SCHAEFFLER

Cylindrical roller bearings for integrated planetary gear bearing arrangements

RSL

Technical Product Information

Foreword

Industrial gearboxes designs need to be increasingly powerful and yet increasingly compact. This is particularly true of planetary gearboxes in industrial applications, which are required to function reliably and with a high level of operational security despite their high power density.

Planetary gears, pins and carriers are subjected to loads up to their physical limits and exposed to enormous alternating bending loads. Particularly in the variable-speed drives of stationary and mobile gearboxes, these loads occur with very high dynamics. Rolling bearings in stationary planetary precision gearboxes must not only provide a high load carrying ability, elasticity and torsional rigidity, but also freedom from excessive clearance.

In order to fulfil these characteristics, Schaeffler offers a wide range of products with various rolling bearing solutions for individual customer requirements, including:

- radially compact, full complement single and double row cylindrical roller bearings RSL without an outer ring, with maximum load carrying capacity
- special bearings RSL with cage and without an outer ring, particularly suitable for high speeds
- individual solutions involving special bearings

Tools such as medias and Bearinx-online are available to assist in the selection and design of our rolling bearings. Experienced Schaeffler application engineers and Schaeffler engineering services are also at your disposal worldwide with their design tools.

This Technical Product Information TPI 277, Cylindrical roller bearings for integrated planetary gear bearing arrangements is a supplement to catalogue HR 1, Rolling Bearings and to the online design tools medias and Bearinx. The design guidelines and fitting guidelines contained in this TPI and the relevant information from catalogue HR 1 must always be observed in the design of the bearing arrangement.

Further information

HR 1 | Rolling Bearings |
https://www.schaeffler.de/std/1D3D

Contents

1 Bearing design

Cylindrical roller bearings RSL are available in various designs:

- single row bearings of type RSL18
- special bearings RSL with cage
- double row bearings, series RSL1850
- double row bearings in RSL design with special dimensions
- in X-life design

Single row bearings of type RSL18 follow the dimension series system. Single row bearings are used in universal gearboxes, which are arranged in series with design size steps. The main dimensions are in accordance with ISO 15:2017, DIN 616:2022 and DIN 5412-1:2005. For higher load carrying capacities, multi-row bearing arrangements can be constructed from single row RSL18 bearings.

Special bearings RSL with cage are single row bearings of series RSL1830 complete with cage. The caged version permits high speed planetary stages with high centrifugal forces. Interchangeability with full complement bearings of series RSL1830 enables the modular design of industrial gearbox series.

Double row bearings of series RSL1850 follow the standardized dimension series system and are predominantly used in corresponding industrial gearboxes. Four row bearing arrangements can be achieved using matched sets from two bearings of series RSL1830 ➤29|13.3.

Double row RSL-type bearings with special dimensions are more finely graduated than standardized dimension series, allowing the bearings to be adapted to the installation space requirements commonly encountered with drivetrains, winch gears and slewing gears. The main dimensions form part of the bearing designation ➤22|10.

X-life is the premium brand that identifies particularly high performance products under the INA and FAG brands. These products are characterised by a longer rating life and operating life.

1.1 Basic design

Cylindrical roller bearings RSL are part of the group of radial roller bearings. The bearings are comprised solid inner rings combined with a large number of cylindrical rollers.

Fixed ribs guide the cylindrical rollers in the axial direction. The bearings have full complement cylindrical rolling element sets. Due to the absence of a cage, the maximum number of rolling elements can be accommodated in a bearing.

Advantages

Cylindrical roller bearings RSL without an outer ring offer advantages for numerous applications:

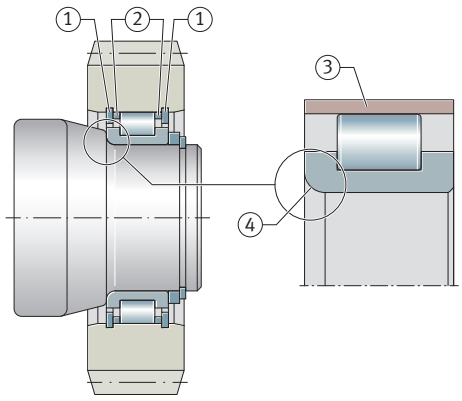
- in applications with a small radial installation space, the outer raceway can be integrated into the planetary gear
- in applications with high radial loads, if axial installation space is available and maximum radial load carrying capacity is required. multiple bearing arrangements can be constructed from RSL-type bearings, provided that the rules governing the use of matched bearing sets are observed ➤29|13.3.
- in applications where a thin gear wall requires a loose fit between the gear and outer ring that could result in the outer ring spinning in the gear bore
- in applications where a maximum power density is required, e.g. for small planetary gears with a high gearing ratio in a small installation space

Unlike comparable SL bearings, the roller set has an enveloping circle specified in the product table. An SL bearing cannot automatically be converted into a bearing that is comparable with an RSL cylindrical roller bearing simply by removing the outer ring. Ease of assembly and the correct internal clearance can only be ensured with the specified enveloping circle.

The roller sets of cylindrical roller bearings RSL are not self-retaining and are supplied in a mounting sleeve. The mounting sleeve is used to transport, handle and fit the bearing.

1.2 Single row bearings, design RSL18

1 Design with adjusted inner ring



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1	Retaining ring, not included in scope of delivery	3	Mounting sleeve
2	Axial ring, not included in scope of delivery	4	Design RV, optional

Bearings of design RSL18 are produced without an inner ring and are comprised of solid inner rings with full complement cylindrical rolling element sets.

Available bearing series:

- RSL1810
- RSL1830
- RSL1822
- RSL1823
- RSL1833

Sizes up to an enveloping circle diameter E_w of approx. 120 mm are produced to X-life quality. A radius variant with an enlarged special radius on the inner ring is also available as an option with the suffix RV. The predefined deviation of the enlarged radius is listed in the product table ➤40|15.

RSL-type bearings with the same number of rows and bore code are suitable for use in constructing multi-row planetary bearing arrangements. These bearings must be ordered as a matched sets ➤29|13.3.

2 Single row bearings, design RSL18

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1.3 Single row special bearings RSL with cage

3 Single row special bearings RSL with cage

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The planetary bearings of series RSLK1830 listed in earlier editions of Schaeffler publications are now available as special bearings. RSLK bearings now have a special designation ➤22|10.

Single row special bearings RSL with cage are derived from planetary bearings of series RSL1830 with a full complement cylindrical roller set and have a bearing cage. Compared with the full complement versions, the bearing cage increases the suitability of the bearings for high speeds and high centrifugal accelerations and results in lower basic load ratings.

As in the case of series RSL1830, the bearings are produced without an outer ring and are comprised of solid inner rings. The rolling element set contains fewer rollers than bearings of series RSL1830, creating space for the cage.

Special bearings RSL with cage, which have the same designation, are suitable for constructing multi-row planetary bearing arrangements. In such cases, the bearings must be ordered as matched sets ➤29|13.3. Special bearings RSL with cage are available for shaft diameters from d = 25 mm to 90 mm and are produced to X-life quality. A quotation drawing is available for special bearings on request.

1.4 Double row full complement cylindrical roller bearings RSL1850 without an outer ring

4 Double row full complement cylindrical roller bearings RSL1850 without an outer ring

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Double row full complement cylindrical roller bearings RSL1850 are produced without an outer ring and are comprised of solid inner rings and full complement cylindrical rolling element sets. Bearings of this series have 3 solid ribs on the inner ring. The inner ring has a central lubrication groove and lubrication holes in the central rib.

Due to the absence of a cage, the bearing can accommodate the maximum number of rolling elements. The roller set is not self-retaining. The bearing is supplied in a mounting sleeve to protect it against inadvertent disassembly.

Four row planetary bearing arrangements can be constructed from two bearings of series RSL1850 with identical bore codes. In such cases, it may be necessary to order the bearings as matched sets ➤29|13.3.

1.5 Double row full complement cylindrical roller bearings RSL with special dimensions

5 Double row full complement cylindrical roller bearings RSL with special dimensions as well as radius variant RV and washer assembly DP

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Double row full complement cylindrical roller bearings RSL with special dimensions constitute an addition to the previously available special bearings RNN. The main dimensions of the bearing form part of the bearing designation ➤22|10.

The bearings comprise solid inner rings. The radius between the end face and the bearing bore is enlarged on one side, see dimension RV ➤40|15. For cantilevered planetary bolts, a radius is therefore available to reduce the notch effect.

Double row full complement cylindrical roller bearings RSL with special dimensions RSL are consistently produced to X-life quality.

The bearings have full complement cylindrical rolling element sets. The inner rings have 3 rigid ribs. Due to the absence of a cage, the bearing can accommodate the maximum number of rolling elements.

2 Areas of application

Cylindrical roller bearings RSL are suitable for planetary gearboxes with a high power density. High transmission ratios in a compact installation space require minimally sized planetary gears. As an intern bearing arrangement, cylindrical roller bearings RSL accommodate the planetary gear in the bore on the planetary pin. In this position, the full width of the gear is available as axial installation space. Multi-row bearing arrangements derived from bearing sets with cylindrical roller bearings RSL provide maximum load carrying capacity in planetary gears with straight teeth.

2.1 Universal industrial gearboxes

The areas of application for single row bearings of design RSL18 primarily comprise industrial gearboxes for universal use. These industrial gearboxes are created as gearbox series and scaled in size. Bearings of type RSL in a dimension series system facilitate design. The interchangeability of design series RSL1830 and special design RSL1830 with cage supports the modular multiple use of planetary gears and other components.

2.2 Winch gears, slewing gears and travel gears

Planetary gearboxes are used in mobile applications as winch gears, slewing gears and travel gears, most notably for construction and mining machinery.

The gearboxes are produced in large quantities and designed to specific application and customer requirements. Optimisations in terms of mass, installation space and costs are carried out on the basis of specified load data. Scalability to other sizes is of minor importance or not necessary. Double row bearings of type RSL with special dimensions permit compact sizes. Cylindrical roller bearings RSL with special radii, suffix RV, support the planetary gear bearing arrangement for single-support planetary carriers. Larger radii reduce notch stresses in cantilevered planetary pins.

3 Load carrying capacity

Cylindrical roller bearings RSL are only capable of supporting radial forces. Axial location in the planetary gear and the axial guidance function of the planets must be ensured by means of additional design elements. Suitable options include thrust washers with retaining rings and a central rib in the planetary gear bore ➤31|13.5.

If sufficient axial installation space is available, multi-row bearing arrangements can be constructed from RSL18 bearings in order to achieve higher load carrying capacities. The load carrying capacity must be determined when constructing multi-row bearing arrangements ➤25|11.1.

4 Compensation of angular misalignments

The permissible degree of tilting between the inner ring and planetary gear raceways is influenced by the following factors:

- internal construction of the bearing
- operating clearance
- bearing load

The complex relationships involved render a general statement about absolute values impossible at this point.

The permissible guide values at which, based on experience, there is no significant reduction in operating life are as follows:

- 4' for cylindrical roller bearings RSL1810, RSL1830, special bearings RSL with cage
- 3' for cylindrical roller bearings RSL1822, RSL1823, RSL1833

No tilting is permitted for double row bearings RSL1850 and RSL with special dimensions.

5 Lubrication

Cylindrical roller bearings are not greased. They must be lubricated with oil or grease.

The lubricants used to lubricate the tooth contacts in planetary gearboxes are also used to lubricate the rolling bearings. Gearbox oil is generally used. As the lubricant in planetary gearboxes is subject to high stress, grease lubrication is only used in a few exceptional cases. For planetary bearing arrangements, the gearbox oil must fulfil the following functions:

- Form a lubricant film to adequately separate the contact surfaces and avoid wear and premature fatigue
  It is important to achieve a viscosity ratio κ that is adequate for bearing lubrication. Further information on this subject can be found in TPI 176.
  By calculating the expanded rating life L_{nm} in accordance with DIN ISO 281:2010, Appendix 4 or the adjusted reference rating life L_{nmr} in accordance with ISO/TS 16281, the effects of lubricant film formation and contamination on bearing life can be taken into account.
- Additional dissipation of heat via the oil if free convection or cooling by means of shaft fans or motor fans is not sufficient
  Immediate cooling of the oil in the planetary gearbox is achieved, among other means, through the use of water cooling covers, cooling coils or circulation cooling systems.
- Corrosion protection through wetting of the bearing surfaces
- Damping of bearing running noise

The gearbox manufacturer is responsible for lubrication design and validation. It must be ensured that oil of a sufficient quality is available to the bearing positions in sufficient quantities when designing the gearbox.

