	–	**SL014840**	–
	250	50	320 000	770 000	84 000	1 410	960	5,7	–	–	**SL024840**
	280	80	680 000	1 440 000	173 000	1 310	820	15,8	–	**SL014940**	–
	280	80	680 000	1 440 000	173 000	1 310	820	15,3	–	–	**SL024940**
	310	150	1 630 000	3 000 000	365 000	1 230	710	40,4	**SL185040-TB**	–	–
220	270	50	335 000	840 000	90 000	1 290	850	6,4	–	**SL014844**	–
	270	50	335 000	840 000	90 000	1 290	850	6,2	–	–	**SL024844**
	300	80	700 000	1 550 000	182 000	1 220	750	17,2	–	**SL014944**	–
	300	80	700 000	1 550 000	182 000	1 220	750	16,7	–	–	**SL024944**
	340	160	1 980 000	3 650 000	430 000	1 140	630	51,6	**SL185044-TB**	–	–
240	300	60	510 000	1 260 000	143 000	1 170	730	10	–	**SL014848**	–
	300	60	510 000	1 260 000	143 000	1 170	730	9,9	–	–	**SL024848**
	320	80	740 000	1 700 000	195 000	1 110	660	18,5	–	**SL014948**	–
	320	80	740 000	1 700 000	195 000	1 110	660	17,9	–	–	**SL024948**
	360	160	2 080 000	4 000 000	460 000	1 040	550	55,2	**SL185048-TB**	–	–
260	320	60	540 000	1 370 000	152 000	1 080	650	11	–	**SL014852**	–
	320	60	540 000	1 370 000	152 000	1 080	650	10,6	–	–	**SL024852**
	360	100	1 100 000	2 470 000	280 000	1 010	570	32	–	**SL014952**	–
	360	100	1 100 000	2 470 000	280 000	1 010	570	31,2	–	–	**SL024952**
	400	190	2 750 000	5 000 000	570 000	940	490	82,6	**SL185052-TB**	–	–
280	350	69	700 000	1 820 000	198 000	980	570	16	–	**SL014856**	–
	350	69	700 000	1 820 000	198 000	980	570	15,6	–	–	**SL024856**
	380	100	1 150 000	2 650 000	295 000	940	520	34	–	**SL014956**	–
	380	100	1 150 000	2 650 000	295 000	940	520	33,1	–	–	**SL024956**
	420	190	2 850 000	5 300 000	590 000	900	460	88	**SL185056-TB**	–	–
300	380	80	820 000	2 070 000	225 000	920	550	23	–	**SL014860**	–
	380	80	820 000	2 070 000	225 000	920	550	22	–	–	**SL024860**
	420	118	1 630 000	3 700 000	405 000	870	445	53	–	**SL014960**	–
	420	118	1 630 000	3 700 000	405 000	870	445	51,9	–	–	**SL024960**
	460	218	3 450 000	6 600 000	660 000	800	395	124	**SL185060-TB**	–	–

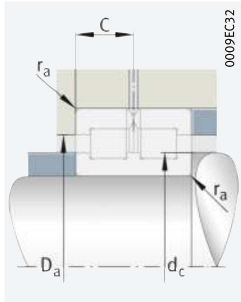
medias ➤ *https://www.schaeffler.de/std/1E45*



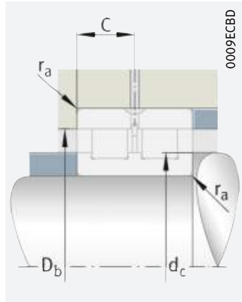
SL0248, SL0249
Non-locating bearings



Mounting dimensions
for semi-locating bearings



Mounting dimensions
for locating bearings

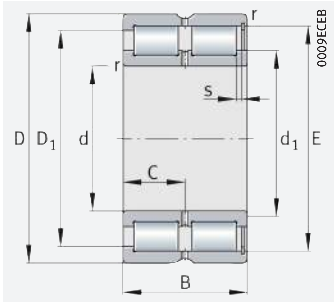


Mounting dimensions
for non-locating bearings

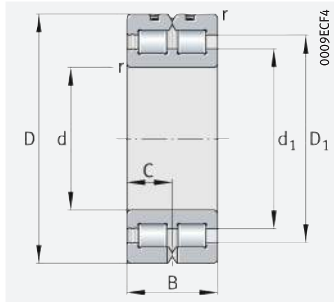
	Designation to DIN 5412	Dimensions						Mounting dimensions			
d		r	s	C	d_1	D_1	E	d_c	D_a	D_b	r_a
		min.			≈	≈					max.
200	NNC4840V	1,5	–	25	218,1	231,2	–	218	231,5	–	1,5
	NNCL4840V	1,5	4	25	218,1	–	235,5	218,5	–	235,5	1,5
	NNC4940V	2,1	–	40	230,5	252,3	–	230,5	252,5	–	2,1
	NNCL4940V	2,1	5	40	230,5	–	259,34	230,5	–	259	2,1
	–	2,1	8,9	75	236,6	276,2	287,8	236,5	276,5	287,5	2,1
220	NNC4844V	1,5	–	25	239,1	252,3	–	239	252,5	–	1,5
	NNCL4844V	1,5	4	25	239,1	–	256,5	239,5	–	256,5	1,5
	NNC4944V	2,1	–	40	248	268,5	–	248	268,5	–	2,1
	NNCL4944V	2,1	5	40	248	–	276,52	248	–	276,5	2,1
	–	3	9	80	254,6	297,8	312,2	254,5	298	312	3
240	NNC4848V	2	–	30	259,5	276,7	–	259,5	277	–	2
	NNCL4848V	2	4	30	259,5	–	281,9	259,5	–	281,5	2
	NNC4948V	2,1	–	40	270,6	292,3	–	270,5	292,5	–	2,1
	NNCL4948V	2,1	5	40	270,6	–	299,46	271	–	299	2,1
	–	3	9	80	277,5	322,1	335,1	277,5	322,5	335	3
260	NNC4852V	2	–	30	281,8	298,8	–	281,5	299	–	2
	NNCL4852V	2	4	30	281,8	–	304,2	282	–	304	2
	NNC4952V	2,1	–	50	294,5	322,1	–	294,5	322,5	–	2,1
	NNCL4952V	2,1	6	50	294,5	–	331,33	294,5	–	331	2,1
	–	4	11,3	95	304	359,7	376	304	360	375,5	4
280	NNC4856V	2	–	34,5	306,8	326,4	–	306,5	326,5	–	2
	NNCL4856V	2	4	34,5	306,8	–	332,4	307	–	332	2
	NNC4956V	2,1	–	50	316,5	344,6	–	316,5	345	–	2,1
	NNCL4956V	2,1	6	50	316,5	–	353,34	316,5	–	353	2,1
	–	4	11,3	95	318,3	374,1	390,3	318	374,5	390	4
300	NNC4860V	2,1	–	40	327,9	349,9	–	327,5	350	–	2,1
	NNCL4860V	2,1	6	40	327,9	–	356,7	328	–	356,5	2,1
	NNC4960V	3	–	59	340,7	374,3	–	340,5	374,5	–	3
	NNCL4960V	3	6	59	340,7	–	385,51	341	–	385,5	3
	–	4	12,5	109	353,6	413,6	433,6	353,5	414	433,5	4

Double row full complement cylindrical roller bearings

Semi-locating, locating and non-locating bearings



SL1850
Semi-locating bearing

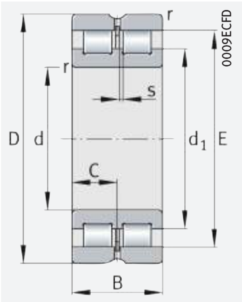


SL0148, SL0149
Locating bearings

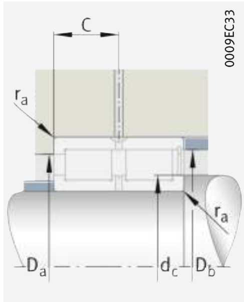
d = 320 – 400 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation ➤534 | 4.12 ➤535 | 4.13		
d	D	B	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	Semi-locating bearing	Locating bearing	Non-locating bearing
320	400	80	850 000	2 220 000	236 000	860	495	24	–	**SL014864**	–
	400	80	850 000	2 220 000	236 000	860	495	23,5	–	–	**SL024864**
	440	118	1 700 000	4 050 000	430 000	800	395	56	–	**SL014964**	–
	440	118	1 700 000	4 050 000	430 000	800	395	54,9	–	–	**SL024964**
	480	218	3 550 000	6 900 000	690 000	770	375	128,4	**SL185064-TB**	–	–
340	420	80	870 000	2 330 000	244 000	810	465	25,5	–	**SL014868**	–
	420	80	870 000	2 330 000	244 000	810	465	25	–	–	**SL024868**
	460	118	1 750 000	4 250 000	445 000	770	375	59	–	**SL014968**	–
	460	118	1 750 000	4 250 000	445 000	770	375	57,8	–	–	**SL024968**
	520	243	4 250 000	8 300 000	790 000	710	335	178	**SL185068-TB**	–	–
360	440	80	900 000	2 480 000	255 000	770	430	27	–	**SL014872**	–
	440	80	900 000	2 480 000	255 000	770	430	26	–	–	**SL024872**
	480	118	1 790 000	4 450 000	460 000	730	350	62,1	–	**SL014972**	–
	480	118	2 020 000	4 450 000	560 000	730	350	60,8	–	–	**SL024972**
	540	243	4 400 000	8 700 000	820 000	680	320	178	**SL185072-TB**	–	–
380	480	100	1 320 000	3 500 000	360 000	710	375	45,5	–	**SL014876**	–
	480	100	1 320 000	3 500 000	360 000	710	375	44	–	–	**SL024876**
	520	140	2 250 000	5 500 000	580 000	680	325	92,4	–	**SL014976**	–
	520	140	2 250 000	5 500 000	580 000	680	325	90,5	–	–	**SL024976**
	560	243	4 450 000	8 900 000	850 000	660	305	196,5	**SL185076-TB**	–	–
400	500	100	1 350 000	3 650 000	370 000	680	360	46,5	–	**SL014880**	–
	500	100	1 350 000	3 650 000	370 000	680	360	45,8	–	–	**SL024880**
	540	140	2 310 000	5 800 000	600 000	650	300	96,5	–	**SL014980**	–
	540	140	2 310 000	5 800 000	600 000	650	300	94,6	–	–	**SL024980**

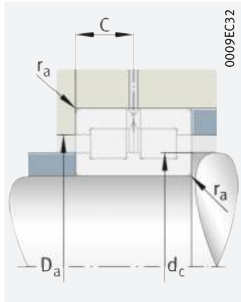
medias ➤ *https://www.schaeffler.de/std/1E46*



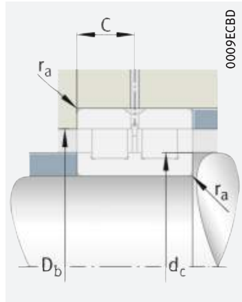
SL0248, SL0249
Non-locating bearings



Mounting dimensions
for semi-locating bearings



Mounting dimensions
for locating bearings

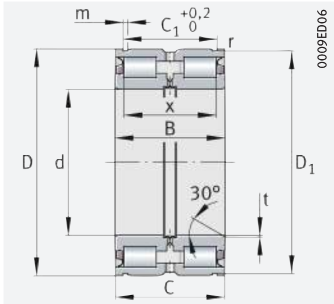


Mounting dimensions
for non-locating bearings

d	Designation to DIN 5412	Dimensions						Mounting dimensions			
		r	s	C	d_1	D_1	E	d_c	D_a	D_b	r_a
		min.			≈	≈					max.
320	NNC4864V	2,1	–	40	350,9	372,9	–	350,5	373	–	2,1
	NNCL4864V	2,1	6	40	350,9	–	379,7	351	–	379,5	2,1
	NNC4964V	3	–	59	367,5	401,1	–	367,5	401,5	–	3
	NNCL4964V	3	6	59	367,5	–	412,27	367,5	–	412	3
	–	4	12,5	109	369,5	431,5	449,5	369,5	431,5	449,5	4
340	NNC4868V	2,1	–	40	368,1	390,1	–	368	390,5	–	2,1
	NNCL4868V	2,1	6	40	368,1	–	396,9	368,5	–	396,5	2,1
	NNC4968V	3	–	59	385,3	418,9	–	385	419	–	3
	NNCL4968V	3	6	59	385,3	–	430,11	385,5	–	430	3
	–	5	14,3	121,5	396	465,5	485,7	396	465,5	485,5	5
360	NNC4872V	2,1	–	40	391	413,2	–	391	413,5	–	2,1
	NNCL4872V	2,1	6	40	391	–	419,8	391	–	419,5	2,1
	NNC4972V	3	–	59	404	436,8	–	404	437	–	3
	NNCL4972V	3	6	59	404	–	447,95	404	–	447,5	3
	–	5	14	121,5	413,8	481	503,5	413,5	481	503	5
380	NNC4876V	2,1	–	50	419	447,2	–	419	447,5	–	2,1
	NNCL4876V	2,1	6	50	419	–	455,8	419	–	455,5	2,1
	NNC4976V	4	–	70	430,2	468,7	–	430	469	–	4
	NNCL4976V	4	7	70	430,2	–	481,35	430,5	–	481	4
	–	5	14,1	121,5	432	499	521,3	432	499	521	5
400	NNC4880V	2,1	–	50	433,8	462	–	433,5	462	–	2,1
	NNCL4880V	2,1	6	50	433,8	–	470,59	434	–	470,5	2,1
	NNC4980V	4	–	70	450,5	489	–	450,5	489	–	4
	NNCL4980V	4	7	70	450,5	–	501,74	450,5	–	501,5	4

Double row full complement cylindrical roller bearings

With annular slots
Locating bearings



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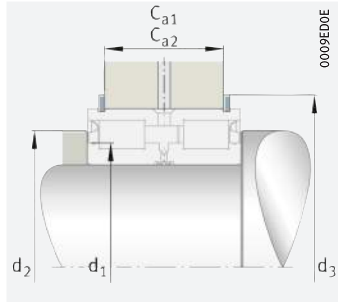


Mounting dimensions

d = 20 – 160 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G grease	m	➤534|4.12 ➤535|4.13
			N	N	N	min^{-1}	≈ kg	
20	42	30	41 500	51 000	6 900	5 500	0,2	**SL045004-D-PP**
25	47	30	46 000	60 000	8 100	4 700	0,24	**SL045005-D-PP**
30	55	34	50 000	67 000	9 500	4 100	0,37	**SL045006-D-PP**
35	62	36	63 000	88 000	12 400	3 550	0,48	**SL045007-D-PP**
40	68	38	80 000	111 000	16 000	3 150	0,56	**SL045008-D-PP**
45	75	40	97 000	139 000	19 900	2 800	0,7	**SL045009-D-PP**
50	80	40	102 000	151 000	21 700	2 600	0,76	**SL045010-D-PP**
55	90	46	120 000	186 000	25 500	2 340	1,18	**SL045011-D-PP**
60	95	46	125 000	201 000	27 500	2 180	1,26	**SL045012-D-PP**
65	100	46	130 000	215 000	29 500	2 040	1,33	**SL045013-D-PP**
70	110	54	175 000	275 000	36 000	1 850	1,87	**SL045014-D-PP**
75	115	54	201 000	315 000	42 000	1 740	1,96	**SL045015-D-PP**
80	125	60	210 000	340 000	45 000	1 620	2,71	**SL045016-D-PP**
85	130	60	219 000	365 000	47 500	1 510	2,83	**SL045017-D-PP**
90	140	67	305 000	510 000	69 000	1 410	3,71	**SL045018-D-PP**
95	145	67	315 000	530 000	71 000	1 360	3,88	**SL045019-D-PP**
100	150	67	330 000	550 000	78 000	1 300	3,95	**SL045020-D-PP**
110	170	80	395 000	680 000	94 000	1 170	6,57	**SL045022-D-PP**
120	180	80	410 000	740 000	99 000	1 090	7,04	**SL045024-D-PP**
130	200	95	540 000	960 000	128 000	960	10,5	**SL045026-D-PP**
	190	80	430 000	790 000	105 000	1 020	7,5	**SL04130-D-PP**
140	210	95	610 000	1 100 000	146 000	910	11,1	**SL045028-D-PP**
	200	80	445 000	840 000	110 000	960	8	**SL04140-D-PP**
150	225	100	710 000	1 260 000	163 000	850	13,3	**SL045030-D-PP**
	210	80	465 000	920 000	117 000	880	8,4	**SL04150-D-PP**
160	240	109	740 000	1 360 000	173 000	790	16,6	**SL045032-D-PP**
	220	80	480 000	970 000	122 000	830	8,8	**SL04160-D-PP**

medias ➤ *https://www.schaeffler.de/std/1E47*

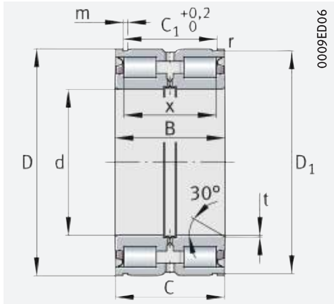
1) For snap rings WRE.

2) For retaining ring to DIN 471.

Dimensions								Mounting dimensions					Snap ring WRE	Retaining ring to DIN 471
d	C	C_1	D_1	m	r	t	x	C_{a1} 1)	C_{a2} 2)	d_1	d_2	d_3 1)		
		+0,2			min.			–0,2	–0,2					
20	29	24,7	40,2	1,8	0,3	0,5	22,5	21,5	21	31	34	47	WRE42	42×1,75
25	29	24,7	45,2	1,8	0,3	0,5	22,5	21,5	21	35,5	39	52	WRE47	47×1,75
30	33	28,2	53	2,1	0,3	0,5	25,5	25	24	41	44	60	WRE55	55×2
35	35	30,2	60	2,1	0,3	0,5	27,5	27	26	46,5	50	67	WRE62	62×2
40	37	32,2	65,8	2,7	0,6	0,8	28,5	28	27	51,5	55	75	WRE68	68×2,5
45	39	34,2	72,8	2,7	0,6	0,8	30,5	30	29	57	61	82	WRE75	75×2,5
50	39	34,2	77,8	2,7	0,6	0,8	30,5	30	29	62	66	87	WRE80	80×2,5
55	45	40,2	87,4	3,2	0,6	1	36	35	34	69	73	99	WRE90	90×3
60	45	40,2	92,4	3,2	0,6	1	36	35	34	74	79	104	WRE95	95×3
65	45	40,2	97,4	3,2	0,6	1	36	35	34	79	84	109	WRE100	100×3
70	53	48,2	107,1	4,2	0,6	1	42	43	40	84,5	91	119	WRE110	110×4
75	53	48,2	112,1	4,2	0,6	1	42	43	40	90	97	124	WRE115	115×4
80	59	54,2	122,1	4,2	0,6	1,5	48	49	46	97,5	105	137	WRE125	125×4
85	59	54,2	127,1	4,2	0,6	1,5	48	49	46	104	112	142	WRE130	130×4
90	66	59,2	137	4,2	0,6	1,5	54	54	51	109,5	118	152	WRE140	140×4
95	66	59,2	142	4,2	0,6	1,5	54	54	51	113,5	122	157	WRE145	145×4
100	66	59,2	147	4,2	0,6	1,5	54	54	51	117,5	128	162	WRE150	150×4
110	79	70,2	167	4,2	0,6	1,8	64	65	62	132	143	182	WRE170	170×4
120	79	71,2	176	4,2	0,6	1,8	64	65	63	141	153	196	WRE180	180×4
130	94	83,2	196	4,2	0,6	1,8	77	77	75	157	170	216	WRE200	200×4
	79	71,2	186	4,2	0,6	1,8	64	65	63	151	160	206	WRE190	190×4
140	94	83,2	206	5,2	0,6	1,8	77	77	73	165,5	181	226	WRE210	210×5
	79	71,2	196	4,2	0,6	1,8	64	65	63	160	170	216	WRE200	200×4
150	99	87,2	221	5,2	0,6	2	80	81	77	176	192	245	WRE225	225×5
	79	71,2	206	5,2	0,6	1,8	64	65	61	174,5	185	226	WRE210	210×5
160	108	95,2	236	5,2	0,6	2	89	89	85	189	207	260	WRE240	240×5
	79	71,2	216	5,2	0,6	1,8	64	65	61	184,5	196	236	WRE220	220×5

Double row full complement cylindrical roller bearings

With annular slots
Locating bearings



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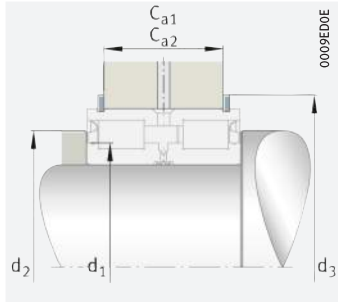


Mounting dimensions

d = 170 – 300 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	dyn. C_r	stat. C_{0r}	C_{ur}	n_G grease	m	➤534|4.12 ➤535|4.13
			N	N	N	min^{-1}	≈ kg	
170	260	122	960 000	1 750 000	220 000	740	22,6	**SL045034-D-PP**
	230	80	490 000	1 030 000	127 000	790	9,3	**SL04170-D-PP**
180	280	136	1 140 000	2 130 000	265 000	680	30,1	**SL045036-D-PP**
	240	80	500 000	1 080 000	132 000	750	9,8	**SL04180-D-PP**
190	290	136	1 160 000	2 210 000	270 000	660	31,5	**SL045038-D-PP**
	260	80	520 000	1 160 000	139 000	700	12,7	**SL04190-D-PP**
200	310	150	1 350 000	2 600 000	310 000	610	40,8	**SL045040-D-PP**
	270	80	540 000	1 210 000	143 000	670	13,2	**SL04200-D-PP**
220	340	160	1 570 000	3 050 000	365 000	560	52,5	**SL045044-D-PP**
	300	95	700 000	1 550 000	182 000	610	19,5	**SL04220-D-PP**
240	360	160	1 630 000	3 300 000	385 000	530	56	**SL045048-D-PP**
	320	95	740 000	1 700 000	195 000	560	21	**SL04240-D-PP**
260	400	190	2 380 000	4 700 000	530 000	475	84,5	**SL045052-D-PP**
	340	95	840 000	1 990 000	225 000	520	22,5	**SL04260-D-PP**
280	420	190	2 600 000	5 200 000	580 000	450	90	**SL045056-D-PP**
	360	95	870 000	2 120 000	235 000	485	24	**SL04280-D-PP**
300	460	218	3 000 000	5 800 000	640 000	415	126	**SL045060-D-PP**
	380	95	900 000	2 250 000	245 000	455	25,5	**SL04300-D-PP**

medias ➤ *https://www.schaeffler.de/std/1E48*

1) For snap rings WRE.

2) For retaining ring to DIN 471.

Dimensions								Mounting dimensions					Snap ring WRE	Retaining ring to DIN 471
d	C	C_1	D_1	m	r	t	x	C_{a1} [1]	C_{a2} [2]	d_1	d_2	d_3 [1]		
		+0,2			min.			−0,2	−0,2					
170	121	107,2	254	5,2	0,6	2	100	99	97	201	220	282	WRE260	260×5
	79	71,2	226	5,2	0,6	1,8	64	65	61	194	206	250	WRE230	230×5
180	135	118,2	274	5,2	0,6	2	112	110	108	218	239	302	WRE280	280×5
	79	71,2	236	5,2	0,6	1,8	64	65	61	203,5	216	260	WRE240	240×5
190	135	118,2	284	5,2	0,6	2	112	110	108	226	248	312	WRE290	290×5
	79	73,2	254	5,2	0,6	1,8	64	65	63	218	231	282	WRE260	260×5
200	149	128,2	304	6,3	0,6	2	126	120	116	243,5	267	336	WRE310	310×6
	79	73,2	264	5,2	0,6	1,8	64	65	63	227,5	241	292	WRE270	270×5
220	159	138,2	334	6,3	1	2	132	130	126	260	286	366	WRE340	340×6
	94	83,2	294	5,2	1	2	72	75	73	249	264	322	WRE300	300×5
240	159	138,2	354	6,3	1	2	132	130	126	279,5	305	386	WRE360	360×6
	94	83,2	314	6,3	1	2	72	75	71	272	287	346	WRE320	320×6
260	189	162,2	394	6,3	1,1	3	150	154	150	305	336	426	WRE400	400×6
	94	83,2	334	6,3	1	3	75	75	71	293	310	366	WRE340	340×6
280	189	163,2	413	7,3	1,1	3	150	154	149	321	354	453	WRE420	420×7
	94	83,2	354	6,3	1	3	75	75	71	310,5	386	327	WRE360	360×6
300	216	185,2	453	7,3	1,1	3	170	176	171	347	375	493	WRE460	460×7
	94	83,2	374	6,3	1	3	75	75	71	328	346	406	WRE380	380×6

Tapered roller bearings

FAG

Matrix for bearing preselection

The matrix gives an overview of the types and design features of tapered roller bearings.

It can be used to make a preliminary assessment of whether a bearing is fundamentally suitable for the envisaged application.

The additional information provided in the product chapter (see column "detailed information") and in the Technical principles must, however, be observed in addition to this overview in selection of the bearing.

+++ extremely suitable
++ highly suitable
+ suitable
(+) suitable with restrictions
– not suitable/not applicable
✓ available

Design features and suitability		Tapered roller bearings: single row	matched pairs	integral tapered roller bearings, fitted in pairs	detailed information ➤ 558
Load carrying capacity	radial	+++	+++	+++	➤564|1.2
	axial, one direction	+++	+++	+++	➤564|1.2
	axial, both directions	–	+++	+++	➤564|1.2
	moments	(+)	(+)	(+)	➤564|1.2
Compensation of angular misalignments	static	(+)	(+)	(+)	➤564|1.3
	dynamic	(+)	(+)	(+)	➤564|1.3
Bearing design	cylindrical bore	✓	✓	✓	➤558|1.1
	tapered bore	–	–	–	➤558|1.1
	separable	✓	✓	–	➤584|1.17
Lubrication	greased	–	–	✓	➤565|1.4
Sealing	open	✓	✓	–	➤566|1.5
	non-contact	–	–	–	➤566|1.5
	contact	–	–	✓	➤566|1.5
Operating temperature in °C	from / to	−30 / +120[1]	−30 / +120[1]	−30 / +110	➤567|1.8
Suitability for	high speeds	+[2]	(+)	(+)	➤566|1.6 ➤64
	high running accuracy	++	++	++	➤568|1.11 ➤114
	low-noise running	(+)	(+)	(+)	➤566|1.7 ➤27
	high rigidity	+++[3]	+++	+++	➤54
	reduced friction	+	+	+	➤56
	length compensation within bearing	–	–	–	
	non-locating bearing arrangement	(+)[3]	(+)	(+)	➤139
	locating bearing arrangement	+++	+++	+++	➤139
X-life bearings		✓	✓	–	➤559
Bearing bore d in mm	from / to	15 / 360[4][5]	40 / 260[4]	30 / 80	➤586
Product tables	from page ➤	586	632	636	

1) Where D > 220 mm: +200 °C
2) Reduced suitability when mounted in pairs
3) For mounting in pairs
4) Larger catalogue bearings ➤ 🕮 GL 1
5) Bearings to ANSI/ABMA up to d = 673,1 mm

1 Tapered roller bearings

Tapered roller bearings are particularly suitable where:

- high radial loads occur ➤558|1.1 and ➤564|1.2
- high axial loads act on one side ➤564|1.2
- combined loads must be supported (radial and axial forces acting simultaneously) ➤564|1.2
- precise axial guidance of the shaft is required (locating bearing function)
- the bearing arrangement must have very high axial rigidity
- the bearing position is operated clearance-free or under preload (single bearings are adjusted against each other) ➤581|1.16
- high running accuracy is required
- the load carrying capacity of angular contact ball bearings is no longer sufficient and the higher speed suitability of angular contact ball bearings is not required ➤558|Figure 1
- the bearings are not required to compensate misalignments
- the design objective comprises compact, rigid and economical bearing arrangements with a high load carrying capacity.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤557.

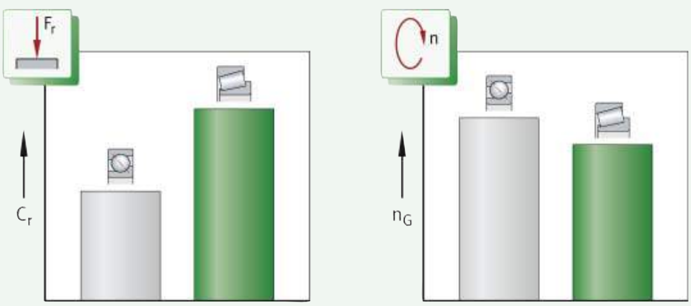


Figure 1
Load carrying capacity and speed comparison – single row tapered roller bearings/single row angular contact ball bearings

F_r = *radial load*
C_r = *basic dynamic load rating*
n_G = *limiting speed*

1.1 Bearing design

Design variants

Tapered roller bearings are available in an extensive range of single row and multi-row designs. X-life is the new performance standard for tapered roller bearings and stands for eXtended life ➤559. The key designs based on single row tapered roller bearings are:

- single row tapered roller bearings
- matched tapered roller bearings
- integral tapered roller bearings.

Tapered roller bearings are also available in many other designs and sizes, as well as for specific applications, by agreement. For general availability, please contact Schaeffler. An upgrade to X-life performance is available. X-life bearings ➤ 📖 TPI 241. Matched tapered roller bearings ➤ 📖 TPI 245. Integral tapered roller bearings ➤ 📖 TPI 151. Larger catalogue bearings and other bearing designs ➤ 📖 GL 1.

Available in metric and inch sizes

Tapered roller bearings are produced in metric and inch sizes.

Classification and designation – bearings in metric and inch sizes

Bearings in metric sizes:

- DIN 720:2008
- ISO 355:2007
- ANSI/ABMA 19.1:2011 (prefix KJ).

Bearings in inch sizes:

- ANSI/ABMA 19.2:2013 (prefix K).

Tapered roller bearings of basic design

✎ Fundamental design features

Tapered roller bearings are part of the group of radial roller bearings. In contrast to the ball, the roller has a larger contact area perpendicular to the roller axis. As a result, it can transmit higher forces, has greater rigidity and allows smaller rolling element diameters under the same load. The single row and multi-row bearings comprise a ribless outer ring, an inner ring with two ribs of different heights and a cage ➤559|2, ➤561|5. The cage contains truncated conical rollers. The roller and cage assembly together with the inner ring forms a unit. The low rib retains, in conjunction with the cage, the rollers on the inner ring raceway; the high rib supports the axial force component arising from the tapered form of the rollers. While the tapered rollers roll on the raceways, they slide on the higher rib of the inner ring. The projected lines of contact of the tapered rollers intersect the projected raceways of the inner and outer ring at a point on the bearing axis ➤559|2. As a result of this geometrical characteristic, tapered roller bearings are highly suitable for supporting combined loads. This also prevents any kinematic forced slippage at the rolling contact.

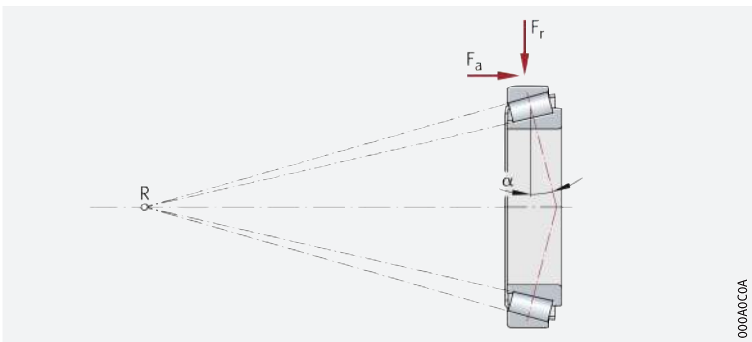
✎ The high dimensional and geometrical accuracy of the rollers reduces running noise and vibrations

Due to the dimensional and geometrical accuracy of the tapered rollers, the rolling elements in a roller set are subjected to virtually the same proportion of load in the load range. In operation, this leads to low-noise and low-vibration running, as well as a high adjustment accuracy.

2

Single row tapered roller bearing: the apex points of the tapered surfaces meet at a point on the bearing axis

F_r = *radial load*
F_a = *axial load*
R = *roller cone apex*
α = *nominal contact angle*



X-life premium quality

Single row tapered roller bearings are available in numerous series and dimensions as X-life bearings. These bearings exhibit considerably higher performance than comparable tapered roller bearings without X-life characteristics ➤560|3. This is achieved, in part, by superior ring materials and optimised contact geometry between roller and raceway, as well as between roller and rib. In combination with an increased surface quality, this leads to improved lubricant film formation.

Advantages

✎ Increased customer benefits due to X-life

These technical enhancements offer a range of advantages, such as:

- up to 20 % higher basic dynamic load ratings C_r ➤560|3
- a higher running accuracy and smooth running
- running with reduced friction and greater energy efficiency (reduction in friction up to 50 %, in the case of tapered roller bearings with a steep taper, up to 75 %)
- lower heat generation in the bearing
- higher limiting speeds
- lower lubricant consumption and therefore longer maintenance intervals if relubrication is carried out
- a measurably longer operating life of the bearings ➤560|4
- high reliability and operational security
- lower overall operating costs
- compact, environmentally-friendly bearing arrangements.

✎ Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

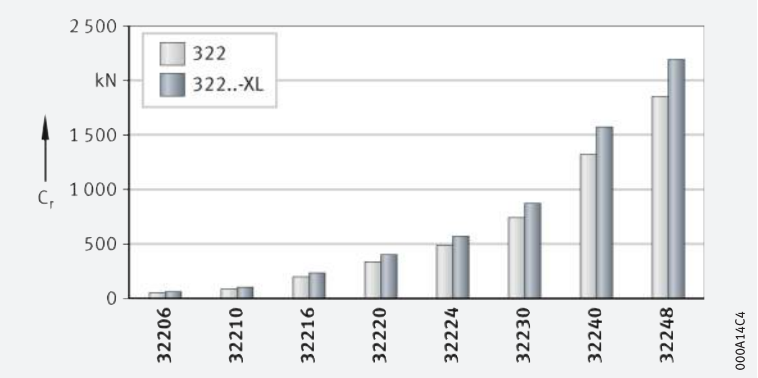
✎ Suffix XL

X-life tapered roller bearings include the suffix XL in the designation ➤573|1.12.

3

Comparison of basic dynamic load rating C_r of X-life tapered roller bearings with bearings without X-life performance

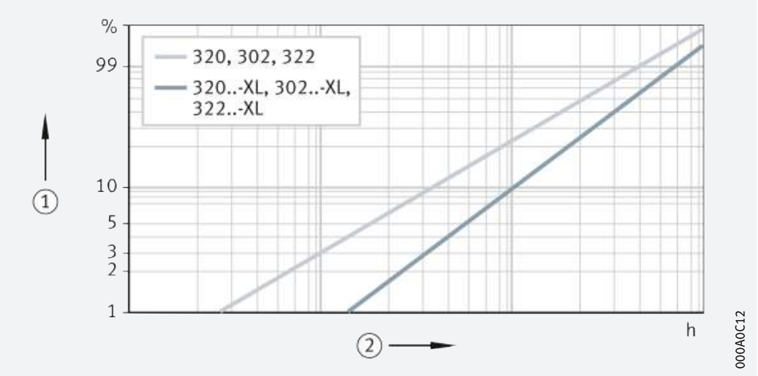
C_r = basic dynamic load rating



4

Fatigue running time in Weibull diagram – comparison of X-life tapered roller bearings with bearings without X-life performance

① Probability of failure
② Running time in hours



Areas of application

Due to their special technical features, X-life tapered roller bearings are highly suitable for bearing arrangements in:

- mobile hydraulics (axial piston and orbital motors)
- tractors (wheel bearings and gearboxes)
- vertical mills (grinding rolls)
- hot and cold rolling mills (work rolls in roll stands)
- applications for oil and gas extraction
- offshore and onshore wind turbines (gearboxes)
- construction machinery (road rollers, drill head bearings).

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤*10* and ➤ 🕮 *TPI 241*.

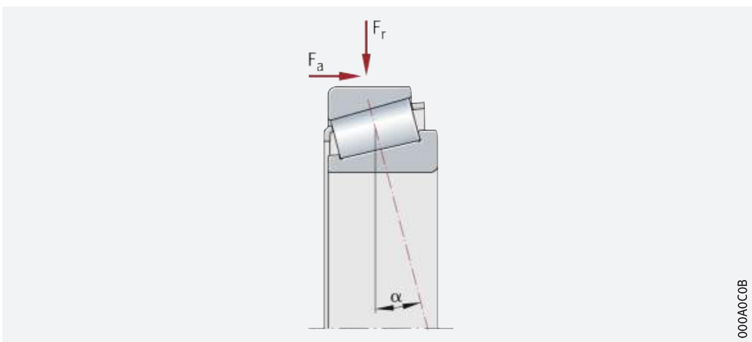
Single row tapered roller bearings

✎ Optimised product characteristics give a sustainable improvement in operating behaviour

Tapered roller bearings are individual, single row bearings of open design which, for technical reasons, are always adjusted against a second tapered roller bearing in a mirror image arrangement ➤*561* | *5*. The bearings are designed such that they reliably cover the extensive demands in relation to generally common requirements.
For example, in order to improve the lubricant film formation and running characteristics, the sliding surfaces on the guidance rib of the inner ring, as well as the end faces and contact profile of the rollers, have been optimised ➤*559*. In addition, the high production accuracy allows the bearings to be adjusted against each other with high functional security. This in turn leads to improved operating characteristics and thus to a higher operational reliability. Tapered roller bearings are not self-retaining. As a result, the inner ring with the roller and cage assembly can be mounted separately from the outer ring. This gives simplified mounting of the bearings.

5
Single row tapered roller bearing

F_r = *radial load*
F_a = *axial load*
α = *nominal contact angle*



Matched tapered roller bearings

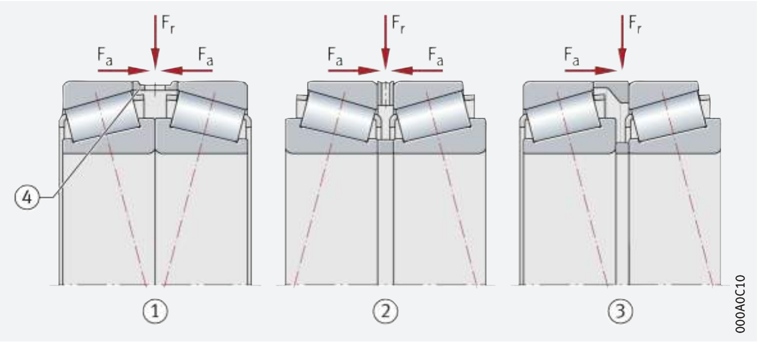
If the load carrying capacity of a bearing is not sufficient or the shaft is to be guided in both directions with a specific axial clearance, then ready-to-fit, matched bearing sets are available. Matched tapered roller bearings are essentially available in three arrangements comprising an X, O and tandem arrangement.

6

Matched tapered rolling bearing pairs in tandem, X and O arrangement, load directions, contact lines

F_r = *radial load*
F_a = *axial load*

① *X arrangement*
② *O arrangement*
③ *Tandem arrangement*
④ *Fit ring*



X arrangement

For bearing sets in an X arrangement, the contact lines converge relative to the bearing axis ➤*562*|*6*. Axial forces occur from both directions, but are always only supported by one bearing. The X arrangement is of simple design and the most frequently used arrangement of matched tapered roller bearings fitted in pairs.

O arrangement

For bearing sets in an O arrangement, the contact lines diverge relative to the bearing axis ➤*562*|*6*. Axial forces occur from both directions, but are always only supported by one bearing. The support base is at its largest in the O arrangement, which is beneficial if the component with small bearing spacing must be guided with the smallest possible tilting clearance, or tilting forces must be supported. Bearing arrangements in an O arrangement are relatively rigid and can also support loads resulting from tilting moments.

Tandem arrangement

For bearing sets in a tandem arrangement, the contact lines run parallel to each other. In contrast to an X and O arrangement, the tandem arrangement can only support axial force in one direction. This bearing pair is usually adjusted against another tapered roller bearing, which supports axial forces in the opposite direction.

The product tables ➤*632*| contain only a few examples of matched tapered roller bearing sets in an X arrangement for reference purposes. Other matched tapered roller bearing sets are available in an X arrangement by agreement. Further information on “Matched tapered roller bearings” ➤ *TPI 245*.

Advantages of matched bearing sets

Matched bearing pairs in an O or X arrangement provide an economical solution to various bearing arrangement problems due, for example, to:

- their ability to support high radial loads as well as axial loads in both directions
- the simplified mounting of bearings, as the insertion of fit rings is no longer required and mounting defects are thus avoided
- the precise axial guidance of the shaft; the axial clearance of the bearing pair is already defined in bearing production
- simple lubrication; the lubricant can be easily fed to the rolling system by means of lubrication holes in the fit ring.

Ordering and designation system

In order to simplify the ordering process, the ordering designation has been modified for matched tapered roller bearings fitted in pairs:

- The first module letter D = 2 (duplex) represents the number of bearings
- The second module letter represents the bearing arrangement:
  - B = O arrangement – Back to Back
  - F = X arrangement – Face to Face
  - T = tandem arrangement
- Where necessary (special design), a third module letter is added as a continuous counter for describing a variant. Example: A, B, ... = different set width, variant of intermediate ring design
- The axial internal clearance is indicated explicitly in the designation. For example, A80-120 means that the axial internal clearance of the unmounted bearing pair (delivered condition) is between 80 μm and 120 μm. Ordering example ➤575 | 15.

! The number of bearing pairs must be stated when ordering matched tapered roller bearings.

Integral tapered roller bearings (JK0S) – fitted in pairs

✎ The bearings are predominantly fitted in pairs

Integral tapered roller bearings are ready-to-fit bearing units, which are greased, sealed on one side and predominantly mounted in pairs in an O arrangement ➤563 | 7. The bearings are not separable.

✎ There is no need to set the axial internal clearance

The precise axial internal clearance is not achieved by adjusting the bearings, but is set automatically when the recommended bearing seat tolerances are observed. As a result, there is no need to adjust the bearings against each other in the manner normally required.

When integral tapered roller bearings are mounted in pairs, a slot is formed on the outer ring for the retaining ring (snap ring BR). Schaeffler integral tapered roller bearings are interchangeable with each other.

! When ordering, please always state the number of single bearings and not the number of bearing pairs. The snap ring must be ordered separately, for example:

- 2 tapered roller bearings JK0S080-A ➤586
- 1 snap ring BR125.

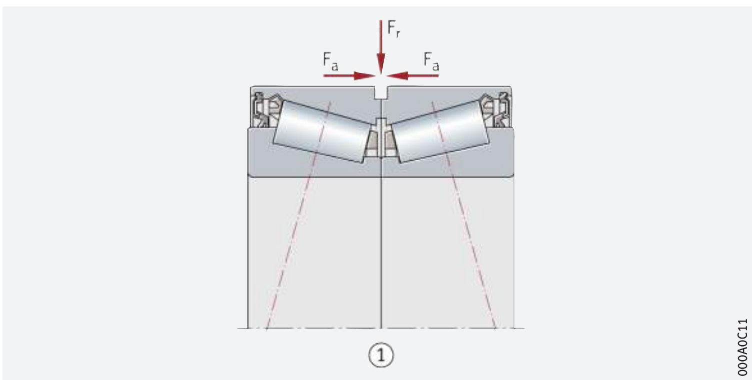
7

Paired integral tapered roller bearing, load directions

F_r = *radial load*

F_a = *axial load*

① *Integral tapered roller bearings (JK0S), fitted in pairs in an O arrangement, sealed, clearance preset*



1.2 Load carrying capacity

Bearings of basic design

Capable of supporting axial loads in one direction and radial loads

Single row tapered roller bearings can support axial loads in one direction and high radial loads ➤559| 2 and ➤561| 5. However, they must always be axially adjusted against a second bearing fitted in a mirror image arrangement. This bearing combination is then fitted in an O or X arrangement.

The larger the contact angle, the higher the axial load carrying capacity

The axial load carrying capacity of the bearings is dependent on the nominal contact angle α ➤559| 2. The greater this angle, the higher the axial load to which the bearing can be subjected. The size of the contact angle – and thus the load carrying capacity of the bearing – is indicated by the value e in the product tables ➤586|. The nominal contact angle α in most bearing series is between 10° and 20°. In special series, α is approximately 28° to 30°. Bearings of series 313, 323..-B, T5ED and T7FC have a very high axial load carrying capacity due to their particularly large contact angle.

Basic load rating and fatigue limit load for bearing pairs comprising single bearings

If two bearings of the same size and design are fitted immediately adjacent to each other in an O or X arrangement, the basic dynamic load rating C_r, the basic static load rating C_{0r} and the fatigue limit load C_{ur} of the bearing pair are as follows:

- $C_r = 1{,}715 \cdot C_{r\ \text{single bearing}}$
- $C_{0r} = 2 \cdot C_{0r\ \text{single bearing}}$
- $C_{ur} = 2 \cdot C_{ur\ \text{single bearing}}$.

Values for single bearings in the product tables ➤586|, ➤614|.

Matched bearings

Capable of supporting radial loads, axial loads in both directions and moment loads

Matched tapered roller bearings support higher radial forces than single row tapered roller bearings. In X and O arrangements, axial forces and moment loads are supported in both directions. The tandem arrangement can only support axial forces in one direction.

Basic load rating and fatigue limit load for matched bearings

For matched bearing pairs of design DF, the basic load ratings and fatigue limit loads are given in the dimension tables ➤632|.

Integral tapered roller bearings – fitted in pairs

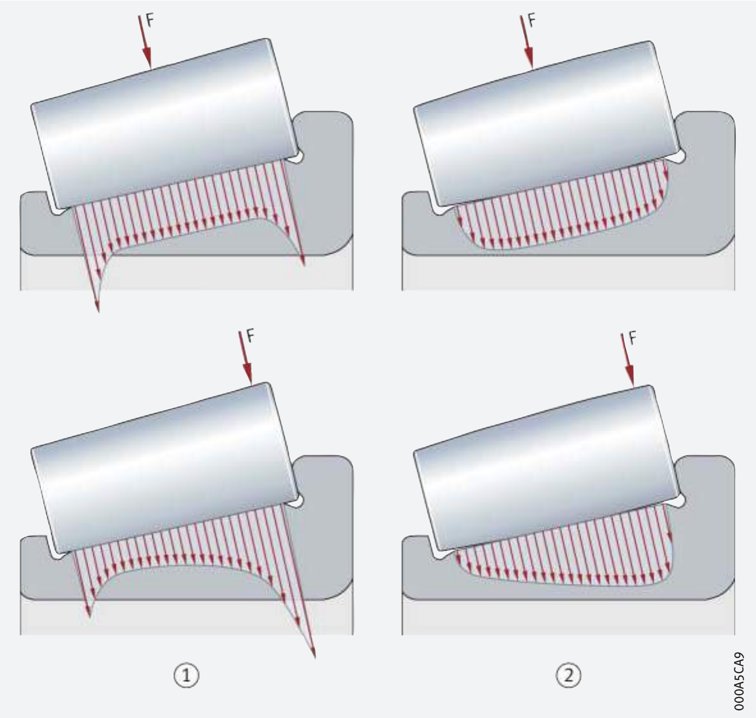
Capable of supporting axial loads in both directions and radial loads

Single row integral tapered roller bearings fitted in pairs in an O arrangement support high axial loads in both directions and high radial loads ➤563| 7.

1.3 Compensation of angular misalignments

Compensation of angular misalignments possible

The modified line contact between the tapered rollers and the raceways ensures optimum stress distribution at the contact points and prevents stress increases at the edges. As a result, the bearings can tolerate certain angular misalignments and give better support of moment loads ➤565| 8.



8
Uniform load distribution due to optimised roller and raceway profile

F = *load on the roller*
① *Straight profile*
② *Logarithmic profile*

Permissible angular misalignment

If the load ratio $P/C_{0r} \leqq 0{,}2$, the tilting of the bearing rings relative to each other must not exceed 4 angular minutes. This is, however, subject to the position of the shaft and housing axis remaining constant (no dynamic movements).

If larger loads/misalignments or dynamic angular defects are present, please consult Schaeffler.

1.4 Lubrication

Single row and matched tapered roller bearings

Oil or grease lubrication is possible

Single row and matched tapered roller bearings are not greased. These bearings must be lubricated with oil or grease.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

Integral tapered roller bearings

Usually maintenance-free due to initial greasing

Integral tapered roller bearings are supplied already greased with a quality grease to DIN 51825. The grease filling is measured such that these bearings are maintenance-free during their operating lives in most applications.

1.5 Sealing

Single row and matched tapered roller bearings

✎ Provide seals in the adjacent construction

Single row and matched tapered roller bearings are not sealed, i. e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing position.

Integral tapered roller bearings

Integral tapered roller bearings are sealed on one side with a contact seal (lip seal).

1.6 Speeds

✎ Limiting speeds and reference speeds in the product tables

The product tables give two speeds for most bearings ➤586|:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

!

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

Reference speeds

✎ $n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

✎ Bearings with contact seals

For bearings with contact seals, no reference speeds are defined in accordance with DIN ISO 15312:2004. As a result, only the limiting speed n_G is given in the product tables for these bearings.

Speeds for matched bearings fitted in pairs

✎ Observing the thermal balance

For matched bearing pairs, the limiting speeds n_G given in the product tables are permissible if the less favourable thermal balance of the bearing pair is taken into consideration in the operating conditions.

1.7 Noise

The Schaeffler Noise Index (SGI) has been developed as a new feature for comparing the noise level of different bearing types and series. As a result, a noise evaluation of rolling bearings can now be carried out for the first time.

Schaeffler Noise Index

The SGI value is based on the maximum permissible noise level of a bearing in accordance with internal standards, which is calculated on the basis of ISO 15242. In order that different bearing types and series can be compared, the SGI value is plotted against the basic static load rating C_0.

This permits direct comparisons between bearings with the same load carrying capacity. The upper limit value is given in each of the diagrams. This means that the average noise level of the bearings is lower than illustrated in the diagram.

The Schaeffler Noise Index is an additional performance characteristic in the selection of bearings for noise-sensitive applications. The specific suitability of a bearing for an application in terms of installation space, load carrying capacity or speed limit for example, must be checked independently of this.

The Noise Index is currently available for the main series. Additional series will be updated and introduced in subsequent publications.

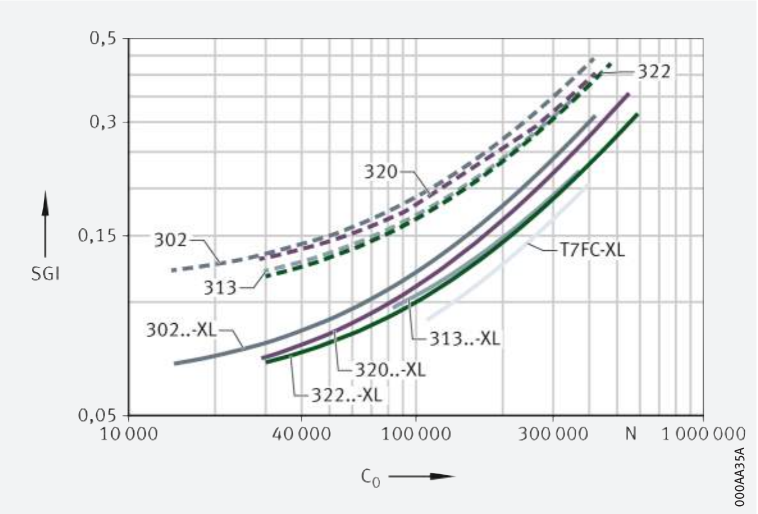
Further information:

- **medias** ➤ https://medias.schaeffler.com.

9

Schaeffler Noise Index for tapered roller bearings

SGI = *Schaeffler Noise Index*
C_0 = *basic static load rating*



1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and tapered rollers
- the cage
- the lubricant
- the seals.

Possible operating temperatures of tapered roller bearings ➤567 | 1.

1

Permissible temperature ranges

Operating temperature	Open tapered roller bearings		Sealed tapered roller bearings
	D ≦ 220 mm, −30 °C to +120 °C	D > 220 mm, −30 °C to +200 °C	−30 °C to +110 °C, limited by the lubricating grease and seal material

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

Sheet steel cages are used as standard

Open tapered roller bearings have sheet steel cages. Plastic cages are available by agreement.

Cages for JK0S

Integral tapered roller bearings have cages made from glass fibre reinforced polyamide PA66.

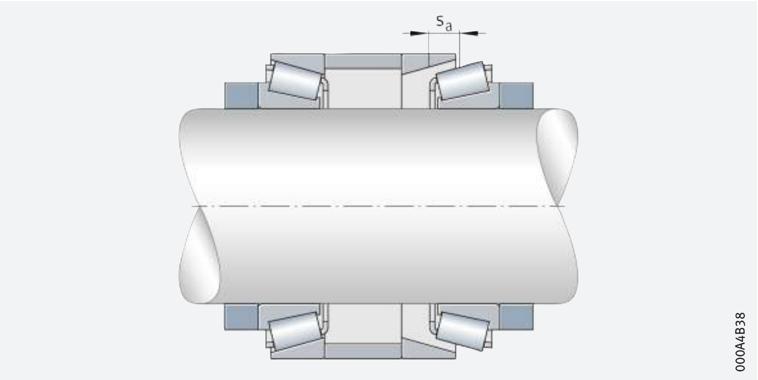
For high continuous temperatures and applications with difficult operating conditions, bearings with sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

1.10 Internal clearance

For tapered roller bearings, the axial internal clearance s_a is a characteristic value. This is the result of mounting the bearing against a second tapered roller bearing ➤568|10.

10
Axial internal clearance

s_a = *axial internal clearance*



Indicating the axial internal clearance

The axial internal clearance is indicated explicitly in the designation. Ordering example ➤575|15.

Matched tapered roller bearing sets

Simple mounting of the bearing sets in the mounting position is achieved by precise matching of the intermediate ring to the required geometric axial internal clearance. As a result, ready-to-fit, matched bearing sets are made available by Schaeffler. This offers high economical and technical advantages such as:

- Uncomplicated mounting: mounting defects are, for example, avoided by the intermediate ring, which is supplied already matched
- Knowledge and inclusion of the axial deflection of the bearings, as well as highly developed measurement methods, guarantee a precise design of the axial internal clearance. This ensures precise axial guidance of the shaft
- Simple maintenance and high operational reliability are achieved by means of design elements, lubrication grooves and holes in the intermediate ring.

1.11 Dimensions, tolerances

Dimension standards – bearings in metric sizes

DIN ISO

The main dimensions of bearings in metric sizes correspond to ISO 355:2007 and DIN 720:2008. Bearings in metric sizes with the prefix KJ correspond to ANSI/ABMA 19.1:2011.

Chamfer dimensions

Tapered roller bearings in metric sizes

The limiting dimensions for the chamfer dimensions of metric tapered roller bearings to DIN/ISO correspond to ISO 582:1995. Overview and limiting values for metric tapered roller bearings to DIN/ISO ➤*137*|▦*30*.

Minimum chamfer dimensions for metric tapered roller bearings to ANSI/ABMA with the prefix KJ correspond to ANSI/ABMA 19.1:2011. The values are given in the product tables.

Bearings in inch sizes to ANSI/ABMA

DIN ISO

Minimum chamfer dimensions r_{min} for bearings in inch sizes correspond to ANSI/ABMA 19.2:2013. The values are given in the product tables ➤*614*|▦.

Tolerances

DIN ISO

All tapered roller bearings to DIN 720, ISO 355 and integral tapered roller bearings have the tolerance class Normal to ISO 492:2014. In contrast to the standard, X-life bearings achieve improved radial runout values t_{Kia} and t_{Kea}, in addition to dedicated axial runout values t_{Sia} ➤*570*|⎗*11*. Inner ring tolerances ➤*569*|▦*2*, outer ring tolerances ➤*569*|▦*3*, width tolerances ➤*570*|▦*4*. This excludes bearings of series 320, 329, 330, 331, 332 for d ≦ 200 mm: these have the tolerance class 6X ➤*570*. The width tolerances $t_{\Delta Ts}$ of the T7FC series with the suffix XL correspond to the tolerance class 6X in accordance with ISO 492:2014 ➤*570*|▦*5*.

▦**2**
Inner ring tolerances, tolerance class Normal

Tolerance symbols ➤*115*|▦*6*
U *= upper limit deviation*
L *= lower limit deviation*
t_{Sia} *= axial runout to Schaeffler standard* ➤*570*|⎗*11*

Nominal bore diameter		Bore deviation		Variation		Radial runout		Axial runout
						ISO 492	X-life	X-life
d		$t_{\Delta dmp}$		t_{Vdsp}	t_{Vdmp}	t_{Kia}	t_{Kia}	t_{Sia}
mm		µm		µm	µm	µm	µm	µm
over	incl.	U	L	max.	max.	max.	max.	max.
10	18	0	–12	12	9	15	7	10
18	30	0	–12	12	9	18	8	13
30	50	0	–12	12	9	20	9	13
50	80	0	–15	15	11	25	10	15
80	120	0	–20	20	15	30	13	18
120	180	0	–25	25	19	35	19	20
180	250	0	–30	30	23	50	24	25
250	315	0	–35	35	26	60	28	28
315	400	0	–40	40	30	70	33	35

▦**3**
Outer ring tolerances, tolerance class Normal

Tolerance symbols ➤*115*|▦*6*
U *= upper limit deviation*
L *= lower limit deviation*

Nominal outside diameter		Deviation of outside diameter		Variation		Radial runout	
						ISO 492	X-life
D		$t_{\Delta Dmp}$		t_{VDsp}	t_{VDmp}	t_{Kea}	t_{Kea}
mm		µm		µm	µm	µm	µm
over	incl.	U	L	max.	max.	max.	max.
18	30	0	–12	12	9	18	9
30	50	0	–14	14	11	20	10
50	80	0	–16	16	12	25	13
80	120	0	–18	18	14	35	16
120	150	0	–20	20	15	40	19
150	180	0	–25	25	19	45	21
180	250	0	–30	30	23	50	25
250	315	0	–35	35	26	60	30
315	400	0	–40	40	30	70	34
400	500	0	–45	45	34	80	40
500	630	0	–50	60	38	100	46

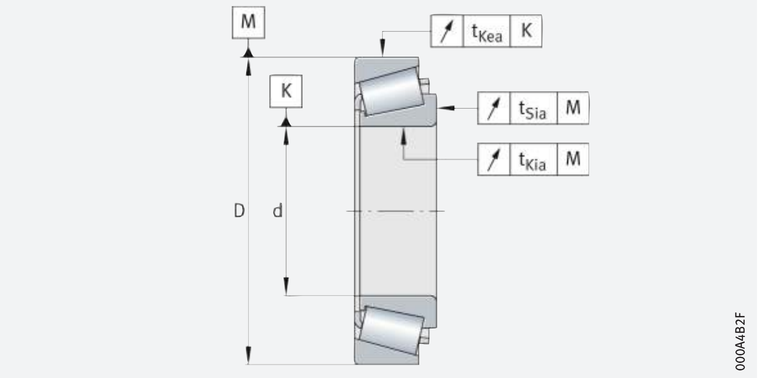
4
Width tolerances, tolerance class Normal

Tolerance symbols ➤115|6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter		Deviation of inner ring width		Deviation of outer ring width		Width deviation					
d		$t_{\Delta Bs}$		$t_{\Delta Cs}$		$t_{\Delta Ts}$		$t_{\Delta T1s}$		$t_{\Delta T2s}$	
mm		µm		µm		µm		µm		µm	
over	incl.	U	L	U	L	U	L	U	L	U	L
10	18	0	−120	0	−120	+200	0	+100	0	+100	0
18	30	0	−120	0	−120	+200	0	+100	0	+100	0
30	50	0	−120	0	−120	+200	0	+100	0	+100	0
50	80	0	−150	0	−150	+200	0	+100	0	+100	0
80	120	0	−200	0	−200	+200	−200	+100	−100	+100	−100
120	180	0	−250	0	−250	+350	−250	+150	−150	+200	−100
180	250	0	−300	0	−300	+350	−250	+150	−150	+200	−100
250	315	0	−350	0	−350	+350	−250	+150	−150	+200	−100
315	400	0	−400	0	−400	+400	−400	+200	−200	+200	−200

11
Axial and radial runout on the drawing

D = *outside diameter*
d = *bearing bore*



Series 320, 329, 330, 331, 332 for d ≦ 200 mm and bearings with the prefix KJ

Bearings 320, 329, 330, 331, 332 for d ≦ 200 mm and bearings with the prefix KJ have dimensional and running tolerances to the tolerance class Normal, but have restricted width tolerances to tolerance class 6X in accordance with ISO 492:2014 ➤*570*|*5*; inner ring tolerances ➤*569*|*2*, outer ring tolerances ➤*569*|*3*.

5
Width tolerances, tolerance class 6X

Tolerance symbols ➤115|6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter		Deviation of inner ring width		Deviation of outer ring width		Width deviation					
d		$t_{\Delta Bs}$		$t_{\Delta Cs}$		$t_{\Delta Ts}$		$t_{\Delta T1s}$		$t_{\Delta T2s}$	
mm		µm		µm		µm		µm		µm	
over	incl.	U	L	U	L	U	L	U	L	U	L
10	18	0	−50	0	−100	+100	0	+50	0	+50	0
18	30	0	−50	0	−100	+100	0	+50	0	+50	0
30	50	0	−50	0	−100	+100	0	+50	0	+50	0
50	80	0	−50	0	−100	+100	0	+50	0	+50	0
80	120	0	−50	0	−100	+100	0	+50	0	+50	0
120	180	0	−50	0	−100	+150	0	+50	0	+100	0
180	200	0	−50	0	−100	+150	0	+50	0	+100	0

Restricted tolerances to tolerance class 5

Tapered roller bearings are also available by agreement with restricted tolerances to tolerance class 5 in accordance with ISO 492:2014; inner ring tolerances ➤571|▦6, outer ring tolerances ➤571|▦7, width tolerances ➤571|▦8.

▦ 6
Restricted inner ring tolerances, tolerance class 5

Tolerance symbols ➤115|▦6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Bore deviation $t_{\Delta dmp}$ µm		Variation t_{Vdsp} µm	Variation t_{Vdmp} µm	Radial runout t_{Kia} µm	Axial runout of lateral face t_{Sd} µm
over	incl.	U	L	max.	max.	max.	max.
10	18	0	–7	5	5	5	7
18	30	0	–8	6	5	5	8
30	50	0	–10	8	5	6	8
50	80	0	–12	9	6	7	8
80	120	0	–15	11	8	8	9
120	180	0	–18	14	9	11	10
180	250	0	–22	17	11	13	11
250	315	0	–25	19	13	13	13
315	400	0	–30	23	15	15	15

▦ 7
Restricted outer ring tolerances, tolerance class 5

Tolerance symbols ➤115|▦6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal outside diameter D mm		Deviation of outside diameter $t_{\Delta Dmp}$ µm		Variation t_{VDsp} µm	Variation t_{VDmp} µm	Radial runout t_{Kea} µm	Axial runout of lateral face t_{Si} µm
over	incl.	U	L	max.	max.	max.	max.
18	30	0	–8	6	5	6	4
30	50	0	–9	7	5	7	4
50	80	0	–11	8	6	8	4
80	120	0	–13	10	7	10	4,5
120	150	0	–15	11	8	11	5
150	180	0	–18	14	9	13	5
180	250	0	–20	15	10	15	5,5
250	315	0	–25	19	13	18	6,5
315	400	0	–28	22	14	20	6,5
400	500	0	–33	26	17	24	8,5
500	630	0	–38	30	20	30	10

▦ 8
Width tolerances, tolerance class 5

Tolerance symbols ➤115|▦6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Deviation of inner ring width $t_{\Delta Bs}$ µm		Deviation of outer ring width $t_{\Delta Cs}$ µm		Width deviation $t_{\Delta Ts}$ µm		Width deviation $t_{\Delta T1s}$ µm		Width deviation $t_{\Delta T2s}$ µm	
over	incl.	U	L	U	L	U	L	U	L	U	L
10	18	0	–200	0	–200	+200	–200	+100	–100	+100	–100
18	30	0	–200	0	–200	+200	–200	+100	–100	+100	–100
30	50	0	–240	0	–240	+200	–200	+100	–100	+100	–100
50	80	0	–300	0	–300	+200	–200	+100	–100	+100	–100
80	120	0	–400	0	–400	+200	–200	+100	–100	+100	–100
120	180	0	–500	0	–500	+350	–250	+150	–150	+200	–100
180	250	0	–600	0	–600	+350	–250	+150	–150	+200	–100
250	315	0	–700	0	–700	+350	–250	+150	–150	+200	–100
315	400	0	–800	0	–800	+400	–400	+200	–200	+200	–200

Total width tolerance of matched bearings

The tolerance for the total width 2T of matched bearing sets of design DF is determined from the axial internal clearance and the deviations of the width $t_{\Delta Ts}$ of the single bearings. The tolerance for the total width 2B is determined from the deviations of the inner ring width $t_{\Delta Bs}$ of the single bearings ➤570|▦4.

Bearings in inch sizes to ANSI/ABMA

Tapered roller bearings with the prefix K are manufactured as standard to the following tables. The values in the tables meet the requirements for normal tolerances in accordance with ANSI/ABMA 19.2:2013 and, in some cases, exceed these by a considerable margin.
Exception: bearings with the prefix KJ correspond to ISO 492:2014.
The bore and outside diameters of bearings in inch sizes have plus tolerances; inner ring tolerances ➤572|▦9, outer ring tolerances ➤572|▦10, width tolerances ➤573|▦11.

▦ 9

Inner ring tolerances, bearings in inch sizes

Tolerance symbols ➤115|▦6
U = upper limit deviation
L = lower limit deviation
t_{Sia} = axial runout to Schaeffler standard ➤570|11

Nominal bore diameter		Bore deviation		Radial runout		Axial runout
				According to standard	X-life	X-life
d		$t_{\Delta dmp}$		t_{Kia}	t_{Kia}	t_{Sia}
mm		µm		µm	µm	µm
over	incl.	U	L	max.	max.	max.
10	18	+12	0	15	7	10
18	30	+12	0	18	8	13
30	50	+12	0	20	9	13
50	80	+12	0	25	10	15
80	120	+25	0	30	13	18
120	180	+25	0	35	19	20
180	250	+25	0	50	24	25
250	304,8	+25	0	50	28	28
304,8	315	+50	0	50	28	28
315	400	+50	0	50	33	35
400	500	+50	0	50	39	38
500	609,6	+50	0	50	45	43
609,6	800	+75	0	75	54	–

▦ 10

Outer ring tolerances, bearings in inch sizes

Tolerance symbols ➤115|▦6
U = upper limit deviation
L = lower limit deviation

Nominal outside diameter		Bore deviation		Radial runout	
				According to standard	X-life
D		$t_{\Delta Dmp}$		t_{Kea}	t_{Kea}
mm		µm		µm	µm
over	incl.	U	L	max.	max.
18	30	+25	0	18	9
30	50	+25	0	20	10
50	80	+25	0	25	13
80	120	+25	0	35	16
120	150	+25	0	40	19
150	180	+25	0	45	21
180	250	+25	0	50	25
250	304,8	+25	0	50	29
304,8	609,6	+50	0	50	45
609,6	800	+75	0	75	54

Table 11 *Width tolerances, bearings in inch sizes*

Tolerance symbols ➤115|Table 6
U = *upper limit deviation*
L = *lower limit deviation*

Nominal bore diameter d mm		Deviation of inner ring width $t_{\Delta Bs}$ µm		Deviation of outer ring width $t_{\Delta Cs}$ µm		Width deviation $t_{\Delta Ts}$ µm	
over	incl.	U	L	U	L	U	L
10	50	0	–120	0	–120	+200	0
50	80	0	–150	0	–150	+200	0
80	101,6	0	–200	0	–200	+200	0
101,6	120	0	–200	0	–200	+350	–250
120	180	0	–250	0	–250	+350	–250
180	304,8	0	–250	0	–250	+350	–250
304,8	800	0	–250	0	–250	+375	–375

1.12 Suffixes

For a description of the suffixes used in this chapter ➤573|Table 12 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

Table 12 *Suffixes and corresponding descriptions*

Suffix	Description of suffix
A	Modified internal construction (excluding bearings to ANSI/ABMA)
B	Increased contact angle (for bearings to DIN)
DF-A..-..	Two tapered roller bearings matched in an X arrangement, with an intermediate ring between the outer rings. Axial internal clearance between .. and .. in µm
X	External dimensions matched to international standards (for bearings to DIN)
XL	X-life

Tapered roller bearings for special applications

Special tapered roller bearings are available for applications where tapered roller bearing arrangements are used under very difficult operating conditions, for example at high operating temperatures or with heavily contaminated lubricating oil. In such cases, please consult Schaeffler. Suffixes for special designs ➤573|Table 13.

Table 13 *Special designs, available by agreement*

Suffix	Description of suffix
DB-A..-..	Two tapered roller bearings matched in an O arrangement, with an intermediate ring between the outer rings and the inner rings, axial internal clearance between .. and .. in µm
DT	Two tapered roller bearings matched in a tandem arrangement, with an intermediate ring between the outer rings
P5	Bearing in tolerance class 5

Other special designs with suffixes are available by agreement, such as for:

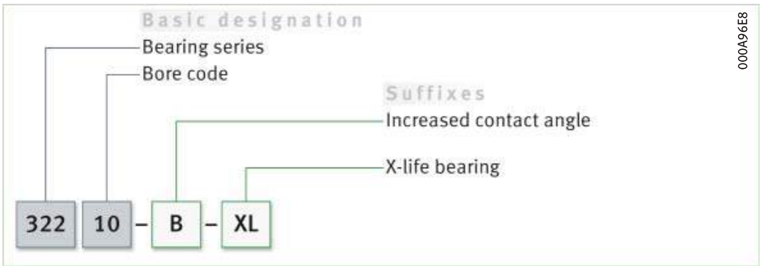
- dimensional stabilisation
- special heat treatment
- special materials
- tapered roller bearings with reduced friction
- tolerance classes
- restricted width tolerances.

1.13 Structure of bearing designation

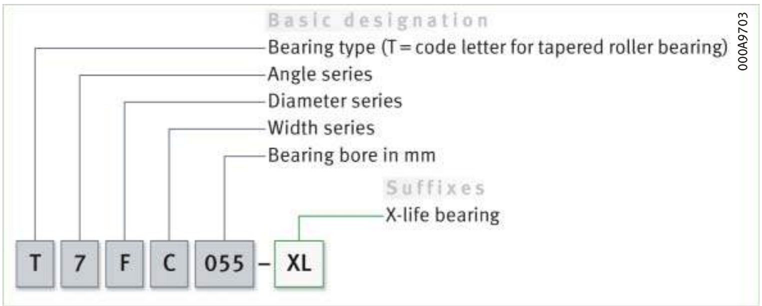
Examples of composition of bearing designation

The designation of bearings follows a set model. Examples ➤574| 12 to ➤575| 16. The composition of designations is subject to DIN 623-1:1993 ➤102| 10, DIN 720:2008 ➤101| 9, ISO 10317:2008, ISO 355:2007 ➤101| 8, ANSI/ABMA 19.1:2011 and ANSI/ABMA 19.2:2013.