Further information

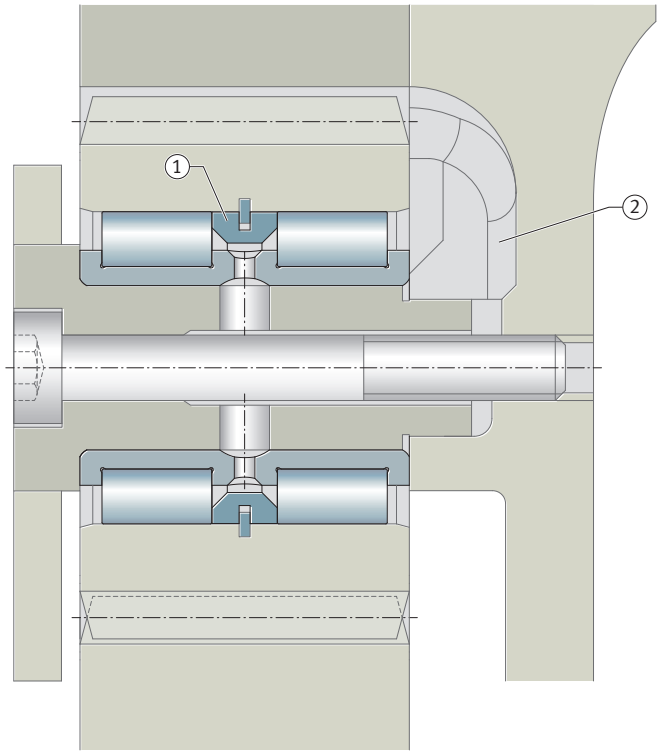
TPI 176 | Lubrication of Rolling Bearings |
https://www.schaeffler.de/std/1F83

5.1 Oil bath lubrication (sump lubrication)

If oil bath lubrication is used for the rolling bearings, the oil level should reach the centre of the lowest rolling element. If the oil level is higher than this, splashing losses may occur, which increase as a function of the speed. The oil level must be monitored as sprayed oil can cause this to drop. At higher planetary carrier speeds, a dynamic annular flow can develop. Ensuring the supply of oil to all bearings can prove difficult for the oil sump, particularly with varying gearbox installation positions. The oil thrown off the gears lubricates bearing positions that are not submerged. The oil level must be checked at regular intervals. An excessively low oil level can lead to wear as a result of lubricant starvation.

5.2 Oil injection lubrication

6 Oil injection lubrication (example)



1	Supply of oil to the rows of rolling elements via ring gap	2	Oil collector groove

During the process of immersing and circulating the planetary gears in the oil sump, oil is thrown off and used to lubricate the planetary bearings. Low fill levels with reduced splashing losses are possible. Bearings to not have to be immersed in the oil sump. Collector pockets incorporated into the design or squeeze oil holes in the planetary gears can facilitate the supply of oil.

5.3 Pressurised oil lubrication

Using oil pumps, oil is sprayed directly into the rotating planetary carriers via feeds and transported to the bearings via oil ducts in the planetary pins under centrifugal force. Low fill levels with reduced splashing losses and a simultaneously high oil flow rate are possible. The bearings do not have to be immersed in the oil sump. The additional use of forced oil cooling allows cooled lubricating oil to be transported directly to the bearing position. Wear particles can be flushed out and retained in oil filters.

6 Speeds

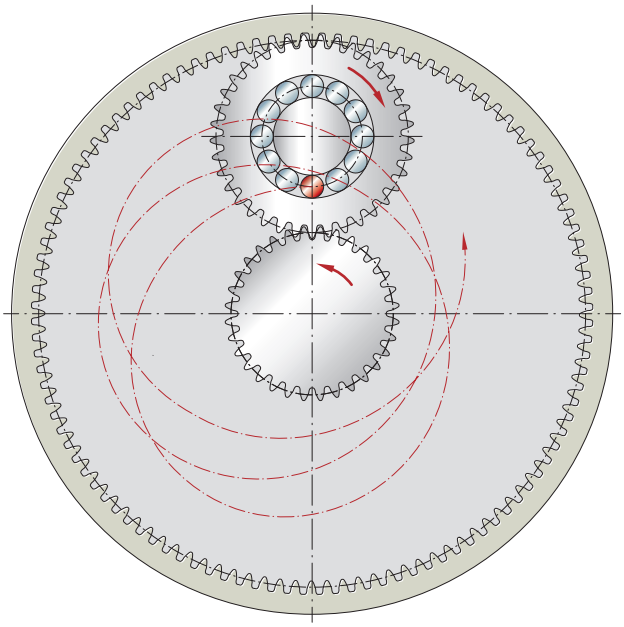
6.1 Limiting speed and thermal speed rating

The thermal speed ratings and limiting speeds listed in the product tables of other bearing catalogues apply to favourable operating conditions. However, limiting speeds and thermal speed ratings do not apply to planetary bearing arrangements exposed to high additional loads from centrifugal accelerations. There is no guarantee that the limiting speeds for basic types SL18, as listed in the catalogues and in medias, can be achieved with sufficient operational reliability using RSL18 cylindrical roller bearings without an outer ring. In practice, limiting speeds are restricted by increased bearing friction, wear resistance and cage resistance. Permissible bearing speeds are one or several orders of magnitude lower. To determine the permissible bearing speed, the permissible radial acceleration for the planetary bearings must be taken into account.

6.2 Radial acceleration in the planetary bearing

The planetary gear rolls between the sun wheel and the internal gear and is guided in a circular bath in the usual 2-shaft operation. The planetary bearing is subject to radial acceleration. This circular path is overlaid by the rolling motion of the rolling elements.

7 Trajectory of the rolling element in 2-shaft operation



6.3 Permissible radial acceleration of full complement cylindrical roller bearings RSL

In full complement cylindrical roller bearings, the loaded rolling bearings are supported on the raceways within the load zone. The unloaded bearings outside of the load zone are supported proportionally on adjacent rolling elements, depending on their position. In some rolling element positions, this

causes high inertial forces from multiple rolling elements to accumulate at the sliding contacts between the rolling elements. The high inertial forces can lead to the localised formation of high contact pressures and frictional torques, which have the following effects on the bearing kinematics:

- The rotational speed of the rolling elements within the load-free zone of the bearing is subject to greater deceleration.
- The frictional torque of the sliding motion between roller and roller and roller and raceway increases disproportionately to the rolling friction in raceway contact as the radial acceleration increases.
- Various limits can be derived for the use of RSL planetary bearings with a full complement cylindrical roller set.

Wear limit according to Potthoff

Under extreme inertial forces, wear damage can occur as a result of smearing at the opposing sliding contact between the rolling elements.

According to Pothoff, a wear limit totalling a maximum of 300 N/mm^2 of pressure at the rolling element contact in the planetary bearing was calculated for good lubrication lubrications. Schaeffler Engineering has suitable tools for calculating the permissible radial acceleration.

Thermal limit

Due to the additional mass inertial forces, the friction losses in the bearing rise as the radial acceleration increases, particularly as a result of the higher sliding components of the impaired kinematics. In contrast to full complement cylindrical roller bearings, which are not exposed to centrifugal force, bearing friction can occur that is increased by a factor of 2 or more.

Thermal calculation of the design:

The calculated coefficients of friction in accordance with DIN ISO 15312 from catalogue HR 1 may no longer be used.

Schaeffler Engineering can provide an approximate calculation of the thermally safe radial acceleration. Validation measures undertaken by the customer are required for verification.

Comparatively high oil temperatures can be encountered with full complement planetary bearing arrangements. The viscosity of the lubricant must be suitable for the higher oil temperatures.

If the operating temperatures are known, the effect of the viscosity ratio can be taken into account by calculating the expanded adjusted rating life in accordance with DIN ISO 281:2010 or ISO/TS 16281.

6.4 Permissible radial acceleration for special bearings RSL with cage

Special bearings RSL with cage are designed for higher radial accelerations. The cages are guided by the inner ring ribs. For use as planetary gear bearing arrangements, the permissible radial accelerations for cages have been calculated on the basis of strength verifications in accordance with the FKM guideline. Needle roller and cage assemblies KZK are suitable for applications involving extreme radial accelerations. They are designed for accelerations of a higher order of magnitude in a number of stages, i.e. to a power of 10, and are

used in planetary gear bearing arrangements for travel gears. Further information on needle roller and cage assemblies KZK can be found in Technical Product Information TPI 94, Needle roller and cage assemblies for crank pins and piston pins.

1 Permissible radial acceleration for special bearings RSL with cage

Cage bearing designation	Basic type RSL	Permissible radial acceleration
		g
F-683684.RN	RSL183005	180
F-683685.RN	RSL183006	236
F-683686.RN	RSL183007	305
F-683687.RN	RSL183008	250
F-683688.RN	RSL183009	230
F-680535.RN	RSL183010	211
F-683689.RN	RSL183011	149
F-683690.RN	RSL183012	141
F-683691.RN	RSL183013	135
F-680536.RN	RSL183014	119
F-680537.RN	RSL183015	131
F-680538.RN	RSL183016	108
F-683692.RN	RSL183017	117
F-680539.RN	RSL183018	94
F-687695.RN	RSL183020	92
F-687696.RN	RSL183022	100
F-687697.RN	RSL183024	135

Further information

TPI 94 | Needle roller and cage assemblies for crank pins and piston pins | https://www.schaeffler.de/std/1FD0

7 Temperature range

The following factors limit the operating temperature of the bearings:

- dimensional stabilisation of the bearing rings and rolling elements
- cage for special bearings RSL with cage
- lubricant

The permissible operating temperature for full complement cylindrical roller bearings RSL and special bearings RSL with cage is −30 °C to +120 °C.

Temperatures outside of the permissible operating temperature are only permissible in consultation with Schaeffler.

8 Dimensions, tolerances

8.1 Dimension standards

The main dimensions of cylindrical roller bearings RSL correspond to ISO 15, DIN 616:2022 and DIN 5412-1:2005.

8.2 Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620.

An overview and limiting values can be found in catalogue HR 1.

Further information

HR 1 | Rolling Bearings |
https://www.schaeffler.de/std/1D3D

8.3 Tolerances

The dimensional tolerances and running tolerances of cylindrical roller bearings RSL correspond to the tolerance class Normal in accordance with ISO 492:2023. Tolerance values to ISO 492:2023 can be found in catalogue HR 1.

A tolerance of 0/−0,1 applies to the width of the thrust washers.

Further information

HR 1 | Rolling Bearings |
https://www.schaeffler.de/std/1D3D

9 Suffixes

▦2 Suffixes

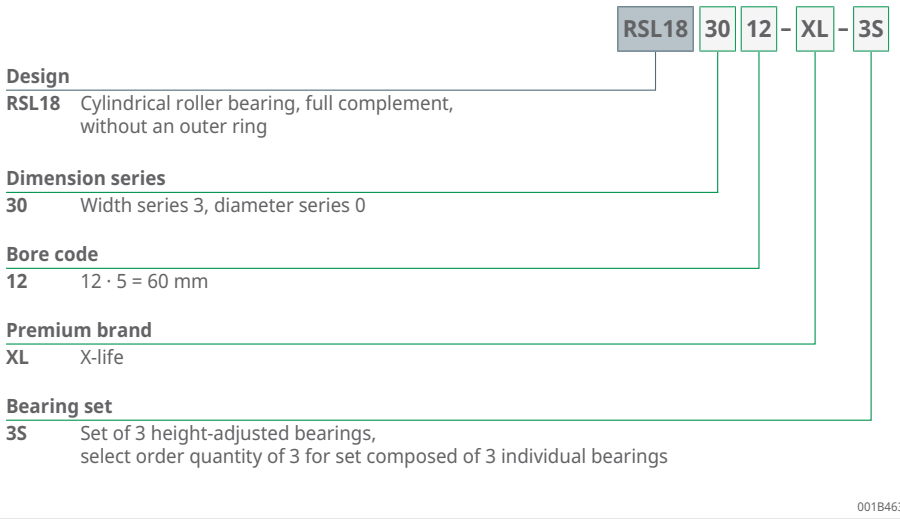
Suffix	Description	Comment
2S	Matching of bearings to bearing set composed of 2 bearings	for RSL18
3S	Matching of bearings to bearing set composed of 3 bearings	for RSL18, single row
4S	Matching of bearings to bearing set composed of 4 bearings	for RSL18, single row
A	Standard internal construction	–
BR	Black oxide coated	–
BRW	Rolling elements with black oxide coating	–
DP	Washer assembly composed of retaining ring and 2 axial washers	for double row RSL bearings with special dimensions
RV	Radius variant, special radius on one side between end face and bearing bore ➤40|15	Standard for double row RSL bearings with special dimensions for single row RSL18 bearings, dependent on bearing size
XL	X-life bearing	Standard, dependent on bearing size and bearing series

Anti-wear black oxide coating (Durotect B)

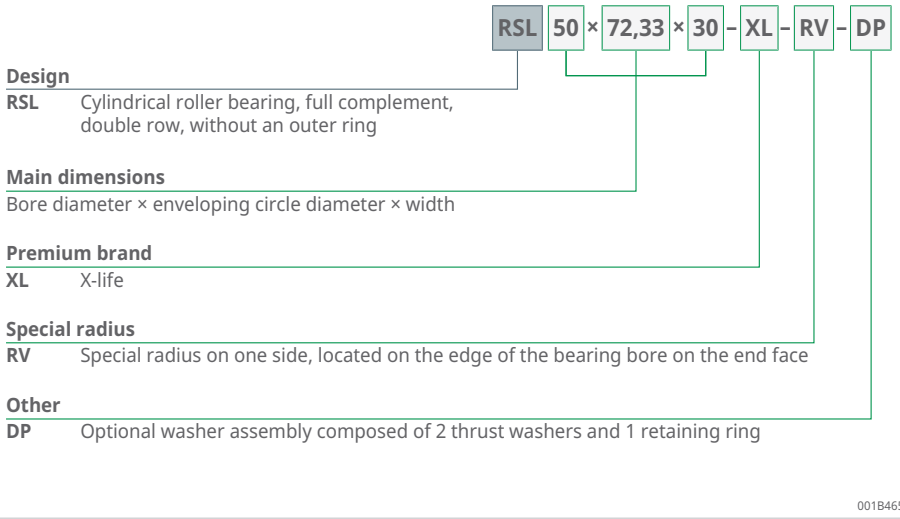
Planetary bearings with a fully complement cylindrical roller set often wear at the sliding contact between rolling elements under unfavourable operating conditions, for example at high radial accelerations or slow running speeds. The use of rollers with a black oxide coating, suffix BRW, reduces the risk of wear. Black oxide coated versions of full complement cylindrical roller bearings with the suffix BR are a widely used solution on the market.

10 Structure of the ordering designation

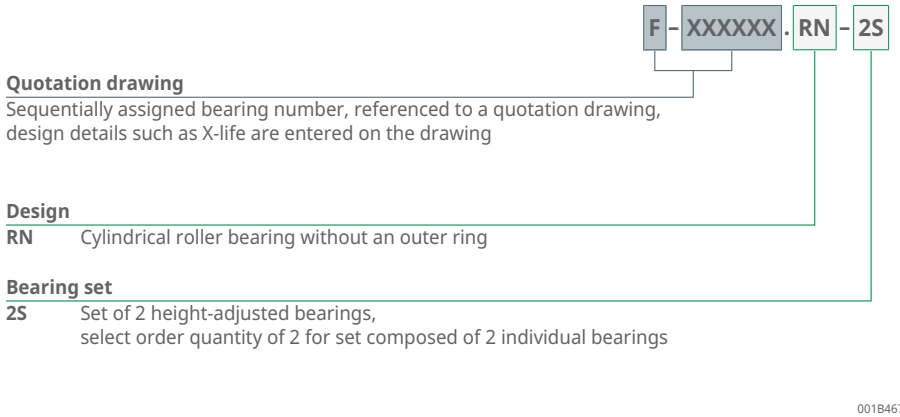
8 Structure of the ordering designation, cylindrical roller bearing RSL18



9 Structure of the ordering designation, cylindrical roller bearing RSL



10 Structure of the ordering designation, cylindrical roller bearing RSL without an outer ring, with and without a cage



11 Dimensioning

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.

The calculation of P is dependent on the load ratio F_a and F_r and the calculation factors e and Y.

𝑓⃞1 Equivalent dynamic bearing load

$$\frac{F_a}{F_r} \leq e \quad \Rightarrow \quad P = F_r$$

The axial forces occurring in planetary bearings are limited in magnitude to load axial guidance forces. A case distinction for high and low specific axial loads F_a/F_r is not required.

For cylindrical roller bearings subjected to static bearing load, the following applies:

𝑓⃞2 Equivalent static bearing load

$$P_0 = F_{0r}$$

P_0	N	Equivalent static bearing load
F_{0r}	N	Largest radial load present (maximum load)

In addition to the basic rating life L (L_{10h}), it is also necessary to check the static load safety factor S_0.

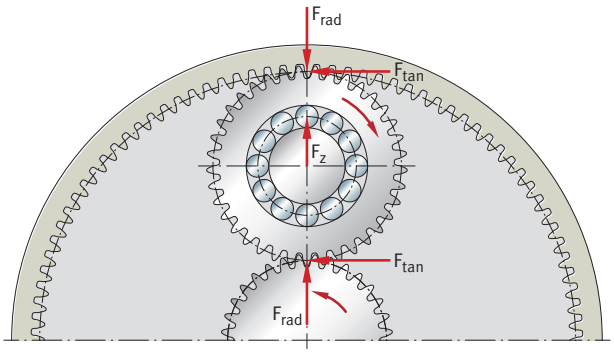
𝑓⃞3 Static load safety factor

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

S_0	–	Static load safety factor
C_0	N	Basic static load rating
P_0	N	Equivalent static bearing load

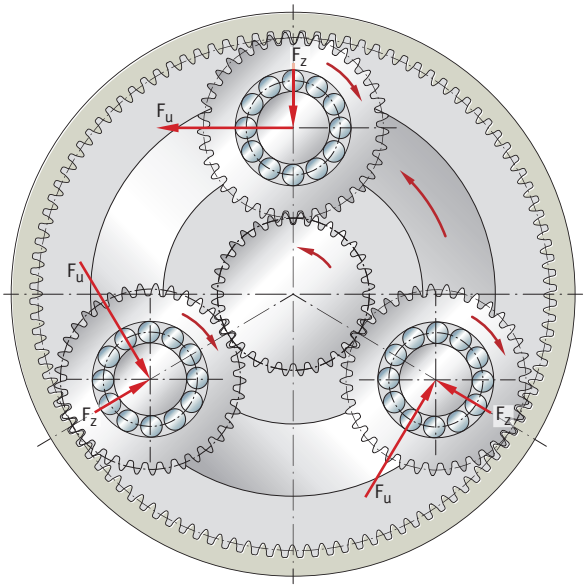
In cylindrical roller bearings RSL, the equivalent dynamic bearing load P_r is a purely radial load F_r ($P_r = F_r$). When used as a planetary wheel bearing, the radial load is the product of the gearing forces.

⧉11 Radial load caused by the gearing forces



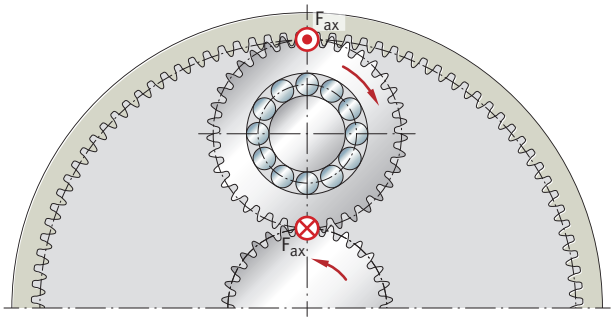
Radial gearing forces F_{rad} occurring in tooth contact with the sun wheel and internal gear largely cancel each other out.

12 Radial bearing forces at planetary stage level



Axial gearing forces F_{ax} are generated by the helical gearing. These gearing forces largely cancel each other out. Friction losses and inertial forces can give rise to low axial guidance forces. Separate axial bearings are uncommon. Axial guidance forces can be supported by cylindrical roller bearings RSL. Additional design elements must be provided on the outer ring raceway, e.g. thrust washers or shoulders in the planetary bore, in order to support these forces.

13 Gearing forces generated by helical gearing



However, axial gearing forces F_{ax} generated by helical gearing induce a tilting moment on the planetary bearing.

Tilting is encountered in particular with single-support planetary carriers and helical planetary gears. The basic rating life L_h in accordance with DIN ISO 281:2010 does not take into account the effects of tilting moments. The calculation of the adjusted reference rating life L_r in accordance with ISO/TS 16281. is recommended in particular for multi-row bearing arrangements.

The basic dynamic load rating C_r of the bearings is provided in the product tables ➤40|15. If the axial installation space is used to construct a multi-row bearing arrangement from individual bearings, a basic system load rating of the multi-row bearing arrangement can be expected.

11.1 Basic load ratings and fatigue load of multi-row bearing arrangements composed of individual bearings

Two or more cylindrical roller bearings RSL of identical size and design can be used as a single bearing location. The basic dynamic load rating C_r, basic static load rating C_{0r} and fatigue limit load C_{ur} are calculated using the following equations, in order to determine the life of the system, for example:

- $C_{r\ System} = C_{r\ Individual\ bearing} \cdot i^{(7/9)}$
- $C_{0r\ System} = i \cdot C_{0r\ Individual\ bearing}$
- $C_{ur\ System} = i \cdot C_{ur\ Individual\ bearing}$

where i = number of rows in the planetary bearing arrangement

The basic load ratings for double row cylindrical roller bearings RSL listed in the product tables were calculated as defined in DIN ISO 281:2010 using a row factor i = 2 in accordance with the above equation. The basic load ratings are reduced in comparison with a bearing arrangement consisting of 2 individual bearings, so as to factor in the statistical effects of a system life. By contrast with the design and life calculation based on individual bearings, the lower basic load ratings must be taken into account. If a four row planetary bearing arrangement is constructed from 2 double row bearings, the above equations must be modified accordingly:

$C_{r\ four\ row} = C_{r\ two\ row} \cdot 2^{(7/9)}$

Alternatively, the individual rows can be recalculated.

11.2 Bearinx-online calculation module Easy Planet

The Bearinx-online Easy Planet calculation service is available from Schaeffler for the purpose of dimensioning planetary bearings:
http://www.schaeffler.de/calculation

Single-stage and multi-stage planetary sets can be calculated using Bearinx-online.
During bearing selection based on geometry specifications, Schaeffler product databases are accessed.

Precise data are retrieved from the product databases:

- internal bearing geometry
- rolling element profiling types
- raceway profiling types

The Bearinx-online Easy Planet calculation model can be used to check that the bearing selection is appropriate for the application, taking the specified load spectrum into account.
The simple menu navigation enables rapid and simple data input for model construction, bearing selection and operating conditions.
Multiple planetary stages can be combined in the calculation. Once the data have been entered, the program displays the respective coupling of the individual planetary sets as a logical structure in a graph. The helical directions for helical gearing are also displayed.
The program loads the geometry data for the appropriate INA and FAG rolling bearings from an integrated database.

The following operating data is required to calculate a static load case or dynamic load cases:

- drive torque
- speed
- time periods
- tooth set data
- geometry of the planetary pin and planet
- lubrication data

The program uses the geometry, tooth set data and operating data to calculate the following values:

- bearing loads
- bearing speeds
- fatigue life
- static load safety factors
- contact pressures of the planetary gear bearing arrangements

The calculation result can be saved or printed for documentation.

12 Minimum load

In order to prevent slippage between the contact partners, the cylindrical roller bearings must be constantly subjected to a sufficiently high load. Based on experience, continuous operation requires a minimum radial load of the order of $P > C_{0r}/60$. In most cases, however, the radial load exceeds the requisite minimum load due to the weight of the supported parts and the external forces.

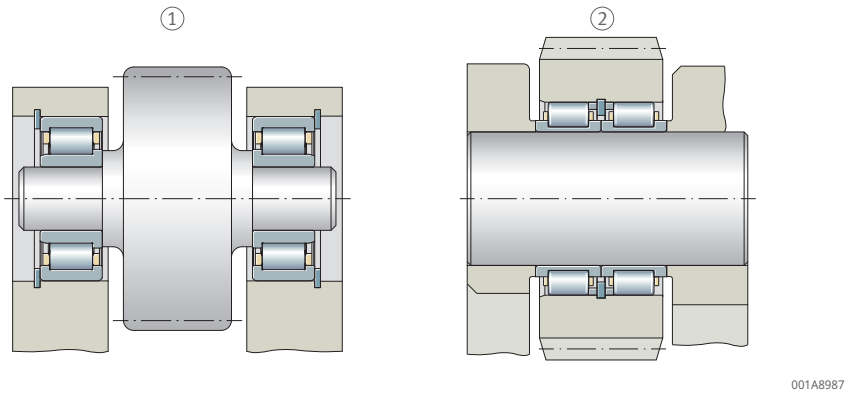
There is a risk of smearing damage in the medium to high speed range. Smearing damage is rarely encountered with planetary gear bearing arrangements in 2-shaft operation, as the planetary gear bearing arrangements are usually subjected to sufficient inertial forces. Slippage occurring in roller/roller contact in full complement cylindrical roller bearings can lead to smearing in the presence of poor lubrication or high centrifugal accelerations. The effect of external loads is of minor importance here. A suitable remedial measure is available in the form of a black oxide coating for the rings and rolling elements, suffix BR.

For a more detailed assessment of the minimum load, contact Schaeffler.

13 Design of the bearing arrangement

13.1 External bearing arrangement and internal bearing arrangement

14 External bearing arrangement and internal bearing arrangement



1	External bearing arrangement	2	Internal bearing arrangement

Cylindrical roller bearings RSL assume the role of internal bearing arrangement in the bore of the planetary gear. The generation of the outer raceway in the bore of the planetary gear permits smaller pinion diameters, which allow higher transmission ratios to be achieved in the same installation space than with the use of cylindrical roller bearings with an outer ring. With these transmission ratios, higher power densities are possible. Any corresponding creeping of the outer ring, as can occur with thin-walled planetary gears, is ruled out. A floating bearing arrangement is the simplest and most economical solution when designing the planetary bearing as an internal bearing arrangement with planetary bearings RSL.

Please observe the following sections when designing the adjacent construction.

13.2 Design of the planetary carrier

Single-support

In the single-support design, the planetary pins are in a cantilevered arrangement on one side of the planetary carrier only. For increased bending and torsional rigidity, the other end of the pin can be connected to the other pins via a ring. The single-support planetary carrier design is a simple, space-saving solution. Tilting places an additional strain on the planetary bearing arrangement here. This can lead to an unfavourable load distribution within the bearing where cylindrical roller bearings RSL are concerned due to the absorption of bending moments. Observe the catalogue recommendation on permissible tilting in the configuration to the basic rating life in accordance with DIN ISO 281:2010 ►13|4. The calculation of the fatigue life in accordance with ISO/TS 16281 allows the tilting moment load to be taken into account. The tilting moment load has a greater effect on multi-row planetary bearing arrangements. The increase in load carrying capacity provided by the additional rows of bearings is limited due to uneven load distribution. Larger transition radii are commonly used on the shoulder of the bearing seat, in order to avoid the notch effect. The transition radii reduce the bending stress on the cantilevered

planetary bin. Cylindrical roller bearings RSL are therefore produced with radius variant RV. Double row cylindrical roller bearings RSL with special dimensions also come with radius variant RV as standard. For single row bearings of design RSL18, radius variant RV is available as an option for enveloping circle diameters up to 120 mm.