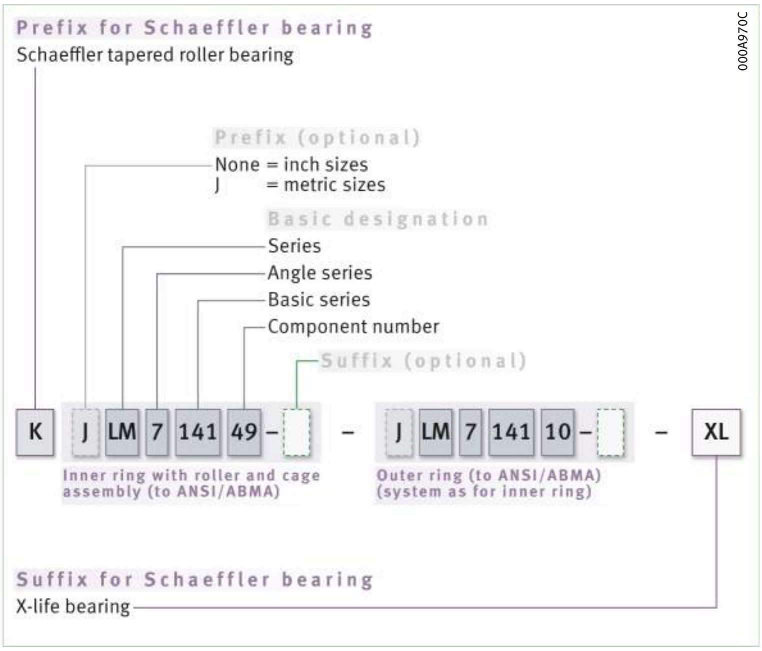
12
Single row tapered roller bearing, metric, to DIN 623-1:1993, DIN 720:2008: designation structure



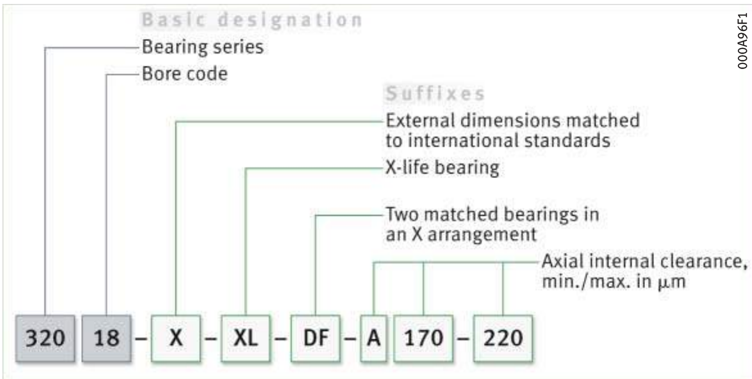
13
Single row tapered roller bearing, metric, to ISO 10317:2008, ISO 355:2007: designation structure



14
Single row tapered roller bearing, metric, to ANSI/ABMA 19.1:2011; inch sizes, to ANSI/ABMA 19.2:2013: designation structure



15
Matched tapered roller bearing pair: designation structure



16
Integral tapered roller bearing: designation structure

1.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_r$ under purely radial load of constant magnitude and direction

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of radial bearings under dynamic load assumes a radial load P of constant magnitude. If the bearing is subjected to purely radial load, the radial load F_r is used directly in the rating life equation for P ($P = F_r$).

✎ P is a substitute force for combined load

If this condition is not met, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

✎ $F_a/F_r \leqq e$ or $F_a/F_r > e$

The calculation of P is dependent on the load ratio F_a/F_r and the factor e.

✎ Single bearings and JK0S bearings

For single bearings under dynamic load and integral tapered roller bearings ➤575|⨍1 and ➤575|⨍2.

⨍1
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r$$

⨍2
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}4 \cdot F_r + Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Resulting axial force ➤577|▦14. The information in the section “Calculation of internal resulting axial force F_a for single bearings” must be taken into consideration when calculating F_a ➤576
e, Y	–	Factors ➤586|▦.

Bearing pairs in O or X arrangement

For bearing pairs under dynamic load in an O or X arrangement comprising single bearings ➤576|ƒ 3 and ➤576|ƒ 4.

ƒ 3
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r + 1{,}12 \cdot Y \cdot F_a$$

ƒ 4
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}67 \cdot F_r + 1{,}68 \cdot Y \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Resulting axial force ➤577|▦ 14. The information in the section “Calculation of internal resulting axial force F_a for single bearings” must be taken into consideration when calculating F_a ➤576
e, Y	–	Factors ➤586|▦.

Matched bearing pairs

For matched bearing pairs under dynamic load 313 (320, 322, 329)..-DF-A ➤576|ƒ 5 and ➤576|ƒ 6.

ƒ 5
Equivalent dynamic load

$$\frac{F_a}{F_r} \leqq e \quad \Rightarrow \quad P = F_r + Y_1 \cdot F_a$$

ƒ 6
Equivalent dynamic load

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = 0{,}67 \cdot F_r + Y_2 \cdot F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_r	N	Radial load
F_a	N	Resulting axial force. The information in the section “Calculation of internal resulting axial force F_a for single bearings” must be taken into consideration when calculating F_a ➤576
e, Y_1, Y_2	–	Factors ➤632|▦.

Calculation of internal resulting axial force F_a for single bearings and for bearing pairs in an X and O arrangement

Reasons why the internal resulting axial force F_a must be taken into consideration

Single row tapered roller bearings transmit radial forces from one raceway to the other oblique to the bearing axis. In the case of a shaft supported by two single row tapered roller bearings of identical or different size, the radial load on bearing A leads, due to the inclination of the raceways ($\alpha_0 \neq 0°$), to an axial load on bearing B. The radial load on bearing B also has the effect of an axial load on bearing A; external forces in bearing systems of this type ➤577| 17 and ➤577| 18. This internal resulting axial force F_a must be taken into consideration in the calculation of the equivalent dynamic bearing load P.

Equations for calculation

Equations for calculation of resulting axial force F_a ➤577|▦ 14.

Preconditions for calculation

Bearing A is subjected to a radial load F_{rA}, bearing B to a radial load F_{rB} ➤577| 17 and ➤577| 18. F_{rA} and F_{rB} act at the central pressure points of the bearings and are always regarded as positive. The bearings are clearance-free, but without preload.

! The stated equations for determining the axial load correspond to an approximation carried out under the assumption of a load zone of 180° in bearings under radial load. For a more precise calculation, the use of BEARINX or BEARINX-online is recommended.

14
Equations for calculation of the internal resulting axial force F_a

Parameters ➤576 | 6, ➤577 | 17 and ➤577 | 18

$Y_A = Y_B$ ➤586 |

Case	Load ratio	External axial force
1	$\frac{F_{rA}}{Y_A} \leqq \frac{F_{rB}}{Y_B}$	$K_a \geqq 0$
2	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$K_a > 0{,}47 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$
3		$K_a \leqq 0{,}47 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$

continued ▼

14
Equations for calculation of the internal resulting axial force F_a

Parameters ➤576 | 6, ➤577 | 17 and ➤577 | 18

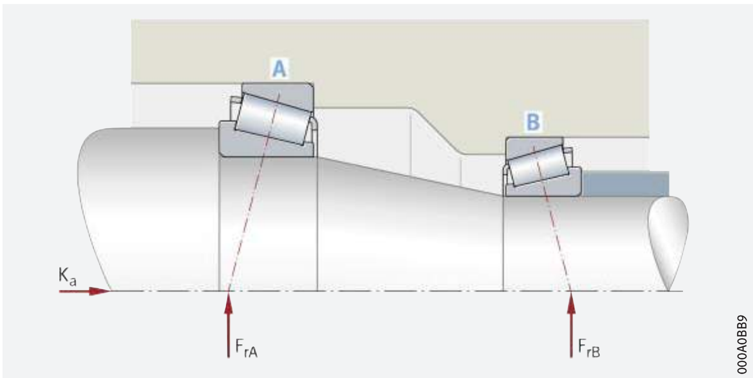
$Y_A = Y_B$ ➤586 |

Case	Load ratio	Resulting axial force F_a	
		Bearing A	Bearing B
1	$\frac{F_{rA}}{Y_A} \leqq \frac{F_{rB}}{Y_B}$	$F_{aA} = K_a + 0{,}47 \cdot \frac{F_{rB}}{Y_B}$	F_a is not taken into consideration in the calculation
2	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$F_{aA} = K_a + 0{,}47 \cdot \frac{F_{rB}}{Y_B}$	F_a is not taken into consideration in the calculation
3		F_a is not taken into consideration in the calculation	$F_{aB} = 0{,}47 \cdot \frac{F_{rA}}{Y_A} - K_a$

continued ▲

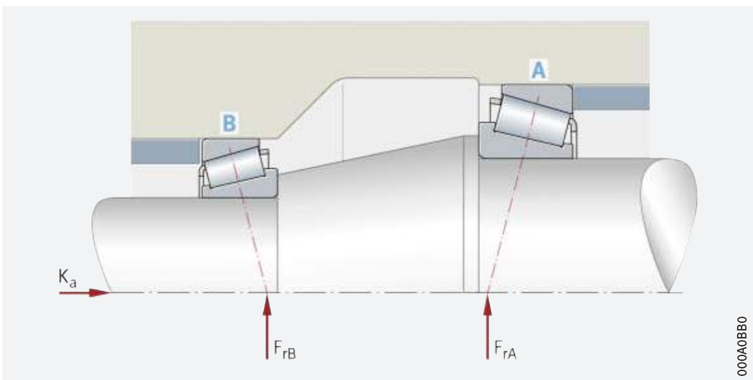
17
Adjusted bearing arrangement with two single row tapered roller bearings in O arrangement, external forces

K_a = *external axial force acting on the shaft*
F_{rA} = *radial load, bearing A*
F_{rB} = *radial load, bearing B*



18
Adjusted bearing arrangement with two single row tapered roller bearings in X arrangement, external forces

K_a = *external axial force acting on the shaft*
F_{rA} = *radial load, bearing A*
F_{rB} = *radial load, bearing B*



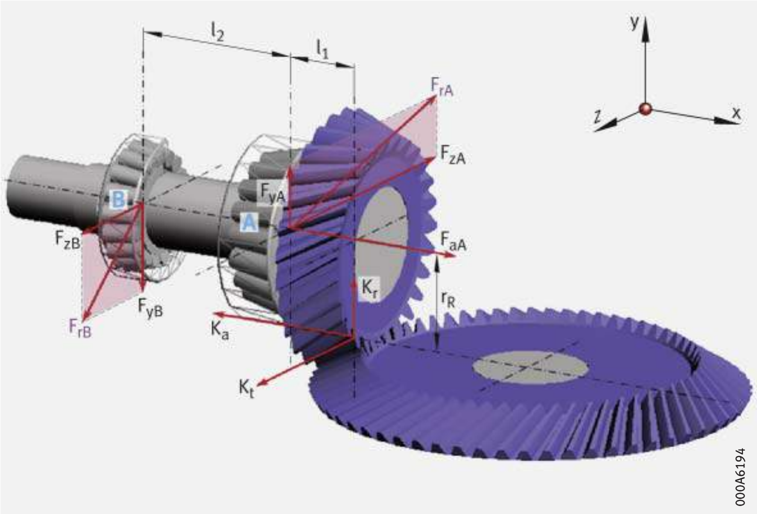
Example of calculation of internal resulting axial force F_a

Bearing arrangement for pinion shaft

Two single row tapered roller bearings are used for the bearing arrangement of a pinion shaft ➤578 | 19. The bearing arrangement should be adjusted and in an O arrangement. In order to calculate the basic rating life of bearing A, the equivalent dynamic bearing load P_A must be determined.

19
BEARINX calculation model: load on bearing A and B

K_a = external axial force = 6,52 kN
K_r = external radial force
K_t = tangential force
F_{rA} = radial load, bearing A (resultant of reaction forces F_{yA} and F_{zA})
F_{rB} = radial load, bearing B (resultant of reaction forces F_{yB} and F_{zB})
l_1 = spacing between pinion and contact cone apex of bearing A
l_2 = spacing between contact cone apexes of bearing A and bearing B



The resulting radial forces F_{rA} and F_{rB} on the bearings must be determined from the external radial force K_r and the tangential force K_t by the solution of the equilibrium of moments and forces on the shaft. Result:

- F_{rA} = 7,3 kN
- F_{rB} = 2,2 kN.

In a bearing arrangement with two single bearings, the resulting axial force F_a must be taken into consideration

Since this is an adjusted bearing arrangement with two single bearings, the internal resulting axial force F_a in the bearing system must be taken into consideration in the bearing calculation in accordance with ➤577| 14. For both tapered roller bearings $Y_A = Y_B = 1,6$.
Loads ➤578| 19. Tapered roller bearing 32206-XL is envisaged for bearing A.

Step 1

Calculate the load ratio using ➤578| 7.

7
Load ratio

$$\frac{F_{rA}}{Y_A} ; \frac{F_{rB}}{Y_B}$$

$$\frac{F_{rA}}{Y_A} = \frac{7,3\ \text{kN}}{1,6} = 4,56$$

$$\frac{F_{rB}}{Y_B} = \frac{2,2\ \text{kN}}{1,6} = 1,38$$

$$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$$

Step 2

Compare the result with possible cases ➤577| 14. Case 2 or case 3 can be considered ➤578| 15.

15
Equations for calculation of the internal resulting axial force F_a

Parameters ➤576| 6

$Y_A = Y_B = 1,6$

Case	Load ratio	External axial force	Resulting axial force F_a	
			Bearing A	Bearing B
2	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$K_a > 0,47 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	$F_{aA} = K_a + 0,47 \cdot \frac{F_{rB}}{Y_B}$	–
3		$K_a \leqq 0,47 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	–	$F_{aB} = 0,47 \cdot \frac{F_{rA}}{Y_A} - K_a$

Step 3

Using ➤579|ƒ 8, check whether case 2 applies ➤578|▦ 15.

ƒ 8
External axial force in relation to load ratio

$$K_a > 0{,}47 \cdot \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B} \right)$$

$$6{,}52\,kN > 0{,}47 \left(\frac{7{,}30\,kN}{1{,}6} - \frac{2{,}20\,kN}{1{,}6} \right)$$
$$> 0{,}47\,(4{,}563\,kN - 1{,}375\,kN)$$
$$6{,}52\,kN > 1{,}498\,kN$$

If case 2 applies ➤578|▦ 15. This means that bearing A supports the external axial force K_a.

Step 4

✎ Calculating F_a

Using ➤579|ƒ 9, calculate the internal resulting axial force F_a for bearing A. The calculations are in accordance with ➤578|▦ 15, case 2.

ƒ 9
Internal resulting axial force for bearing A

$$F_{aA} = K_a + 0{,}47 \cdot \frac{F_{rB}}{Y_B}$$

$$F_{aA} = 6{,}52\,kN + 0{,}47 \cdot \frac{2{,}20\,kN}{1{,}6}$$
$$= 7{,}17\,kN$$

Example of calculation of P

✎ Using value F_a in the calculation of P

Using ➤579|ƒ 10, calculate the ratio between the axial force F_a and radial force F_r of bearing A and compare this with the limit value e in accordance with the product table (in this instance e = 0,37).

ƒ 10
Load ratio, bearing A

$$\frac{F_{aA}}{F_{rA}}$$

$$\frac{7{,}17\,kN}{7{,}3\,kN} = 0{,}98$$

This gives:

$$\frac{F_a}{F_r} > e = 0{,}37$$

As a result, the axial force F_a of bearing A (F_{aA}) must be taken into consideration within the equivalent bearing load P_A of bearing A ➤575|ƒ 2 and thus ➤579|ƒ 11 apply.

ƒ 11
P for $F_a/F_r > e$

$$P_A = 0{,}4 \cdot F_{rA} + Y_A \cdot F_{aA}$$

$$P_A = 0{,}4 \cdot 7{,}3\,kN + 1{,}6 \cdot 7{,}17\,kN$$
$$= 14{,}39\,kN$$

The equivalent dynamic bearing load P_A of bearing A is then used to calculate the basic rating life of bearing A.

Equivalent static bearing load

Single bearings and JKOS bearings

For single bearings under static load and integral tapered roller bearings ➤580|ƒ 12 and ➤580|ƒ 13.

ƒ 12 *Equivalent static load*

$$\frac{F_{0a}}{F_{0r}} \leq \frac{1}{2 \cdot Y_0} \quad \Rightarrow \quad P_0 = F_{0r}$$

ƒ 13 *Equivalent static load*

$$\frac{F_{0a}}{F_{0r}} > \frac{1}{2 \cdot Y_0} \quad \Rightarrow \quad P_0 = 0{,}5 \cdot F_{0r} + Y_0 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load)
Y_0	–	Axial load factor.

For bearing pairs under static load in an O or X arrangement ➤580|ƒ 14.

ƒ 14 *Equivalent static load*

$$P_0 = F_{0r} + 2 \cdot Y_0 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load)
Y_0	–	Axial load factor.

For matched bearing pairs under static load 313 (320, 322, 329)..-DF-A.. ➤580|ƒ 15.

ƒ 15 *Equivalent static load*

$$P_0 = F_{0r} + Y_0 \cdot F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0r}, F_{0a}	N	Largest radial or axial load present (maximum load)
Y_0	–	Axial load factor.

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤580|ƒ 16.

ƒ 16 *Static load safety factor*

$$S_0 = \frac{C_0}{P_0}$$

Legend

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load.

1.15 Minimum load

In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/60$ is required

In order that no slippage occurs between the contact partners, the tapered roller bearings must be constantly subjected to a sufficiently high load. Based on experience, a minimum radial load of the order of $P > C_{0r}/60$ is thus necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

1.16 Design of bearing arrangements

Radial location of bearings

✎ For secure radial location, tight fits are necessary

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point. Clearance, transition or interference fits ➤150|▦6 and ➤158|▦7.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2, excluding tapered roller bearings to ANSI/ABMA 19.2:2013 or with special tolerances
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4, excluding tapered roller bearings to ANSI/ABMA 19.2:2013 or with special tolerances
- housing fits ➤158|▦7.

Shaft and housing fits for bearings in inch sizes

For bearings with a different tolerance accuracy, such as ANSI/ABMA 19.2:2013 for example, the tolerance class must be shifted in accordance with the fit.

Shaft and housing fits for integral tapered roller bearings

Recommended shaft and housing tolerances for integral tapered roller bearings ➤581|▦16.

▦16
Tolerances for integral tapered roller bearings

Circumferential load	Tolerance class	
	Shaft	Housing
on inner ring	m6 Ⓔ	H7 Ⓔ
on outer ring	g6 Ⓔ	M7 Ⓔ

Axial location of bearings

✎ The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings and retaining rings etc., are fundamentally suitable ➤584|🗨20.

Dimensional, geometrical and running accuracy of the bearing seats

A minimum of IT6 should be provided for the shaft seat and a minimum of IT7 for the housing seat

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For single row tapered roller bearings with the tolerance class Normal or 6X, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7; with tolerance class 5, the shaft seat should correspond to a minimum of IT5 and the housing seat to a minimum of IT6. Guide values for the geometrical and positional tolerances of bearing seating surfaces ➤582|▦17, tolerances t_1 to t_3 in accordance with ➤168|11. Numerical values for IT grades ➤582|▦18.

17 *Guide values for the geometrical and positional tolerances of bearing seating surfaces*

Bearing tolerance class to ISO 492	Bearing tolerance class to DIN 620	Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades): Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial runout tolerance of abutment shoulder t_3
Normal 6X	PN (P0) P6X	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	
5	P5	Shaft	IT5	Circumferential load IT2/2	Circumferential load IT2/2	IT2
				Point load IT3/2	Point load IT3/2	
		Housing	IT6	Circumferential load IT3/2	Circumferential load IT3/2	IT3
				Point load IT4/2	Point load IT4/2	

18 *Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010*

IT grade	Nominal dimension in mm over 10 incl. 18	over 18 incl. 30	over 30 incl. 50	over 50 incl. 80	over 80 incl. 120	over 120 incl. 180	over 180 incl. 250	over 250 incl. 315	over 315 incl. 400	over 400 incl. 500	over 500 incl. 630	over 630 incl. 800
	Values in μm											
IT2	2	2,5	2,5	3	4	5	7	8	9	10	11	13
IT3	3	4	4	5	6	8	10	12	13	15	16	18
IT4	5	6	7	8	10	12	14	16	18	20	22	25
IT5	8	9	11	13	15	18	20	23	25	27	32	36
IT6	11	13	16	19	22	25	29	32	36	40	44	50
IT7	18	21	25	30	35	40	46	52	57	63	70	80

Roughness of cylindrical bearing seats

✎ Ra must not be too high

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤583|▦ 19.

▦ 19
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4
500	1 250	3,2[1]	1,6	1,6	0,8

1) For the mounting of bearings using the hydraulic method, a value Ra = 1,6 µm must not be exceeded.

Mounting dimensions for the contact surfaces of bearing rings

✎ The contact surfaces for the rings must be of sufficient height

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of the abutment shoulders are defined in accordance with DIN 5418 ➤586|▦. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

If single row tapered roller bearings are mounted in a tandem arrangement, it must be ensured that the end faces of the outer rings in contact with each other have sufficient overlap. In case of doubt, please consult Schaeffler.

Cage projection

In the open bearings, the cages project laterally to a certain extent. In order to prevent the cages from grazing the adjacent construction, the lateral minimum distances C_a and C_b in the product tables must be taken into consideration in the design of the adjacent construction ➤586|▦.

Adjustment of bearings

✎ Always adjust single bearings against a second bearing

Due to their internal construction, single row tapered roller bearings cannot be mounted alone, but must always be used together with a second bearing or as a bearing set ➤584|⊡ 20. In bearing arrangements with two individual single row bearings, these must be adjusted against each other until the requisite preload or desired clearance is achieved ➤584|⊡ 20. The preload is only achieved once the bearings have been fitted and is dependent on the adjustment against the second bearing.

✎ Select the adjustment such that full function and operational reliability of the bearings is ensured

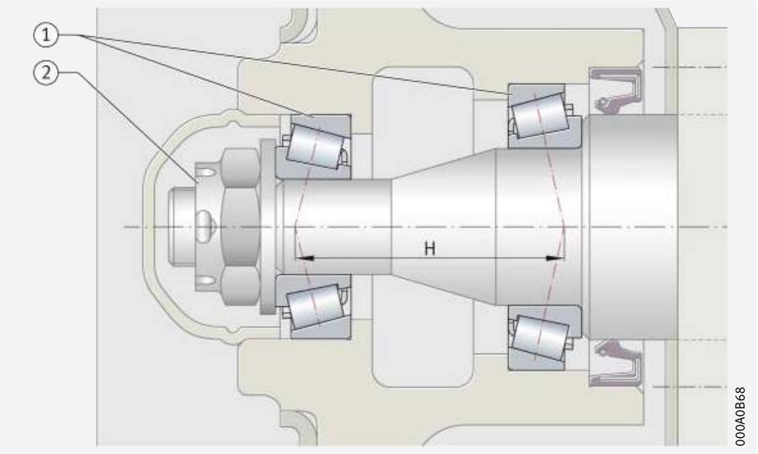
The correct adjustment of the bearings has a considerable influence on the function and operational reliability of the bearing arrangement. If the clearance is too large, the load carrying capacity of the bearings will not be fully utilised; if the preload is too high, the increased friction losses will give rise to higher operating temperatures, which will, in turn, have a negative effect on the rating life of the bearings.

In order that the rollers can be positioned correctly, the shaft or housing must be rotated several times in both directions when adjusting the bearings.

20
Adjusted bearing arrangement with two single row tapered roller bearings

H = *support spacing*

① *Tapered roller bearings mounted in an O arrangement and adjusted against each other*
② *Fixing nut*



Matched bearings

Adjustment not required for matched bearing sets

Matched tapered roller bearings do not need to be adjusted ➤*558*|*1.1*. The desired operating clearance or required preload is already set at the manufacturing plant.

1.17 Mounting and dismounting

The mounting and dismounting options for tapered roller bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

Ensure that the bearings are not damaged during mounting

Integral tapered roller bearings are not separable. In the mounting of such bearings, the mounting forces must always be applied to the bearing ring with a tight fit.

Schaeffler Mounting Handbook

Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤*https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

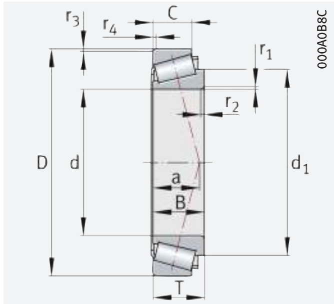
1.19 Further information

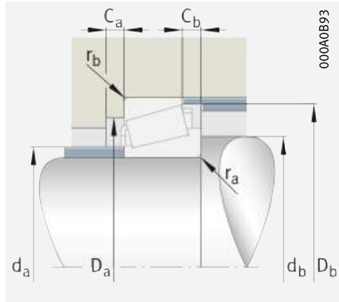
In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤ *34*
- Rigidity ➤ *54*
- Friction and increases in temperature ➤ *56*
- Speeds ➤ *64*
- Bearing data ➤ *97*
- Lubrication ➤ *70*
- Sealing ➤ *182*
- Design of bearing arrangements ➤ *139*
- Mounting and dismounting ➤ *191*.

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

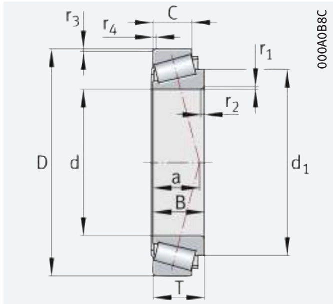
d = 15 – 25 mm

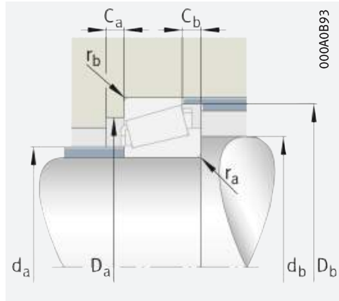
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
15	35	11	10	11,75	17 700	14 400	1 740	26 000	13 400	0,055	**30202-XL**	–
	42	13	11	14,25	27 500	20 800	2 800	21 700	12 000	0,095	**30302-XL**	T2FB015
17	40	12	11	13,25	22 900	19 000	2 490	22 200	11 800	0,079	**30203-XL**	T2DB017
	40	16	14	17,25	34 500	30 000	4 300	21 400	10 700	0,107	**32203-XL**	T2DD017
	47	14	12	15,25	33 000	25 000	3 400	19 300	10 800	0,13	**30303-XL**	T2FB017
	47	19	16	20,25	36 500	36 000	3 750	17 200	10 300	0,181	**32303-A**	T2FD017
20	37	12	9	12	15 700	18 400	1 960	21 100	11 700	0,053	**32904**	T2BD020
	42	15	12	15	28 500	29 000	3 950	19 900	10 700	0,111	**32004-X-XL**	T3CC020
	45	14	10	14	22 200	21 100	2 240	17 500	10 700	0,103	**T4DB020**	–
	47	14	12	15,25	32 000	27 500	3 800	18 500	10 100	0,121	**30204-XL**	T2DB020
	47	18	15	19,25	39 000	37 000	5 600	17 600	9 500	0,17	**32204-B-XL**	T5DD020
	47	18	15	19,25	40 500	36 500	5 400	18 400	9 700	0,165	**32204-XL**	T2DD020
	50	22	18,5	22	46 000	49 000	5 800	15 400	9 400	0,23	**T2ED020**	–
	52	15	13	16,25	34 000	32 500	3 600	15 600	9 700	0,187	**30304-A**	T2FB020
	52	15	11	16,25	30 500	29 500	3 350	14 900	8 400	0,174	**31304**	–
	52	21	18	22,25	46 000	47 500	5 600	15 200	9 400	0,241	**32304-A**	T2FD020
22	40	12	9	12	16 000	18 100	1 910	19 300	10 700	0,065	**329/22**	T2BC022
	44	15	11,5	15	24 800	30 500	3 200	17 000	10 000	0,11	**320/22-X**	T3CC022
	47	14	10	14	23 300	22 800	2 430	16 600	10 000	0,109	**T4CB022**	–
	52	22	18,5	22	47 500	51 000	6 000	14 600	8 800	0,239	**T2ED022**	–
	56	16	14	17,25	38 000	36 000	4 050	14 600	9 400	0,21	**303/22**	–
25	42	12	9	12	14 900	18 800	1 910	18 000	9 900	0,067	**32905**	T2BD025
	47	17	14	17	33 000	41 500	4 650	15 700	9 400	0,133	**33005**	T2CE025
	47	15	11,5	15	31 500	34 000	4 700	17 200	9 000	0,117	**32005-X-XL**	T4CC025
	50	14	10	14	24 200	24 600	2 650	15 300	9 200	0,121	**T4CB025**	–
	52	22	18	22	48 500	58 000	6 900	14 200	8 300	0,222	**33205**	T2DE025
	52	15	13	16,25	38 500	35 500	5 000	16 400	9 100	0,154	**30205-XL**	T3CC025
	52	18	15	19,25	44 500	46 000	7 000	15 500	8 100	0,195	**32205-B-XL**	T5CD025
	52	18	16	19,25	47 500	45 000	6 700	15 900	8 000	0,186	**32205-XL**	T2CD025
	58	26	21	26	61 000	69 000	8 500	12 900	8 200	0,349	**T2EE025**	–
	62	17	15	18,25	47 000	45 500	5 100	12 800	8 000	0,264	**30305-A**	T2FB025
	62	17	13	18,25	37 000	38 500	4 400	12 000	7 100	0,297	**31305-A**	T7FB025
	62	24	20	25,25	62 000	66 000	7 800	12 500	7 800	0,378	**32305-A**	T2FD025
	62	24	20	25,25	57 000	66 000	8 000	12 200	7 900	0,405	**32305-B**	–

medias ➤ *https://www.schaeffler.de/std/1EFB*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
15	0,6	0,6	9	25,8	20	19	29	29	32	2	1,5	0,6	0,6	0,35	1,73	0,95
	1	1	10	28,7	22	21	36	36	38	2	3	1	1	0,29	2,11	1,16
17	1	1	10	29,5	23	23	34	34	37	2	2	1	1	0,35	1,74	0,96
	1	1	11	29,3	22	23	34	34	37	3	3	1	1	0,31	1,92	1,06
	1	1	11	32	25	23	40	41	42	2	3	1	1	0,29	2,11	1,16
	1	1	12	31,5	24	23	39	41	43	3	4	1	1	0,29	2,11	1,16
20	0,3	0,3	8	29,5	24	24	32	34	34	2	3	0,3	0,3	0,32	1,88	1,04
	0,6	0,6	10	33,1	25	25	36	37	39	3	3	0,6	0,6	0,37	1,6	0,88
	1	1	11	32,9	26	27	38	40	42	3	4	1	1	0,45	1,34	0,73
	1	1	12	34,7	27	26	40	41	43	2	3	1	1	0,35	1,74	0,96
	1	1	15	36,2	26	27	37	41	44	2	4	1	1	0,52	1,16	0,64
	1	1	13	33,9	26	26	39	41	43	3	4	1	1	0,33	1,81	1
	2	1,5	14	35	26	28	41	43	47	4	3	2	1,5	0,33	1,8	0,99
	1,5	1,5	12	36,1	28	27	44	45	47	2	3	1,5	1,5	0,3	2	1,1
	1,5	1,5	16	37,3	27	27	40	45	48	3	5	1,5	1,5	0,73	0,82	0,45
	1,5	1,5	14	35,3	27	27	43	45	47	3	4	1,5	1,5	0,3	2	1,1
22	0,3	0,3	9	31,5	26	26	35	37	37	2	3	0,3	0,3	0,32	1,88	1,04
	0,6	0,6	11	35,3	27	27	38	39	41	3	3,5	0,6	0,6	0,4	1,51	0,83
	1	1	12	34,9	28	29	40	42	44	3	4	1	1	0,47	1,27	0,7
	2	1,5	14	36,9	28	30	43	45	49	4	3,5	2	1,5	0,33	1,84	1,01
	1,5	1,5	12	37,3	30	29	47	49	50	2	3	1,5	1,5	0,3	2,01	1,1
25	0,3	0,3	9	34,2	29	30	37	38	39	2	3	0,3	0,3	0,32	1,88	1,04
	0,6	0,6	11	37,3	30	30	41	42	44	3	3	0,6	0,6	0,29	2,07	1,14
	0,6	0,6	12	38,5	30	30	40	42	44	3	3,5	0,6	0,6	0,43	1,39	0,77
	1	1	13	38	30	32	43	45	47	3	4	1	1	0,51	1,18	0,65
	1	1	14	39,6	30	31	43	46	49	4	4	1	1	0,35	1,71	0,94
	1	1	13	38,5	31	31	44	46	48	2	3	1	1	0,37	1,6	0,88
	1	1	16	41,3	30	31	41	46	49	2	4	1	1	0,58	1,03	0,57
	1	1	14	39,5	31	31	44	46	48	3	3	1	1	0,36	1,67	0,92
	2	1,5	16	42	32	34	48	51	54	4	5	2	1,5	0,33	1,8	0,99
	1,5	1,5	13	42,3	34	32	54	55	57	2	3	1,5	1,5	0,3	2	1,1
	1,5	1,5	21	46,3	34	32	47	55	59	3	5	1,5	1,5	0,83	0,73	0,4
	1,5	1,5	16	42,3	33	32	53	55	57	3	5	1,5	1,5	0,3	2	1,1
	1,5	1,5	20	45,7	31	36	46	55	58	3	5	1,5	1,5	0,55	1,1	0,6

Tapered roller bearings
Single row to DIN/ISO





Mounting dimensions

d = 28 – 32 mm

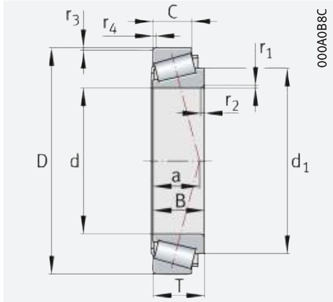
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min⁻¹	$n_{\vartheta r}$ min⁻¹	m ≈ kg	➤573|1.12 ➤574|1.13 X-life ➤559	
28	45	12	9	12	15 800	20 900	2 130	16 700	8 900	0,073	**329/28**	T2BD028
	52	16	12	16	34 000	40 500	4 550	14 200	8 400	0,164	**320/28-X**	T4CC028
	55	14,5	11	15	30 000	31 000	3 400	13 900	8 400	0,151	**T4CB028**	–
	58	19	16	20,25	43 500	52 000	6 100	12 800	7 500	0,257	**322/28-B**	T5DD028
	58	24	19	24	57 000	66 000	8 000	12 700	7 700	0,306	**332/28**	–
	65	27	22	27	71 000	78 000	9 400	11 600	7 500	0,451	**T2ED028**	–
	68	18	16	19,75	53 000	51 000	5 800	11 700	7 600	0,342	**303/28**	–
30	47	12	9	12	16 300	22 000	2 260	15 900	8 400	0,077	**32906**	T2BD030
	55	17	13	17	46 000	47 000	6 500	14 600	7 900	0,174	**32006-X-XL**	T4CC030
	55	20	16	20	53 000	57 000	8 800	14 500	8 300	0,212	**33006-XL**	T2CE030
	60	16,5	12,5	17	38 000	38 500	4 500	12 600	8 000	0,207	**T4CB030**	–
	62	16	14	17,25	52 000	48 500	7 200	13 700	7 400	0,238	**30206-XL**	T3DB030
	62	20	17	21,25	62 000	65 000	9 700	12 900	6 700	0,28	**32206-B-XL**	T5DC030
	62	20	17	21,25	63 000	62 000	9 700	13 300	6 800	0,28	**32206-XL**	T3DC030
	62	25	19,5	25	77 000	78 000	12 400	13 000	7 000	0,365	**33206-XL**	T2DE030
	68	29	24	29	80 000	93 000	11 500	10 900	7 100	0,534	**T2EE030**	–
	72	19	16	20,75	77 000	61 000	8 400	12 100	7 100	0,445	**30306-XL**	T2FB030
	72	19	14	20,75	45 000	46 500	5 300	10 300	6 400	0,441	**31306-A**	T7FB030
	72	27	23	28,75	80 000	89 000	10 800	10 700	7 000	0,57	**32306-A**	T2FD030
	72	27	23	28,75	73 000	87 000	10 600	10 400	7 100	0,602	**32306-B**	T5FD030
32	52	15	10	14	24 200	30 500	3 000	14 300	7 900	0,114	**329/32**	T2BD032
	58	17	13	17	39 000	48 500	5 600	12 600	7 500	0,197	**320/32-X**	T4CC032
	65	17	15	18,25	47 500	52 000	6 100	11 800	7 300	0,279	**302/32**	T3DB032
	65	26	20,5	26	71 000	85 000	10 500	11 200	6 800	0,41	**332/32**	T2DE032
	65	17,5	13,5	18	43 500	45 000	5 300	11 700	7 500	0,262	**T4DB032**	–
	72	29	24	29	87 000	100 000	12 200	10 400	6 700	0,594	**T2ED032**	–
	75	20	17,5	21,75	67 000	68 000	7 900	10 400	6 800	0,464	**303/32**	–