Double-support

If the planetary carriers are subjected to high transverse forces such as driving forces this can disrupt both the self-centring function of the planetary gears and the distribution of load. Double-support planetary carrier designs are provided, which are supported separately on both sides in carrier bearings. As a result, the planetary bearing arrangements have lower bending moments. In addition, multi-row planetary bearing arrangements can also be used. This configuration enables better load distribution across the rows of bearings.

13.3 Multi-row bearing arrangement

Multi-row bearing arrangements can be constructed from individual RSL18 bearings or from special bearings RSL with cage, ensuring that bearings with the same designation are used. A multi-row bearing arrangement enables optimal utilisation of the axial installation space in the planetary gear to provide maximum load carrying capacity. An increased load carrying capacity over multi-row bearing arrangements requires the even distribution of load across all rows. To ensure the even distribution of load, the effects of tilting moments and the use of matched bearing sets must be taken into account.

Tilting moments

High tilting moments and pin deflections result in an uneven distribution of load across the bearing rows. The more bearing rows are used, the greater the reduction in load carrying capacity. A calculation must be carried out in accordance with ISO/TS 16281.

Sets of matched bearings

Deviations within the production tolerances for rolling bearings affecting the inside diameter and enveloping circle lead to the uneven distribution of load across the bearing rows. Depending on the arrangement and number of rows, Schaeffler recommends using sets obtained through the sorting of matched bearings.

Double row bearing arrangement

A planetary bearing arrangement composed of 2 unsorted individual bearings can only compensate for differences in height to a limited extent through tilting and deflection. If there is insufficient space between the bearings, load distribution will be impaired. Schaeffler recommends a distance of one bearing width between the bearings. If the distance between the bearings is less than one bearing width, Schaeffler recommends using sets of matched bearings ➤22|10.

Multi-row bearing arrangement with 3 or 4 rows

When constructing a multi-row planetary bearing arrangement composed of 3 or 4 individual bearings, Schaeffler recommends using sets of matched bearings. Four row bearing arrangements can be assembled from 2 bearings of series RSL1850 with the same bore code. If the distance between the bearings falls short of the minimum distance of one bearing width, Schaeffler recommends matching to a set composed of 2 matched RSL1850 series.

Multi-row bearing arrangement with more than 4 rows

Multi-row planetary bearing arrangements with more than 4 rows are unusual. A significant increase in load carrying capacity is not achieved through additional rows of bearings where uneven load distribution is present.

13.4 Radial location

In order to make full use of the bearing's load carrying capacity, the inner rings must be supported on the pin over the entire circumference. The inner rings must also be securely located in a radial direction to prevent them from creeping on the planetary pin under load. Inadequately or incorrectly located inner rings can cause severe damage to bearings and adjacent machine parts. The following points must be taken into consideration in the selection of fits:

- conditions of rotation
- magnitude of the load
- internal clearance
- temperature conditions
- materials and their coefficients of thermal expansion
- design of the planetary pins
- fitting and dismantling options

conditions of rotation

The conditions of rotation describe the motion of the bearing rings with respect to the load direction ➤58|16.

Planetary bearings RSL are designed as internal bearing arrangements for planetary gears on planetary studs. The outer raceway with gear rotates in a tangential direction relative to the tooth force and is always subject to a circumferential load with respect to the conditions of rotation. By integrating the raceway into the planetary bore, the issue of a co-rotating outer ring under circumferential load and dynamic ovalisation of the loaded planetary gear is avoided. This ovalisation is described as the band effect. The inner ring is subject to point load. A loose fit g6 is suitable for easy mounting and dismounting. For increased smooth running requirements, standard tolerance IT5 can be used for the seat.

▦3 Tolerance class of the planetary pin for point load on inner ring

Condition of rotation	Bearing type	Stud diameter	Magnitude of load	Tolerance class of the planetary pin
Point load on inner ring	Planetary bearing RSL	all	all	g6 (g5)

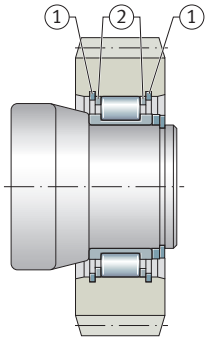
13.5 Axial location

As the loose fit does not ensure axial location of the inner ring, an additional suitable means of axial location is required in the form of shaft shoulders on studs or retaining rings. For axial guidance of the planetary gear via the floating bearing arrangement, additional design elements are required. Depending on the design of the bearing arrangement, a central rib in the planetary bore or thrust washers located by means of retaining rings are required.

Thrust washers

Thrust washers are not included in the standard scope of delivery and can be requested from Schaeffler as a separate product. The thrust washers are provided on both sides. Schaeffler recommends thrust washers that are hardened to a minimum of 56 HRC and tempered. The contact surfaces must be precision machined. Recommended dimensions can be found in the appendix ➤61 | 17. Retaining rings hold the thrust washers in place. To ensure correct bearing kinematics, the rollers must be able to move freely between the thrust washers. The minimum axial clearance value between roller and thrust washer is 0,2 mm.

15 Axial guidance and retention of the planetary gear for single row bearings RSL



1	Retaining ring	2	Thrust washer

Multi-row bearing arrangements

Floating bearing arrangements are achieved by means of a central rib in the planetary bore or in the thrust washers. In floating bearing arrangements, the thrust washers are positioned outside or between the rows of bearings. The outside position requires more axial installation space, with uncomplicated disassembly.

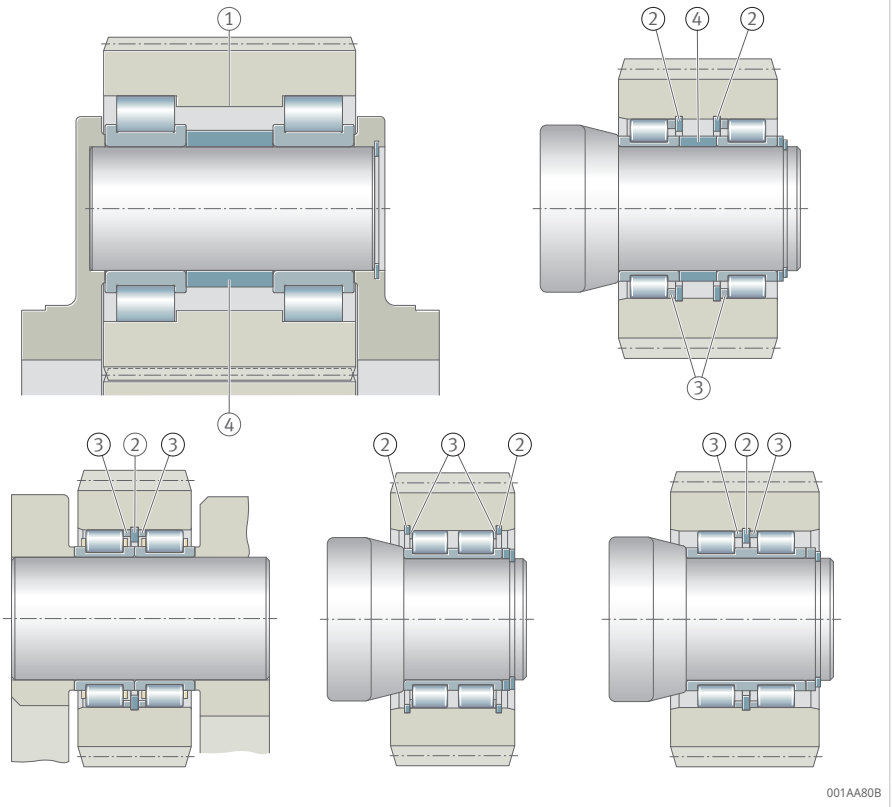
Sufficient axial clearance to the thrust washers is necessary to prevent the rollers from jamming.

Multi-row bearing arrangements with individual rings

For multi-row bearing arrangements with individual rings, the tolerance of the rib width is factored into our recommendations. The minimum axial clearance can be greater than 0,2 mm.

The maximum axial clearance from the product tables serves as the design specification for the minimum axial clearance of the gearing ➤40 | 15.

16 Axial location by means of central rib or thrust washers



1	Central rib	2	Retaining ring
3	Thrust washer	4	Intermediate ring

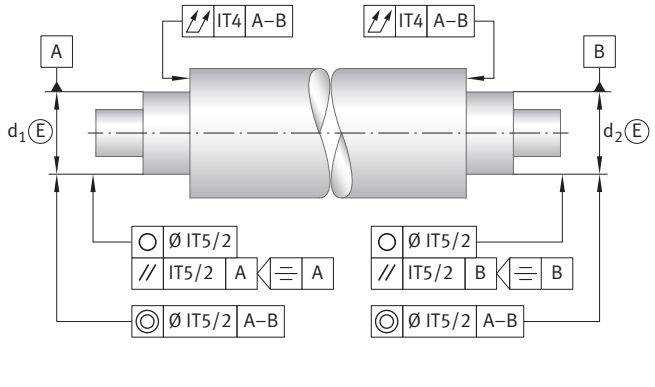
13.6 Dimensional, geometrical and positional tolerances of mating parts

Planetary bearings RSL have no outer ring. The outer raceway must be created in the form of a direct bearing arrangement in the bore of the planetary gear. The specifications that serve as a recommendation for designing the raceway are described below. These specifications are guide values. Schaeffler recommends coordinating these specifications with Schaeffler Engineering and verifying the application using suitable validation measures.

As a rolling bearing raceway, the planetary gear bore must be hardened and ground. The planetary gear bore is always wave-free, precision machined and of wear-resistant design. The specified mean roughness value Ra must not be exceeded. Various limit values are specified for standard qualities and X-life qualities.

Chamfers on both sides of the planetary gear bore facilitate mounting of the bearing. The lateral contact faces in multi-row designs must be precision machined and of wear-resistant design. Alternatively, depending on the design, thrust washers can be used.

17 Guide values for the geometrical and positional tolerances of bearing seating surfaces

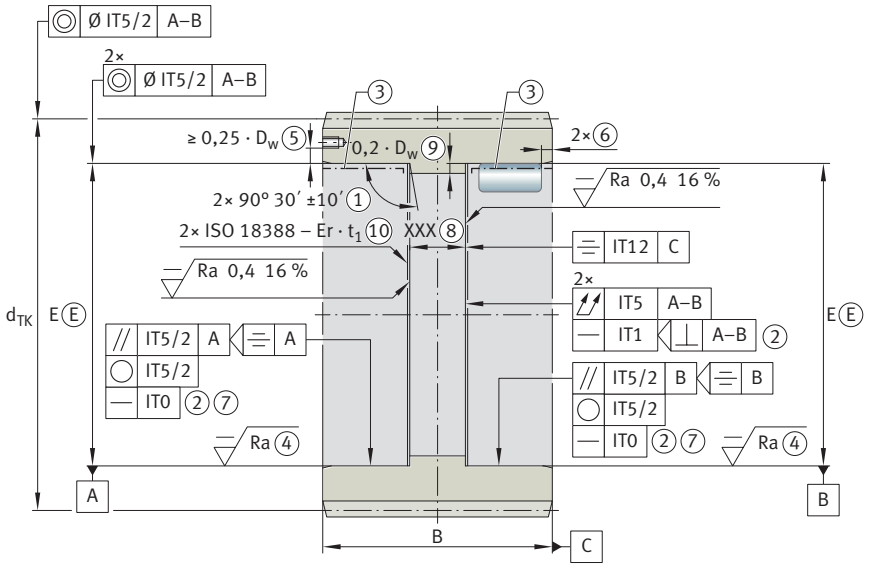


d_1	Diameter of the 1st bearing seat	d_2	Diameter of the 2nd bearing seat

Accuracy of the bearing seating surfaces and raceways

- **ISO fundamental tolerances**
  The degree of accuracy must be taken into account for the tolerances of the bearing seats on the shaft and in the housing as well as the ISO fundamental tolerances in accordance with DIN ISO 286-1:2010-11. Further information can be found in HR 1, Technical principles, Dimensional, geometrical and positional accuracy of mating parts.
- **2nd bearing seat**
  If 2 bearing seats are provided on the planetary pin, datum B describes the necessary geometrical and positional tolerances ➤33|17.

18 Geometric specification on the design of raceways in the planetary gear



1	Rib opening angle, not to scale	6	Projection of planetary gear relative to rolling element ≥ rib width, possibly smaller following consultation with Schaeffler Engineering
2	Not concave	7	Avoid running the rollers on their edges. For a continuous hole in a multi-row planetary gear raceway which is not interrupted by a central rib, IT3 applies.
3	Surface layer hardened and tempered	8	Rib width, coordinate with Schaeffler Engineering.
4	Raceway surface ➤34|▦4	9	Rib diameter tolerance ➤35|▦5
5	Distance from supporting thread	10	Description of undercut type E in accordance with DIN EN ISO 18388
D_w	Rolling element diameter	d_{TK}	Pitch circle diameter of the planetary gear
t_1	Recess depth of undercut	r	Undercut radius

Surface texture in accordance with DIN EN ISO 21920-1:2022, DIN EN ISO 21920-2:2022 and DIN EN ISO 21920-3:2022

Surface hardness of raceway in gear area (58 +4/0) HRC

4 Raceway surface texture as a function of the diameter

Diameter E_w		Mean roughness value	
Nominal size		Ra	
mm		µm	
>	≤	Standard	X-life
10	18	0,2	0,1
18	30	0,2	0,1
30	50	0,2	0,1
50	80	0,2	0,1
80	120	0,3	0,15
120	150	0,4	0,2
150	180	0,4	0,2
180	250	0,4	0,2
250	315	0,4	0,2
315	400	0,4	0,2

5 Tolerances as a function of the rib diameter

Rib diameter		Tolerance
mm		mm
over	up to	
–	80	±0,2
80	120	±0,25
120	250	±0,3
250	400	±0,4
400	630	±0,6

Further information

HR 1 | Rolling Bearings |
https://www.schaeffler.de/std/1D3D

13.7 Steels for the raceways in direct bearing arrangements

Through hardening steels

Through hardening steels in accordance with ISO 683-17, such as 100Cr6, are suitable as materials for rolling bearing raceways in direct bearing arrangements. These steels can also be surface layer hardened.