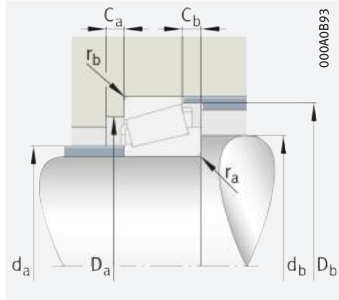
medias *➤ https://www.schaeffler.de/std/1EFC*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
28	0,3	0,3	9	37,3	32	32	41	41	42	2	3	0,3	0,3	0,32	1,88	1,04
	1	1	13	41	33	34	45	46	49	3	4	1	1	0,43	1,39	0,77
	1	1	13	41,4	34	35	48	49	52	3	4	1	1	0,47	1,27	0,7
	1	1	17	44,8	33	34	46	52	55	3	4	1	1	0,56	1,07	0,59
	1	1	16	43,1	33	34	49	52	55	4	5	1	1	0,34	1,77	0,97
	2	2	18	45,6	35	37	54	57	61	5	5	2	2	0,34	1,77	0,97
	1,5	1,5	14	46,5	38	35	59	61	62	3	3,5	1,5	1,5	0,3	2	1,1
30	0,3	0,3	9	39,2	34	34	43	43	44	2	3	0,3	0,3	0,32	1,88	1,04
	1	1	14	43,9	35	36	48	49	52	3	4	1	1	0,43	1,39	0,77
	1	1	13	43,8	35	36	48	49	52	3	4	1	1	0,29	2,06	1,13
	1	1	15	44,6	36	37	52	54	57	3	4,5	1	1	0,47	1,27	0,7
	1	1	14	46,2	37	36	53	56	57	2	3	1	1	0,37	1,6	0,88
	1	1	18	48,5	36	36	50	56	60	3	4	1	1	0,56	1,07	0,59
	1	1	16	46,8	37	36	52	56	59	3	4	1	1	0,37	1,6	0,88
	1	1	16	46,9	36	36	53	56	59	5	5,5	1	1	0,34	1,76	0,97
	2	2	19	48,8	37	40	56	60	64	5	5	2	2	0,33	1,81	1
	1,5	1,5	15	50,1	40	37	62	65	66	3	4,5	1,5	1,5	0,32	1,9	1,05
	1,5	1,5	24	54	40	37	55	65	68	3	6,5	1,5	1,5	0,83	0,73	0,4
	1,5	1,5	18	49,3	39	37	59	65	66	4	5,5	1,5	1,5	0,32	1,9	1,05
	1,5	1,5	23	52,7	38	37	59	65	67	4	5,5	1,5	1,5	0,55	1,1	0,6
32	0,6	0,6	10	42,4	36	37	47	48	49	3	3	0,6	0,6	0,32	1,88	1,04
	1	1	14	46,5	38	38	50	52	55	3	4	1	1	0,45	1,32	0,73
	1	1	14	47,7	39	38	56	59	60	3	3	1	1	0,37	1,6	0,88
	1	1	17	48,6	38	38	55	59	62	4	5,5	1	1	0,35	1,73	0,95
	1	1	16	48	39	40	56	59	61	3	4,5	1	1	0,47	1,27	0,7
	2	2	19	51,1	40	42	60	64	67	5	5	2	2	0,34	1,78	0,98
	2	1,5	16	51,8	42	39	65	68	69	3	4	2	1,5	0,32	1,9	1,05

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 35 – 42 mm

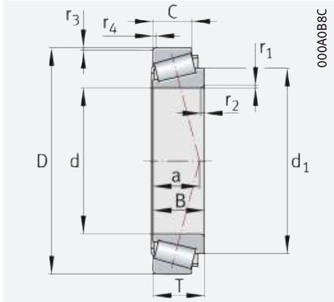
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573|1.12 ➤574|1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
35	55	14	11,5	14	27 500	38 000	3 850	13 200	7 000	0,127	**32907**	T2BD035
	62	21	17	21	53 000	70 000	8 500	11 500	7 200	0,273	**33007**	T2CE035
	62	18	14	18	54 000	57 000	8 900	12 800	7 000	0,225	**32007-X-XL**	T4CC035
	70	18	14	19	51 000	55 000	6 400	10 800	6 900	0,317	**T4DB035**	–
	72	17	15	18,25	64 000	59 000	8 900	11 700	6 400	0,336	**30207-XL**	T3DB035
	72	23	19	24,25	75 000	80 000	12 500	11 100	6 200	0,464	**32207-B-XL**	T5DC035
	72	23	19	24,25	84 000	85 000	13 400	11 400	6 000	0,449	**32207-XL**	T3DC035
	72	28	22	28	103 000	105 000	16 800	11 100	6 200	0,555	**33207-XL**	T2DE035
	78	32,5	27	33	106 000	120 000	14 700	9 400	6 400	0,777	**T2EE035**	–
	80	21	18	22,75	73 000	75 000	8 600	9 700	6 500	0,525	**30307-A**	T2FB035
	80	21	15	22,75	60 000	64 000	7 500	9 100	5 700	0,514	**31307-A**	T7FB035
	80	31	25	32,75	100 000	113 000	13 600	9 400	6 500	0,758	**32307-A**	T2FE035
	80	31	25	32,75	95 000	116 000	14 400	9 100	6 400	0,806	**32307-B**	T5FE035
38	65	18	14	18	49 000	64 000	7 500	11 100	6 400	0,252	**320/38-X**	–
40	62	15	12	15	32 500	46 000	5 000	11 700	6 200	0,186	**32908**	T2BC040
	68	22	18	22	62 000	87 000	10 600	10 400	6 300	0,34	**33008**	T2BE040
	68	19	14,5	19	63 000	71 000	10 100	11 600	6 200	0,28	**32008-X-XL**	T3CD040
	75	26	20,5	26	93 000	104 000	16 800	10 400	5 500	0,517	**33108-XL**	T2CE040
	75	18	14	19	53 000	59 000	6 900	9 900	6 300	0,345	**T4CB040**	–
	80	32	25	32	105 000	134 000	16 600	9 000	5 700	0,741	**33208**	T2DE040
	80	18	16	19,75	73 000	67 000	10 100	10 500	5 900	0,432	**30208-XL**	T3DB040
	80	23	19	24,75	87 000	88 000	13 900	10 000	5 500	0,57	**32208-B-XL**	T5DC040
	80	23	19	24,75	94 000	94 000	14 700	10 200	5 300	0,6	**32208-XL**	T3DC040
	85	32,5	28	33	114 000	139 000	17 000	8 600	5 700	0,9	**T2EE040**	–
	90	23	20	25,25	91 000	102 000	11 900	8 500	5 700	0,812	**30308-A**	T2FB040
	90	23	17	25,25	89 000	83 000	12 100	8 700	5 100	0,723	**31308-XL**	T7FB040
	90	33	27	35,25	120 000	149 000	18 200	8 000	5 600	1,08	**32308-B**	–
	90	33	27	35,25	143 000	148 000	23 400	9 200	5 700	1,09	**32308-XL**	T2FD040
42	72	20	15,5	20	59 000	82 000	9 800	9 900	5 700	0,345	**320/42-X**	–

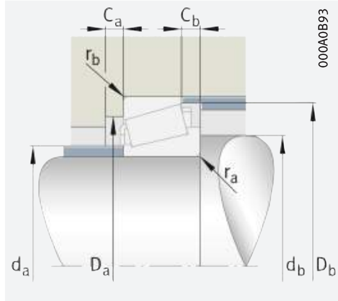
medias ➤ *https://www.schaeffler.de/std/1EFD*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
35	0,6	0,6	11	45,7	40	40	50	50	52	3	3	0,6	0,6	0,29	2,06	1,13
	1	1	14	49,2	41	41	55	56	59	4	4	1	1	0,31	1,97	1,08
	1	1	15	50,1	40	41	54	56	59	4	4	1	1	0,45	1,32	0,73
	1	1	16	51,8	43	43	61	64	66	4	5	1	1	0,45	1,32	0,73
	1,5	1,5	15	53,4	44	42	62	65	67	3	3	1,5	1,5	0,37	1,6	0,88
	1,5	1,5	22	56	42	42	56	65	68	3	5	1,5	1,5	0,58	1,03	0,57
	1,5	1,5	18	53,9	43	42	61	65	67	3	5,5	1,5	1,5	0,37	1,6	0,88
	1,5	1,5	18	53,9	42	42	61	65	68	5	6	1,5	1,5	0,35	1,7	0,93
	2,5	2	21	55,3	43	45	65	70	74	6	6	2,5	2	0,32	1,85	1,02
	2	1,5	16	55,2	45	44	70	71	74	3	4,5	2	1,5	0,32	1,9	1,05
	2	1,5	26	59,9	44	44	62	71	76	4	7,5	2	1,5	0,83	0,73	0,4
	2	1,5	20	55,2	44	44	66	71	74	4	7,5	2	1,5	0,32	1,9	1,05
	2	1,5	25	59,8	42	44	61	71	76	4	7,5	2	1,5	0,55	1,1	0,6
38	1	1	14	52	43	44	58	59	62	4	4	1	1	0,37	1,6	0,88
40	0,6	0,6	12	51,6	45	45	57	57	59	3	3	0,6	0,6	0,29	2,07	1,14
	1	1	15	54,6	46	46	61	62	65	4	4	1	1	0,28	2,12	1,17
	1	1	15	55,2	46	46	60	62	65	4	4,5	1	1	0,38	1,58	0,87
	1,5	1,5	18	59,2	47	47	65	68	71	4	5,5	1,5	1,5	0,36	1,69	0,93
	1	1	18	57,5	47	48	65	69	71	4	5	1	1	0,49	1,22	0,67
	1,5	1,5	21	60,1	47	47	67	73	76	5	7	1,5	1,5	0,36	1,68	0,92
	1,5	1,5	17	59	49	47	69	73	74	3	3,5	1,5	1,5	0,37	1,6	0,88
	1,5	1,5	22	61,1	48	47	65	73	76	4	5,5	1,5	1,5	0,55	1,1	0,6
	1,5	1,5	19	60	48	47	68	73	75	3	5,5	1,5	1,5	0,37	1,6	0,88
	2,5	2	22	61,9	48	51	70	75	80	6	5	2,5	2	0,34	1,74	0,96
	2	1,5	19	63,3	52	49	77	81	82	3	5	2	1,5	0,35	1,74	0,96
	2	1,5	30	67,7	51	49	71	81	86	4	8	2	1,5	0,83	0,73	0,4
	2	1,5	28	67	50	49	69	81	85	4	8	2	1,5	0,55	1,1	0,6
	2	1,5	23	64,2	50	49	73	81	82	4	8	2	1,5	0,35	1,74	0,96
42	1	1	16	58,3	48	48	64	66	69	4	4,5	1	1	0,37	1,6	0,88

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 45 – 50 mm

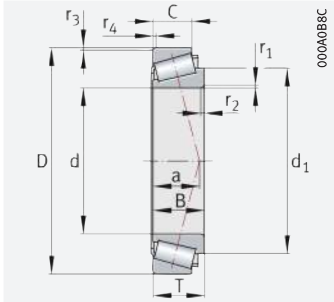
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573|1.12 ➤574|1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
45	68	15	12	15	34 500	52 000	5 700	10 600	5 500	0,196	**32909**	T2BC045
	75	24	19	24	71 000	103 000	12 700	9 400	5 900	0,432	**33009**	T2CE045
	75	20	15,5	20	72 000	86 000	13 300	10 300	5 400	0,355	**32009-X-XL**	T3CC045
	80	26	20,5	26	84 000	115 000	14 400	8 800	4 950	0,542	**33109**	T3CE045
	85	32	25	32	107 000	146 000	18 300	8 200	5 200	0,8	**33209**	T3DE045
	85	19	16	20,75	84 000	83 000	12 600	9 600	5 400	0,488	**30209-XL**	T3DB045
	85	23	19	24,75	93 000	99 000	15 500	9 200	4 950	0,62	**32209-B-XL**	T5DC045
	85	23	19	24,75	97 000	100 000	15 700	9 400	4 850	0,592	**32209-XL**	T3DC045
	85	20	15,5	21	69 000	77 000	9 200	8 700	5 600	0,497	**T4DB045**	–
	90	31	26	32	105 000	141 000	17 800	7 900	5 200	0,967	**T5ED045**	–
	95	35	30	36	143 000	175 000	21 600	7 700	5 100	1,22	**T2ED045**	–
	95	26,5	20	29	105 000	109 000	16 600	8 100	6 100	0,93	**T7FC045-XL**	–
	100	25	22	27,25	111 000	125 000	14 800	7 600	5 100	0,997	**30309-A**	T2FB045
	100	25	18	27,25	114 000	108 000	16 000	7 800	4 650	0,97	**31309-XL**	T7FB045
	100	36	30	38,25	154 000	193 000	23 900	7 300	4 900	1,42	**32309-A**	T2FD045
	100	36	30	38,25	144 000	188 000	23 200	7 200	5 100	1,46	**32309-BA**	T5FD045
50	72	15	12	15	35 500	55 000	6 100	9 900	5 100	0,2	**32910**	T2BC050
	80	20	15,5	20	75 000	94 000	14 500	9 600	4 950	0,39	**32010-X-XL**	T3CC050
	80	24	19	24	89 000	114 000	18 200	9 600	5 300	0,454	**33010-XL**	T2CE050
	85	26	20	26	86 000	122 000	15 200	8 200	4 600	0,59	**33110**	T3CE050
	90	20	17	21,75	94 000	97 000	14 800	9 000	5 000	0,564	**30210-XL**	T3DB050
	90	23	19	24,75	98 000	102 000	16 000	8 600	4 600	0,66	**32210-B-XL**	T5DC050
	90	23	19	24,75	104 000	110 000	17 300	8 800	4 500	0,702	**32210-XL**	T3DC050
	90	32	24,5	32	136 000	163 000	26 500	8 400	4 700	0,87	**33210-XL**	T3DE050
	90	20	15,5	21	71 000	82 000	9 800	8 100	5 200	0,534	**T4DB050**	–
	100	35	30	36	150 000	188 000	23 400	7 200	4 750	1,28	**T2ED050**	–
	100	34,5	29	36	131 000	183 000	23 100	7 000	4 750	1,35	**T5ED050**	–
	105	29	22	32	127 000	135 000	20 700	7 200	5 600	1,23	**T7FC050-XL**	–
	110	27	23	29,25	130 000	148 000	17 700	6 800	4 700	1,25	**30310-A**	T2FB050
	110	27	19	29,25	131 000	125 000	18 500	7 100	4 300	1,25	**31310-XL**	T7FB050
	110	40	33	42,25	187 000	237 000	29 500	6 600	4 550	1,9	**32310-A**	T2FD050
	110	40	33	42,25	165 000	223 000	28 000	6 500	4 800	1,95	**32310-B**	T5FD050

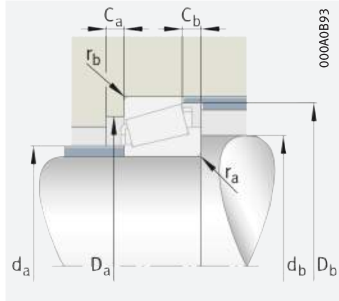
medias ➤ *https://www.schaeffler.de/std/1EFE*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
45	0,6	0,6	12	57,8	51	50	62	63	64	3	3	0,6	0,6	0,32	1,88	1,04
	1	1	16	61,8	51	51	67	69	71	4	5	1	1	0,29	2,04	1,12
	1	1	17	62,2	51	51	67	69	72	4	4,5	1	1	0,39	1,53	0,84
	1,5	1,5	19	63,8	52	52	69	73	77	4	5,5	1,5	1,5	0,38	1,57	0,86
	1,5	1,5	22	66,2	52	52	72	78	81	5	7	1,5	1,5	0,39	1,56	0,86
	1,5	1,5	18	64,8	54	52	74	78	80	3	4,5	1,5	1,5	0,4	1,48	0,81
	1,5	1,5	24	66,8	53	52	70	78	82	4	5,5	1,5	1,5	0,59	1,01	0,56
	1,5	1,5	20	65,6	53	52	73	78	80	3	5,5	1,5	1,5	0,4	1,48	0,81
	2	2	19	63,7	53	54	74	77	80	5	5,5	2	2	0,46	1,31	0,72
	4	2	27	69,7	52	57	70	82	86	5	6	4	2	0,55	1,1	0,6
	2,5	2,5	24	68,8	54	56	80	83	89	6	6	2,5	2,5	0,32	1,86	1,02
	2,5	2,5	33	73,5	53	59	71	83	91	5	9	2,5	2,5	0,87	0,69	0,38
	2	1,5	21	70,7	59	54	86	91	92	3	5	2	1,5	0,35	1,74	0,96
	2	1,5	32	74,7	56	54	79	91	95	4	9	2	1,5	0,83	0,73	0,4
	2	1,5	26	71,1	56	54	82	91	93	4	8	2	1,5	0,35	1,74	0,96
	2	1,5	30	74,2	55	54	76	91	94	5	8	2	1,5	0,55	1,1	0,6
50	0,6	0,6	14	61,6	55	55	66	67	69	3	3	0,6	0,6	0,34	1,76	0,97
	1	1	18	67,3	56	56	72	74	77	4	4,5	1	1	0,42	1,42	0,78
	1	1	18	66,5	56	56	72	74	76	4	5	1	1	0,32	1,9	1,04
	1,5	1,5	21	69,1	56	57	74	78	82	4	6	1,5	1,5	0,41	1,46	0,8
	1,5	1,5	20	69,7	58	57	79	83	85	3	4,5	1,5	1,5	0,42	1,43	0,79
	1,5	1,5	25	71,2	57	57	76	83	87	4	6,5	1,5	1,5	0,59	1,02	0,56
	1,5	1,5	21	70,1	58	57	78	83	85	3	5,5	1,5	1,5	0,42	1,43	0,79
	1,5	1,5	24	72,5	57	57	77	83	87	5	7,5	1,5	1,5	0,41	1,45	0,8
	2	2	21	69	58	59	79	82	85	4	5,5	2	2	0,49	1,23	0,67
	2,5	2,5	25	73,5	59	61	84	90	94	6	6	2,5	2,5	0,34	1,75	0,96
	4	2	30	77,7	59	64	78	91	95	5	7	4	2	0,53	1,13	0,62
	3	3	36	81,1	59	65	78	91	100	5	10	3	3	0,87	0,69	0,38
	2,5	2	23	77,6	65	60	95	100	102	4	6	2,5	2	0,35	1,74	0,96
	2,5	2	35	81,7	62	60	87	100	104	4	10	2,5	2	0,83	0,73	0,4
	2,5	2	29	79,1	62	60	90	100	102	5	9	2,5	2	0,35	1,74	0,96
	2,5	2	33	82,3	60	60	83	100	103	5	9	2,5	2	0,55	1,1	0,6

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 55 – 60 mm

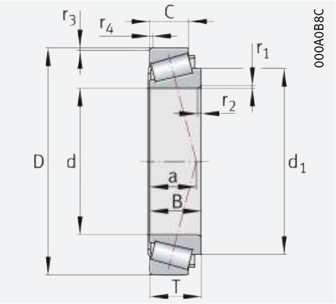
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
55	80	17	14	17	46 500	78 000	9 000	8 900	4 650	0,304	**32911**	T2BC055
	90	27	21	27	94 000	142 000	18 000	7 700	4 900	0,671	**33011**	T2CE055
	90	23	17,5	23	96 000	118 000	18 800	8 500	4 600	0,57	**32011-X-XL**	T3CC055
	95	30	23	30	113 000	163 000	20 400	7 300	4 250	0,873	**33111**	T3CE055
	95	20	15,5	21	73 000	88 000	10 500	7 600	4 700	0,575	**T4CB055**	–
	100	21	18	22,75	109 000	109 000	16 200	8 100	4 600	0,728	**30211-XL**	T3DB055
	100	25	19	26,75	124 000	130 000	20 100	7 800	4 150	0,88	**32211-B-XL**	–
	100	25	21	26,75	130 000	137 000	21 200	7 900	4 100	0,87	**32211-XL**	T3DC055
	100	35	27	35	164 000	194 000	31 500	7 600	4 350	1,17	**33211-XL**	T3DE055
	105	34,5	29	36	135 000	193 000	24 400	6 600	4 450	1,43	**T5ED055**	–
	110	39	32	39	176 000	226 000	28 500	6 500	4 350	1,63	**T2ED055**	–
	115	31	23,5	34	152 000	165 000	25 500	6 600	5 000	1,59	**T7FC055-XL**	–
	120	29	25	31,5	180 000	175 000	27 000	6 900	4 350	1,63	**30311-XL**	T2FB055
	120	29	21	31,5	145 000	139 000	21 000	6 500	4 100	1,75	**31311-XL**	T7FB055
	120	43	35	45,5	211 000	270 000	33 500	6 100	4 350	2,39	**32311-A**	T2FD055
	120	43	35	45,5	194 000	265 000	33 000	5 900	4 450	2,49	**32311-B**	T5FD055
60	85	17	14	17	49 000	85 000	9 900	8 300	4 250	0,315	**32912**	T2BC060
	95	27	21	27	95 000	148 000	18 800	7 300	4 650	0,714	**33012**	T2CE060
	95	23	17,5	23	97 000	124 000	19 600	8 000	4 350	0,61	**32012-X-XL**	T4CC060
	100	30	23	30	116 000	171 000	21 500	6 900	3 950	0,918	**33112**	T3CE060
	100	20	15,5	21	75 000	93 000	11 100	7 200	4 400	0,597	**T4CB060**	–
	110	38	29	38	169 000	237 000	29 500	6 300	4 050	1,55	**33212**	T3EE060
	110	22	19	23,75	122 000	123 000	18 400	7 500	4 250	0,95	**30212-XL**	–
	110	28	21	29,75	151 000	162 000	25 500	7 000	3 900	1,19	**32212-B-XL**	–
	110	28	24	29,75	158 000	171 000	27 000	7 200	3 850	1,18	**32212-XL**	T3EC060
	115	39	33	40	189 000	250 000	31 500	6 100	4 050	2,04	**T2EE060**	–
	115	38	31	39	156 000	223 000	28 000	6 000	4 150	1,82	**T5ED060**	–
	125	33,5	26	37	181 000	200 000	31 000	6 100	4 700	2,03	**T7FC060-XL**	–
	130	31	26	33,5	208 000	204 000	31 500	6 300	4 050	2,03	**30312-XL**	T2FB060
	130	31	22	33,5	173 000	169 000	25 500	6 000	3 800	1,94	**31312-XL**	T7FB060
	130	46	37	48,5	220 000	300 000	38 000	5 400	4 150	3,1	**32312-BA**	T5FD060
	130	46	37	48,5	285 000	310 000	51 000	6 100	4 050	2,96	**32312-XL**	T2FD060

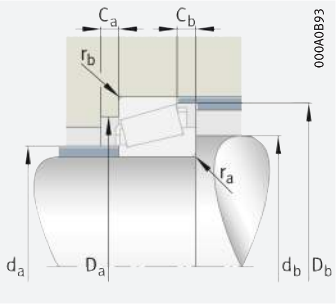
medias ➤ *https://www.schaeffler.de/std/1EFF*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
55	1	1	15	68,8	61	61	73	74	76	4	3	1	1	0,31	1,94	1,07
	1,5	1,5	19	74,2	63	62	81	83	86	5	6	1,5	1,5	0,31	1,92	1,06
	1,5	1,5	20	75,1	63	62	81	83	86	4	5,5	1,5	1,5	0,41	1,48	0,81
	1,5	1,5	22	76,2	62	62	83	88	91	5	7	1,5	1,5	0,37	1,6	0,88
	2	2	20	74,3	64	65	85	87	90	5	5,5	2	2	0,45	1,35	0,74
	2	1,5	21	76	64	64	88	91	94	4	4,5	2	1,5	0,4	1,48	0,81
	2	1,5	26	78	61	64	85	91	96	4	7,5	2	1,5	0,57	1,05	0,58
	2	1,5	23	76,7	63	64	87	91	95	4	5,5	2	1,5	0,4	1,48	0,81
	2	1,5	26	79,4	62	64	85	91	96	6	8	2	1,5	0,4	1,5	0,83
	4	2,5	31	82,9	63	69	82	95	100	5	7	4	2,5	0,56	1,07	0,59
	2,5	2,5	27	81,5	65	68	93	100	104	7	7	2,5	2,5	0,35	1,73	0,95
	3	3	40	88,8	65	72	86	101	109	5	10,5	3	3	0,87	0,69	0,38
	2,5	2	25	85,4	71	65	104	110	111	4	6,5	2,5	2	0,35	1,74	0,96
	2,5	2	39	88,5	68	65	94	110	113	4	10,5	2,5	2	0,83	0,73	0,4
	2,5	2	30	85,6	68	65	99	110	111	5	10,5	2,5	2	0,35	1,74	0,96
	2,5	2	36	89,6	65	65	91	110	112	5	10,5	2,5	2	0,55	1,1	0,6
60	1	1	16	73,8	66	66	78	79	81	4	3	1	1	0,33	1,81	1
	1,5	1,5	20	78,6	67	67	85	88	90	5	6	1,5	1,5	0,33	1,83	1,01
	1,5	1,5	21	79,6	67	67	85	88	91	4	5,5	1,5	1,5	0,43	1,39	0,77
	1,5	1,5	24	81,9	67	67	88	93	96	5	7	1,5	1,5	0,4	1,51	0,83
	2	2	22	79,9	68	70	89	92	95	4	5,5	2	2	0,47	1,27	0,7
	2	1,5	28	86,2	68	69	93	101	105	6	9	2	1,5	0,4	1,48	0,82
	2	1,5	22	82,4	70	69	96	101	103	4	4,5	2	1,5	0,41	1,48	0,81
	2	1,5	29	85,6	69	69	92	104	105	5	8,5	2	1,5	0,57	1,05	0,58
	2	1,5	25	83,2	69	69	95	101	104	4	5,5	2	1,5	0,4	1,48	0,81
	2,5	2,5	28	86,1	70	73	98	103	108	7	7	2,5	2,5	0,33	1,8	0,99
	4	2,5	33	90,9	69	76	91	103	110	6	8	4	2,5	0,53	1,13	0,62
	3	3	42	95,8	71	78	94	111	119	6	11	3	3	0,82	0,73	0,4
	3	2,5	27	92,2	77	72	112	118	120	5	7,5	3	2,5	0,35	1,74	0,96
	3	2,5	41	96,2	73	72	103	118	123	5	11,5	3	2,5	0,83	0,73	0,4
	3	2,5	39	97	71	72	100	118	122	6	11,5	3	2,5	0,55	1,1	0,6
	3	2,5	32	92,5	74	72	107	118	120	6	11,5	3	2,5	0,35	1,74	0,96

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 65 – 70 mm

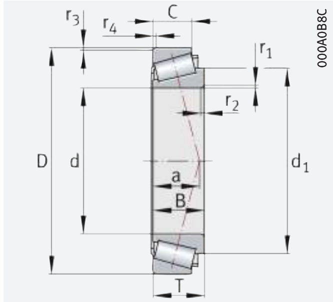
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
65	90	17	14	17	49 500	88 000	10 200	7 800	4 000	0,326	**32913**	T2BC065
	100	27	21	27	100 000	161 000	20 300	6 900	4 300	0,766	**33013**	T2CE065
	100	23	17,5	23	97 000	125 000	20 400	7 500	4 150	0,66	**32013-X-XL**	T4CC065
	105	20	15,5	21	80 000	102 000	12 300	6 800	4 100	0,65	**T4CB065**	–
	110	34	26,5	34	149 000	225 000	28 500	6 200	3 650	1,31	**33113**	T3DE065
	120	23	20	24,75	142 000	143 000	21 500	6 800	3 850	1,16	**30213-XL**	T3EB065
	120	31	23	32,75	174 000	185 000	29 000	6 500	3 750	1,53	**32213-B-XL**	–
	120	31	27	32,75	185 000	202 000	32 000	6 500	3 600	1,57	**32213-XL**	T3EC065
	120	41	32	41	242 000	285 000	46 500	6 300	3 750	2,02	**33213-XL**	T3EE065
	120	38	31	39	161 000	235 000	29 500	5 700	3 950	1,91	**T5ED065**	–
	130	33,5	26	37	186 000	211 000	32 500	5 700	4 450	2,15	**T7FC065-XL**	–
	140	33	28	36	196 000	228 000	27 000	5 300	3 850	2,4	**30313-A**	T2GB065
	140	33	23	36	193 000	188 000	28 500	5 500	3 650	2,39	**31313-XL**	T7GB065
	140	48	39	51	248 000	340 000	43 000	5 000	3 850	3,7	**32313-BA**	T5GD065
	140	48	39	51	320 000	350 000	56 000	5 600	3 750	3,61	**32313-XL**	T2GD065
70	100	20	16	20	85 000	116 000	18 300	7 600	3 800	0,494	**32914-XL**	T2BC070
	110	31	25,5	31	136 000	223 000	28 500	6 200	3 850	1,21	**33014**	T2CE070
	110	25	19	25	123 000	159 000	26 000	6 900	3 800	0,88	**32014-X-XL**	T4CC070
	110	20	15,5	21	82 000	108 000	13 100	6 500	3 800	0,691	**T4CB070**	–
	120	37	29	37	174 000	260 000	33 000	5 700	3 500	1,71	**33114**	T3DE070
	125	41	32	41	210 000	300 000	38 000	5 500	3 550	2,12	**33214**	T3EE070
	125	24	21	26,25	155 000	162 000	24 500	6 400	3 700	1,31	**30214-XL**	T3EB070
	125	31	23,5	33,25	179 000	196 000	31 000	6 100	3 550	1,64	**32214-B-XL**	–
	125	31	27	33,25	194 000	216 000	34 000	6 200	3 450	1,81	**32214-XL**	T3EC070
	130	42	35	43	225 000	310 000	39 000	5 300	3 550	2,52	**T2ED070**	–
	130	40	34	42	195 000	295 000	37 500	5 200	3 550	2,51	**T5ED070**	–
	140	35,5	27	39	208 000	237 000	37 500	5 300	4 150	2,68	**T7FC070-XL**	–
	150	35	30	38	223 000	260 000	30 500	4 900	3 650	3,02	**30314-A**	T2GB070
	150	35	25	38	221 000	219 000	33 000	5 200	3 450	2,96	**31314-XL**	T7GB070
	150	51	42	54	285 000	395 000	48 500	4 650	3 600	4,51	**32314-BA**	T5GD070
	150	51	42	54	370 000	410 000	65 000	5 200	3 500	4,39	**32314-XL**	T2GD070

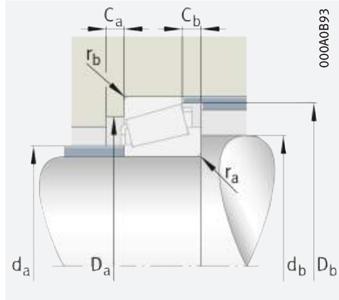
medias ➤ *https://www.schaeffler.de/std/1F00*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
65	1	1	17	79	71	71	83	84	86	4	3	1	1	0,35	1,7	0,93
	1,5	1,5	21	84,6	72	72	89	93	96	5	6	1,5	1,5	0,35	1,72	0,95
	1,5	1,5	23	85,1	72	72	90	93	97	4	5,5	1,5	1,5	0,46	1,31	0,72
	2	2	24	84,4	73	75	94	97	100	4	5,5	2	2	0,5	1,2	0,66
	1,5	1,5	26	89,6	73	72	96	103	106	6	7,5	1,5	1,5	0,39	1,55	0,85
	2	1,5	24	90,6	77	74	106	111	113	4	4,5	2	1,5	0,4	1,48	0,81
	2	1,5	31	92,1	74	74	101	111	114	5	9,5	2	1,5	0,56	1,07	0,59
	2	1,5	27	91,6	76	74	104	111	115	4	5,5	2	1,5	0,4	1,48	0,81
	2	1,5	30	93,1	74	74	102	111	115	6	9	2	1,5	0,39	1,54	0,85
	4	2,5	35	95,9	74	80	95	108	115	6	8	4	2,5	0,56	1,07	0,59
	3	3	45	101	75	83	98	116	124	5	11	3	3	0,87	0,69	0,38
	3	2,5	29	99,6	83	77	122	128	130	5	8	3	2,5	0,35	1,74	0,96
	3	2,5	44	103,5	79	77	111	128	132	5	13	3	2,5	0,83	0,73	0,4
	3	2,5	42	104,3	77	77	109	128	133	6	12	3	2,5	0,55	1,1	0,6
	3	2,5	35	99,6	80	77	117	128	130	6	12	3	2,5	0,35	1,74	0,96
70	1	1	18	85,9	76	76	93	94	96	4	4	1	1	0,32	1,9	1,05
	1,5	1,5	23	91	78	77	99	103	105	5	5,5	1,5	1,5	0,28	2,11	1,16
	1,5	1,5	24	91,7	78	77	98	103	105	5	6	1,5	1,5	0,43	1,38	0,76
	2	2	23	90,2	78	80	100	102	105	4	5,5	2	2	0,46	1,3	0,72
	2	1,5	28	96	79	79	104	111	115	6	8	2	1,5	0,38	1,58	0,87
	2	1,5	31	97,5	79	79	107	116	120	7	9	2	1,5	0,41	1,47	0,81
	2	1,5	25	95,2	81	79	110	116	118	4	5	2	1,5	0,42	1,43	0,79
	2	1,5	34	97,5	78	79	105	116	120	5	9,5	2	1,5	0,59	1,02	0,56
	2	1,5	28	96,4	80	79	108	116	119	4	6	2	1,5	0,42	1,43	0,79
	3	2,5	31	99,6	80	85	111	119	123	7	8	3	2,5	0,33	1,8	0,99
	4	2,5	37	103,2	81	87	105	119	124	7	8	4	2,5	0,52	1,15	0,63
	3	3	47	108,8	81	90	106	126	133	6	12	3	3	0,87	0,69	0,38
	3	2,5	30	106,6	89	82	130	138	140	5	8	3	2,5	0,35	1,74	0,96
	3	2,5	47	110,4	84	82	118	138	141	5	13	3	2,5	0,83	0,73	0,4
	3	2,5	44	111,9	83	82	117	138	143	7	12	3	2,5	0,55	1,1	0,6
	3	2,5	37	106,4	86	82	125	138	140	6	12	3	2,5	0,35	1,74	0,96

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 75 – 80 mm

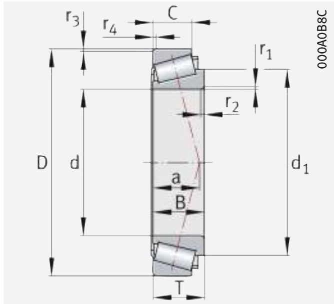
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
75	105	20	16	20	74 000	124 000	15 000	6 600	3 550	0,519	**32915**	T2BC075
	115	31	25,5	31	139 000	232 000	30 000	5 900	3 700	1,16	**33015**	T2CE075
	115	25	19	25	124 000	165 000	26 500	6 500	3 600	0,92	**32015-X-XL**	T4CC075
	115	20	15,5	21	83 000	113 000	13 700	6 100	3 600	0,722	**T4CB075**	–
	125	37	29	37	178 000	275 000	34 500	5 400	3 300	1,81	**33115**	T3DE075
	130	25	22	27,25	160 000	169 000	26 000	6 100	3 600	1,4	**30215-XL**	T4DB075
	130	31	27	33,25	201 000	227 000	36 000	5 900	3 250	1,76	**32215-XL**	T4DC075
	130	41	31	41	245 000	310 000	51 000	5 700	3 350	2,25	**33215-XL**	T3EE075
	135	42	35	43	233 000	330 000	41 000	5 100	3 350	2,66	**T2ED075**	–
	135	40	34	42	200 000	310 000	39 000	5 000	3 400	2,66	**T5ED075**	–
	150	38	29	42	238 000	275 000	42 500	4 950	3 950	3,22	**T7FC075-XL**	–
	160	37	31	40	250 000	295 000	34 500	4 600	3 400	3,9	**30315-A**	T2GB075
	160	37	26	40	240 000	236 000	34 500	4 850	3 300	3,46	**31315-XL**	T7GB075
	160	55	45	58	360 000	475 000	57 000	4 450	3 300	5,8	**32315-A**	T2GD075
	160	55	45	58	330 000	470 000	54 000	4 350	3 400	5,56	**32315-B**	T5GD075
80	110	20	16	20	77 000	132 000	16 000	6 300	3 350	0,56	**32916**	T2BC080
	125	29	22	29	162 000	212 000	34 000	6 000	3 450	1,29	**32016-X-XL**	T3CC080
	125	36	29,5	36	208 000	290 000	48 500	5 900	3 550	1,63	**33016-XL**	T2CE080
	125	22,5	17,5	24	114 000	150 000	17 800	5 600	3 450	1	**T4CB080**	–
	130	37	29	37	188 000	300 000	37 000	5 200	3 050	1,91	**33116**	T3DE080
	140	26	22	28,25	184 000	193 000	28 500	5 700	3 400	1,68	**30216-XL**	T3EB080
	140	33	28	35,25	234 000	265 000	40 500	5 500	3 050	2,15	**32216-XL**	T3EC080
	140	46	35	46	295 000	385 000	61 000	5 300	3 150	2,98	**33216-XL**	T3EE080
	140	40	34	42	204 000	320 000	40 000	4 800	3 250	2,75	**T5ED080**	–
	145	45	38	46	265 000	370 000	45 500	4 750	3 200	3,2	**T2ED080**	–
	160	41	31	45	270 000	315 000	48 000	4 600	3 750	3,98	**T7FC080-XL**	–
	170	39	33	42,5	285 000	345 000	39 500	4 250	3 200	4,37	**30316-A**	T2GB080
	170	39	27	42,5	270 000	270 000	38 500	4 550	3 150	4,16	**31316-XL**	T7GB080
	170	58	48	61,5	355 000	510 000	61 000	4 100	3 300	7,02	**32316-B**	T5GD080
	170	58	48	61,5	475 000	540 000	82 000	4 550	3 150	7,02	**32316-XL**	T2GD080

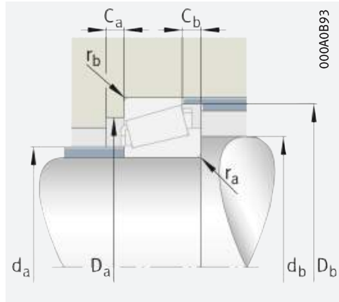
medias ➤ *https://www.schaeffler.de/std/1F01*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
75	1	1	19	90,5	81	81	98	99	101	4	4	1	1	0,33	1,8	0,99
	1,5	1,5	23	96,4	83	82	104	108	110	6	5,5	1,5	1,5	0,3	2,01	1,11
	1,5	1,5	26	97	83	82	103	108	110	5	6	1,5	1,5	0,46	1,31	0,72
	2	2	25	94,6	83	85	104	107	110	4	5,5	2	2	0,48	1,24	0,68
	2	1,5	30	101,9	84	84	109	116	120	6	8	2	1,5	0,4	1,51	0,83
	2	1,5	27	100,4	86	84	115	121	124	4	5	2	1,5	0,43	1,38	0,76
	2	1,5	30	101,6	85	84	115	121	124	4	6	2	1,5	0,43	1,38	0,76
	2	1,5	32	103,9	83	84	111	121	125	7	10	2	1,5	0,43	1,4	0,77
	3	2,5	32	103,4	86	89	116	124	128	7	8	3	2,5	0,35	1,73	0,95
	5	2,5	38	108,5	85	92	109	124	129	6	8	5	2,5	0,55	1,1	0,6
	3	3	51	116,6	87	96	114	136	143	6	13	3	3	0,87	0,69	0,38
	3	2,5	32	114	95	87	139	148	149	5	9	3	2,5	0,35	1,74	0,96
	3	2,5	50	117,6	91	87	127	148	151	6	14	3	2,5	0,83	0,73	0,4
	3	2,5	39	114	91	87	133	148	149	7	13	3	2,5	0,35	1,74	0,96
	3	2,5	47	119	90	87	124	148	151	7	14	3	2,5	0,55	1,1	0,6
80	1	1	20	96,1	86	86	102	104	106	4	4	1	1	0,35	1,71	0,94
	1,5	1,5	27	104,2	89	87	112	117	120	6	7	1,5	1,5	0,42	1,42	0,78
	1,5	1,5	26	103,2	90	87	112	117	119	6	6,5	1,5	1,5	0,28	2,16	1,19
	2	2	26	101	86	90	113	115	120	5	6,5	2	2	0,45	1,33	0,73
	2	1,5	31	106,6	89	89	114	121	126	6	8	2	1,5	0,42	1,44	0,79
	2,5	2	28	106,4	91	90	124	130	132	4	6	2,5	2	0,42	1,43	0,79
	2,5	2	31	107,7	90	90	122	130	134	5	7	2,5	2	0,42	1,43	0,79
	2,5	2	35	112,2	89	90	119	130	135	7	11	2,5	2	0,43	1,41	0,78
	5	3	40	113,5	89	97	113	128	124	6	8	5	3	0,57	1,05	0,58
	3	2,5	33	110,3	92	95	125	134	137	7	8	3	2,5	0,32	1,88	1,03
	3	3	54	124,3	93	103	121	146	152	7	14	3	3	0,87	0,69	0,38
	3	2,5	34	121,7	102	92	148	158	159	5	9,5	3	2,5	0,35	1,74	0,96
	3	2,5	53	124,4	97	92	134	158	159	6	15	3	2,5	0,83	0,73	0,4
	3	2,5	49	126,9	96	92	130	158	160	7	13,5	3	2,5	0,55	1,1	0,6
	3	2,5	42	120,6	98	92	142	158	159	7	13,5	3	2,5	0,35	1,74	0,96

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 85 – 90 mm

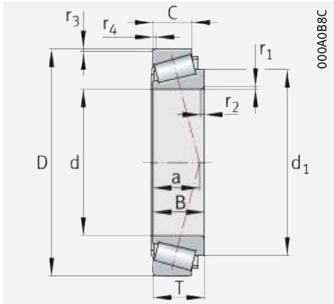
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤*573*|*1.12* ➤*574*|*1.13* X-life ➤*559*	
					N	N	N	$\min^{-1}$	$\min^{-1}$	≈ kg		
85	120	23	18	23	95 000	160 000	20 000	5 700	3 250	0,778	**32917**	T2BC085
	130	36	29,5	36	184 000	315 000	39 500	5 100	3 300	1,89	**33017**	T2CE085
	130	29	22	29	167 000	224 000	35 500	5 700	3 250	1,36	**32017-X-XL**	T4CC085
	130	22,5	17,5	24	116 000	157 000	18 400	5 400	3 300	1,05	**T4CB085**	–
	140	41	32	41	221 000	350 000	43 000	4 750	2 950	2,54	**33117**	T3DE085
	145	40	34	42	210 000	340 000	41 500	4 600	3 050	2,87	**T5ED085**	–
	150	49	37	49	295 000	435 000	53 000	4 500	3 050	3,58	**33217**	T3EE085
	150	28	24	30,5	212 000	226 000	33 000	5 300	3 250	2,13	**30217-XL**	T3EB085
	150	36	30	38,5	270 000	305 000	46 500	5 200	2 950	2,71	**32217-XL**	T3EC085
	150	46	38	46	275 000	395 000	48 000	4 600	3 050	3,35	**T2ED085**	–
	170	45	33	48	310 000	365 000	55 000	4 350	3 550	4,83	**T7FC085-XL**	–
	180	41	28	44,5	255 000	300 000	34 000	3 900	3 000	4,88	**31317**	T7GB085
	180	41	34	44,5	310 000	375 000	42 000	4 050	3 100	5,07	**30317-A**	T2GB085
	180	60	49	63,5	480 000	590 000	90 000	4 250	3 000	7,75	**32317-B-XL**	T5GD085
	180	60	49	63,5	510 000	580 000	88 000	4 300	3 000	7,4	**32317-XL**	T2GD085
90	125	23	18	23	99 000	171 000	21 000	5 500	3 050	0,918	**32918**	T2BC090
	135	22,5	17,5	24	119 000	164 000	18 900	5 100	3 100	1,1	**T4CB090**	–
	140	39	32,5	39	216 000	365 000	45 000	4 750	3 150	2,26	**33018**	T2CE090
	140	32	24	32	195 000	255 000	40 000	5 400	3 200	1,76	**32018-X-XL**	T3CC090
	150	45	35	45	315 000	425 000	66 000	4 900	2 800	3,13	**33118-XL**	T3DE090
	150	40	34	42	214 000	355 000	43 000	4 450	2 900	2,99	**T5ED090**	–
	155	46	38	46	280 000	410 000	49 000	4 400	2 900	3,5	**T2ED090**	–
	160	55	42	55	345 000	530 000	64 000	4 200	2 950	4,76	**33218**	T3FE090
	160	30	26	32,5	239 000	260 000	37 500	5 000	3 050	2,61	**30218-XL**	T3FB090
	160	40	34	42,5	310 000	360 000	55 000	4 800	2 850	3,43	**32218-XL**	T3FC090
	190	43	30	46,5	275 000	325 000	35 500	3 700	2 900	5,45	**31318**	T7GB090
	190	43	36	46,5	330 000	395 000	43 500	3 850	3 050	5,7	**30318-A**	T2GB090
	190	64	53	67,5	435 000	630 000	73 000	3 650	2 850	9,29	**32318-B**	–
	190	64	53	67,5	580 000	660 000	98 000	4 050	2 750	8,21	**32318-XL**	T2GD090

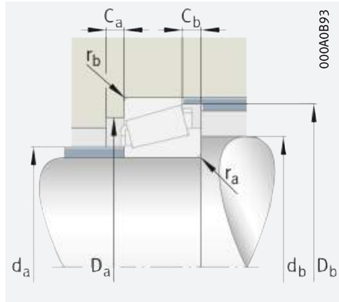
medias ➤ *https://www.schaeffler.de/std/1F02*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
85	1,5	1,5	21	102,6	92	92	111	113	115	5	5	1,5	1,5	0,33	1,83	1,01
	1,5	1,5	27	108,5	94	92	118	122	125	6	6,5	1,5	1,5	0,29	2,06	1,13
	1,5	1,5	29	109,1	94	92	117	122	125	6	7	1,5	1,5	0,44	1,36	0,75
	2	2	27	106,1	91	95	118	120	125	5	6,5	2	2	0,47	1,27	0,7
	2,5	2	33	114,7	95	95	122	130	135	7	9	2,5	2	0,41	1,48	0,81
	5	3	39	118,5	96	103	120	133	139	6	8	5	3	0,52	1,14	0,63
	2,5	2	37	117,6	95	95	128	140	144	7	12	2,5	2	0,42	1,43	0,79
	2,5	2	30	112,9	97	95	132	140	141	5	6,5	2,5	2	0,42	1,43	0,79
	2,5	2	34	114,7	96	95	130	140	142	5	8,5	2,5	2	0,42	1,43	0,79
	3	3	34	115,5	97	100	130	138	142	5	7	3	3	0,33	1,8	0,99
	4	4	55	132	100	110	131	153	161	7	15	4	4	0,8	0,75	0,41
	4	3	56	129,3	103	99	143	166	169	6	16,5	4	3	0,83	0,73	0,4
	3	3	36	127,6	107	99	156	166	167	6	10,5	3	3	0,35	1,74	0,96
	4	3	52	133,5	102	99	138	166	169	7	14,5	4	3	0,55	1,1	0,6
	4	3	44	127,6	103	99	150	166	167	8	14,5	4	3	0,35	1,74	0,96
90	1,5	1,5	22	107,8	97	97	116	131	120	5	5	1,5	1,5	0,34	1,75	0,96
	2	2	30	111,1	96	100	123	125	130	5	6,5	2	2	0,49	1,21	0,67
	2	1,5	28	116	100	99	127	131	135	7	6,5	2	1,5	0,27	2,23	1,23
	2	1,5	30	115,8	100	99	125	131	134	6	8	2	1,5	0,42	1,42	0,78
	2,5	2	36	121,8	100	100	130	140	144	7	10	2,5	2	0,4	1,51	0,83
	5	3	41	123,7	100	107	124	138	144	6	8	5	3	0,55	1,1	0,6
	3	3	34	120,5	102	106	135	143	147	6	8	3	3	0,33	1,84	1,01
	2,5	2	41	125,8	101	100	135	150	154	9	13	2,5	2	0,42	1,43	0,78
	2,5	2	32	120	103	100	140	150	150	5	6,5	2,5	2	0,42	1,43	0,79
	2,5	2	36	122,1	102	100	138	150	152	5	8,5	2,5	2	0,42	1,43	0,79
	4	3	58	135,9	109	104	151	176	179	6	16,5	4	3	0,83	0,73	0,4
	4	3	37	135	113	104	165	176	176	6	10,5	4	3	0,35	1,74	0,96
	4	3	55	141,8	108	104	146	176	180	8	14,5	4	3	0,55	1,1	0,6
	4	3	47	133	108	104	157	176	177	8	14,5	4	3	0,35	1,74	0,96

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 95 – 100 mm

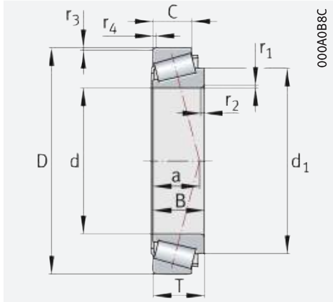
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
95	130	23	18	23	102 000	181 000	22 000	5 300	2 900	0,964	**32919**	T2BC095
	140	22,5	17,5	24	114 000	167 000	19 100	4 950	2 950	1,15	**T4CB095**	–
	145	32	24	32	201 000	275 000	42 500	5 100	3 000	1,86	**32019-X-XL**	T4CC095
	145	39	32,5	39	260 000	380 000	60 000	5 000	3 000	2,57	**33019-XL**	T2CE095
	155	40	34	42	218 000	365 000	44 500	4 250	2 800	3,15	**T5ED095**	–
	160	49	38	49	305 000	490 000	59 000	4 150	2 700	4,04	**33119**	T3EE095
	160	46	38	46	285 000	430 000	51 000	4 250	2 750	3,76	**T2ED095**	–
	170	58	44	58	375 000	560 000	66 000	3 950	2 850	5,55	**33219**	T3FE095
	170	32	27	34,5	265 000	285 000	41 500	4 700	2 950	3,13	**30219-XL**	T3FB095
	170	43	37	45,5	355 000	420 000	63 000	4 500	2 700	4,21	**32219-XL**	T3FC095
	180	45	33	49	325 000	400 000	59 000	4 000	3 300	5,23	**T7FC095-XL**	–
	200	45	38	49,5	360 000	440 000	47 500	3 650	2 950	6,78	**30319-A**	T2GB095
	200	45	32	49,5	305 000	370 000	40 000	3 500	2 800	6,45	**31319-A**	T7GB095
	200	67	55	71,5	570 000	690 000	102 000	3 750	2 700	10,9	**32319-B-XL**	–
	200	67	55	71,5	620 000	710 000	105 000	3 850	2 600	10	**32319-XL**	T2GD095
100	140	25	20	25	126 000	211 000	24 900	4 900	2 750	1,17	**32920**	T2CC100
	145	22,5	17,5	24	119 000	179 000	20 200	4 750	2 800	1,21	**T4CB100**	–
	150	39	32,5	39	225 000	395 000	47 500	4 450	2 900	2,42	**33020**	T2CE100
	150	32	24	32	205 000	285 000	43 500	4 950	2 900	1,94	**32020-X-XL**	T4CC100
	160	40	34	42	275 000	395 000	60 000	4 550	2 650	3,51	**T5ED100-XL**	–
	165	52	40	52	325 000	540 000	64 000	4 000	2 650	4,46	**33120**	T3EE100
	165	46	39	47	300 000	470 000	56 000	4 100	2 600	4,25	**T2EE100**	–
	180	63	48	63	430 000	660 000	77 000	3 700	2 650	6,71	**33220**	T3FE100
	180	34	29	37	295 000	325 000	46 500	4 400	2 850	3,76	**30220-XL**	T3FB100
	180	46	39	49	400 000	475 000	71 000	4 250	2 600	5,12	**32220-XL**	T3FC100
	215	47	39	51,5	410 000	500 000	54 000	3 400	2 750	8,3	**30320-A**	T2GB100
	215	51	35	56,5	385 000	480 000	51 000	3 200	2 550	8,81	**31320-X**	T7GB100
	215	73	60	77,5	680 000	780 000	114 000	3 550	2 500	13,4	**32320-B-XL**	–
	215	73	60	77,5	610 000	840 000	94 000	3 250	2 360	12,9	**32320-A**	T2GD100

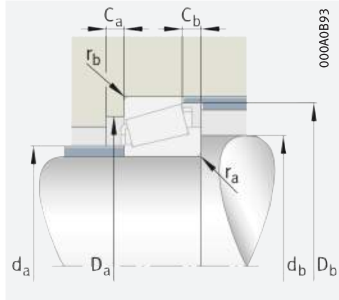
medias ➤ *https://www.schaeffler.de/std/1F03*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
95	1,5	1,5	24	113	102	102	121	123	125	5	5	1,5	1,5	0,36	1,68	0,92
	2	2	29	117,2	104	107	129	130	135	5	6,5	2	2	0,45	1,32	0,73
	2	1,5	32	121,4	105	104	130	136	140	6	8	2	1,5	0,44	1,36	0,75
	2	1,5	29	120,8	104	104	131	136	139	7	6,5	2	1,5	0,28	2,16	1,19
	5	3	43	128,8	104	112	128	143	150	6	8	5	3	0,57	1,06	0,58
	2,5	2	38	128,7	106	105	138	150	154	8	11	2,5	2	0,39	1,54	0,85
	3	3	35	125,6	107	111	140	148	152	8	8	3	3	0,34	1,77	0,97
	3	2,5	43	132	107	107	144	158	163	9	14	3	2,5	0,41	1,47	0,81
	3	2,5	34	127,3	110	107	149	158	159	5	7,5	3	2,5	0,42	1,43	0,79
	3	2,5	39	129	108	107	145	158	161	5	8,5	3	2,5	0,42	1,43	0,79
	4	4	61	142,4	108	119	138	164	172	7	16	4	4	0,87	0,69	0,38
	4	3	40	139	118	109	172	186	184	6	11,5	4	3	0,35	1,74	0,96
	4	3	62	142,5	114	109	157	186	187	6	17,5	4	3	0,83	0,73	0,4
	4	3	58	149,3	115	109	153	186	189	8	16,5	4	3	0,55	1,1	0,6
	4	3	49	142	115	109	166	186	186	8	16,5	4	3	0,35	1,74	0,96
100	1,5	1,5	24	120,6	109	107	131	131	135	5	5	1,5	1,5	0,33	1,82	1
	3	3	30	122,7	109	112	133	133	140	5	6,5	3	3	0,47	1,27	0,7
	2	1,5	29	124,7	108	109	135	141	143	7	6,5	2	1,5	0,29	2,09	1,15
	2	1,5	33	126,3	109	109	134	141	144	6	8	2	1,5	0,46	1,31	0,72
	5	3	42	133,8	110	117	135	146	154	6	8	5	3	0,53	1,14	0,63
	2,5	2	41	134,7	111	110	142	155	159	8	12	2,5	2	0,41	1,48	0,81
	3	3	35	131,3	112	116	145	151	157	8	8	3	3	0,32	1,88	1,04
	3	2,5	46	140	112	112	151	168	172	10	15	3	2,5	0,4	1,48	0,82
	3	2,5	36	134,2	116	112	157	168	168	5	8	3	2,5	0,42	1,43	0,79
	3	2,5	42	136,5	114	112	154	168	171	5	10	3	2,5	0,42	1,43	0,79
	4	3	42	151	127	114	184	201	197	6	12,5	4	3	0,35	1,74	0,96
	4	3	68	159,5	121	114	168	201	202	7	21,5	4	3	0,83	0,73	0,4
	4	3	53	152	123	114	177	201	200	8	17,5	4	3	0,35	1,74	0,96
	4	3	62	155,9	117	114	166	201	203	8	17,5	4	3	0,53	1,13	0,62

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 105 – 120 mm

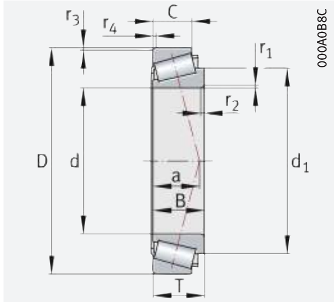
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573|1.12 ➤574|1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
105	145	25	20	25	128 000	217 000	25 500	4 700	2 650	1,15	**32921**	T2CC105
	150	22,5	17,5	24	121 000	185 000	20 700	4 600	2 650	1,25	**T4CB105**	–
	160	43	34	43	265 000	450 000	53 000	4 150	2 850	3,06	**33021**	T2DE105
	160	35	26	35	238 000	330 000	49 500	4 650	2 800	2,45	**32021-X-XL**	T4DC105
	170	46	39	47	315 000	495 000	58 000	3 950	2 500	4,13	**T2EE105**	–
	175	56	44	56	360 000	600 000	71 000	3 750	2 600	5,44	**33121**	T3EE105
	190	68	52	68	495 000	760 000	88 000	3 500	2 480	8,38	**33221**	T3FE105
	190	36	30	39	330 000	370 000	52 000	4 150	2 700	4,46	**30221-XL**	T3FB105
	190	50	43	53	455 000	550 000	82 000	4 000	2 550	6,3	**32221-XL**	T3FC105
	225	49	41	53,5	530 000	560 000	76 000	3 600	2 550	10,5	**30321-XL**	T2GB105
	225	53	36	58	480 000	510 000	70 000	3 350	2 440	10	**31321-X-XL**	T7GB105
	225	77	63	81,5	670 000	930 000	103 000	3 100	2 220	15,9	**32321-A**	T2GD105
110	150	25	20	25	133 000	231 000	27 000	4 550	2 500	1,41	**32922**	T2CC110
	160	25,5	19,5	27	148 000	222 000	24 800	4 300	2 600	1,69	**T4CB110**	–
	170	47	37	47	295 000	520 000	61 000	3 950	2 750	3,89	**33022**	T2DE110
	170	38	29	38	285 000	395 000	59 000	4 350	2 650	3,06	**32022-X-XL**	T4DC110
	175	46	39	47	325 000	520 000	60 000	3 800	2 400	4,27	**T2EE110**	–
	180	56	43	56	440 000	630 000	95 000	4 000	2 460	5,64	**33122-XL**	T3EE110
	200	38	32	41	375 000	420 000	59 000	3 950	2 550	5,68	**30222-XL**	T3FB110
	200	53	46	56	490 000	590 000	86 000	3 800	2 410	7,2	**32222-XL**	T3FC110
	240	50	42	54,5	570 000	600 000	79 000	3 350	2 340	11	**30322-XL**	T2GB110
	240	57	38	63	550 000	590 000	78 000	3 100	2 250	12,2	**31322-X-XL**	T7GB110
	240	80	65	84,5	740 000	1 020 000	126 000	2 900	2 030	19	**32322-A**	T2GD110
120	165	29	23	29	176 000	305 000	35 000	4 100	2 370	1,82	**32924**	T2CC120
	170	25	19,5	27	181 000	238 000	33 000	4 400	2 420	1,74	**T4CB120-XL**	–
	180	48	38	48	310 000	560 000	65 000	3 700	2 600	4,53	**33024**	T2DE120
	180	38	29	38	295 000	420 000	62 000	4 050	2 460	3,29	**32024-X-XL**	T4DC120
	190	49	41	50	360 000	590 000	67 000	3 500	2 230	5,28	**T2EE120**	–
	200	62	48	62	460 000	770 000	87 000	3 250	2 160	7,68	**33124**	T3FE120
	215	40	34	43,5	395 000	445 000	62 000	3 650	2 470	6,26	**30224-XL**	T4FB120
	215	58	50	61,5	570 000	730 000	105 000	3 450	2 150	9,31	**32224-XL**	T4FD120
	260	62	42	68	640 000	700 000	92 000	2 850	2 020	15,8	**31324-X-XL**	T7GB120
	260	86	69	90,5	670 000	970 000	118 000	2 750	2 060	21,1	**32324**	–
	260	55	46	59,5	560 000	700 000	83 000	2 800	2 150	14,2	**30324-A**	T2GB120

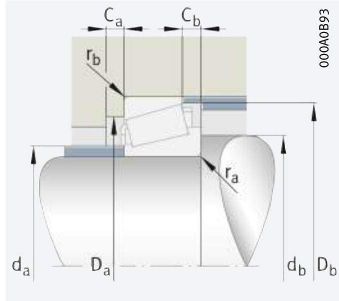
medias ➤ *https://www.schaeffler.de/std/1F04*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
105	1,5	1,5	25	125	114	112	135	136	140	5	5	1,5	1,5	0,34	1,75	0,96
	3	3	32	127,3	114	116	138	138	145	5	6,5	3	3	0,49	1,22	0,67
	2,5	2	31	131,5	116	115	145	150	153	7	9	2,5	2	0,28	2,12	1,17
	2,5	2	35	133,7	116	115	143	150	154	6	9	2,5	2	0,44	1,35	0,74
	3	3	36	136,3	117	121	150	158	163	8	8	3	3	0,33	1,83	1,01
	2,5	2	43	142	116	115	150	165	169	9	12	2,5	2	0,4	1,48	0,82
	3	2,5	49	148	117	117	159	178	182	10	16	3	2,5	0,4	1,49	0,82
	3	2,5	38	141,6	122	117	165	178	177	6	9	3	2,5	0,42	1,43	0,79
	3	2,5	45	143,6	120	117	161	178	180	5	10	3	2,5	0,42	1,43	0,79
	4	3	44	154,9	132	119	193	211	206	7	12,5	4	3	0,35	1,74	0,96
	4	3	70	161,9	127	119	176	211	211	7	22	4	3	0,83	0,73	0,4
	4	3	56	160,9	128	119	185	211	209	9	18,5	4	3	0,35	1,74	0,96
110	1,5	1,5	26	130,9	118	117	140	141	145	5	5	1,5	1,5	0,36	1,69	0,93
	3	3	32	134	120	122	147	148	154	6	7,5	3	3	0,44	1,36	0,75
	2,5	2	33	139,2	123	120	152	160	161	7	10	2,5	2	0,29	2,09	1,15
	2,5	2	37	141,2	122	120	152	160	163	7	9	2,5	2	0,43	1,39	0,77
	4	3	37	140,9	121	125	155	163	168	8	8	4	3	0,34	1,78	0,98
	2,5	2	44	147,6	121	120	155	170	174	9	13	2,5	2	0,42	1,43	0,79
	3	2,5	40	149,3	129	122	174	188	187	6	9	3	2,5	0,42	1,43	0,79
	3	2,5	46	151,4	126	122	170	188	190	6	10	3	2,5	0,42	1,43	0,79
	4	3	45	166,6	141	124	206	226	220	8	12,5	4	3	0,35	1,74	0,96
	4	3	75	176,7	135	124	188	226	224	7	25	4	3	0,83	0,73	0,4
	4	3	58	171,5	137	124	198	226	222	9	19,5	4	3	0,35	1,74	0,96
120	1,5	1,5	29	141	128	127	154	158	160	6	6	1,5	1,5	0,35	1,72	0,95
	3	3	35	144,6	130	132	157	157	164	5	7,5	3	3	0,47	1,27	0,7
	2,5	2	36	148,5	132	130	160	170	171	6	10	2,5	2	0,31	1,97	1,08
	2,5	2	40	151,2	131	130	161	170	173	7	9	2,5	2	0,46	1,31	0,72
	4	3	39	153,5	133	137	169	177	182	9	9	4	3	0,32	1,86	1,02
	2,5	2	48	161,4	133	130	172	190	192	9	14	2,5	2	0,4	1,51	0,83
	3	2,5	44	162	140	132	187	203	201	6	9,5	3	2,5	0,43	1,38	0,76
	3	2,5	51	164,3	136	132	181	203	204	7	11,5	3	2,5	0,43	1,38	0,76
	4	3	82	191,5	145	134	203	246	244	9	26	4	3	0,83	0,73	0,4
	4	3	66	187	148	134	213	246	239	9	21,5	4	3	0,39	1,53	0,84
	4	3	48	183,5	152	134	221	246	237	10	13,5	4	3	0,35	1,74	0,96

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

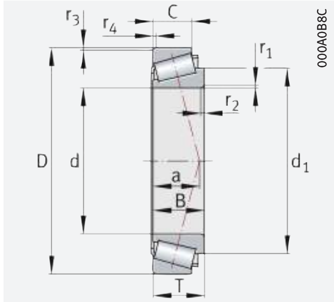
d = 130 – 150 mm

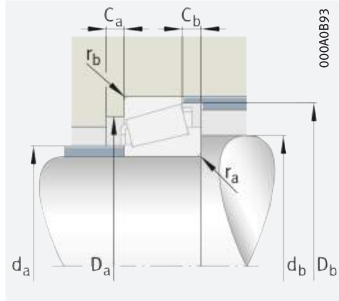
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573|1.12 ➤574|1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
130	180	32	25	32	208 000	370 000	41 500	3 750	2 220	2,4	**32926**	T2CC130
	185	27	21	29	179 000	275 000	29 500	3 700	2 280	2,27	**T4CB130**	–
	200	55	43	55	410 000	740 000	83 000	3 250	2 260	6,33	**33026**	T2EE130
	200	45	34	45	385 000	550 000	79 000	3 650	2 320	4,83	**32026-X-XL**	T4EC130
	230	40	34	43,75	420 000	470 000	63 000	3 400	2 290	7,08	**30226-XL**	T4FB130
	230	64	54	67,75	660 000	850 000	120 000	3 200	1 980	11,4	**32226-XL**	T4FD130
	280	58	49	63,75	770 000	850 000	110 000	2 850	1 870	17	**30326-XL**	T2GB130
	280	66	44	72	720 000	790 000	101 000	2 650	1 860	19	**31326-X-XL**	T7GB130
	280	93	78	98,75	830 000	1 120 000	133 000	2 500	1 860	26,7	**32326**	–
140	190	32	25	32	214 000	395 000	43 000	3 500	2 070	2,6	**32928**	T2CC140
	195	27	21	29	190 000	305 000	32 000	3 450	2 100	2,43	**T4CB140**	–
	210	56	44	56	415 000	770 000	85 000	3 100	2 140	6,81	**33028**	T2DE140
	210	45	34	45	400 000	590 000	84 000	3 450	2 180	5,4	**32028-X-XL**	T4DC140
	215	52	44	53	430 000	730 000	80 000	3 050	1 860	6,89	**T2ED140**	–
	250	42	36	45,75	490 000	560 000	74 000	3 100	2 040	8,8	**30228-XL**	T4FB140
	250	68	58	71,75	760 000	990 000	137 000	2 950	1 760	14,5	**32228-XL**	T4FD140
	300	62	53	67,75	690 000	730 000	93 000	2 750	2 000	20,3	**30328-XL**	–
	300	70	47	77	830 000	910 000	114 000	2 470	1 690	23,2	**31328-X-XL**	T7GB140
	300	102	85	107,75	1 390 000	1 710 000	224 000	2 500	1 450	35,1	**32328-XL**	–
150	210	38	30	38	285 000	495 000	53 000	3 200	2 040	3,9	**32930**	T2DC150
	210	30	23	32	217 000	345 000	33 500	3 250	2 040	3,1	**T4DB150**	–
	225	48	36	48	455 000	680 000	94 000	3 200	1 990	6,5	**32030-X-XL**	T4EC150
	225	59	46	59	550 000	890 000	124 000	3 150	1 910	8,1	**33030-XL**	T2EE150
	225	52	44	53	435 000	760 000	83 000	2 900	1 740	7,25	**T2ED150**	–
	270	45	38	49	550 000	630 000	82 000	2 900	1 880	10,9	**30230-XL**	T4GB150
	270	73	60	77	870 000	1 150 000	156 000	2 750	1 590	18,1	**32230-XL**	T4GD150
	320	65	55	72	800 000	1 030 000	113 000	2 270	1 630	25,2	**30330-A**	T2GB150
	320	75	50	82	930 000	1 040 000	128 000	2 300	1 540	27,8	**31330-X-XL**	T7GB150
	320	108	90	114	1 330 000	1 950 000	222 000	2 120	1 320	46,1	**32330-A**	–

medias ➤ *https://www.schaeffler.de/std/1F05*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
130	2	1,5	32	154,7	141	139	167	171	173	6	7	2	1,5	0,34	1,77	0,97
	3	3	38	156,3	140	143	171	171	178	6	8	3	3	0,47	1,27	0,7
	2,5	2	42	166,2	143	140	178	190	192	8	12	2,5	2	0,34	1,76	0,97
	2,5	2	44	165,9	144	140	178	190	192	8	11	2,5	2	0,43	1,38	0,76
	4	3	46	174,4	152	144	203	216	217	7	9,5	4	3	0,44	1,38	0,76
	4	3	56	176,5	146	144	193	216	219	7	13,5	4	3	0,43	1,38	0,76
	5	4	53	196,5	164	148	239	262	255	8	14,5	5	4	0,35	1,74	0,96
	5	4	88	205	157	148	218	262	261	9	28	5	4	0,83	0,73	0,4
	5	4	69	197,3	160	147	230	262	260	10	20,5	5	4	0,34	1,75	0,96
140	2	1,5	34	164,8	150	149	177	181	184	6	7	2	1,5	0,36	1,67	0,92
	3	3	41	167,2	150	153	180	183	189	6	8	3	3	0,5	1,19	0,66
	2,5	2	46	175,8	152	150	186	200	202	7	12	2,5	2	0,36	1,67	0,92
	2,5	2	46	175,6	153	150	187	200	202	8	11	2,5	2	0,46	1,31	0,72
	4	3	43	175,6	154	159	193	202	206	9	9	4	3	0,32	1,88	1,04
	4	3	48	188	163	154	219	236	234	9	9,5	4	3	0,43	1,38	0,76
	4	3	60	191,5	159	154	210	236	238	8	13,5	4	3	0,43	1,38	0,76
	5	4	52	204	176	158	255	282	273	8	14,5	5	4	0,28	2,18	1,2
	5	4	94	220,5	169	158	235	282	280	9	30	5	4	0,83	0,73	0,4
	5	4	74	213	170	157	247	282	280	10	22,5	5	4	0,35	1,74	0,96
150	2,5	2	36	177,8	162	160	194	201	202	7	8	2,5	2	0,33	1,83	1,01
	3	3	42	179	161	164	194	198	203	5	9	3	3	0,46	1,3	0,72
	3	2,5	50	187,8	164	162	200	213	216	8	12	3	2,5	0,46	1,31	0,72
	3	2,5	48	189,5	164	162	200	213	217	8	13	3	2,5	0,36	1,64	0,9
	4	4	45	185,6	163	168	202	210	216	9	9	4	4	0,34	1,79	0,98
	4	3	52	201,5	175	164	234	256	250	9	11	4	3	0,43	1,38	0,76
	4	3	64	205,5	171	164	226	256	254	8	17	4	3	0,43	1,38	0,76
	5	4	60	224	189	168	273	302	292	9	17	5	4	0,35	1,74	0,96
	5	4	100	235,5	181	168	251	302	300	9	32	5	4	0,83	0,73	0,4
	5	4	79	230	184	167	264	302	299	12	24	5	4	0,35	1,74	0,96