Case hardening steels

Case hardening steels must conform to DIN EN ISO 683-17, such as 17MnCr5 and 18CrNiMo7-6, or to DIN EN ISO 683-3, such as 16MnCr5.

Steels for inductive surface layer hardening

For flame and induction hardening, steels in accordance with DIN EN ISO 683-17, such as C56E2 and 43CrMo4, or in accordance with DIN 17212, such as Cf53, must be used.

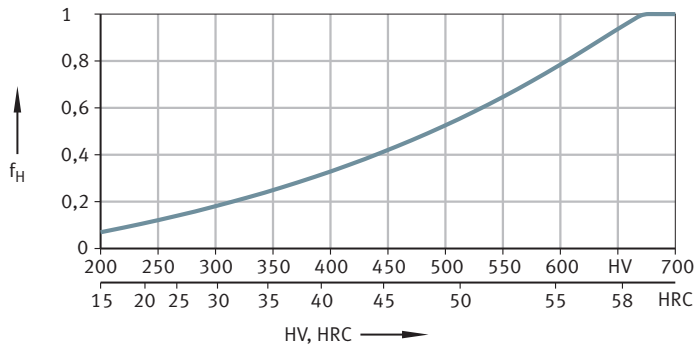
Raceway hardness of less than 670 HV

If the raceway fulfils the requirements for rolling bearing materials and the raceway hardness is less than 670 HV (58 HRC), the load on the bearing arrangement cannot be as high as the full load carrying capacity of the bearing.

In order to determine the dynamic load carrying capacity of the bearing arrangement, the basic dynamic load rating C of the bearings must be multiplied by the reduction factor f_H as the dynamic hardness factor ➤36|19.

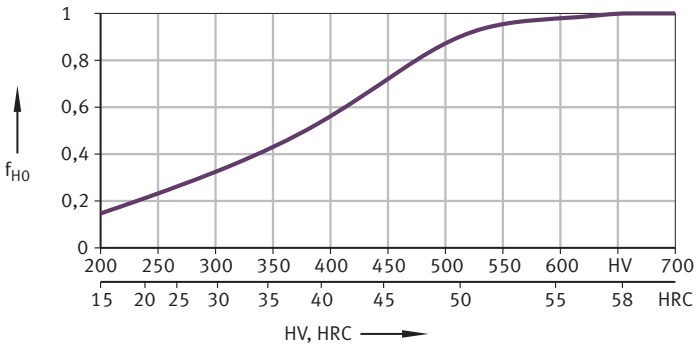
In order to determine the static load carrying capacity of the bearing arrangement, the basic static load rating C_{0r} must be multiplied by the reduction factor f_{H0} as the static hardness factor ➤36|20.

19 Dynamic hardness factor at reduced hardness of raceways and rolling elements



f_H	Dynamic hardness factor	HV, HRC	Surface hardness

20 Static hardness factor at reduced hardness of raceways and rolling elements



f_{H0}	Static hardness factor	HV, HRC	Surface hardness

Determining the case hardening depth

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. The approximation value for determining the minimum hardness depth is calculated as follows:

4 Case hardening depth

$$CHD \geqq 0{,}052 \cdot D_w$$

CHD	mm	Case hardening depth
D_w	mm	Rolling element diameter

$CHD = 0{,}04 \cdot D_w$ at dynamic pressure < 2000 MPa

The local hardness must always be above the local requisite hardness, which can be calculated from the equivalent stress.

Determining the surface hardening depth

In these surface hardening methods, the load and contact geometry must be taken into consideration when determining the requisite hardening depth.

The surface hardening depth SHD is calculated as follows:

f_{15} Surface hardening depth

$$SHD \geqq 140 \cdot D_w / R_{p0,2}$$

SHD	mm	Surface hardening depth
D_w	mm	Rolling element diameter
$R_{p0,2}$	N/mm²	Yield point of base material

13.8 internal clearance

Accuracy

The dimensional and running tolerances of the bearings correspond to tolerance class P6 in accordance with DIN 620.

The enveloping circle diameters of the bearings are given in the product tables ➤40 | 15.

Radial internal clearance

In direct bearing arrangements with cylindrical roller bearings RSL, the planetary gear fulfils the function of the outer ring with integrated raceway. The radial internal clearance (C2, CN, C3, C4) is therefore determined by the design of the planetary gear bore as a function of the enveloping circle diameter E_w of the rolling bearing (C2, CN, C3, C4) ➤40 | 15.

The internal clearance is selected on the basis of an operating clearance configured in accordance with catalogue HR 1, Technical principles, Operating clearance.

In most cases, the planetary gear heats up to a greater degree than the pin and the bearing. As a result, the increase in operating clearance is greater than the increase in internal clearance after fitting. Schaeffler recommends that the customer carry out suitable validation measures.

6 Radial internal clearance C2 and CN

Nominal bore diameter		Bore code		Tolerance for planetary gear bore		Radial internal clearance		Tolerance for planetary gear bore		Radial internal clearance	
d						C2 (group 2)				CN (group N)	
mm				µm		µm		µm		µm	
>	≤	>	≤	U	L	min.	max.	U	L	min.	max.
–	20	–	04	+15	0	0	25	+35	+20	20	45
20	30	04	06	+15	0	0	25	+35	+20	20	45
30	40	06	08	+20	+5	5	30	+40	+25	25	50
40	50	08	10	+20	+5	5	35	+45	+30	30	60
50	65	10	13	+25	+10	10	40	+55	+40	40	70
65	80	13	16	+25	+10	10	45	+55	+40	40	75
80	100	16	20	+30	+15	15	50	+65	+50	50	85
100	120	20	24	+35	+15	15	55	+70	+50	50	90
120	140	24	28	+35	+15	15	60	+80	+60	60	105
140	160	28	32	+45	+20	20	70	+95	+70	70	120
160	180	32	36	+50	+25	25	75	+100	+75	75	125
180	200	36	40	+65	+35	35	90	+120	+90	90	145
200	220	40	44	+75	+45	45	105	+135	+105	105	165
220	240	44	48	+80	+45	45	110	+145	+110	110	175

L µm Lower limit deviation
U µm Upper limit deviation

7 Radial internal clearance C3 and C4

Nominal bore diameter		Bore code		Tolerance for planetary gear bore		Radial internal clearance		Tolerance for planetary gear bore		Radial internal clearance	
d						C3 (group 3)				C4 (group 4)	
mm				µm		µm		µm		µm	
>	≤	>	≤	U	L	min.	max.	U	L	min.	max.
–	20	–	04	+50	+35	35	60	+65	+50	50	75
20	30	04	06	+50	+35	35	60	+65	+50	50	75
30	40	06	08	+60	+45	45	70	+75	+60	60	85
40	50	08	10	+65	+50	50	80	+85	+70	70	100
50	65	10	13	+75	+60	60	90	+95	+80	80	110
65	80	13	16	+80	+65	65	100	+105	+90	90	125
80	100	16	20	+90	+75	75	110	+120	+105	105	140
100	120	20	24	+105	+85	85	125	+145	+125	125	165
120	140	24	28	+120	+100	100	145	+165	+145	145	190
140	160	28	32	+140	+115	115	165	+190	+165	165	215
160	180	32	36	+145	+120	120	170	+195	+170	170	220
180	200	36	40	+170	+140	140	195	+225	+195	195	250
200	220	40	44	+190	+160	160	220	+250	+220	220	280
220	240	44	48	+205	+170	170	235	+270	+235	235	300

L µm Lower limit deviation
U µm Upper limit deviation

Further information

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https://www.schaeffler.de/std/1D3D

14 Mounting and dismounting

The mounting and dismounting options for cylindrical roller bearings RSL must be taken into consideration in the design of the bearing position. Loose fits on the pin permit easy mounting without the use of thermal or mechanical methods ➤30|13.4. As cylindrical roller bearings RSL do not have a self-retaining roller set, the mounting sleeve must be used for the fitting process. Axial location is the process of retaining cylindrical roller bearings RSL on the pin and planetary gear ➤31|13.5.

15 Product tables

15.1 Explanations

B	mm	Width of inner ring
B_{AS}	mm	Width of thrust washer
C_{0r}	N	Basic static load rating, radial
C_r	N	Basic dynamic load rating, radial
C_{ur}	N	Fatigue limit load, radial
d	mm	Bore diameter
d_1	mm	Inner ring rib diameter
d_a	mm	Abutment diameter of shaft shoulder
$D_{AS\ max}$	mm	Max. outside diameter of thrust washer
E_w	mm	Outer enveloping circle diameter
m	kg	Mass
r	mm	Chamfer dimension
RV	mm	Edge radius, optional
s_{min}	mm	Min. axial clearance
X	mm	Auxiliary dimension for configuring the axial clearance

For individual bearings, the distance B_a between the thrust washers is:
$B_a = X + 2 \cdot B_{AS} + s_{min}$

For multi-row bearings constructed from individual bearings, the distance B_a between the thrust washers is:
$B_a = X + B + 2 \cdot B_{AS} + s_{min}$

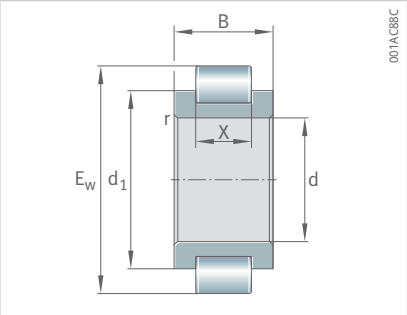
The value B_a increases accordingly if the individual bearings are installed at a distance from one another ➤61|17.

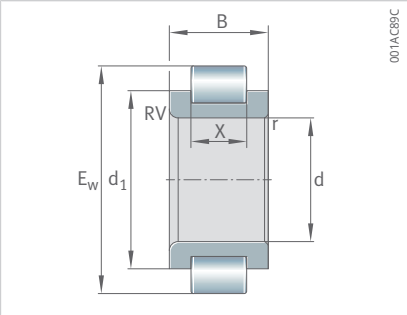
B_{AS} is toleranced at (0/−0,1). $D_{AS\ max}$ have clearance to the dimension E_w.

15.2 Cylindrical roller bearings RSL18 without an outer ring

Full complement

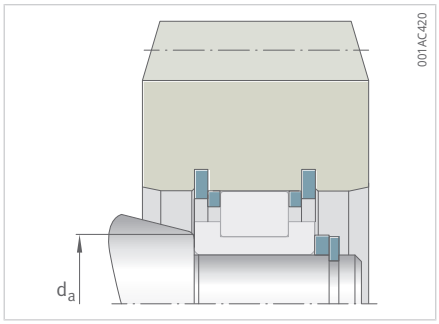
Single row



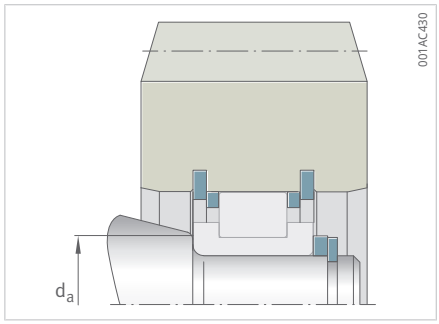


With special radius, RSL18..-RV

Designation	d	E_w	B	X min.	r min.	RV
	mm	mm	mm	mm	mm	mm
RSL183003-XL	13	27,15	13	8	0,3	–
RSL183003-XL-RV	13	27,15	13	8	0,3	2,30
RSL1830/17-XL	17	27,15	14	8	0,3	–
RSL1830/17-XL-RV	17	27,15	14	8	0,3	2,30
RSL182204-XL	20	41,47	18	12	1	–
RSL182204-XL-RV	20	41,47	18	12	1	2,75
RSL183004-XL	20	36,81	16	9	0,6	–
RSL183004-XL-RV	20	36,81	16	9	0,6	3,00
RSL183305-XL	25	53,72	28	19	1,1	–
RSL183305-XL-RV	25	53,72	28	19	1,1	4,00
RSL181005-XL	25	42,51	12	6	0,6	–
RSL181005-XL-RV	25	42,51	12	6	0,6	2,75
RSL183005-XL	25	42,51	16	9	0,6	–
RSL183005-XL-RV	25	42,51	16	9	0,6	3,00
RSL182205-XL	25	46,52	18	12	1,1	–
RSL182205-XL-RV	25	46,52	18	12	1,1	2,75
RSL182305-XL	25	53,72	24	15	1,1	–
RSL182305-XL-RV	25	53,72	24	15	1,1	4,00
RSL181006-XL	30	49,6	13	7	1	–
RSL181006-XL-RV	30	49,6	13	7	1	2,75
RSL183006-XL	30	49,6	19	10	1	–
RSL183006-XL-RV	30	49,6	19	10	1	3,50
RSL182206-XL	30	55,19	20	14	1	–
RSL182206-XL-RV	30	55,19	20	14	1	2,75
RSL182306-XL	30	62,3	27	18	1,1	–
RSL182306-XL-RV	30	62,3	27	18	1,1	4,00
RSL183306-XL	30	62,3	30,2	21	1,1	–
RSL183306-XL-RV	30	62,3	30,2	21	1,1	4,00
RSL183007-XL	35	55,52	20	11	1	–
RSL183007-XL-RV	35	55,52	20	11	1	3,50
RSL182207-XL	35	63,97	23	15	1,1	–
RSL182207-XL-RV	35	63,97	23	15	1,1	3,50
RSL182307-XL	35	72,68	31	20	1,5	–
RSL182307-XL-RV	35	72,68	31	20	1,5	5,00
RSL183307-XL	35	72,68	34,9	22	1,5	–
RSL183307-XL-RV	35	72,68	34,9	22	1,5	5,00
RSL183008-XL	40	61,74	21	12	1	–
RSL183008-XL-RV	40	61,74	21	12	1	3,50
RSL182208-XL	40	70,94	23	15	1,1	–
RSL182208-XL-RV	40	70,94	23	15	1,1	3,50