Tapered roller bearings
Single row to DIN/ISO





Mounting dimensions

d = 160 – 190 mm

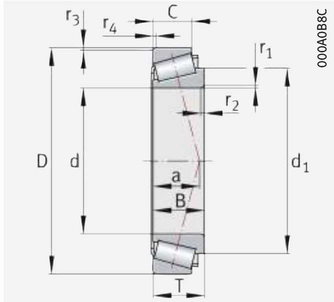
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤*573*|*1.12* ➤*574*|*1.13* X-life ➤*559*	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
160	220	38	30	38	295 000	530 000	56 000	3 000	1 900	4,13	**32932**	T2DC160
	220	30	23	32	226 000	370 000	38 000	3 050	1 910	3,3	**T4DB160**	–
	235	52	44	53	455 000	820 000	100 000	2 800	1 610	7,68	**T2ED160**	–
	240	51	38	51	500 000	740 000	102 000	3 000	1 850	7,8	**32032-X-XL**	T4EC160
	290	48	40	52	630 000	790 000	101 000	2 650	1 610	14,8	**30232-XL**	T4GB160
	290	80	67	84	1 030 000	1 380 000	184 000	2 550	1 430	23,1	**32232-XL**	T4GD160
	340	114	95	121	1 170 000	1 740 000	194 000	2 030	1 390	49,5	**32332**	–
	340	68	58	75	890 000	1 140 000	123 000	2 130	1 500	29,4	**30332-A**	T2GB160
170	230	38	30	38	295 000	560 000	59 000	2 850	1 790	4,36	**32934**	T3DC170
	230	30	23	32	228 000	390 000	39 500	2 950	1 790	3,47	**T4DB170**	–
	245	52	44	53	470 000	860 000	103 000	2 650	1 500	8,02	**T2ED170**	–
	260	57	43	57	600 000	880 000	119 000	2 750	1 690	10,5	**32034-X-XL**	T4EC170
	310	52	43	57	690 000	810 000	101 000	2 500	1 590	17	**30234-XL**	T4GB170
	310	86	71	91	1 160 000	1 560 000	204 000	2 350	1 310	28,8	**32234-XL**	T4GD170
	360	120	100	127	1 640 000	2 550 000	280 000	1 870	1 090	61,3	**32334**	–
	360	72	62	80	1 040 000	1 360 000	146 000	1 990	1 340	35,3	**30334-A**	T2GB170
180	240	30	23	32	230 000	400 000	44 500	2 800	1 710	3,65	**T4DB180**	–
	250	45	34	45	360 000	710 000	84 000	2 600	1 670	7,08	**32936**	T4DC180
	255	52	44	53	475 000	890 000	106 000	2 550	1 420	8,37	**T2ED180**	–
	280	64	48	64	740 000	1 100 000	144 000	2 550	1 510	14	**32036-X-XL**	T3FD180
	320	52	43	57	720 000	850 000	105 000	2 420	1 510	17,7	**30236-XL**	T4GB180
	320	86	71	91	1 190 000	1 640 000	213 000	2 270	1 240	30,1	**32236-XL**	T4GD180
	380	75	64	83	1 120 000	1 470 000	155 000	1 880	1 250	40,9	**30336**	–
	380	126	106	134	1 440 000	2 170 000	236 000	1 810	1 200	67,5	**32336**	–
190	260	45	34	45	370 000	750 000	89 000	2 490	1 560	6,87	**32938**	T4DC190
	260	34	27	37	300 000	520 000	60 000	2 600	1 630	5,32	**T4DB190**	–
	270	55	46	56	530 000	1 000 000	118 000	2 400	1 310	9,98	**T2ED190**	–
	290	64	48	64	740 000	1 120 000	147 000	2 460	1 440	14,6	**32038-X-XL**	T4FD190
	340	55	46	60	800 000	930 000	113 000	2 270	1 390	21,4	**30238-XL**	T4GB190
	340	92	75	97	1 340 000	1 820 000	231 000	2 120	1 150	35,9	**32238-XL**	T4GD190
	400	78	65	86	1 210 000	1 600 000	165 000	1 800	1 180	46,7	**30338**	–
	400	132	109	140	1 960 000	2 950 000	315 000	1 680	970	83,2	**32338**	–

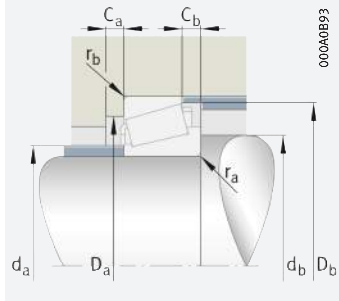
medias ➤ *https://www.schaeffler.de/std/1F06*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
160	2,5	2	38	188	173	170	204	210	212	7	8	2,5	2	0,35	1,73	0,95
	3	3	45	189,3	171	174	204	206	213	7	9	3	3	0,49	1,23	0,68
	4	4	47	195,8	173	178	211	220	226	9	9	4	4	0,35	1,71	0,94
	3	2,5	53	200,4	175	172	213	228	231	8	13	3	2,5	0,46	1,31	0,72
	4	3	56	220,5	189	174	252	276	269	9	12	4	3	0,43	1,38	0,76
	4	3	69	221	183	174	242	276	274	10	17	4	3	0,43	1,38	0,76
	5	4	86	245	190	177	280	321	320	12	26	5	4	0,38	1,58	0,87
	5	4	63	237	201	178	290	322	310	9	17	5	4	0,35	1,74	0,96
170	2,5	2	42	199	183	180	213	220	222	7	8	2,5	2	0,38	1,57	0,86
	3	3	45	199	182	185	214	216	223	6	9	3	3	0,46	1,3	0,72
	5	4	46	205,4	183	188	223	230	236	9	9	5	4	0,33	1,84	1,01
	3	2,5	57	214,5	187	182	230	248	249	10	14	3	2,5	0,44	1,35	0,74
	5	4	60	232	203	188	269	292	288	8	14	5	4	0,43	1,38	0,76
	5	4	74	237	196	188	259	292	294	10	20	5	4	0,43	1,38	0,76
	5	4	90	256	208	187	295	341	335	12	27	5	4	0,36	1,67	0,92
	5	4	67	252	213	188	307	342	329	9	18	5	4	0,35	1,74	0,96
180	3	3	48	209,4	192	195	224	228	233	5	9	3	3	0,48	1,24	0,68
	2,5	2	54	217	193	190	225	240	241	8	11	2,5	2	0,48	1,25	0,69
	5	4	49	215,6	193	198	232	239	246	9	9	5	4	0,34	1,77	0,97
	3	2,5	60	228	199	192	247	268	267	10	16	3	2,5	0,42	1,42	0,78
	5	4	62	241	211	198	278	302	297	9	14	5	4	0,45	1,33	0,73
	5	4	77	246,5	204	198	267	302	303	10	20	5	4	0,45	1,33	0,73
	5	4	69	267	230	197	327	359	350	10	19	5	4	0,35	1,74	0,96
	5	4	93	274	215	197	310	361	355	14	28	5	4	0,38	1,58	0,87
190	2,5	2	55	226	204	200	235	249	251	8	11	2,5	2	0,48	1,26	0,69
	3	3	50	223,5	204	207	241	246	251	7	10	3	3	0,45	1,33	0,73
	5	4	50	228,2	205	210	247	254	260	9	10	5	4	0,33	1,84	1,01
	3	2,5	63	239	209	202	257	278	279	10	16	3	2,5	0,44	1,36	0,75
	5	4	64	255,5	224	207	298	322	318	9	14	5	4	0,43	1,38	0,76
	5	4	81	261	216	207	286	322	323	10	22	5	4	0,43	1,38	0,76
	6	5	72	278,9	240	210	341	378	364	10	21	6	5	0,35	1,74	0,96
	6	5	97	281	230	210	330	378	373	14	31	6	5	0,35	1,73	0,95

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 200 – 260 mm

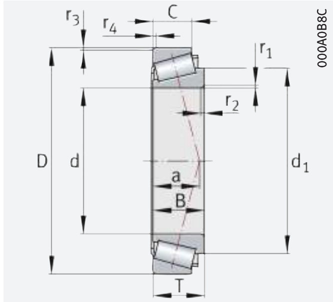
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
200	270	34	27	37	310 000	550 000	63 000	2 460	1 530	5,55	**T4DB200**	–
	280	51	39	51	495 000	930 000	107 000	2 320	1 410	10,2	**32940-A**	T3EC200
	280	55	46	56	540 000	1 040 000	120 000	2 300	1 240	10,4	**T2ED200**	–
	310	70	53	70	900 000	1 380 000	176 000	2 290	1 280	18,7	**32040-X-XL**	T4FD200
	360	58	48	64	900 000	1 060 000	127 000	2 140	1 290	25,3	**30240-XL**	T4GB200
	360	98	82	104	1 570 000	2 080 000	255 000	2 030	1 080	42,8	**32240-XL**	T3GD200
	420	80	67	89	1 300 000	1 720 000	174 000	1 700	1 100	52,7	**30340**	–
	420	138	115	146	2 550 000	3 400 000	405 000	1 740	870	94	**32340-XL**	–
220	290	34	27	37	320 000	590 000	66 000	2 270	1 370	6	**T4DB220**	–
	300	51	39	51	495 000	980 000	110 000	2 150	1 280	10,1	**32944**	T3EC220
	300	55	46	56	570 000	1 140 000	130 000	2 140	1 100	11,3	**T2ED220**	–
	340	76	57	76	1 060 000	1 640 000	204 000	2 080	1 130	24,1	**32044-X-XL**	T4FD220
	400	65	54	72	1 120 000	1 330 000	150 000	1 930	1 130	34,5	**30244-XL**	–
	400	108	90	114	1 820 000	2 550 000	305 000	1 800	920	59,2	**32244-XL**	–
	460	88	73	97	1 440 000	1 880 000	185 000	1 560	1 030	68	**30344**	–
	460	145	122	154	2 400 000	3 650 000	370 000	1 470	820	115	**32344**	–
240	320	51	39	51	510 000	1 050 000	116 000	2 000	1 160	11	**32948**	T4EC240
	320	56	46	57	590 000	1 250 000	138 000	2 000	1 000	12,3	**T2EE240**	–
	360	76	57	76	1 060 000	1 680 000	207 000	1 950	1 060	25,8	**32048-X-XL**	T4FD240
	440	72	60	79	1 030 000	1 260 000	141 000	1 800	1 130	47,5	**30248-XL**	–
	440	120	100	127	2 190 000	3 100 000	365 000	1 630	810	80,5	**32248-XL**	–
	500	95	80	105	1 780 000	2 410 000	233 000	1 430	870	88,6	**30348**	–
	500	155	132	165	3 300 000	4 300 000	480 000	1 480	720	148	**32348-XL**	–
260	340	39	30	42	415 000	770 000	76 000	1 930	1 130	8,91	**T4DB260**	–
	360	63,5	48	63,5	890 000	1 500 000	181 000	1 960	1 000	18,6	**32952-XL**	T3EC260
	400	87	65	87	1 360 000	2 140 000	255 000	1 760	910	41,1	**32052-X-XL**	T4FC260
	480	80	67	89	1 730 000	2 090 000	224 000	1 580	860	63,2	**30252-XL**	–
	480	130	106	137	2 650 000	3 800 000	430 000	1 480	690	104	**32252-XL**	–
	540	102	85	113	1 940 000	2 600 000	247 000	1 320	820	105	**30352**	–
	540	165	136	176	3 150 000	4 900 000	475 000	1 240	650	181	**32352**	–

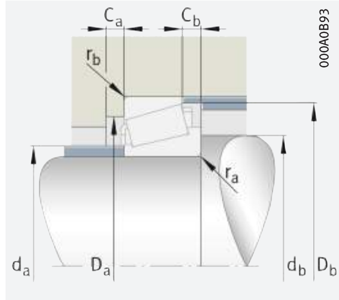
medias ➤ *https://www.schaeffler.de/std/1F07*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
200	3	3	54	234	214	218	251	254	262	7	10	3	3	0,47	1,27	0,7
	3	2,5	54	239	216	212	257	268	271	9	12	3	2,5	0,39	1,52	0,84
	5	4	53	238,3	214	220	256	264	271	9	10	5	4	0,34	1,77	0,97
	3	2,5	67	253	221	212	273	298	297	11	17	3	2,5	0,43	1,39	0,77
	5	4	69	270	237	217	315	342	336	9	16	5	4	0,43	1,38	0,76
	5	4	83	269,5	226	217	302	342	340	11	22	5	4	0,41	1,48	0,81
	6	5	76	288	250	250	360	397	385	10	22	6	5	0,35	1,74	0,96
	6	5	104	302	240	258	344	397	392	17	31	6	5	0,36	1,67	0,92
220	3	3	60	254,1	233	238	270	276	282	7	10	3	3	0,51	1,17	0,64
	3	2,5	59	260	234	232	275	288	290	9	12	3	2,5	0,43	1,41	0,78
	5	4	53	258,5	235	240	277	284	290	9	10	5	4	0,32	1,87	1,03
	4	3	73	278,5	243	234	300	326	326	12	19	4	3	0,43	1,39	0,77
	5	4	75	296	255	237	348	382	371	10	18	5	4	0,42	1,43	0,79
	5	4	95	305	258	237	336	382	380	12	24	5	4	0,43	1,38	0,76
	6	5	82	321	274	240	392	437	418	10	24	6	5	0,35	1,74	0,96
	6	5	107	318,5	260	250	380	437	430	16	32	6	5	0,35	1,74	0,96
240	3	2,5	65	281	254	252	294	308	311	9	12	3	2,5	0,46	1,31	0,72
	6	4	58	278,8	254	260	296	304	311	9	11	6	4	0,34	1,74	0,96
	4	3	79	298,5	261	254	318	346	346	12	19	4	3	0,46	1,31	0,72
	5	4	76	322,5	285	257	383	420	410	10	19	5	4	0,36	1,68	0,92
	5	4	105	334,5	286	257	372	422	415	14	27	5	4	0,43	1,38	0,76
	6	5	90	347,5	296	260	425	476	454	12	25	6	5	0,35	1,74	0,96
	6	5	115	351	285	260	411	476	465	16	32	6	5	0,35	1,74	0,96
260	3	3	68	297,5	274	279	318	326	330	8	12	3	3	0,49	1,23	0,67
	3	2,5	70	307,5	279	272	328	348	347	11	15,5	3	2,5	0,41	1,48	0,81
	5	4	86	327,5	287	278	352	382	383	14	22	5	4	0,43	1,38	0,76
	6	5	89	353,5	310	280	419	457	447	10	22	6	5	0,4	1,48	0,81
	6	5	113	366	306	280	401	457	455	14	31	6	5	0,43	1,39	0,77
	7,5	6	96	377	320	286	456	508	490	12	28	7,5	6	0,35	1,73	0,95
	7,5	6	124	381,8	310	286	450	513	500	16	40	7,5	6	0,35	1,74	0,96

Tapered roller bearings

Single row to DIN/ISO





Mounting dimensions

d = 280 – 360 mm

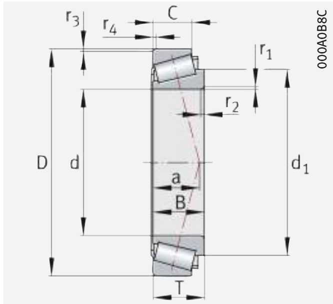
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation	Interchange designation to ISO 10317 and ISO 355
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559	
					N	N	N	min^{-1}	min^{-1}	≈ kg		
280	380	63,5	48	63,5	880 000	1 520 000	184 000	1 840	940	19,8	**32956-XL**	T4EC280
	420	87	65	87	1 420 000	2 300 000	270 000	1 670	840	40,8	**32056-X-XL**	T4FC280
	500	80	67	89	1 740 000	2 130 000	229 000	1 520	830	66,5	**30256-XL**	–
	500	130	106	137	2 700 000	3 950 000	445 000	1 410	650	112	**32256-XL**	–
	580	108	90	119	2 300 000	3 150 000	285 000	1 230	710	133	**30356**	–
	580	175	145	187	3 600 000	5 700 000	530 000	1 150	570	220	**32356**	–
300	420	76	57	76	1 170 000	2 040 000	238 000	1 660	810	31,3	**32960-XL**	T3FD300
	460	100	74	100	1 780 000	2 850 000	330 000	1 520	750	58,1	**32060-X-XL**	T4GD300
	540	85	71	96	2 020 000	2 440 000	255 000	1 410	750	83,7	**30260-XL**	–
	540	140	115	149	3 150 000	4 550 000	500 000	1 310	590	139	**32260-XL**	–
320	440	76	57	76	1 260 000	2 280 000	260 000	1 580	730	33,5	**32964-XL**	T3FD320
	480	100	74	100	1 850 000	3 050 000	350 000	1 440	690	60,8	**32064-X-XL**	T4GD320
	580	92	75	104	2 310 000	3 000 000	305 000	1 290	650	107	**30264-XL**	–
	580	150	125	159	3 550 000	5 200 000	560 000	1 210	530	170	**32264-XL**	–
340	460	76	57	76	1 270 000	2 370 000	300 000	1 500	690	35	**32968-XL**	T4FD340
360	480	76	57	76	1 260 000	2 370 000	265 000	1 430	660	36,4	**32972-XL**	T4FD360

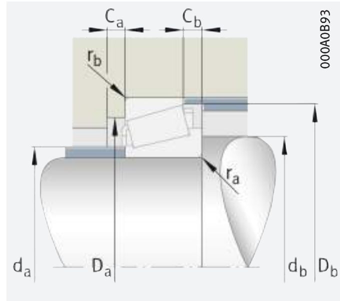
medias ➤ *https://www.schaeffler.de/std/1F08*

Dimensions					Mounting dimensions									Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	max.	min.	min.	min.	max.	max.			
280	3	2,5	75	328	298	292	348	368	368	11	15,5	3	2,5	0,43	1,39	0,76
	5	4	91	347	305	298	370	402	402	14	22	5	4	0,46	1,31	0,72
	6	5	97	369,5	330	300	433	477	465	12	22	6	5	0,45	1,33	0,73
	6	5	118	384,5	322	300	418	477	475	14	31	6	5	0,45	1,34	0,73
	7,5	6	101	401,7	345	357	492	548	525	15	29	7,5	6	0,35	1,74	0,96
	7,5	6	132	411,6	335	306	480	552	540	16	41	7,5	6	0,35	1,74	0,96
300	4	3	80	359	324	314	383	406	405	12	19	4	3	0,39	1,52	0,84
	5	4	98	376	329	318	404	442	439	15	26	5	4	0,43	1,38	0,76
	6	5	103	391,5	340	352	468	517	500	15	25	6	5	0,43	1,38	0,76
	6	5	127	412,5	346	320	453	517	510	16	34	6	5	0,43	1,38	0,76
320	4	3	86	379	343	334	402	426	426	13	19	4	3	0,42	1,44	0,79
	5	4	104	398,5	350	338	424	462	461	15	26	5	4	0,46	1,31	0,72
	6	5	112	432,5	380	340	501	556	536	12	29	6	5	0,43	1,38	0,76
	6	5	136	443	372	340	486	556	555	16	34	6	5	0,43	1,38	0,76
340	4	3	91	399	361	354	421	446	446	12	19	4	3	0,44	1,37	0,75
360	4	3	97	419,5	380	374	439	466	466	14	19	4	3	0,46	1,31	0,72

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

d = 15,875 – 34,925 mm

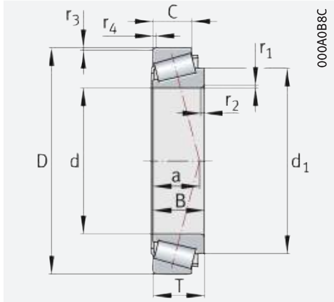
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
15,875	42,863	14,287	9,525	14,288	17 900	18 000	1 890	18 800	0,104	**K11590-11520**
17,462	39,878	14,605	10,668	13,843	21 200	20 800	2 190	20 100	0,08	**KLM11749-LM11710**
19,05	45,237	16,637	12,065	15,494	28 000	28 000	3 050	17 800	0,131	**KLM11949-LM11910**
21,43	50,005	18,288	13,97	17,526	37 500	39 000	4 400	15 800	0,169	**KM12649-M12610**
21,986	45,237	16,637	12,065	15,494	28 500	32 000	3 550	16 900	0,118	**KLM12749-LM12710**
	45,974	16,637	12,065	15,494	28 500	32 000	3 550	16 900	0,122	**KLM12749-LM12711**
22,606	47	15,5	12	15,5	23 700	27 000	2 850	16 300	0,129	**KLM72849-LM72810**
25,4	50,292	14,732	10,668	14,224	26 000	29 500	3 150	15 200	0,128	**KL44643-L44610**
	56,896	19,837	15,875	19,368	43 000	46 500	5 300	14 200	0,243	**K1780-1729**
26,988	50,292	14,732	10,668	14,224	26 000	29 500	3 150	15 200	0,128	**KL44649-L44610**
	63,5	20,638	15,875	20,638	47 500	55 000	6 300	12 100	0,324	**K15106-15250-X**
28,575	57,15	19,355	15,875	19,845	48 000	55 000	6 400	13 100	0,233	**K1985-1922**
	57,15	19,355	15,875	19,845	48 000	55 000	6 400	13 100	0,267	**K1988-1922**
	59,131	16,764	11,811	15,875	34 000	40 000	4 500	12 800	0,207	**KLM67043-LM67010**
	72,626	24,257	17,462	24,608	56 000	53 000	6 000	10 900	0,492	**K41125-41286**
30,162	64,292	21,433	16,67	21,433	52 000	67 000	8 000	11 500	0,376	**KM86649-M86610**
31,75	59,131	16,764	11,811	15,875	34 000	40 000	4 500	12 800	0,187	**KLM67047-LM67010**
	59,131	16,764	11,811	15,875	34 000	40 000	4 500	12 800	0,203	**KLM67048-LM67010**
	59,131	16,764	11,811	15,875	34 000	40 000	4 500	12 800	0,19	**KLM67049-A-LM67010**
	61,986	16,764	11,811	15,875	34 000	40 000	4 500	12 800	0,212	**KLM67048-LM67014**
	73,025	27,782	23,02	29,37	72 000	97 000	12 100	9 900	0,641	**KHM88542-HM88510**
	76,2	28,575	23,02	29,37	79 000	107 000	13 400	9 400	0,705	**KHM89440-HM89411**
33,338	68,262	22,225	17,462	22,225	56 000	72 000	8 700	10 700	0,38	**KM88048-M88010**
	73,025	27,783	23,02	29,37	72 000	97 000	12 100	9 900	0,601	**KHM88547-HM88510**
	76,2	28,575	23,02	29,37	79 000	107 000	13 400	9 400	0,757	**KHM89443-HM89410**
34,925	65,088	18,288	13,97	18,034	46 500	56 000	6 400	11 500	0,261	**KLM48548-A-LM48510**
	65,088	18,288	13,97	18,034	46 500	56 000	6 400	11 500	0,252	**KLM48548-LM48510**
	65,088	18,288	13,97	18,034	46 500	56 000	6 400	11 500	0,278	**KLM48549-X-LM48510**
	72,233	25,4	19,842	25,4	68 000	91 000	11 300	10 000	0,5	**KHM88649-HM88610**
	73,025	24,608	19,05	23,812	78 000	78 000	12 400	11 400	0,462	**K25877-25821-XL**
	76,2	28,575	23,812	29,37	77 000	91 000	11 100	9 700	0,636	**K31594-31520**
	76,2	28,575	23,02	29,37	79 000	107 000	13 400	9 400	0,664	**KHM89446-HM89410**
	79,375	29,771	23,812	29,37	90 000	110 000	13 500	9 400	0,785	**K3478-3420**

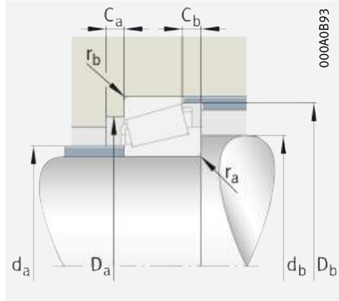
medias ➤ *https://www.schaeffler.de/std/1F09*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
15,875	1,5	1,5	13	32,1	22,5	24,5	34,5	39,5	2	4,5	1,5	1,5	0,7	0,85	0,47
17,462	1,3	1,3	9	29,6	21,5	23	34	37	3	3	1,3	1,3	0,29	2,1	1,15
19,05	1,3	1,3	10	31,8	23,5	25	39,5	41,5	3,5	4,5	1,3	1,3	0,3	2	1,1
21,43	1,3	1,3	11	34,5	25,5	27,5	44	46	4	3,5	1,3	1,3	0,28	2,16	1,19
21,986	1,3	1,3	10	34,8	26	27,5	39,5	42	3	3	1,3	1,3	0,31	1,96	1,08
	1,3	1,3	10	34,8	26	27,5	40	42,5	3	3	1,3	1,3	0,31	1,96	1,08
22,606	1,5	1	13	36,1	28	30	40,5	44	2	3	1,5	1	0,47	1,27	0,7
25,4	1,3	1,3	11	39,5	30	32	44,5	47	3	3,5	1,3	1,3	0,37	1,6	0,88
	0,8	1,3	13	39,9	30	30,5	49	51	2	3	0,8	1,3	0,31	1,95	1,07
26,988	3,6	1,3	11	40,1	31	37,5	44,5	47	2,5	3,5	3,6	1,3	0,37	1,6	0,88
	0,8	1,5	15	46,8	32,5	33,5	55	59	3	3,5	0,8	1,5	0,35	1,71	0,94
28,575	0,8	1,5	14	43	33,5	34	51	53,5	3	3,5	0,8	1,5	0,33	1,82	1
	3,6	1,5	14	43	33,5	39,5	51	53,5	3	4	3,6	1,5	0,33	1,82	1
	4,75	1,3	13	45,7	34	40,5	52	56	3	4	4,75	1,3	0,41	1,46	0,8
	4,8	1,5	21	50,8	36,5	48	61	68	4	6,5	4,8	1,5	0,6	0,99	0,55
30,162	1,5	1,5	18	50,7	38	44	54	60	3	4,5	1,5	1,5	0,55	1,1	0,6
31,75	2,3	1,3	13	45,7	36,5	42,5	52	56	3	4	2,3	1,3	0,41	1,46	0,8
	3,6	1,3	13	45,8	36	42,5	52	56	3,5	4,5	3,6	1,3	0,41	1,46	0,8
	0,8	1,3	13	45,8	36	37	52	56	3	4	0,8	1,3	0,41	1,46	0,8
	3,6	1,3	13	45,8	36	42,5	52	56	3,5	4,5	3,6	1,3	0,41	1,46	0,8
	1,3	3,3	24	58	42,6	45,5	59	70	4	6	1,3	3,3	0,55	1,1	0,6
	0,8	0,8	24	60,1	44,5	45,5	65	73	3	6	0,8	0,8	0,55	1,1	0,6
33,338	0,8	1,5	20	53,3	41	42,5	58	65	3	4	0,8	1,5	0,55	1,1	0,6
	0,8	3,3	24	56,8	42,6	45,5	59	70	4	6	0,8	3,3	0,55	1,1	0,6
	0,8	3,3	24	60,5	44,5	46,5	62	73	3	5,5	0,8	3,3	0,55	1,1	0,6
34,925	0,8	1,3	14	49,9	42,2	40,5	58	61	4	4	0,8	1,3	0,38	1,59	0,88
	3,6	1,3	14	49,7	41,5	48	58	61	3	4	3,6	1,3	0,38	1,59	0,88
	2,3	1,3	14	49,7	40	42	58	61	3	4	2,3	1,3	0,38	1,59	0,88
	2,3	2,3	21	56,8	42,5	48,5	60	69	3	5	2,3	2,3	0,55	1,1	0,6
	1,5	0,8	16	53,9	43	46	62	67	5	4	1,5	0,8	0,29	2,07	1,14
	1,5	3,3	22	57,2	43,5	46	64	72	2	5	1,5	3,3	0,4	1,49	0,82
	3,6	3,3	24	60,5	44,6	53	62	73	3	6	3,6	3,3	0,55	1,1	0,6
	3,6	3,3	21	57,5	43,5	50	67	74	2	5	3,6	3,3	0,37	1,64	0,9

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

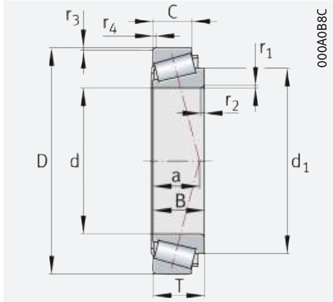
d = 34,988 – 41,275 mm

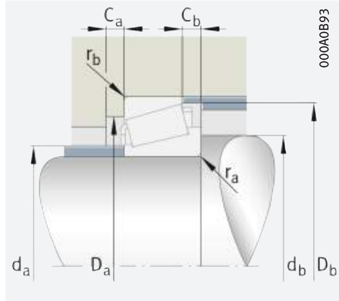
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	m ≈ kg	➤573|1.12 ➤574|1.13 X-life ➤559
34,988	59,131	16,764	11,938	15,875	34 000	44 500	5 000	12 400	0,171	**KL68149-L68110**
	59,974	16,764	11,938	15,875	34 000	44 500	5 000	12 400	0,179	**KL68149-L68111**
	61,973	17	15	18	38 000	49 000	5 700	11 800	0,215	**KLM78349-A-LM78310-C**
	61,973	17	13,6	16,7	38 000	49 000	5 700	11 800	0,2	**KLM78349-LM78310-A**
35,717	72,233	25,4	19,842	25,4	68 000	91 000	11 300	10 000	0,54	**KHM88648-HM88610**
36,512	76,2	28,575	23,02	29,37	79 000	107 000	13 400	9 400	0,65	**KHM89448-HM89410**
	76,2	28,575	23,02	29,37	79 000	107 000	13 400	9 400	0,717	**KHM89449-HM89410**
	76,2	28,575	23,02	29,37	79 000	107 000	13 400	9 400	0,647	**KHM89449-HM89411**
	79,375	28,829	22,664	29,37	92 000	111 000	13 600	9 200	0,679	**KHM89249-HM89210**
38	63	17	13,5	17	39 500	53 000	6 100	11 400	0,204	**KJL69349-JL69310**
38,1	65,088	18,288	13,97	18,034	45 000	60 000	6 900	11 200	0,227	**KLM29748-LM29710**
	65,088	18,288	13,97	18,034	45 000	60 000	6 900	11 200	0,26	**KLM29749-LM29710**
	65,088	18,288	15,748	19,812	45 000	60 000	6 900	11 200	0,275	**KLM29749-LM29711**
	79,375	29,771	23,812	29,37	90 000	110 000	13 500	9 400	0,677	**K3490-3420**
	82,55	28,575	23,02	29,37	89 000	122 000	15 200	8 700	0,874	**KHM801346-HM801310**
	90,488	40,386	33,338	39,688	142 000	185 000	23 200	8 000	1,33	**K4375-4335**
39,688	79,974	30,391	23,812	29,37	94 000	109 000	13 400	9 200	0,731	**K3382-3325**
	79,974	30,391	23,812	29,37	94 000	109 000	13 400	9 200	0,534	**K3386-3325**
	80,167	30,391	23,812	29,37	94 000	109 000	13 400	9 200	0,66	**K3382-3320**
	80,167	30,391	23,812	29,37	94 000	109 000	13 400	9 200	0,537	**K3386-3320**
40,483	82,55	28,575	23,02	29,37	89 000	122 000	15 200	8 700	0,724	**KHM801349-HM801310**
40,987	67,975	18	13,5	17,5	46 000	63 000	7 300	10 700	0,255	**KLM300849-LM300811**
	78	18	13,5	17,5	46 000	63 000	7 300	10 700	0,392	**KLM300849-LM300816**
41,275	73,431	19,812	14,732	19,558	55 000	68 000	8 100	10 000	0,334	**KLM501349-LM501310**
	73,431	19,812	16,604	21,43	55 000	68 000	8 100	10 000	0,366	**KLM501349-LM501314**
	80	22,403	21	24,176	68 000	74 000	8 700	9 400	0,498	**K336-332-A**
	82,55	25,654	20,193	26,543	83 000	111 000	13 800	8 700	0,647	**KM802048-M802011**
	87,313	30,886	23,812	30,163	97 000	121 000	14 900	8 500	0,857	**K3585-3525**
	88,5	29,083	22,225	26,988	89 000	98 000	11 700	8 900	0,79	**K419-414**
	88,9	29,37	23,02	30,162	93 000	123 000	15 400	8 000	0,9	**KHM803146-HM803110**
	90	22,225	15,875	20	72 000	84 000	9 900	8 400	0,648	**K365-A-362**
	93,662	31,75	26,195	31,75	110 000	142 000	17 600	7 900	1,12	**K46162-46368**
	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,19	**KHM804840-HM804810**

medias ➤ *https://www.schaeffler.de/std/1F0A*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
34,988	3,6	1,3	13	48,8	39	45,5	53	56	3	4	3,6	1,3	0,42	1,44	0,79
	3,6	1,3	13	48,8	39	45,5	53	56	3	4	3,6	1,3	0,42	1,44	0,79
	1,5	1,5	16	49,7	39,5	42	56	59	3	3	1,5	1,5	0,44	1,35	0,74
	3,6	1,5	14	49,7	40	46	54	59	3	3	3,6	1,5	0,44	1,35	0,74
35,717	3,5	2,3	21	56,8	43	52	60	69	4	5,5	3,5	2,3	0,55	1,1	0,6
36,512	0,8	3,3	24	60,5	44,5	48,5	62	73	3	5,5	0,8	3,3	0,55	1,1	0,6
	3,6	3,3	24	60,5	44,5	54	62	73	3	5,5	3,6	3,3	0,55	1,1	0,6
	3,6	0,8	24	60,1	44,5	54	65	73	3	5	3,6	0,8	0,55	1,1	0,6
	3,6	3,3	23	59,3	44	55	66	75	3	6,7	3,6	3,3	0,55	1,1	0,6
38	3,6	1,3	15	51,8	42,5	49	56	60	3	4	3,6	1,3	0,42	1,44	0,79
38,1	3,6	1,3	13	53	42,5	49	59	62	2	4	3,6	1,3	0,33	1,8	0,99
	2,3	1,3	13	53	42,5	46	59	62	2	4	2,3	1,3	0,33	1,8	0,99
	2,3	1,3	15	53	42,5	46	58	62	2	4	2,3	1,3	0,33	1,8	0,99
	3,6	3,3	21	57,5	45,5	52	67	74	2	5	3,6	3,3	0,37	1,64	0,9
	0,8	3,3	24	64,3	49,1	51	68	78	5	6	0,8	3,3	0,55	1,1	0,6
	1,5	3,3	25	66,1	51	53	77	85	3,5	6,3	1,5	3,3	0,28	2,11	1,16
39,688	3,6	3,3	19	59,5	45,5	52	70	75	2	6	3,6	3,3	0,27	2,2	1,21
	0,8	3,3	19	59,5	45,5	46,5	70	75	2	6	0,8	3,3	0,27	2,2	1,21
	3,6	3,3	19	59,5	45,5	52	70	75	2	6	3,6	3,3	0,27	2,2	1,21
	0,8	3,3	19	59,5	45,5	46,5	70	75	2	6	0,8	3,3	0,27	2,2	1,21
40,483	3,6	3,3	24	65,6	49	58	68	78	3	6	3,6	3,3	0,55	1,1	0,6
40,987	3,6	1,5	14	55,8	45	52	61	65	3	4	3,6	1,5	0,35	1,72	0,95
	3,6	0,3	14	55,8	45	52	61	65	5	4	3,6	0,3	0,35	1,72	0,95
41,275	3,6	0,8	16	57,2	46,5	53	67	70	4	4,5	3,6	0,8	0,4	1,5	0,83
	3,6	0,8	18	57,2	46,5	53	66	70	1,5	4,5	3,6	0,8	0,4	1,5	0,83
	0,8	2,3	18	59,1	46	47	71	75	2	6	0,8	2,3	0,27	2,21	1,21
	3,6	3,3	23	64,2	51	57	70	79	3	5,5	3,6	3,3	0,55	1,1	0,6
	1,5	3,3	20	64,5	48	50	75	81	3,5	6	1,5	3,3	0,31	1,96	1,08
	3,6	1,5	17	60,4	47	54	77	80	5	6	3,6	1,5	0,26	2,27	1,25
	3,6	3,3	26	69,5	52	57	70	84	4	7	3,6	3,3	0,55	1,1	0,6
	3,6	2	16	68,1	48,5	55	81	84	5	5,5	3,6	2	0,32	1,88	1,03
	0,8	3,3	24	69,1	51	52	79	87	3,5	5,5	0,8	3,3	0,4	1,49	0,82
	3,6	3,3	26	73,1	54	61	81	91	4,5	7	3,6	3,3	0,55	1,1	0,6