Mounting dimension on shaft



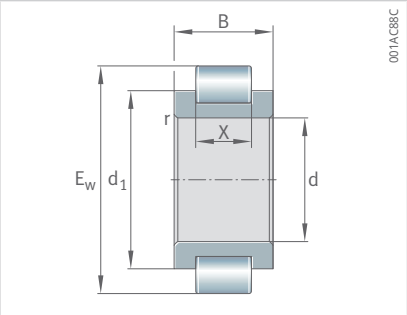
Mounting dimension on shaft

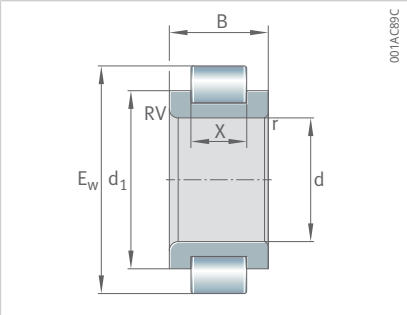
d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
22,9	22,9	18400	16100	2850	0,03
22,9	22,9	18400	16100	2850	0,03
24,4	24,4	23400	19600	3300	0,04
24,4	24,4	23400	19600	3300	0,04
30,3	30,3	45500	37000	6200	0,1
30,3	30,3	45500	37000	6200	0,1
28,8	28,8	30500	26000	4550	0,06
28,8	28,8	30500	26000	4550	0,06
36,7	36,7	89000	76000	12900	0,26
36,7	36,7	89000	76000	12900	0,26
34,6	34,6	26600	19300	3500	0,06
34,6	34,6	26600	19300	3500	0,06
34,6	34,6	35000	32000	5600	0,08
34,6	34,6	35000	32000	5600	0,08
35,3	35,3	51000	44500	7500	0,12
53,3	53,3	51000	44500	7500	0,12
34,6	34,5	73000	59000	9600	0,21
34,6	34,6	73000	59000	9600	0,21
40	40	32500	27500	4900	0,08
40	40	32500	27500	4900	0,06
40	40	45000	42000	7600	0,12
40	40	45000	42000	7600	0,12
42	42	70000	64000	10400	0,19
42	42	70000	64000	10400	0,19
44,3	44,3	100000	87000	14800	0,34
44,3	44,3	100000	87000	14800	0,34
43,3	43,3	114000	102000	6800	0,37
43,3	43,3	114000	102000	6800	0,37
44,9	44,9	55000	53000	9600	0,15
44,9	44,9	55000	53000	9600	0,15
47	47	88000	78000	12900	0,27
47	47	88000	78000	12900	0,27
50,7	50,7	126000	110000	20500	0,5
50,7	50,7	126000	110000	20500	0,5
50,3	50,3	136000	122000	5800	0,55
50,3	50,3	136000	122000	5800	0,55
50,5	50,5	66000	67000	11400	0,2
50,5	50,5	66000	67000	11400	0,2
54	54	97000	91000	15200	0,34
54	54	97000	91000	15200	0,34

15.2 Cylindrical roller bearings RSL18 without an outer ring

Full complement

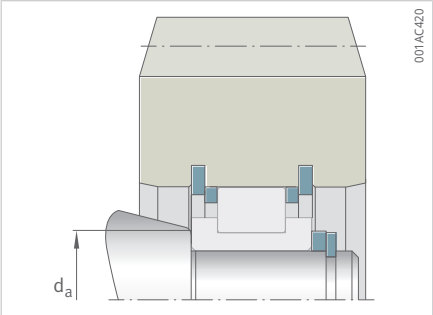
Single row



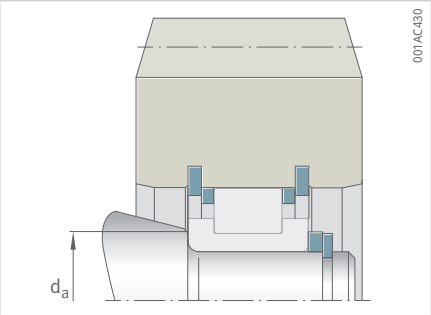


With special radius, RSL18..-RV

Designation	d	E_w	B	X min.	r min.	RV
	mm	mm	mm	mm	mm	mm
RSL182308-XL	40	83,12	33	24	1,5	–
RSL182308-XL-RV	40	83,12	33	24	1,5	4,00
RSL183308-XL	40	83,12	36,5	27	1,5	–
RSL183308-XL-RV	40	83,12	36,5	27	1,5	4,50
RSL183009-XL	45	66,85	23	12	1	–
RSL183009-XL-RV	45	66,85	23	12	1	4,00
RSL182209-XL	45	74,43	23	15	1,1	–
RSL182209-XL-RV	45	74,43	23	15	1,1	3,50
RSL182309-XL	45	88,32	36	24	1,5	–
RSL182309-XL-RV	45	88,32	36	24	1,5	5,00
RSL183309-XL	45	88,32	39,7	27	1,5	–
RSL183309-XL-RV	45	88,32	39,7	27	1,5	5,00
RSL183010-XL	50	72,33	23	14	1	–
RSL183010-XL-RV	50	72,33	23	14	1	3,00
RSL182210-XL	50	81,4	23	15	1,1	–
RSL182210-XL-RV	50	81,4	23	15	1,1	3,50
RSL182310-XL	50	98,72	40	28	2	–
RSL182310-XL-RV	50	98,72	40	28	2	5,00
RSL183310-XL	50	98,72	44,4	32	2	–
RSL183310-XL-RV	50	98,72	44,4	32	2	5,00
RSL183011-XL	55	83,54	26	17	1,1	–
RSL183011-XL-RV	55	83,54	26	17	1,1	4,00
RSL182211-XL	55	88,81	25	18	1,5	–
RSL182211-XL-RV	55	88,81	25	18	1,5	3,00
RSL182311-XL	55	109,11	43	30	2	–
RSL182311-XL-RV	55	109,11	43	30	2	5,00
RSL183012-XL	60	86,74	26	17	1,1	–
RSL183012-XL-RV	60	86,74	26	17	1,1	4,00
RSL182212-XL	60	99,17	28	14	1,5	–
RSL182212-XL-RV	60	99,17	28	20	1,5	3,50
RSL182312-XL	60	115,62	46	30	2	–
RSL182312-XL-RV	60	115,62	46	30	2	7,00
RSL183013-XL	65	93,09	26	17	1,1	–
RSL183013-XL-RV	65	93,09	26	17	1,1	4,00
RSL182213-XL	65	106,25	31	22	1,5	–
RSL182213-XL-RV	65	106,25	31	22	1,5	4,00
RSL182313-A	65	126,69	48	22	2,1	–
RSL183014-XL	70	100,28	30	18	1,1	–
RSL183014-XL-RV	70	100,28	30	18	1,1	4,00
RSL182214-XL	70	111,01	31	22	1,5	–



Mounting dimension on shaft



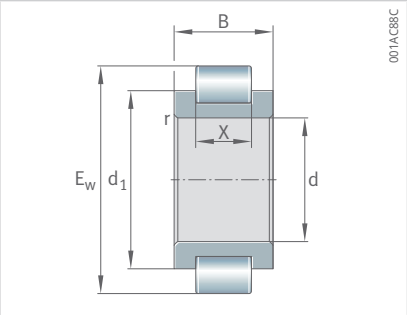
Mounting dimension on shaft

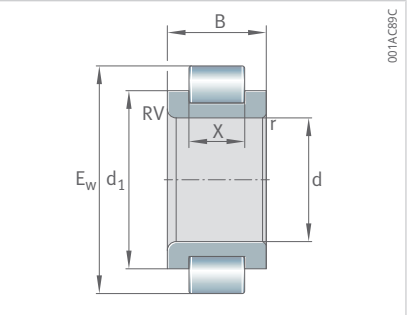
d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
50,5	50,5	170000	153000	29000	0,74
50,5	50,5	170000	153000	29000	0,74
57,1	57,1	187000	153000	33000	0,82
57,1	57,1	187000	153000	33000	0,82
55,3	55,3	70000	74000	12700	0,23
55,3	55,3	70000	74000	12700	0,23
57,5	57,5	101000	98000	16300	0,34
57,5	57,5	101000	98000	16300	0,34
61,1	61,1	181000	163000	30500	0,81
61,1	61,1	181000	163000	30500	0,81
62,3	62,3	199000	192000	36500	0,93
62,3	62,3	199000	192000	36500	0,93
59,1	59,1	88000	94000	15300	0,25
59,1	59,1	88000	94000	15300	0,25
64,4	64,4	109000	111000	18500	0,41
64,4	64,4	109000	111000	18500	0,41
68,3	68,3	232000	215000	41000	1,17
68,3	68,3	232000	215000	41000	1,17
68,3	68,3	260000	248000	47500	1,32
68,3	68,3	260000	248000	47500	1,32
68,5	68,5	120000	136000	23000	0,45
68,5	68,5	120000	136000	23000	0,45
70	70	140000	148000	25500	0,54
70	70	140000	148000	25500	0,54
75,5	75,5	270000	250000	48500	1,57
75,5	75,5	270000	250000	48500	1,57
71,1	71,1	123000	143000	24100	0,43
71,1	71,1	123000	143000	24100	0,43
76,8	76,8	169000	176000	33000	0,76
76,8	76,8	169000	176000	33000	0,76
71,7	71,7	285000	275000	53000	1,78
71,7	71,7	285000	275000	53000	1,78
78,1	78,1	130000	157000	26500	0,5
78,1	78,1	130000	157000	26500	0,5
82,3	82,3	198000	210000	39500	0,95
82,3	82,3	198000	210000	39500	0,95
90	90	310000	345000	55000	2,36
81,5	81,5	153000	174000	30000	0,6
81,5	81,5	153000	174000	30000	0,6
87	87	205000	223000	42000	0,98

15.2 Cylindrical roller bearings RSL18 without an outer ring

Full complement

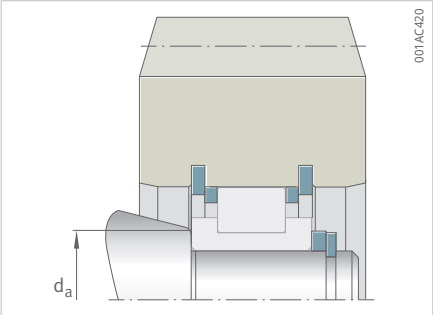
Single row



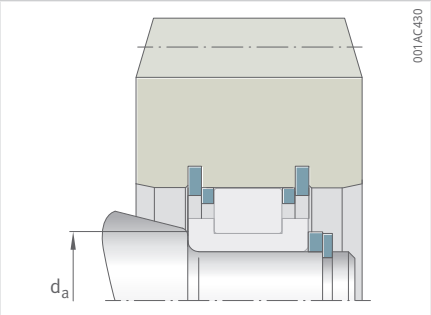


With special radius, RSL18..-RV

Designation	d	E_w	B	X min.	r min.	RV
	mm	mm	mm	mm	mm	mm
RSL182214-XL-RV	70	111,01	31	22	1,5	4,00
RSL182314-A	70	132,14	51	36	2,1	–
RSL183015-XL	75	107,9	30	18	1,1	–
RSL183015-XL-RV	75	107,9	30	18	1,1	5,00
RSL182215-XL	75	115,78	31	22	1,5	–
RSL182215-XL-RV	75	115,78	31	22	1,5	4,00
RSL182315-A	75	143,22	55	40	2,1	–
RSL183016-XL	80	116,99	34	20	1,1	–
RSL183016-XL-RV	80	116,99	34	20	1,1	5,50
RSL182216-A	80	125,81	33	24	2	–
RSL182316-A	80	154,24	58	44	2,1	–
RSL183017-A	85	121,44	34	20	1,1	–
RSL182217-A	85	133,21	36	26	2	–
RSL182317-A	85	163,01	60	44	3	–
RSL183018-A	90	130,11	37	22	1,5	–
RSL182218-A	90	140,61	40	28	2	–
RSL182318-A	90	165,26	64	48	3	–
RSL183020-A	100	139,65	37	22	1,5	–
RSL182320-A	100	187,3	73	55	3	–
RSL182220-A	100	162,81	46	34	2,1	–
RSL182322-A	110	218,27	80	56	3	–
RSL183022-A	110	156,13	45	26	2	–
RSL182222-A	110	177	53	36	2,1	–
RSL183024-A	120	167,58	46	26	2	–
RSL182224-A	120	192,32	58	40	2,1	–
RSL183026-A	130	183,81	52	34	2	–
RSL182226-A	130	192,32	64	44	3	–
RSL182326-A	130	247,9	93	68	4	–
RSL182228-TB	140	221,12	68	48	3	–
RSL182328-A	140	264,45	102	72	4	–
RSL183030-A	150	206,8	56	34	2,1	–
RSL182330-A	150	286,49	108	80	4	–
RSL183032-A	160	224,8	60	36	2,1	–
RSL183034-A	170	242,85	67	44	2,1	–



Mounting dimension on shaft



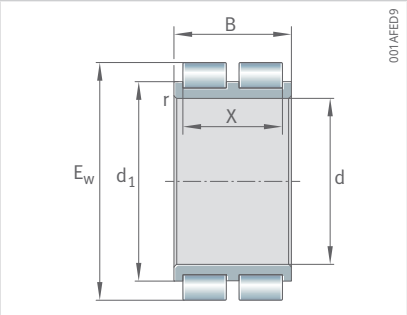
Mounting dimension on shaft

d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
87	87	205000	223000	42000	0,98
94	94	340000	385000	60000	2,63
89	89	162000	192000	33000	0,73
89	89	162000	192000	33000	0,73
91,8	91,8	212000	236000	44500	1,03
91,8	91,8	212000	236000	44500	1,03
102	102	405000	465000	72000	3,43
95	95	193000	220000	41500	0,97
95	95	193000	220000	41500	0,97
98,5	98,5	223000	280000	41500	1,33
110	110	475000	560000	82000	4,33
99,5	99,5	175000	231000	34500	1
104,5	104,5	255000	320000	47500	1,61
118,2	118	500000	610000	88000	4,58
106,5	106,5	205000	275000	41000	1,28
110	110	285000	365000	54000	1,96
117,5	117,5	550000	650000	96000	5,15
116	116	216000	300000	43500	1,38
133	133	700000	850000	122000	7,75
127,5	127,5	390000	510000	74000	3,35
151,5	151,5	840000	970000	133000	11,5
127,5	127,5	280000	385000	55000	2,09
137	137	450000	580000	83000	4,22
139	139	295000	425000	59000	2,41
151	151	530000	720000	100000	5,57
149	149	425000	600000	84000	3,45
162,3	162,3	620000	850000	115000	7,08
176	176	1110000	1380000	184000	17,4
174	174	720000	1000000	134000	8,6
187,5	187,5	1250000	1570000	205000	21,1
170,5	170,5	475000	700000	93000	4,41
203,3	203,3	1490000	1900000	220000	27,2
185	185	540000	800000	105000	5,82
198,1	198,1	700000	1050000	135000	8,3

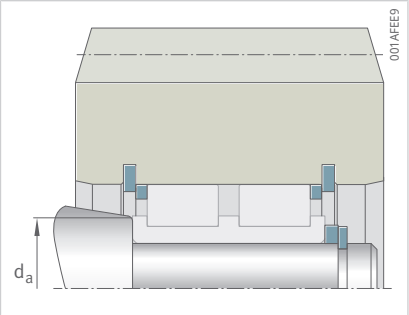
15.3 Cylindrical roller bearings RSL1850 without an outer ring

Full complement

Double row

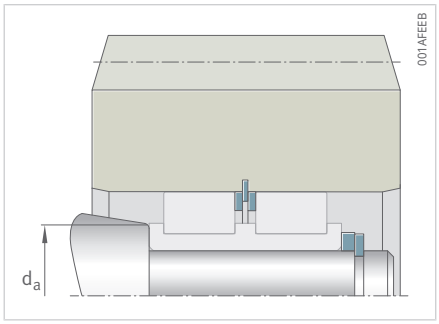


Double row bearings in standard design

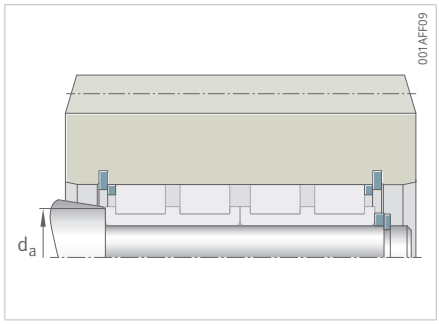


Mounting dimension on shaft

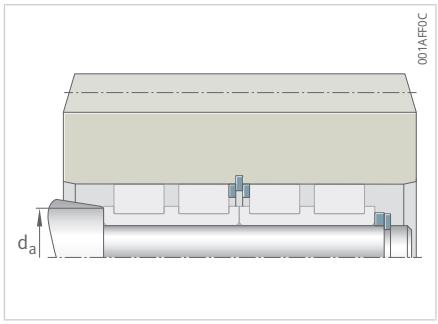
Designation	d	E_w	B	X min.	r min.
	mm	mm	mm	mm	mm
RSL185005	25	42,51	30	23	0,6
RSL185006	30	49,6	34	26	1
RSL185007	35	55,52	36	28	1
RSL185008	40	61,74	38	30	1
RSL185009	45	66,85	40	30	1
RSL185010	50	72,33	40	33	1
RSL185011	55	83,54	46	39	1,1
RSL185012	60	86,74	46	39	1,1
RSL185013	65	93,09	46	39	1,1
RSL185014	70	100,28	54	42	1,1
RSL185015	75	107,9	54	42	1,1
RSL185016	80	116,99	60	47	1,1
RSL185017	85	121,44	60	47	1,1
RSL185018	90	130,11	67	52	1,5
RSL185020	100	139,65	67	52	1,5
RSL185022	110	156,13	80	62	2
RSL185024	120	167,58	80	62	2
RSL185026	130	183,81	95	78	2
RSL185030	150	206,8	100	80	2,1
RSL185032	160	224,8	109	86	2,1
RSL185034-XL	170	242,85	122	100	2,1
RSL185034	170	242,85	122	100	2,1



Mounting dimension on shaft



Mounting dimension on shaft



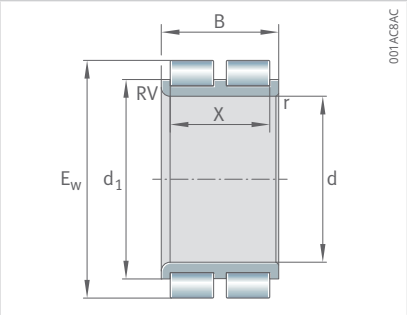
Mounting dimension on shaft

d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
34,5	34,5	53000	64000	9100	0,15
40	40	69000	84000	12300	0,22
44,9	44,9	83000	107000	15600	0,28
50,5	50,5	100000	133000	18400	0,35
55,3	55,5	106000	148000	20500	0,42
59,1	59,5	134000	188000	24800	0,46
68,5	68,5	182000	275000	37000	0,86
71,7	71,5	187000	285000	39000	0,79
78,1	78	197000	315000	43000	0,94
81,5	81,5	233000	350000	48500	1,12
89	89	245000	385000	54000	1,46
95	95	290000	440000	66000	1,84
99	99,5	300000	465000	69000	1,9
106,1	106,5	350000	550000	82000	2,48
115,7	116	370000	600000	87000	2,6
127,3	128	485000	770000	111000	3,95
138,8	139	510000	850000	119000	4,55
148,6	149	730000	1210000	167000	6,7
170	170,5	810000	1390000	186000	8,2
184,8	185	930000	1610000	210000	11
198,1	198,5	1360000	2110000	330000	15,6
198,1	198,5	1200000	2110000	270000	15,6

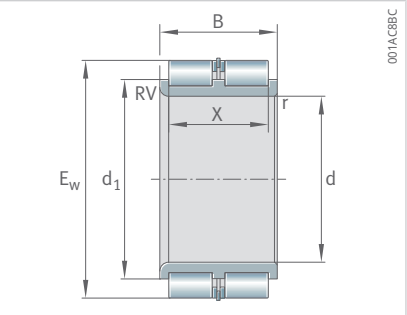
15.4 Cylindrical roller bearings RSL without an outer ring

Full complement

Double row

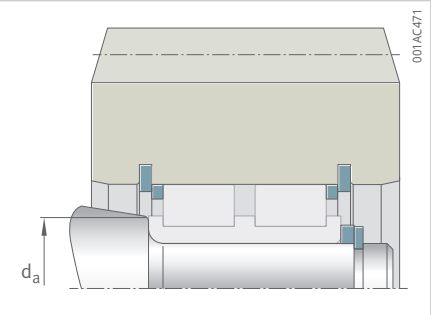


With special radius, RSL..-RV

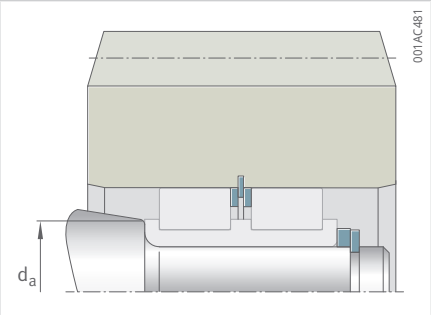


With special radius and washer assembly, RSL..-RV-DP

Designation	d	E_w	B	X min.	r min.	RV
	mm	mm	mm	mm	mm	mm
RSL20×32,17×23-XL-RV	20	32,17	23	17,2	0,3	2,50
RSL20×32,17×23-XL-RV-DP	20	32,17	23	17,2	0,3	2,50
RSL20×36,81×30-XL-RV	20	36,81	30	19	0,6	2,30
RSL20×36,81×30-XL-RV-DP	20	36,81	30	19	0,6	2,30
RSL22×35,5×24,5-XL-RV	22	35,5	24,5	19	0,3	2,20
RSL22×35,5×24,5-XL-RV-DP	22	35,5	24,5	19	0,3	2,20
RSL22×35,5×28-XL-RV	22	35,5	28	23	0,3	2,30
RSL22×35,5×28-XL-RV-DP	22	35,5	28	23	0,3	2,30
RSL22×38,75×22,5-XL-RV	22	38,75	22,5	17,2	0,6	2,40
RSL22×38,75×22,5-XL-RV-DP	22	38,75	22,5	17,2	0,6	2,40
RSL25×38,58×24,5-XL-RV	25	38,58	24,5	19,2	0,3	2,30
RSL25×38,58×24,5-XL-RV-DP	25	38,58	24,5	19,2	0,3	2,30
RSL25×38,58×30-XL-RV	25	38,58	30	23,2	0,3	3,00
RSL25×38,58×30-XL-RV-DP	25	38,58	30	23,2	0,3	3,00
RSL25×42,51×24-XL-RV	25	42,51	24	17	0,6	3,00
RSL25×42,51×24-XL-RV-DP	25	42,51	24	17	0,6	3,00
RSL25×42,51×30-XL-RV	25	42,51	23	23	0,6	3,00
RSL25×42,51×30-XL-RV-DP	25	42,51	23	23	0,6	3,00
RSL30×43,5×24,5-XL-RV	30	43,5	24,5	19,2	0,3	2,30
RSL30×43,5×24,5-XL-RV-DP	30	43,5	24,5	19,2	0,3	2,30
RSL30×43,5×30-XL-RV	30	43,5	30	23,2	0,3	3,00
RSL30×43,5×30-XL-RV-DP	30	43,5	30	23,2	0,3	3,00
RSL30×49,6×25-XL-RV	30	49,6	25	19,3	1	2,50
RSL30×49,6×25-XL-RV-DP	30	49,6	25	19,3	1	2,50
RSL30×49,6×32-XL-RV	30	49,6	32	25,3	1	3,00
RSL30×49,6×32-XL-RV-DP	30	49,6	32	25,3	1	3,00
RSL35×49,72×28-XL-RV	35	49,72	28	21,3	0,6	3,00
RSL35×49,72×28-XL-RV-DP	35	49,72	28	21,3	0,6	3,00
RSL35×49,72×36-XL-RV	35	49,72	36	29,3	0,6	2,75
RSL35×49,72×36-XL-RV-DP	35	49,72	36	29,3	0,6	2,75
RSL35×55,52×27-XL-RV	35	55,52	27	20,2	1	3,00
RSL35×55,52×27-XL-RV-DP	35	55,52	27	20,2	1	3,00
RSL35×55,52×34-XL-RV	35	55,52	34	27,2	1	3,00
RSL35×55,52×34-XL-RV-DP	35	55,52	34	27,2	1	3,00
RSL40×56,09×28-XL-RV	40	56,09	28	21	0,6	3,00
RSL40×56,09×28-XL-RV-DP	40	56,09	28	21	0,6	3,00
RSL40×56,09×36-XL-RV	40	56,09	36	29	0,6	3,00
RSL40×56,09×36-XL-RV-DP	40	56,09	36	29	0,6	3,00
RSL40×61,74×28-XL-RV	40	61,74	28	21	1	3,00
RSL40×61,74×28-XL-RV-DP	40	61,74	28	21	1	3,00