Tapered roller bearings
Single row to ANSI/ABMA





Mounting dimensions

d = 42,07 – 47,625 mm

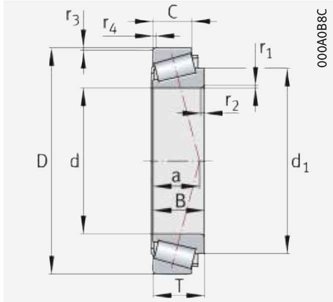
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573|1.12 ➤574|1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
42,07	90,488	40,386	33,338	39,688	142 000	185 000	23 200	8 000	1,29	**K4395-4335**
44,45	82,931	25,4	19,05	23,812	81 000	105 000	13 000	8 900	0,561	**K25581-25520**
	88,9	29,37	23,02	30,162	93 000	123 000	15 400	8 000	0,86	**KHM803149-HM803110**
	90,119	21,692	21,808	23	74 000	86 000	10 200	8 800	0,694	**K355-X-352**
	93,264	30,302	23,812	30,162	123 000	138 000	22 200	8 500	0,976	**K3782-3720-XL**
	93,662	31,75	25,4	31,75	109 000	130 000	15 800	8 000	1,02	**K49175-49368**
	95,25	28,575	22,225	27,783	131 000	145 000	23 400	8 300	1	**AK33885-33822-XL**
	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,13	**KHM804842-HM804810**
	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,16	**KHM804843-HM804810**
	95,25	28,575	22,225	30,958	99 000	120 000	14 400	7 500	1,01	**KHM903249-HM903210**
	101,6	31,75	25,4	31,75	108 000	132 000	16 100	7 200	1,27	**K49576-49520**
	104,775	36,512	28,575	36,512	145 000	201 000	25 500	6 700	1,6	**KHM807040-HM807010**
	111,125	36,957	30,162	38,1	146 000	186 000	23 000	6 900	1,88	**K535-532-A**
44,987	104,986	31,75	23,368	32,512	116 000	157 000	19 200	6 600	1,43	**KHM905843-HM905810**
45,242	73,431	19,812	15,748	19,558	57 000	79 000	9 500	9 700	0,316	**KLM102949-LM102910**
	77,788	19,842	15,08	19,842	55 000	69 000	8 200	9 300	0,369	**KLM603049-LM603011**
	77,788	19,842	16,667	21,43	55 000	69 000	8 200	9 300	0,38	**KLM603049-LM603012**
	80	19,842	15,08	19,842	55 000	69 000	8 200	9 300	0,399	**KLM603049-LM603014**
45,618	83,058	25,4	19,114	23,877	81 000	105 000	13 000	8 900	0,577	**K25590-25522**
45,987	74,975	18	14	18	48 500	67 000	7 900	9 600	0,3	**KLM503349-A-LM503310**
	74,975	18	14	18	48 500	67 000	7 900	9 600	0,304	**KLM503349-LM503310**
	90,975	32	26,5	32	117 000	146 000	18 100	7 900	0,958	**KHM204049-HM204010**
46,038	85	21,692	17,462	20,635	74 000	86 000	10 200	8 800	0,694	**K359-S-354-X**
47,625	88,9	22,225	16,513	20,637	72 000	84 000	9 900	8 400	0,559	**K369-A-362-A**
	88,9	22,225	16,513	20,637	72 000	84 000	9 900	8 400	0,556	**K369-S-362-A**
	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,09	**KHM804846-HM804810**
	96,838	21,946	15,875	21	76 000	95 000	11 200	7 500	0,725	**K386-A-382-A**
	112,713	28,575	20,638	30,163	102 000	133 000	16 100	6 300	1,5	**KHM907639-HM907616**

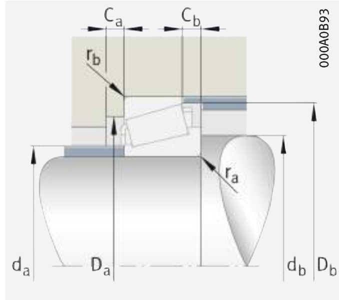
medias ➤ *https://www.schaeffler.de/std/1F0B*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
42,07	3,6	3,3	25	66,1	51	57	78	85	4	6	3,6	3,3	0,28	2,11	1,16
44,45	0,5	0,8	18	64,1	50	51	74	77	4,5	5,5	0,5	0,8	0,33	1,79	0,99
	3,6	3,3	26	69,1	53	62	74	85	4	7	3,6	3,3	0,55	1,1	0,6
	3,6	2,3	18	63,2	50	56	78	82	2	2,5	3,6	2,3	0,31	1,96	1,08
	3,6	3,3	22	72,2	52	58	82	88	3,5	7	3,6	3,3	0,34	1,77	0,97
	3,6	3,3	23	67,2	53	59	82	87	3	5,5	3,6	3,3	0,36	1,67	0,92
	0,8	0,8	20	73,4	53	53	86	90	5,5	6,5	0,8	0,8	0,33	1,82	1
	3,6	3,3	26	73,1	54	61	81	91	4,5	7	3,6	3,3	0,55	1,1	0,6
	3,6	3,3	26	73,1	57	63	81	91	4,5	7	3,6	3,3	0,55	1,1	0,6
	3,6	0,8	31	72	54	65	81	91	2	6,5	3,6	0,8	0,74	0,81	0,45
	0,8	3,3	25	76,5	54	55	88	96	4	6,5	0,8	3,3	0,4	1,5	0,82
	3,6	3,3	29	80,4	59	66	91	100	6	7,5	3,6	3,3	0,49	1,23	0,68
	3,6	3,3	26	78,1	54	60	95	100	2,5	8	3,6	3,3	0,3	2,02	1,11
44,987	2,5	2,5	34	82,2	60	68	86	100	3	7	2,5	2,5	0,78	0,77	0,42
45,242	3,6	0,8	15	60	50	56	68	70	3	4	3,6	0,8	0,31	1,97	1,08
	3,6	0,8	18	61,7	50	57	71	74	3	4,5	3,6	0,8	0,43	1,41	0,77
	3,6	0,8	19	61,7	50	57	70	74	2	4,5	3,6	0,8	0,43	1,41	0,77
	3,6	0,8	18	61,7	50	57	71	75	3	4,5	3,6	0,8	0,43	1,41	0,77
45,618	3,6	2	18	64,1	51	58	73	77	4,5	5,5	3,6	2	0,33	1,79	0,99
45,987	3,6	1,5	16	62	51	57	67	71	3,5	4	3,6	1,5	0,4	1,49	0,82
	2,3	1,5	16	61,9	51	55	67	71	4	3,5	2,3	1,5	0,4	1,49	0,82
	3,6	3,6	22	67,5	54	63	79	86	4	4	3,6	3,6	0,33	1,8	0,99
46,038	2,3	1,5	16	63,2	51	55	77	80	3	3	2,3	1,5	0,31	1,96	1,08
47,625	3,6	1,3	16	68,1	53	60	81	84	5	5,5	3,6	1,3	0,32	1,88	1,03
	2,3	1,3	16	68,1	53	60	81	84	5	5,5	2,3	1,3	0,32	1,88	1,03
	3,6	3,3	26	73,1	57	66	81	91	4,5	7	3,6	3,3	0,55	1,1	0,6
	0,8	0,8	19	76,6	55	56	89	92	5,5	5	0,8	0,8	0,35	1,69	0,93
	3,6	3,3	37	85,7	65,3	72	91	106	4	10	3,6	3,3	0,88	0,68	0,37

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

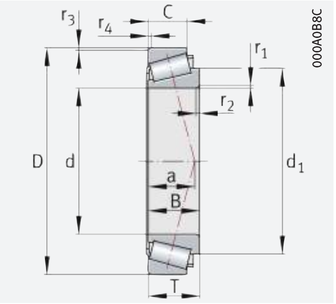
d = 48,412 – 55 mm

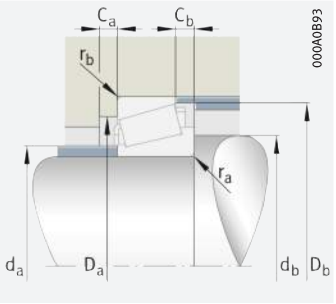
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
48,412	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,37	**KHM804848-HM804810**
	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,09	**KHM804848-HM804811**
	95,25	29,37	23,02	30,162	111 000	151 000	18 900	7 500	1,09	**KHM804849-HM804810**
49,212	104,775	36,512	28,575	36,512	145 000	201 000	25 500	6 700	1,5	**KHM807044-HM807010**
50	90	28	23	28	104 000	136 000	16 900	7 900	0,744	**KJM205149-JM205110**
50,8	82,55	22,225	16,51	21,59	69 000	94 000	11 500	8 700	0,428	**KLM104949-LM104911**
	82,931	22,225	16,51	21,59	69 000	94 000	11 500	8 700	0,432	**KLM104949-LM104912**
	88,9	22,225	16,513	20,637	72 000	84 000	9 900	8 400	0,516	**K368-362-A**
	88,9	22,225	16,513	20,637	72 000	84 000	9 900	8 400	0,555	**K368-A-362-A**
	93,264	30,302	23,812	30,162	104 000	137 000	17 000	7 700	0,89	**K3780-3720**
	95,25	28,575	22,225	27,783	107 000	138 000	17 200	7 500	0,861	**K33889-33822**
	104,775	30,958	23,812	30,162	126 000	162 000	20 100	6 800	1,25	**K45284-45220**
	104,775	40,157	33,338	39,688	159 000	226 000	28 500	6 700	1,67	**K4580-4535**
	104,775	36,512	28,575	36,512	145 000	201 000	25 500	6 700	1,64	**KHM807046-HM807010**
	104,775	36,512	28,575	36,512	145 000	201 000	25 500	6 700	1,49	**KHM807046-HM807011**
	107,95	36,957	28,575	36,512	146 000	186 000	23 000	6 900	1,69	**K537-532-X**
	111,125	28,575	20,638	30,163	106 000	140 000	16 900	6 300	1,4	**KHM907643-HM907614**
	123,825	32,791	25,4	36,512	135 000	150 000	17 900	6 000	2,18	**K72200-72487**
51,592	88,9	22,225	16,513	20,637	72 000	84 000	9 900	8 400	0,509	**K368-S-362-A**
	90	22,225	20	20	72 000	84 000	9 900	8 400	0,545	**K368-S-363**
53,975	88,9	19,05	13,492	19,05	69 000	78 000	12 100	8 800	0,434	**KLM806649-LM806610-XL**
	95,25	28,575	22,225	27,783	107 000	138 000	17 200	7 500	0,806	**K33895-33822**
	104,775	36,512	28,575	36,512	145 000	201 000	25 500	6 700	1,42	**KHM807049-HM807010**
	123,825	32,791	25,4	36,512	135 000	150 000	17 900	6 000	1,98	**K72212-72487**
54,488	104,775	36,512	28,575	36,512	145 000	201 000	25 000	6 700	1,41	**KHM807048-HM807010**
55	95	29	23,5	29	111 000	152 000	19 000	7 400	0,8	**KJM207049-JM207010**
	96,838	21,946	15,875	21	76 000	95 000	11 200	7 500	0,63	**K385-X-382-A**

medias ➤ *https://www.schaeffler.de/std/1F0C*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
48,412	2,3	3,3	26	73,1	57	63	81	91	4,5	7	2,3	3,3	0,55	1,1	0,6
	2,3	0,8	26	73,1	57	63	83	91	4,5	7	2,3	0,8	0,55	1,1	0,6
	3,6	3,3	26	73,1	57	66	81	91	4,5	7	3,6	3,3	0,55	1,1	0,6
49,212	3,6	3,3	29	80,4	63	69	91	100	6	7,5	3,6	3,3	0,49	1,23	0,68
50	3	2,5	21	70,1	57	62	80	85	4,5	5	3	2,5	0,33	1,82	1
50,8	3,6	1,3	16	66,3	55	62	75	78	3	5	3,6	1,3	0,31	1,97	1,08
	3,6	1,3	16	66,3	55	62	75	78	3	4	3,6	1,3	0,31	1,97	1,08
	1,5	1,3	16	68,1	56	58	81	84	5	5,5	1,5	1,3	0,32	1,88	1,03
	3,6	1,3	16	68	56	59	81	84	5	5,5	3,6	1,3	0,32	1,88	1,03
	3,6	3,3	22	72,3	58	64	82	88	3,5	7	3,6	3,3	0,34	1,77	0,97
	3,6	0,8	20	73,1	58	64	86	90	5,5	6,5	3,6	0,8	0,33	1,82	1
	6,4	3,3	22	79,6	59	71	93	99	4	6	6,4	3,3	0,33	1,81	0,99
	3,6	3,3	28	80,3	61	67	90	99	4	6	3,6	3,3	0,34	1,79	0,98
	3,6	3,3	29	80,4	63	70	89	100	4	6	3,6	3,3	0,49	1,23	0,68
	3,6	0,8	29	80,4	63	70	91	100	4	6	3,6	0,8	0,49	1,23	0,68
	3,6	3,3	24	78,1	59	65	94	100	4	7,5	3,6	3,3	0,3	2,02	1,11
	3,6	3,3	37	85,7	65,3	74	91	105	4	10	3,6	3,3	0,88	0,68	0,37
	3,6	3,2	38	86,8	67	79	102	116	3,5	8,5	3,6	3,2	0,74	0,81	0,45
51,592	2	1,3	16	68,1	56	59	81	84	5	5,5	2	1,3	0,32	1,88	1,03
	2	0,8	16	68,1	56	59	81	84	5	5,5	2	0,8	0,32	1,88	1,03
53,975	2,3	2	22	73,2	61	64	78	84	4	5	2,3	2	0,55	1,1	0,6
	1,5	0,8	20	73,1	60	63	86	90	5,5	6,5	1,5	0,8	0,33	1,82	1
	3,6	3,3	29	80,4	63	73	89	100	6	7,5	3,6	3,3	0,49	1,23	0,68
	3,6	3,2	38	86,8	67	79	102	116	3,5	8,5	3,6	3,2	0,74	0,81	0,45
54,488	3,6	3,3	29	81	63	73	91	100	4	6	3,6	3,3	0,49	1,23	0,68
55	1,5	2,5	21	74,7	62	64	85	91	4,5	5,5	1,5	2,5	0,33	1,79	0,99
	3,5	0,8	19	75,7	61	67	89	92	5,5	5	3,5	0,8	0,35	1,69	0,93

Tapered roller bearings
Single row to ANSI/ABMA





Mounting dimensions

d = 57,15 – 65,088 mm

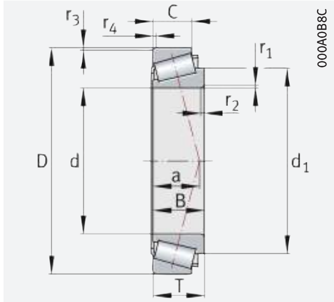
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	m ≈ kg	➤573 | 1.12 ➤574 | 1.13 X-life ➤559
57,15	87,312	18,258	14,288	18,258	56 000	88 000	10 400	8 100	0,418	**KL507949-L507910**
	96,838	21,945	15,875	21	76 000	95 000	11 200	7 500	0,593	**K387-382-A**
	96,838	21,946	15,875	21	76 000	95 000	11 200	7 500	0,59	**K387-A-382-A**
	96,838	21,946	20,274	25,4	76 000	95 000	11 200	7 500	0,66	**K387-A-382-S**
	98,425	21,946	17,826	21	76 000	95 000	11 200	7 500	0,637	**K387-A-382**
	104,775	29,317	24,605	30,162	111 000	141 000	17 000	6 900	1,07	**K462-453-X**
	104,775	29,317	24,605	30,162	111 000	141 000	17 000	6 900	1,08	**K462-A-453-X**
	110	29,317	27	27,795	111 000	141 000	17 000	6 900	1,26	**K462-454**
	112,712	30,162	23,812	30,162	137 000	192 000	23 800	6 200	1,41	**K39580-39520**
	112,712	30,162	23,812	30,162	137 000	192 000	23 800	6 200	1,42	**K39581-39520**
	112,712	30,048	23,812	30,162	119 000	176 000	22 000	6 300	1,44	**K3979-3920**
	117,475	30,162	23,812	30,162	124 000	189 000	23 900	5 900	1,62	**K33225-33462**
	119,985	30,162	26,949	32,75	137 000	192 000	23 800	6 200	1,76	**K39580-39528**
59,987	130,175	30,924	23,812	34,1	146 000	171 000	20 600	5 400	2,05	**KHM911244-HM911210**
60,325	122,238	38,354	29,718	38,1	193 000	255 000	32 000	5 800	2,09	**KHM212044-HM212011**
	130,175	33,338	23,812	36,513	146 000	171 000	20 600	5 400	2,13	**KHM911245-HM911210**
61,912	110	21,996	18,824	22	86 000	115 000	13 700	6 600	0,886	**K392-394-A**
	146,05	39,688	25,4	41,275	199 000	236 000	28 000	4 800	3,52	**KH913842-H913810**
62,738	101,6	25,4	19,845	25,4	91 000	135 000	16 700	7 000	0,78	**K28995-28920**
63,5	110	21,996	18,824	22	86 000	115 000	13 700	6 600	0,912	**K395-394-A**
	112,712	30,162	23,812	30,162	137 000	192 000	23 800	6 200	1,28	**K39585-39520**
	112,712	30,048	23,812	30,162	119 000	176 000	22 000	6 300	1,3	**K3982-3920**
	122,238	38,354	29,718	38,1	230 000	255 000	41 500	6 400	2,18	**KHM212047-HM212011-XL**
	130	36,17	29	36,937	168 000	238 000	29 500	5 600	2,29	**K565-562-X**
65	110	28	22,5	28	119 000	167 000	20 700	6 400	1,06	**KJM511946-JM511910**
65,088	135,755	56,007	44,45	53,975	275 000	385 000	49 000	5 200	3,74	**AK6379-6320**

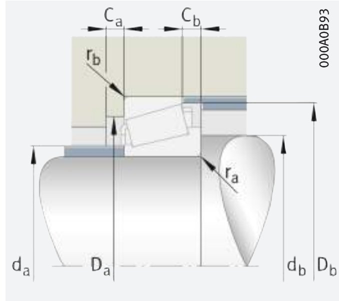
medias ➤ *https://www.schaeffler.de/std/1F0D*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2 min.	r_3, r_4 min.	a ≈	d_1 ≈	d_a max.	d_b min.	D_a min.	D_b min.	C_a min.	C_b min.	r_a max.	r_b max.	e	Y	Y_0
57,15	1,5	1,5	17	73,9	62	65	79	83	2	3,8	1,5	1,5	0,39	1,54	0,85
	2,3	0,8	19	75,7	62	66	89	92	4	5	2,3	0,8	0,35	1,69	0,93
	3,6	0,8	19	76,6	62	69	89	92	4	5,1	3,6	0,8	0,35	1,69	0,93
	3,6	2,3	23	76,6	62	69	87	91	2	6,5	3,6	2,3	0,35	1,69	0,93
	3,6	0,8	19	76,6	62	69	90	92	4	3,1	3,6	0,8	0,35	1,69	0,93
	2,3	3,3	24	80,3	67	70	92	98	3	5,5	2,3	3,3	0,34	1,79	0,98
	2,3	3,3	24	80,3	67	70	92	98	3	5,5	2,3	3,3	0,34	1,79	0,98
	2,3	2	22	80,3	67	70	96	100	2	2	2,3	2	0,34	1,79	0,98
	3,6	3,3	24	89,5	66	72	101	107	6	6	3,6	3,3	0,34	1,77	0,97
	7,9	3,3	24	90	66	81	101	107	6	6	7,9	3,3	0,34	1,77	0,97
	3,6	3,3	27	89	66	72	99	106	4	6	3,6	3,3	0,4	1,49	0,82
	3,6	3,3	28	95,6	68	74	104	112	3,5	6,5	3,6	3,3	0,44	1,38	0,76
	3,6	0,8	26	89,5	66	72	101	107	2,5	5,5	3,6	0,8	0,34	1,77	0,97
59,987	3,6	3,3	42	97,3	74,4	84	109	123,6	4	8	3,6	3,3	0,82	0,73	0,4
60,325	7,9	3,3	27	91,5	70	85	108	116	4	7	7,9	3,3	0,34	1,78	0,98
	5,2	3,3	42	97,3	74,4	87	109	123,6	6	4	5,2	3,3	0,82	0,73	0,4
61,912	0,8	1,3	21	87,4	69	70	101	104,5	5	3	0,8	1,3	0,4	1,49	0,82
	3,6	3,3	45	109,4	82,5	90	124	138	5	12,5	3,6	3,3	0,78	0,77	0,42
62,738	3,6	3,3	23	82,9	69	75	90	97	3	5,5	3,6	3,3	0,43	1,41	0,78
63,5	3,6	1,3	21	88,1	70	77	101	104,5	5	3	3,6	1,3	0,4	1,49	0,82
	3,6	3,3	24	90	71	77	101	107	6	6	3,6	3,3	0,34	1,77	0,97
	3,6	3,3	27	89	71	77	99	106	4	6	3,6	3,3	0,4	1,49	0,82
	7,1	3,3	27	91,7	73	87	108	116	4	7	7,1	3,3	0,34	1,78	0,98
	3,6	3	29	98,5	78	85	114	121	4	7,5	3,6	3	0,36	1,65	0,91
65	3	2,5	24	87,7	72	78	99	105	3	5	3	2,5	0,4	1,49	0,82
65,088	3,6	3,3	35	98,1	77	84	117	126	6	9	3,6	3,3	0,32	1,85	1,02

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

d = 66,675 – 77,788 mm

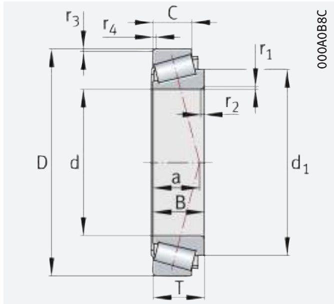
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
66,675	110	21,996	18,824	22	86 000	115 000	13 700	6 600	0,855	**K395-A-394-A**
	110	21,996	18,824	22	86 000	115 000	13 700	6 600	0,801	**K395-S-394-A**
	112,712	30,162	23,812	30,162	137 000	192 000	23 800	6 200	1,2	**K39590-39520**
	112,712	30,048	23,812	30,162	119 000	176 000	22 000	6 300	1,31	**K3984-3920**
	112,712	30,048	23,812	30,162	119 000	176 000	22 000	6 300	1,31	**K3994-3920**
	122,238	38,354	29,718	38,1	193 000	255 000	32 000	5 800	1,93	**KHM212049-HM212010**
	122,238	38,354	29,718	38,1	193 000	255 000	32 000	5 800	1,93	**KHM212049-HM212011**
	136,525	41,275	31,75	41,275	270 000	295 000	46 500	5 700	2,77	**KH414242-H414210-XL**
68,263	110	21,996	18,824	22	86 000	115 000	13 700	6 600	0,781	**K399-A-394-A**
	110	21,996	18,824	22	86 000	115 000	13 700	6 600	0,781	**K399-AS-394-A**
69,85	112,712	21,996	15,875	22,225	85 000	115 000	13 700	6 400	0,798	**KLM613449-LM613410**
	117,475	30,162	23,812	30,162	124 000	189 000	23 900	5 900	1,21	**K33275-33462**
	120	32,545	26,195	32,545	152 000	224 000	28 000	5 800	1,53	**K47487-47420**
	120	29,007	24,237	29,794	112 000	150 000	18 300	6 000	1,32	**K482-472**
	127	36,17	28,575	36,512	168 000	238 000	29 500	5 600	1,95	**K566-563**
70	115	29	23	29	127 000	178 000	22 000	6 000	1,13	**KJM612949-JM612910**
71,438	120	32,545	26,195	32,545	152 000	224 000	28 000	5 800	1,61	**K47490-47420**
73,025	112,712	25,4	19,05	25,4	97 000	154 000	19 500	6 100	0,993	**K29685-29620**
	117,475	30,162	23,812	30,162	124 000	189 000	23 900	5 900	1,26	**K33281-33462**
	117,475	30,162	23,812	30,162	124 000	189 000	23 900	5 900	1,21	**K33287-33462**
75	115	25	19	25	124 000	165 000	26 500	6 500	0,919	**KJLM714149-JLM714110-XL**
	120	29,5	25	31	144 000	183 000	30 500	6 300	1,27	**KJM714249-JM714210-XL**
75,987	131,975	39	32	39	206 000	295 000	37 000	5 200	2,26	**KHM215249-HM215210**
76,2	127	31	22,225	30,162	136 000	199 000	24 400	5 500	1,51	**K42687-42620**
	133,35	29,769	22,225	30,163	134 000	200 000	24 100	5 200	1,95	**K495-A-492-A**
	133,35	39,688	32,545	39,688	183 000	310 000	39 500	5 000	2,43	**KHM516442-HM516410**
	133,35	39,688	32,545	39,688	183 000	310 000	39 500	5 000	2,43	**KHM516447-HM516410**
	136,525	29,769	22,225	30,163	134 000	200 000	24 100	5 200	2,05	**K495-A-493**
	142,138	46,1	33,338	44,45	206 000	290 000	35 500	5 000	2,99	**KHM515745-HM515716**
77,788	117,475	25,4	19,05	25,4	99 000	159 000	20 200	5 800	0,932	**KLM814849-LM814810**
	121,442	23,012	17,462	24,607	82 000	113 000	13 800	5 900	0,931	**K34306-34478**
	127	31	22,225	30,162	136 000	199 000	24 400	5 500	1,45	**K42690-42620**

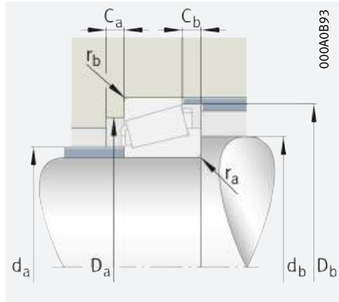
medias ➤ *https://www.schaeffler.de/std/1F0E*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
66,675	0,8	1,3	21	87,4	73	73	101	104	4,5	2	0,8	1,3	0,4	1,49	0,82
	3,6	1,3	21	88,1	73	79	101	104,5	5	3	3,6	1,3	0,4	1,49	0,82
	3,6	3,3	24	90	75	82	101	107	6	6	3,6	3,3	0,34	1,77	0,97
	3,6	3,3	27	89	74	80	99	106	4	6	3,6	3,3	0,4	1,49	0,82
	5,6	3,3	27	89	74	84	99	106	4	6	5,6	3,3	0,4	1,49	0,82
	3,6	1,5	27	91,5	75,5	82	108	116	4	8	3,6	1,5	0,34	1,78	0,98
	3,6	3,3	27	91,5	75,5	82	108	116	4	8	3,6	3,3	0,34	1,78	0,98
	3,6	3,3	30	101,2	81	85	121	129	6	9	3,6	3,3	0,36	1,67	0,92
68,263	2,3	1,3	21	88,1	74	78	101	104,5	5	3	2,3	1,3	0,4	1,49	0,82
	5,1	1,3	21	87,4	74	83	101	104,5	5	3	5,1	1,3	0,4	1,49	0,82
69,85	1,5	0,8	22	91	76	78	104	107	3	6	1,5	0,8	0,42	1,44	0,79
	3,6	3,3	28	95,5	77	84	104	112	4	6	3,6	3,3	0,44	1,38	0,76
	3,6	3,3	27	96	78	84	107	114	4	6	3,6	3,3	0,36	1,67	0,92
	3,6	2	26	93,9	77	83	107	112	3	5	3,6	2	0,38	1,56	0,86
	3,6	3,3	29	98,5	78	85	112	120	4	7,5	3,6	3,3	0,36	1,65	0,91
70	3	2,5	26	92,5	77	83	103	110	5	6	3	2,5	0,43	1,39	0,77
71,438	3,6	3,3	27	95,2	79	86	107	114	4	6	3,6	3,3	0,36	1,67	0,92
73,025	3,6	3,3	26	95,6	80	86	101	109	5	6	3,6	3,3	0,49	1,23	0,68
	3,6	3,3	28	95,5	79	87	104	112	4	6	3,6	3,3	0,44	1,38	0,76
	3,6	3,3	28	95,6	79	87	104	112	4	6	3,6	3,3	0,44	1,38	0,76
75	3	2,5	26	97	81	87	104	110	4,5	6	3	2,5	0,46	1,31	0,72
	3	2,5	29	99,4	83	88	108	115	4	6	3	2,5	0,44	1,35	0,74
75,987	7,1	3,6	30	103,2	85	98	118	126	7	7	7,1	3,6	0,33	1,8	0,99
76,2	3,6	3,3	27	102,6	84	90	114	121	4	8	3,6	3,3	0,42	1,43	0,79
	3,6	3,3	30	110,6	86	92	120	128	4	7,5	3,6	3,3	0,44	1,35	0,74
	3,6	3,3	32	110,6	87	93	118	128	5	7	3,6	3,3	0,4	1,49	0,82
	3,6	3,3	32	110,6	87	93	118	128	5	8	3,6	3,3	0,4	1,49	0,82
	3,6	3,3	30	110,6	86	92	122	130	4	7,5	3,6	3,3	0,44	1,35	0,74
	3,6	3,3	33	107,2	87	92	124	133	6	10	3,6	3,3	0,39	1,55	0,85
77,788	3,6	3,3	28	99,2	85	91	105	113	3	6	3,6	3,3	0,51	1,18	0,65
	3,6	2	26	99,7	84	90	110	116	3	7	3,6	2	0,45	1,33	0,73
	3,6	3,3	27	102,6	85	91	114	121	4	8	3,6	3,3	0,42	1,43	0,79

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

d = 79,975 – 99,975 mm

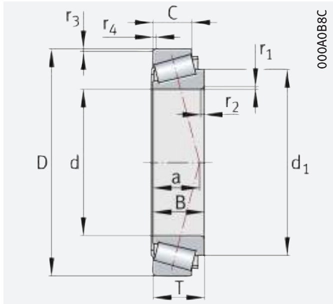
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573|1.12 ➤574|1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
79,975	146,975	40	32,5	40	233 000	355 000	43 000	4 600	3,02	**KHM218238-HM218210**
80	130	34	28,5	35	160 000	239 000	29 500	5 300	1,74	**KJM515649-JM515610**
80,963	136,525	29,769	22,225	30,162	134 000	200 000	24 100	5 200	1,91	**K496-493**
82,55	133,35	33,338	26,195	33,338	153 000	235 000	29 000	5 200	1,94	**AK47686-47620**
	133,35	39,688	32,545	39,688	183 000	310 000	39 500	5 000	2,32	**KHM516449-HM516410**
	136,525	29,769	22,225	30,163	134 000	200 000	24 100	5 200	1,67	**K495-493**
	139,992	36,098	28,575	36,512	177 000	265 000	32 000	5 000	2,25	**K580-572**
	146,05	41,275	31,75	41,275	250 000	305 000	48 000	5 200	2,79	**K663-653-XL**
84,138	133,35	29,769	22,225	30,163	134 000	200 000	24 100	5 200	1,53	**K498-492-A**
	136,525	29,769	22,225	30,163	134 000	200 000	24 100	5 200	1,81	**K498-493**
85	130	29	24	30	130 000	205 000	25 500	5 200	1,37	**KJM716649-JM716610**
85,725	133,35	29,769	22,225	30,162	134 000	200 000	24 100	5 200	1,47	**K497-492-A**
	136,525	29,769	22,225	30,162	134 000	200 000	24 100	5 200	1,75	**K497-493**
	142,138	42,862	34,133	42,862	216 000	350 000	43 500	4 700	2,72	**KHM617049-HM617010**
88,9	152,4	39,688	30,163	39,688	244 000	350 000	41 000	4 500	2,94	**KHM518445-HM518410**
89,975	146,975	40	32,5	40	233 000	355 000	43 000	4 600	2,57	**KHM218248-HM218210**
90	145	34	27	35	177 000	265 000	32 000	4 700	2,15	**KJM718149-A-JM718110**
	145	34	27	35	177 000	265 000	32 000	4 700	2,15	**KJM718149-JM718110**
92,075	146,05	34,925	26,195	33,338	167 000	275 000	33 000	4 650	2,11	**K47890-47820**
	146,05	34,925	26,195	33,338	167 000	275 000	33 000	4 650	1,98	**K47896-47820**
	150	36,322	27	35,992	182 000	285 000	34 000	4 600	2,41	**K598-A-593-X**
95	135	20	14	20	83 000	138 000	16 400	5 100	0,893	**KJL819349-JL819310**
	150	34	27	35	182 000	285 000	34 000	4 600	2,26	**KJM719149-JM719113**
95,25	152,4	36,322	30,162	39,688	215 000	285 000	44 500	5 000	2,57	**K594-A-592-A-XL**
	152,4	36,322	30,162	39,688	215 000	285 000	44 000	5 000	2,55	**K594-592-A-XL**
	168,275	41,275	30,162	41,275	265 000	350 000	53 000	4 550	3,78	**K683-672-XL**
96,838	148,43	28,971	21,433	28,575	139 000	216 000	25 500	4 650	1,75	**K42381-42584**
	188,912	46,038	31,75	50,8	270 000	340 000	38 000	3 550	5,62	**K90381-90744**
99,975	156,975	42	34	42	250 000	410 000	48 500	4 250	2,94	**KHM220149-HM220110**

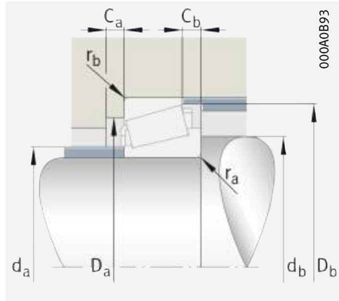
medias ➤ *https://www.schaeffler.de/std/1F0F*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
79,975	7,1	3,6	32	117,5	91	104	133	141	7	7,5	7,1	3,6	0,33	1,8	0,99
80	3	2,5	29	105,4	88	94	117	125	4,5	6,5	3	2,5	0,39	1,54	0,85
80,963	3,6	3,3	30	110,6	89	95	122	130	4	7,5	3,6	3,3	0,44	1,35	0,74
82,55	3,6	3,3	30	108,2	90	97	119	128	5	7	3,6	3,3	0,4	1,48	0,82
	3,6	3,3	32	110,5	92	99	118	128	5	7	3,6	3,3	0,4	1,49	0,82
	3,6	3,3	30	110,6	90	97	122	130	4	7,5	3,6	3,3	0,44	1,35	0,74
	3,6	3,3	31	110,7	91	98	125	133	5	7,5	3,6	3,3	0,4	1,49	0,82
	3,6	3,3	33	114,5	92	99	131	139	5	8	3,6	3,3	0,41	1,47	0,81
84,138	3,6	3,3	30	110,6	91	98	120	128	4	7,5	3,6	3,3	0,44	1,35	0,74
	3,6	3,3	30	110,6	91	98	122	130	4	7,5	3,6	3,3	0,44	1,35	0,74
85	3	2,5	30	109	92	98	117	125	4	6	3	2,5	0,44	1,35	0,74
85,725	3,6	3,3	30	110,6	93	99	120	128	4	7,5	3,6	3,3	0,44	1,35	0,74
	3,6	3,3	30	110,6	93	99	122	130	4	7,5	3,6	3,3	0,44	1,35	0,74
	4,8	3,3	36	115,8	95	106	125	137	5	8	4,8	3,3	0,43	1,39	0,76
88,9	6,4	3,3	34	119,5	100	110	134	146	4	8,5	6,4	3,3	0,4	1,49	0,82
89,975	7,1	3,6	32	119	99	112	133	141	5,5	7,5	7,1	3,6	0,33	1,8	0,99
90	6	2,5	33	118,5	99	111	131	139	4	7	6	2,5	0,44	1,35	0,74
	3	2,5	33	118,5	99	105	131	139	4	7	3	2,5	0,44	1,35	0,74
92,075	3,6	3,3	33	122,2	101	107	131	140	4,5	7	3,6	3,3	0,45	1,34	0,74
	3,6	3,3	33	122,2	101	107	131	140	4,5	7	3,6	3,3	0,45	1,34	0,74
	6,4	3,3	33	122,7	103	109	130	142	7	8	6,4	3,3	0,44	1,36	0,75
95	5	2,5	31	116,8	102	111	123	129	3,5	5,5	5	2,5	0,58	1,03	0,57
	3	2,5	33	121,4	104	109	135	143	4	6	3	2,5	0,44	1,36	0,75
95,25	5,1	3,3	37	122	103	109	128	141	3	9	5,1	3,3	0,44	1,36	0,75
	3,6	3,3	37	122	103	109	128	141	3	9	3,6	3,3	0,44	1,36	0,75
	3,6	3,3	38	133,5	106	113	149	160	5	9	3,6	3,3	0,47	1,28	0,7
96,838	3,6	3	32	123,3	104	110	134	142	4	6,5	3,6	3	0,49	1,22	0,67
	3,5	3,3	64	142,9	113	125	161	179	2,5	12	3,5	3,3	0,87	0,69	0,38
99,975	7,9	3,6	33	128,7	109	120	140	150	5	8	7,9	3,6	0,33	1,8	0,99

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

d = 100 – 152,4 mm

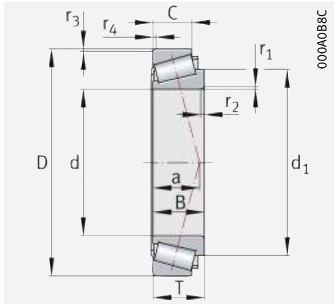
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573|1.12 ➤574|1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
100	155	35	28	36	187 000	305 000	36 000	4 300	2,38	**KJM720249-JM720210**
101,6	168,275	41,275	30,162	41,275	265 000	350 000	53 000	4 550	3,42	**K687-672-XL**
106,362	165,1	36,512	26,988	36,512	244 000	335 000	50 000	4 500	2,79	**AK56418-56650-XL**
107,95	158,75	21,438	15,875	23,02	100 000	164 000	18 500	4 400	1	**K37425-37625**
	161,925	34,925	26,988	34,925	175 000	305 000	35 000	4 150	2,46	**K48190-48120**
	165,1	36,512	26,988	36,512	244 000	335 000	50 000	4 500	2,71	**AK56425-56650-XL**
	168,275	36,512	26,988	36,512	244 000	335 000	50 000	4 500	2,89	**AK56425-56662-XL**
109,538	158,75	21,438	15,875	23,02	100 000	164 000	18 500	4 400	1,36	**K37431-37625**
	158,75	21,438	15,875	23,02	100 000	164 000	18 500	4 400	1,35	**K37431-A-37625**
109,987	159,987	34,925	26,988	34,925	174 000	340 000	40 500	4 200	2,36	**KLM522548-LM522510**
	159,987	34,925	26,988	34,925	174 000	340 000	40 500	4 200	2,34	**KLM522549-LM522510**
	164,737	34,925	32,131	37,312	174 000	340 000	40 500	4 200	2,71	**KLM522549-LM522518**
110	165	35	26,5	35	188 000	305 000	35 500	4 050	2,53	**KJM822049-JM822010**
	180	46	38	47	320 000	510 000	58 000	3 750	5,03	**KJHM522649-JHM522610**
114,3	177,8	41,275	30,162	41,275	285 000	395 000	57 000	4 150	3,63	**K64450-64700-XL**
	212,725	66,675	53,975	66,675	580 000	720 000	105 000	3 650	10	**K938-932-XL**
119,957	195,262	57,15	44,45	53,975	375 000	630 000	72 000	3 500	6,4	**KHM124649-HM124618**
120	180	36	26	36	221 000	355 000	40 000	3 750	3	**KJM624649-JM624610**
120,65	190,5	46,038	34,925	46,038	305 000	490 000	55 000	3 500	4,77	**KHM624749-HM624710**
127	234,95	63,5	49,212	63,5	520 000	810 000	101 000	2 900	12	**K95500-95925**
133,35	196,85	46,038	38,1	46,038	370 000	570 000	82 000	3 700	4,65	**K67390-67322-XL**
	234,95	63,5	49,212	63,5	520 000	810 000	101 000	2 900	12,3	**K95525-95925**
136,525	194,975	33	27,5	33	223 000	400 000	43 500	3 450	3,18	**KLM229139-LM229110**
139,7	187,325	29,37	23,02	28,575	180 000	350 000	39 000	3 600	2,21	**KLM328448-LM328410**
	254	66,675	47,625	66,675	580 000	970 000	117 000	2 650	14,3	**K99550-99100**
	295,275	87,312	57,15	82,55	830 000	1 120 000	130 000	2 450	24,1	**KHH231649-HH231615**
142,875	194,975	33	27,5	33	223 000	400 000	43 500	3 450	2,79	**KLM229146-LM229110**
	200,025	39,688	34,13	41,275	255 000	510 000	57 000	3 300	3,87	**K48684-48620**
	200,025	39,688	34,13	41,275	255 000	510 000	57 000	3 300	3,91	**K48685-48620**
146,05	193,675	28,575	23,02	28,575	215 000	335 000	46 500	3 850	2,24	**AK36690-36620-XL**
150	205	28,575	21,438	28,575	173 000	315 000	33 000	3 300	2,65	**KJL730646-JL730612**
152,4	268,288	74,612	57,15	74,612	670 000	1 070 000	127 000	2 500	18,2	**K107060-107105**
	307,975	93,662	66,675	88,9	960 000	1 290 000	146 000	2 260	28,8	**KHH234048-HH234010**

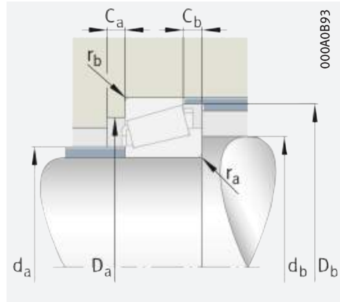
medias ➤ *https://www.schaeffler.de/std/1F10*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2	r_3, r_4	a	d_1	d_a	d_b	D_a	D_b	C_a	C_b	r_a	r_b	e	Y	Y_0
	min.	min.	≈	≈	max.	min.	min.	min.	min.	min.	max.	max.			
100	3	2,5	36	127,5	109	115	140	149	4	6,5	3	2,5	0,47	1,27	0,7
101,6	3,6	3,3	38	133,5	112	118	149	160	7	11	3,6	3,3	0,47	1,28	0,7
106,362	3,6	3,3	38	137,1	117	123	145	159	4	8	3,6	3,3	0,5	1,21	0,66
107,95	3,6	3,3	37	134,2	115	122	143	152	3,5	7	3,6	3,3	0,61	0,99	0,54
	3,6	3,3	39	138,1	116	122	146	156	3,5	7,5	3,6	3,3	0,51	1,19	0,65
	3,6	3,3	38	137,1	117	123	145	159	4	8	3,6	3,3	0,5	1,21	0,66
	3,6	3,3	38	137,1	117	123	145	159	4	8	3,6	3,3	0,5	1,21	0,66
109,538	3,6	3,3	37	134,2	116	123	143	152	3	7	3,6	3,3	0,61	0,99	0,54
	5	3,3	37	134,2	116	126	143	152	3	7	5	3,3	0,61	0,99	0,54
109,987	8,1	3,3	33	138,2	118	133	146	154	4	8	8,1	3,3	0,4	1,49	0,82
	3,6	3,3	33	138,2	118	124	146	154	4	7,5	3,6	3,3	0,4	1,49	0,82
	3,6	2,3	36	138,2	118	124	149	157	4	4	3,6	2,3	0,4	1,49	0,82
110	3	2,5	38	139	119	124	149	159	4,5	8	3	2,5	0,5	1,21	0,66
	3	2,5	41	145	122	127	162	172	5	7	3	2,5	0,41	1,48	0,81
114,3	3,6	3,3	43	147,3	125	131	160	172	5	9	3,6	3,3	0,52	1,16	0,64
	7,1	3,3	47	153,5	128	141	187	193	5	10	7,1	3,3	0,33	1,84	1,01
119,957	3	3,3	38	151,8	131	137	168	179	5	9,5	3	3,3	0,26	2,27	1,25
120	3,6	1,5	37	149,6	128	135	166	173	5,5	9,5	3,6	1,5	0,43	1,4	0,77
120,65	3,6	1,5	43	155,1	132	138	174	184	5	8,5	3,6	1,5	0,43	1,41	0,77
127	6,4	3,3	50	179,2	142	154	209	217	7	14	6,4	3,3	0,37	1,62	0,89
133,35	3,6	3,3	40	165,5	143	149	180	189	4	6,5	3,6	3,3	0,34	1,74	0,96
	9,7	3,3	50	179,2	148	166	209	217	8	12	9,7	3,3	0,37	1,62	0,89
136,525	3,6	3,6	33	168,2	146	152	182	190	5,5	7,5	3,6	3,6	0,33	1,8	0,99
139,7	1,5	1,5	32	163,7	147	149	176	182	5	5	1,5	1,5	0,36	1,69	0,93
	7,1	3,3	55	201,5	156	170	227	238	8	13,5	7,1	3,3	0,41	1,47	0,81
	9,7	6,4	56	199,1	161	177	258	264	9	19	9,7	6,4	0,32	1,88	1,04
142,875	3,6	3,6	33	168	150	157	182	190	5	5,5	3,6	3,6	0,33	1,8	0,99
	7,9	3,3	38	172,3	151	158	185	193	5	7	7,9	3,3	0,34	1,78	0,98
	3,6	3,3	38	172,3	151	158	185	193	5	7	3,6	3,3	0,34	1,78	0,98
146,05	1,5	1,5	33	168,2	153	155	180	186	5	5	1,5	1,5	0,37	1,63	0,9
150	2,5	2	40	178,3	158	164	190	198	4	7	2,5	2	0,46	1,31	0,72
152,4	6,4	6,4	60	204	171	181	237	249	8	13,5	6,4	6,4	0,39	1,55	0,85
	9,7	6,9	63	219,2	179	191	276	285,4	9	17	9,7	6,9	0,33	1,84	1,01

Tapered roller bearings

Single row to ANSI/ABMA





Mounting dimensions

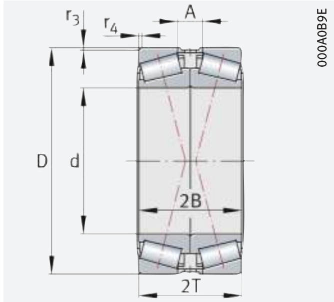
d = 160 – 673,1 mm

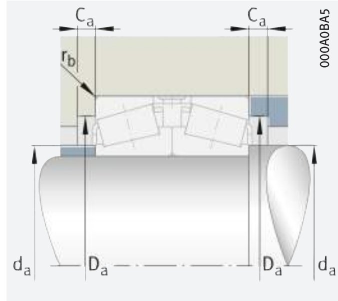
Main dimensions					Basic load ratings		Fatigue limit load	Limiting speed	Mass	Designation
d	D	B	C	T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	m	➤573|1.12 ➤574|1.13 X-life ➤559
					N	N	N	min^{-1}	≈ kg	
160	240	44,5	37	46	345 000	650 000	78 000	2 700	7,14	**KJM734445-JM734410**
	252,413	69,85	52,388	63,5	520 000	900 000	110 000	2 650	13	**KHM133448-HM133416**
165,1	225,425	39,688	33,338	41,275	239 000	520 000	56 000	2 950	5,03	**K46790-46720**
	336,55	95,25	69,85	92,075	1 280 000	1 550 000	193 000	2 280	37,1	**KHH437549-HH437510-XL**
170	240	44,5	37	46	345 000	650 000	78 000	2 700	6,25	**KJM734449-JM734410**
177,8	227,012	30,162	23,02	30,162	221 000	395 000	51 000	3 250	3,17	**K36990-36920-XL**
180	250	45	37	47	360 000	710 000	84 000	2 600	6,8	**KJM736149-JM736110**
184,15	234,95	33	28	34	234 000	485 000	33 500	2 800	3,46	**KLM236749-LM236710**
	235,229	33	28	34	234 000	485 000	33 500	2 800	3,47	**KLM236749-LM236710-A**
190	260	44	36,5	46	370 000	750 000	89 000	2 490	7,06	**KJM738249-JM738210**
190,5	266,7	46,833	38,1	47,625	415 000	730 000	95 000	2 700	8,19	**K67885-67820-XL**
196,85	257,175	39,688	30,163	39,688	260 000	590 000	69 000	2 550	5,4	**KLM739749-LM739710**
199,949	282,575	49,212	36,512	46,038	435 000	810 000	103 000	2 500	9,6	**K67982-67920-XL**
200,025	276,225	46,038	34,133	42,862	380 000	720 000	82 000	2 420	7,85	**KLM241147-LM241110**
203,2	276,225	42,862	34,133	42,862	380 000	720 000	82 000	2 420	7,21	**KLM241149-LM241110**
203,987	276,225	46,038	34,133	42,862	380 000	720 000	82 000	2 420	7,25	**KLM241148-LM241110**
	276,225	46,038	34,132	42,862	380 000	720 000	82 000	2 420	7,21	**KLM241148-LM241111**
206,375	282,575	46,038	36,512	46,038	435 000	810 000	103 000	2 500	8,6	**K67985-67920-XL**
212,725	285,75	46,038	34,925	46,038	360 000	790 000	79 000	2 240	8,96	**KLM742745-LM742710**
215,9	285,75	46,038	34,925	46,038	360 000	790 000	79 000	2 240	7,86	**KLM742749-LM742710**
216,408	285,75	49,212	34,925	46,038	360 000	790 000	79 000	2 240	7,85	**KLM742747-LM742710**
216,713	285,75	49,213	34,925	46,038	360 000	790 000	79 000	2 240	7,77	**KLM742747-A-LM742710**
223,838	295,275	46,038	34,925	46,038	370 000	830 000	82 000	2 170	8,29	**KLM844049-LM844010**
228,6	295,275	31,75	23,813	33,338	250 000	510 000	56 000	2 320	5,31	**AK544090-544116**
230,188	317,5	52,388	36,512	47,625	455 000	830 000	91 000	2 090	11,1	**KLM245846-LM245810**
231,775	317,5	52,388	36,512	47,625	540 000	830 000	103 000	2 300	10,8	**KLM245848-LM245810-XL**
234,95	314,325	49,213	36,512	49,212	480 000	990 000	110 000	2 070	10,3	**KLM545849-LM545810**
279,982	380,898	65,088	49,212	65,088	690 000	1 610 000	171 000	1 670	21,3	**KLM654642-LM654610**
285,75	380,898	65,088	49,212	65,088	690 000	1 610 000	171 000	1 670	19,9	**KLM654649-LM654610**
317,5	447,675	85,725	68,262	85,725	1 210 000	2 600 000	260 000	1 420	41,6	**KHM259049-HM259010**
596,9	685,8	31,75	25,4	31,75	410 000	1 120 000	84 000	1 010	18,7	**K680235-680270**
673,1	793,75	61,912	49,212	66,675	1 060 000	3 250 000	247 000	820	53,3	**KLL481448-LL481411**

medias ➤ *https://www.schaeffler.de/std/1F11*

Dimensions					Mounting dimensions								Calculation factors		
d	r_1, r_2 min.	r_3, r_4 min.	a ≈	d_1 ≈	d_a max.	d_b min.	D_a min.	D_b min.	C_a min.	C_b min.	r_a max.	r_b max.	e	Y	Y_0
160	3	2,5	50	205,5	173	178	222	232	6	9	3	2,5	0,44	1,37	0,75
	1,5	3,3	46	199,7	174	178	221	233	7	11,5	1,5	3,3	0,26	2,27	1,25
165,1	3,6	3,3	45	199	174	181	209	218	2,5	6,5	3,6	3,3	0,38	1,57	0,86
	3,3	6,4	72	239,5	197	196	280	308	10	22	3,3	6,4	0,37	1,62	0,89
170	3	2,5	50	205,5	180	185	222	232	6	9	3	2,5	0,44	1,37	0,75
177,8	1,5	1,5	43	203,6	186	188	214	221	4	7	1,5	1,5	0,44	1,36	0,75
180	3	2,5	54	217	190,5	196	232	242,6	5	8	3	2,5	0,48	1,25	0,69
184,15	2	2	39	209,8	191	195	224	229	4	5	2	2	0,33	0,99	1,79
	2	2	39	209,8	191	195	224	229	4	5	2	2	0,33	0,99	1,79
190	3	2,5	55	226	200	206	242	252	5	7,5	3	2,5	0,48	0,69	1,26
190,5	3,6	3,3	58	233	206	209	239	257	4	7,5	3,6	3,3	0,48	1,26	0,69
196,85	3,6	3,3	51	230	206	213	239	251	4	7,5	3,6	3,3	0,45	0,74	1,34
199,949	3,6	3,3	62	248,5	221	220	254	272	5	8	3,6	3,3	0,51	1,18	0,65
200,025	3,6	3,3	45	240,6	214	219	260	267	5	9	3,6	3,3	0,32	1,04	1,88
203,2	3,6	3,3	45	240,4	214	219	260	267	5	8	3,6	3,3	0,32	1,04	1,88
203,987	3,6	3,3	45	240,6	214	219	260	267	5	9	3,6	3,3	0,32	1,04	1,88
	3,6	3,3	45	240,6	214	219	260	267	5	8	3,6	3,3	0,32	1,04	1,88
206,375	3,6	3,3	62	248,5	221	220	254	272	5	8	3,6	3,3	0,51	1,18	0,65
212,725	3,6	3,3	61	255	225	230	266	279	5	10,5	3,6	3,3	0,48	0,69	1,25
215,9	3,6	3,3	61	255	227	233	266	279	5	11	3,6	3,3	0,48	0,69	1,25
216,408	3,6	3,3	61	254,1	227	233	266	279	5	11	3,6	3,3	0,48	0,69	1,25
216,713	3,6	3,3	61	254,1	227	233	266	279	5	11	3,6	3,3	0,48	0,69	1,25
223,838	3,6	3,3	64	263,5	235	241	275	288	5	11	3,6	3,3	0,5	0,66	1,2
228,6	3,6	3,3	50	262,5	240	244	280	287	4	9,5	3,6	3,3	0,4	0,82	1,49
230,188	3,3	3,3	50	270	245	248	299	306	10	11	3,3	3,3	0,32	1,04	1,88
231,775	3,3	3,3	50	270	247	248	296	304	10	11	3,3	3,3	0,32	1,88	1,04
234,95	3,6	3,3	58	274,2	246	252	296	306	5	10	3,6	3,3	0,4	0,83	1,51
279,982	3,6	3,3	76	334,5	298	302	356	368	4,5	12	3,6	3,3	0,43	0,76	1,39
285,75	3,6	3,3	76	334,5	302	306	356	368	7	16	3,6	3,3	0,43	0,76	1,39
317,5	3,6	3,3	80	380,4	337	341	418	428	9	13,5	3,6	3,3	0,33	0,99	1,8
596,9	3,6	3,3	126	637	615	621	659	667	8	6	3,6	3,3	0,53	0,63	1,14
673,1	6,4	6,4	117	725	690	702	765	771	7	14	6,4	6,4	0,36	0,92	1,67

Tapered roller bearings
Matched pairs





Mounting dimensions

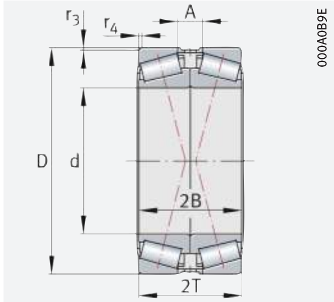
d = 40 – 140 mm

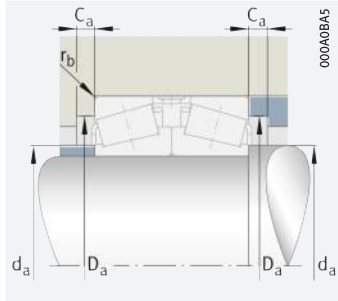
Main dimensions				Basic load ratings for bearing pair		Fatigue limit load Bearing pair	Limiting speed Bearing pair	Speed rating Bearing pair	Mass for bearing pair	Designation
d	D	2B	2T	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	$n_{\vartheta r}$	m	➤573 | 1.12 ➤574 | 1.13 X-life ➤559
				N	N	N	min^{-1}	min^{-1}	≈ kg	
40	90	46	50,5	153 000	165 000	24 200	8 700	5 100	1,52	**31308-XL-DF-A115-155**
	90	46	50,5	153 000	165 000	24 200	8 700	5 100	1,52	**31308-XL-DF-A50-90**
60	110	44	47,5	210 000	246 000	36 500	7 500	4 250	1,97	**30212-XL-DF-A100-140**
80	125	58	58	280 000	425 000	68 000	6 000	3 450	2,66	**32016-X-XL-DF-A140-170**
	125	58	58	280 000	425 000	68 000	6 000	3 450	2,66	**32016-X-XL-DF-A150-200**
	125	58	58	280 000	425 000	68 000	6 000	3 450	2,66	**32016-X-XL-DF-A25-50**
85	130	58	58	285 000	450 000	71 000	5 700	3 250	2,8	**32017-X-XL-DF-A170-220**
	130	58	58	285 000	450 000	71 000	5 700	3 250	2,8	**32017-X-XL-DF-A190-230**
90	140	64	64	335 000	510 000	80 000	5 400	3 200	3,64	**32018-X-XL-DF-A170-220**
	160	80	85	530 000	720 000	109 000	4 800	2 650	7,12	**32218-XL-DF-A220-270**
100	150	64	64	350 000	570 000	87 000	4 950	2 900	4,02	**32020-X-XL-DF-A220-270**
	180	68	74	430 000	650 000	71 000	4 000	2 650	7,82	**30220-A-DF-A180-220**
	180	68	74	430 000	650 000	71 000	4 000	2 650	7,82	**30220-A-DF-A220-270**
	180	68	74	430 000	650 000	71 000	4 000	2 650	7,82	**30220-A-DF-A250-280**
105	160	70	70	410 000	660 000	99 000	4 650	2 650	5,11	**32021-X-XL-DF-A280-330**
	190	100	106	780 000	1 110 000	163 000	4 000	2 110	13	**32221-XL-DF-A230-280**
110	170	76	76	490 000	790 000	117 000	4 350	2 440	6,31	**32022-X-XL-DF-A170-230**
	170	76	76	490 000	790 000	117 000	4 350	2 440	6,31	**32022-X-XL-DF-A220-270**
	170	76	76	490 000	790 000	117 000	4 350	2 440	6,31	**32022-X-XL-DF-A90-130**
	240	114	126	940 000	1 170 000	157 000	3 100	1 890	26,2	**31322-X-XL-DF-A200-250**
	240	114	126	940 000	1 170 000	157 000	3 100	1 890	26,2	**31322-X-XL-P5-DF-A120-160**
	240	114	126	940 000	1 170 000	157 000	3 100	1 890	26,2	**31322-X-XL-P5-DF-A140-180**
	240	114	126	940 000	1 170 000	157 000	3 100	1 890	26,2	**31322-X-XL-P5-DF-A60-100**
120	180	76	76	510 000	840 000	123 000	4 050	2 240	6,76	**32024-X-XL-DF-A230-280**
130	200	90	90	660 000	1 100 000	158 000	3 650	1 960	9,94	**32026-X-XL-DF-A125-175**
	200	90	90	660 000	1 100 000	158 000	3 650	1 960	9,94	**32026-X-XL-DF-A200-250**
	200	90	90	660 000	1 100 000	158 000	3 650	1 960	9,94	**32026-X-XL-DF-A250-300**
140	210	90	90	690 000	1 180 000	168 000	3 450	1 810	11,1	**32028-X-XL-DF-A250-300**

medias ➤ *https://www.schaeffler.de/std/1F12*

Dimensions			Mounting dimensions					Calculation factors			
d	r_3, r_4	A	d_a	D_a	D_a	C_a	r_b	e	Y_1	Y_2	Y_0
	min.		max.	min.	max.	min.	max.				
40	1,5	16,5	51	71	81	4	1,5	0,83	0,82	1,22	0,8
	1,5	16,5	51	71	81	4	1,5	0,83	0,82	1,22	0,8
60	1,5	9,5	70	96	101	4	1,5	0,41	1,67	2,48	1,63
80	1,5	14	89	112	117	6	1,5	0,42	1,6	2,38	1,56
	1,5	14	89	112	117	6	1,5	0,42	1,6	2,38	1,56
	1,5	14	89	112	117	6	1,5	0,42	1,6	2,38	1,56
85	1,5	14	94	117	122	6	1,5	0,44	1,53	2,27	1,49
	1,5	14	94	117	122	6	1,5	0,44	1,53	2,27	1,49
90	1,5	16	100	125	131	6	1,5	0,42	1,6	2,38	1,56
	2	17	102	138	150	5	2	0,42	1,61	2,39	1,57
100	1,5	16	109	134	141	6	1,5	0,46	1,47	2,19	1,44
	2,5	16	116	157	168	5	2,5	0,42	1,61	2,39	1,57
	2,5	16	116	157	168	5	2,5	0,42	1,61	2,39	1,57
	2,5	16	116	157	168	5	2,5	0,42	1,61	2,39	1,57
105	2	18	116	143	150	6	2	0,44	1,52	2,26	1,49
	2,5	20	120	161	178	5	2,5	0,42	1,61	2,39	1,57
110	2	18	122	152	160	7	2	0,43	1,57	2,34	1,53
	2	18	122	152	160	7	2	0,43	1,57	2,34	1,53
	2	18	122	152	160	7	2	0,43	1,57	2,34	1,53
	3	50	135	188	226	7	3	0,83	0,82	1,22	0,8
	3	50	135	188	226	7	3	0,83	0,82	1,22	0,8
	3	50	135	188	226	7	3	0,83	0,82	1,22	0,8
	3	50	135	188	226	7	3	0,83	0,82	1,22	0,8
120	2	18	131	161	170	7	2	0,46	1,47	2,19	1,44
130	2	22	144	178	190	8	2	0,43	1,55	2,31	1,52
	2	22	144	178	190	8	2	0,43	1,55	2,31	1,52
	2	22	144	178	190	8	2	0,43	1,55	2,31	1,52
140	2	22	153	187	200	8	2	0,46	1,47	2,19	1,44

Tapered roller bearings
Matched pairs





Mounting dimensions

d = 150 – 260 mm

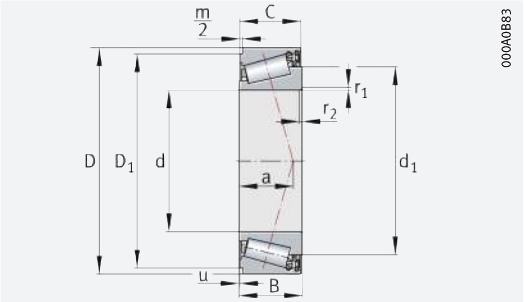
Main dimensions				Basic load ratings for bearing pair		Fatigue limit load Bearing pair	Limiting speed Bearing pair	Speed rating Bearing pair	Mass for bearing pair	Designation
d	D	2B	2T	dyn. C_r N	stat. C_{0r} N	C_{ur} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ kg	➤573 | 1.12 ➤574 | 1.13 X-life ➤559
150	225	96	96	780 000	1 350 000	188 000	3 200	1 650	13,5	**32030-X-XL-DF-A120-170**
	225	96	96	780 000	1 350 000	188 000	3 200	1 650	13,5	**32030-X-XL-DF-A280-330**
	225	118	118	950 000	1 770 000	249 000	3 150	1 580	16,7	**33030-XL-DF-A0-35**
170	310	172	182	1 980 000	3 100 000	410 000	2 350	1 090	59,2	**32234-XL-DF-A320-370**
	310	172	182	1 980 000	3 100 000	410 000	2 350	1 090	59,2	**32234-XL-DF-A350-410**
	310	172	182	1 980 000	3 100 000	410 000	2 350	1 090	59,2	**32234-XL-DF-A490-540**
180	280	128	128	1 270 000	2 200 000	290 000	2 550	1 250	28,9	**32036-X-XL-DF-A240-290**
	280	128	128	1 270 000	2 200 000	290 000	2 550	1 250	28,9	**32036-X-XL-DF-A320-370**
	280	128	128	1 270 000	2 200 000	290 000	2 550	1 250	28,9	**32036-X-XL-DF-A330-380**
	320	172	182	2 040 000	3 300 000	425 000	2 270	1 020	62,3	**32236-XL-DF-A330-380**
	320	172	182	2 040 000	3 300 000	425 000	2 270	1 020	62,3	**32236-XL-DF-A380-430**
	320	172	182	2 040 000	3 300 000	425 000	2 270	1 020	62,3	**32236-XL-DF-A385-445**
	320	172	182	2 040 000	3 300 000	425 000	2 270	1 020	62,3	**32236-XL-DF-A430-480**
190	290	128	128	1 280 000	2 250 000	295 000	2 460	1 180	30,1	**32038-X-XL-DF-A120-150**
	290	128	128	1 280 000	2 250 000	295 000	2 460	1 180	30,1	**32038-X-XL-DF-A200-250**
	290	128	128	1 280 000	2 250 000	295 000	2 460	1 180	30,1	**32038-X-XL-DF-A300-350**
	290	128	128	1 280 000	2 250 000	295 000	2 460	1 180	30,1	**32038-X-XL-DF-A350-400**
	290	128	128	1 280 000	2 250 000	295 000	2 460	1 180	30,1	**32038-X-XL-DF-A370-420**
	290	128	128	1 280 000	2 250 000	295 000	2 460	1 180	30,1	**32038-X-XL-DF-A580-630**
200	360	196	208	2 700 000	4 150 000	510 000	2 030	890	88,2	**32240-XL-DF-A350-400**
	360	196	208	2 700 000	4 150 000	510 000	2 030	890	88,2	**32240-XL-DF-A400-450**
	360	196	208	2 700 000	4 150 000	510 000	2 030	890	88,2	**32240-XL-DF-A500-550**
240	360	152	152	1 820 000	3 350 000	415 000	1 950	870	53,5	**32048-X-XL-DF-A300-350**
	360	152	152	1 820 000	3 350 000	415 000	1 950	870	53,5	**32048-X-XL-DF-A400-450**
	360	152	152	1 820 000	3 350 000	415 000	1 950	870	53,5	**32048-X-XL-DF-A450-500**
	360	152	152	1 820 000	3 350 000	415 000	1 950	870	53,5	**32048-X-XL-DF-A700-750**
	440	240	254	3 750 000	6 200 000	730 000	1 630	660	166	**32248-XL-DF-A350-400**
	440	240	254	3 750 000	6 200 000	730 000	1 630	660	166	**32248-XL-DF-A450-500**
260	480	260	274	4 550 000	7 600 000	860 000	1 480	560	215	**32252-XL-DF-A500-550**
	480	260	274	4 550 000	7 600 000	860 000	1 480	560	215	**32252-XL-DF-A550-600**

medias ➤ *https://www.schaeffler.de/std/1F13*

Dimensions			Mounting dimensions					Calculation factors			
d	r_3, r_4	A	d_a	D_a	D_a	C_a	r_b	e	Y_1	Y_2	Y_0
	min.		max.	min.	max.	min.	max.				
150	2,5	24	164	200	213	8	2,5	0,46	1,47	2,19	1,44
	2,5	24	164	200	213	8	2,5	0,46	1,47	2,19	1,44
	2,5	26	164	200	213	8	2,5	0,36	1,85	2,76	1,81
170	4	40	196	259	292	10	4	0,44	1,55	2,31	1,52
	4	40	196	259	292	10	4	0,44	1,55	2,31	1,52
	4	40	196	259	292	10	4	0,44	1,55	2,31	1,52
180	2,5	32	199	247	268	10	2,5	0,42	1,6	2,38	1,56
	2,5	32	199	247	268	10	2,5	0,42	1,6	2,38	1,56
	2,5	32	199	247	268	10	2,5	0,42	1,6	2,38	1,56
	4	40	204	267	302	10	4	0,45	1,5	2,23	1,47
	4	40	204	267	302	10	4	0,45	1,5	2,23	1,47
	4	40	204	267	302	10	4	0,45	1,5	2,23	1,47
	4	40	204	267	302	10	4	0,45	1,5	2,23	1,47
190	2,5	32	209	257	278	10	2,5	0,44	1,53	2,27	1,49
	2,5	32	209	257	278	10	2,5	0,44	1,53	2,27	1,49
	2,5	32	209	257	278	10	2,5	0,44	1,53	2,27	1,49
	2,5	32	209	257	278	10	2,5	0,44	1,53	2,27	1,49
	2,5	32	209	257	278	10	2,5	0,44	1,53	2,27	1,49
	2,5	32	209	257	278	10	2,5	0,44	1,53	2,27	1,49
200	4	44	226	302	342	11	4	0,41	1,66	2,47	1,62
	4	44	226	302	342	11	4	0,41	1,66	2,47	1,62
	4	44	226	302	342	11	4	0,41	1,66	2,47	1,62
240	3	38	261	318	346	12	3	0,46	1,47	2,19	1,44
	3	38	261	318	346	12	3	0,46	1,47	2,19	1,44
	3	38	261	318	346	12	3	0,46	1,47	2,19	1,44
	3	38	261	318	346	12	3	0,46	1,47	2,19	1,44
	4	54	286	372	422	14	4	0,43	1,55	2,31	1,52
	4	54	286	372	422	14	4	0,43	1,55	2,31	1,52
260	5	62	306	401	458	14	5	0,43	1,57	2,34	1,53
	5	62	306	401	458	14	5	0,43	1,57	2,34	1,53

Integral tapered roller bearings

Sealed on one side



d = 30 – 80 mm

Main dimensions				Basic load ratings		Fatigue limit load	Limiting speed	Load carrying capacity	Max. axial assembly clamping force	Mass Bearing[1]	Designation ➤573 | 1.12 ➤574 | 1.13	
d	D	B	C	dyn. C_r	stat. C_{0r}	C_{ur}	n_G grease	F_{BR}[2]	Bearing pair	m	Bearing	Snap ring
				N	N	N	min^{-1}	N	N	≈ kg		
30	55	19	18,5	38 500	46 500	5 300	6 100	15 700	7 700	0,19	**JK0S030**	BR55
40	68	21	20,5	53 000	71 000	8 300	4 950	12 900	10 600	0,3	**JK0S040**[3]	BR68
50	80	22	21,5	64 000	93 000	11 200	4 050	31 400	12 800	0,41	**JK0S050**	BR80
60	95	26	25	82 000	123 000	15 200	3 350	59 300	16 400	0,67	**JK0S060**	BR95
70	110	27	26,5	104 000	159 000	20 100	2 900	49 000	20 800	0,93	**JK0S070-A**	BR110
80	125	30	29,5	137 000	211 000	26 000	2 550	40 200	27 400	1,32	**JK0S080-A**	BR125

medias ➤ *https://www.schaeffler.de/std/1F14*

Other sizes and designs are also available; please contact us.

Ordering note

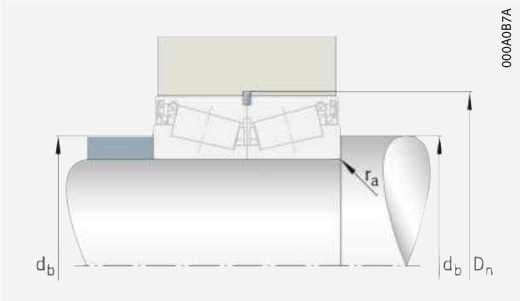
FAG integral tapered roller bearings are interchangeable with each other.
When ordering, please always state the number of single bearings, not the number of bearing pairs.
The snap ring must be ordered separately, for example

2 tapered roller bearings JK0S080-A
1 snap ring BR125

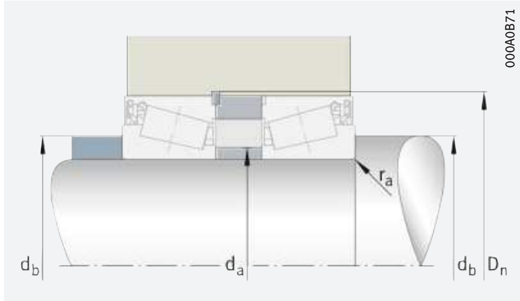
[1] Ungreased.

[2] For snap ring connection located against a sharp edge.

[3] Also available with 95% grease filling; designation: JK0S040-J14.



Mounting dimensions



Mounting dimensions

Dimensions								Mounting dimensions					Calculation factors		
								Shaft			Slot				
d	r_1, r_2	D_1	$m/2$	a	u	Δ_u	d_1	d_a	d_b	r_a	D_n	Δ_{Dn}	e	Y	Y_0
	min.			≈		Devi-ations	≈	max.	min.	max.	Nominal dimension	Devi-ations			
30	1	51,4	0,75	15	0,02	+0,05 0	43,6	35	36	1	56,5	+0,19 0	0,43	1,4	0,77
40	1	64,4	0,75	16	0,03	+0,05 0	53,8	46	46	1	69,5	+0,19 0	0,37	1,6	0,88
50	1	75,7	1	19	0,02	+0,05 0	66,4	56	56	1	81,8	+0,22 0	0,42	1,43	0,79
60	1,5	89,3	1,25	23	0,03	+0,05 0	79,5	67	67	1,5	97	+0,22 0	0,43	1,4	0,77
70	1,5	104,8	1,25	25	0,03	+0,05 0	91,5	78	77	1,5	112,3	+0,22 0	0,43	1,38	0,76
80	1,5	119,8	1,25	28	0,03	+0,05 0	104,2	89	87	1,5	127,3	+0,25 0	0,42	1,42	0,78