Mounting dimension on shaft



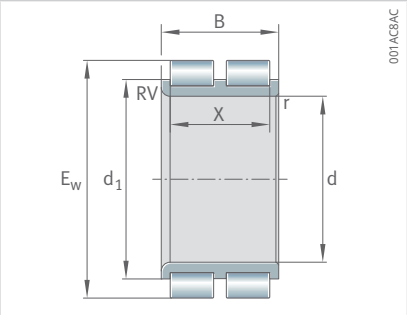
Mounting dimension on shaft

d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
27,87	27,5	30500	32500	5600	0,06
27,87	27,5	30500	32500	5600	0,06
29,2	28,5	53000	52000	9100	0,12
29,2	28,5	53000	52000	9100	0,12
29,2	29	40500	41000	6800	0,08
29,2	29	40500	41000	6800	0,08
29,2	29	51000	55000	9500	0,09
29,2	29	51000	55000	9500	0,09
30,85	30,5	37000	33500	6100	0,09
30,85	30,5	37000	33500	6100	0,09
32,28	32	43000	46500	7700	0,09
32,28	32	43000	46500	7700	0,09
32,28	32	54000	62000	10700	0,11
32,28	32	54000	62000	10700	0,11
34,61	34,5	40500	38500	7000	0,12
34,61	34,5	40500	38500	7000	0,12
34,61	34,5	60000	64000	11300	0,15
34,61	34,5	60000	64000	11300	0,15
37,2	37	47000	54000	9000	0,1
37,2	37	47000	54000	9000	0,1
37,2	37	59000	73000	12600	0,13
37,2	37	59000	73000	12600	0,13
40	40	56000	55000	9800	0,16
40	40	56000	55000	9800	0,16
40	40	78000	84000	15200	0,21
40	40	78000	84000	15200	0,21
43,42	43	59000	76000	12900	0,15
43,42	43	59000	76000	12900	0,15
43,42	43	84000	119000	20500	0,2
43,42	43	84000	119000	20500	0,2
44,92	44,5	66000	68000	12000	0,2
44,92	44,5	66000	68000	12000	0,2
44,92	44,5	94000	107000	19200	0,27
44,92	44,5	94000	107000	19200	0,27
49,79	49,5	64000	88000	14900	0,2
49,79	49,5	64000	88000	14900	0,2
49,79	49,5	91000	138000	23800	0,26
49,79	49,5	91000	138000	23800	0,26
50,54	50,5	78000	83000	14900	0,25
50,54	50,5	78000	83000	14900	0,25

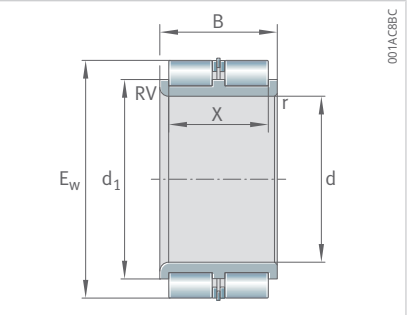
15.4 Cylindrical roller bearings RSL without an outer ring

Full complement

Double row

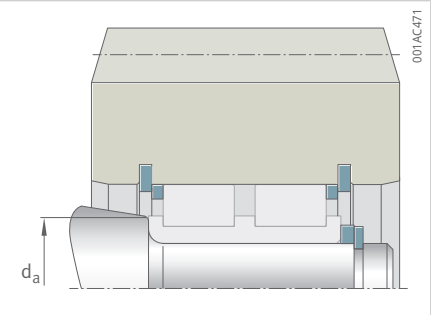


With special radius, RSL..-RV

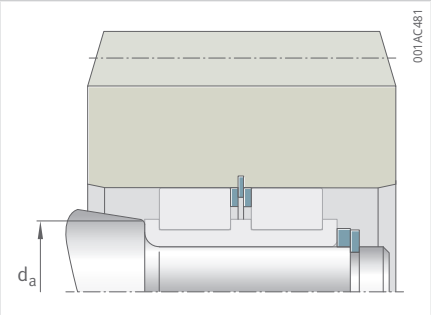


With special radius and washer assembly, RSL..-RV-DP

Designation	d	E_w	B	X min.	r min.	RV
	mm	mm	mm	mm	mm	mm
RSL40×61,74×36-XL-RV	40	61,74	36	29	1	3,00
RSL40×61,74×36-XL-RV-DP	40	61,74	36	29	1	3,00
RSL45×61,55×30-XL-RV	45	61,55	30	23,2	0,6	3,00
RSL45×61,55×30-XL-RV-DP	45	61,55	30	23,2	0,6	3,00
RSL45×61,55×36-XL-RV	45	61,55	36	29,2	0,6	3,00
RSL45×61,55×36-XL-RV-DP	45	61,55	36	29,2	0,6	3,00
RSL45×66,85×28-XL-RV	45	66,85	28	21,2	1	3,00
RSL45×66,85×28-XL-RV-DP	45	66,85	28	21,2	1	3,00
RSL45×66,85×40-XL-RV	45	66,85	40	33,2	1	3,50
RSL45×66,85×40-XL-RV-DP	45	66,85	40	33,2	1	3,50
RSL45×74,43×44-XL-RV	45	74,43	44	37,1	1,1	3,00
RSL45×74,43×44-XL-RV-DP	45	74,43	44	37,1	1,1	3,00
RSL50×69,67×32-XL-RV	50	69,67	32	25,2	0,6	3,00
RSL50×69,67×32-XL-RV-DP	50	69,67	32	25,2	0,6	3,00
RSL50×69,67×40-XL-RV	50	69,67	40	33,2	0,6	3,00
RSL50×69,67×40-XL-RV-DP	50	69,67	40	33,2	0,6	3,00
RSL50×72,33×30-XL-RV	50	72,33	30	23,4	1	3,00
RSL50×72,33×30-XL-RV-DP	50	72,33	30	23,4	1	3,00
RSL50×72,33×40-XL-RV	50	72,33	40	33,4	1	3,00
RSL50×72,33×40-XL-RV-DP	50	72,33	40	33,4	1	3,00
RSL50×72,33×48-XL-RV	50	72,33	48	41,4	1	3,00
RSL50×72,33×48-XL-RV-DP	50	72,33	48	41,4	1	3,00
RSL50×81,4×44-XL-RV	50	81,4	44	37,1	1,1	3,00
RSL50×81,4×44-XL-RV-DP	50	81,4	44	37,1	1,1	3,00
RSL55×77,07×42-XL-RV	55	69,07	42	34,6	1	3,50
RSL55×77,07×42-XL-RV-DP	55	69,07	42	34,6	1	3,50
RSL55×83,54×48-XL-RV	55	83,54	48	41,6	1,1	3,00
RSL55×83,54×48-XL-RV-DP	55	83,54	48	41,6	1,1	3,00
RSL55×83,54×55-XL-RV	55	83,54	55	47,6	1,1	3,50
RSL55×83,54×55-XL-RV-DP	55	83,54	55	47,6	1,1	3,50
RSL55×88,81×50-XL-RV	55	88,81	50	42	1,5	3,50
RSL55×88,81×50-XL-RV-DP	55	88,81	50	42	1,5	3,50
RSL60×83,83×44-XL-RV	60	83,83	44	35,5	1	4,00
RSL60×83,83×44-XL-RV-DP	60	83,83	44	35,5	1	4,00
RSL60×86,74×50-XL-RV-DP	60	86,74	50	42	1,1	3,50
RSL60×86,74×50-XL-RVV	60	86,74	50	42	1,1	3,50
RSL60×86,74×55-XL-RV	60	86,74	55	48	1,1	3,00
RSL60×86,74×55-XL-RV-DP	60	86,74	55	48	1,1	3,00
RSL60×99,17×55-XL-RV	60	99,17	55	47	1,5	5,00
RSL60×99,17×55-XL-RV-DP	60	99,17	55	47	1,5	5,00



Mounting dimension on shaft



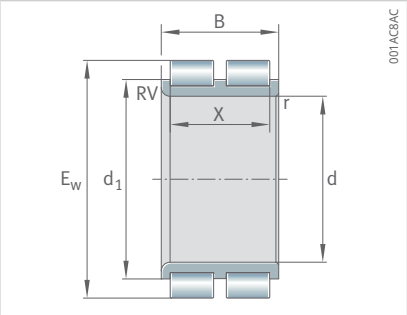
Mounting dimension on shaft

d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
50,54	50,5	113000	133000	22800	0,34
50,54	50,5	113000	133000	22800	0,34
53,65	53,5	79000	104000	18400	0,23
53,65	53,5	79000	104000	18400	0,23
53,65	53,5	102000	145000	25500	0,28
53,65	53,5	102000	145000	25500	0,28
55,65	55,5	83000	92000	16600	0,28
55,65	55,5	83000	92000	16600	0,28
55,65	55,5	137000	176000	30500	0,43
55,65	55,5	137000	176000	30500	0,43
57,43	57	173000	196000	32500	0,65
57,43	57	173000	196000	32500	0,65
60,07	60	100000	132000	24000	0,32
60,07	60	100000	132000	24000	0,32
60,07	60	135000	193000	33500	0,42
60,07	60	135000	193000	33500	0,42
59,13	59	102000	114000	16800	0,32
59,13	59	102000	114000	16800	0,32
59,13	59	151000	188000	30500	0,46
59,13	59	151000	188000	30500	0,46
59,13	59	187000	248000	41500	0,57
59,13	59	187000	248000	41500	0,57
64,4	64	187000	222000	37000	0,78
64,4	64	187000	222000	37000	0,78
65,87	65,5	152000	212000	37000	0,53
65,87	65,5	152000	212000	37000	0,53
68,54	68,5	206000	275000	46000	0,84
68,54	68,5	206000	275000	46000	0,84
68,54	68,5	236000	325000	56000	0,97
68,54	68,5	236000	325000	56000	0,97
69,81	69,5	239000	295000	51000	1,06
69,81	69,5	239000	295000	51000	1,06
70,63	70,5	169000	228000	37500	0,62
70,63	70,5	169000	228000	37500	0,62
71,74	71,5	212000	285000	48500	0,83
71,74	71,5	212000	285000	48500	0,83
71,74	71,5	243000	340000	59000	0,94
71,74	71,5	243000	340000	59000	0,94
76,77	76,5	290000	350000	66000	1,49
76,77	76,5	290000	350000	66000	1,49

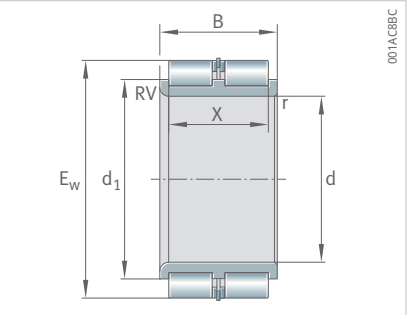
15.4 Cylindrical roller bearings RSL without an outer ring

Full complement

Double row

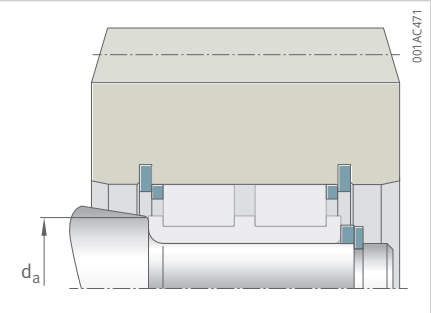


With special radius, RSL..-RV

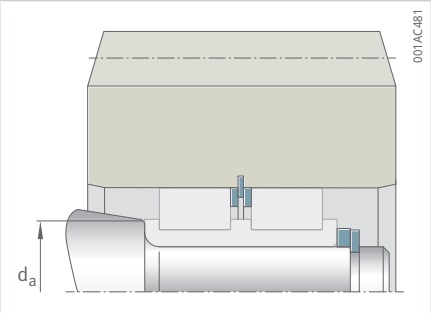


With special radius and washer assembly, RSL..-RV-DP

Designation	d	E_w	B	X min.	r min.	RV
	mm	mm	mm	mm	mm	mm
RSL65×106,25×60-XL-RV	65	106,25	60	50,4	1,5	4,50
RSL65×106,25×60-XL-RV-DP	65	106,25	60	50,4	1,5	4,50
RSL65×89,8×48-XL-RV	65	89,8	48	40,5	1	3,50
RSL65×89,8×48-XL-RV-DP	65	89,8	48	40,5	1	3,50
RSL65×93,09×50-XL-RV	65	93,09	50	42	1,1	3,50
RSL65×93,09×50-XL-RV-DP	65	93,09	50	42	1,1	3,50
RSL65×93,09×55-XL-RV	65	93,09	55	48,1	1,1	3,00
RSL65×93,09×55-XL-RV-DP	65	93,09	55	48,1	1,1	3,00
RSL70×100,28×54-XL-RV	70	100,28	54	44	1,1	4,50
RSL70×100,28×54-XL-RV-DP	70	100,28	54	44	1,1	4,50
RSL70×100,28×62-XL-RV	70	100,28	62	54	1,1	3,50
RSL70×100,28×62-XL-RV-DP	70	100,28	62	54	1,1	3,50
RSL70×95,29×54-XL-RV	70	95,29	54	44	1	4,00
RSL70×95,29×54-XL-RV-DP	70	95,29	54	44	1	4,00
RSL75×107,9×54-XL-RV	75	107,9	54	44	1,1	4,50
RSL75×107,9×54-XL-RV-DP	75	107,9	54	44	1,1	4,50
RSL75×107,9×62-XL-RV	75	107,9	62	54	1,1	3,50
RSL75×107,9×62-XL-RV-DP	75	107,9	62	54	1,1	3,50
RSL80×116,99×58-XL-RV	80	116,99	58	48	1,1	4,50
RSL80×116,99×58-XL-RV-DP	80	116,99	58	48	1,1	4,50



Mounting dimension on shaft



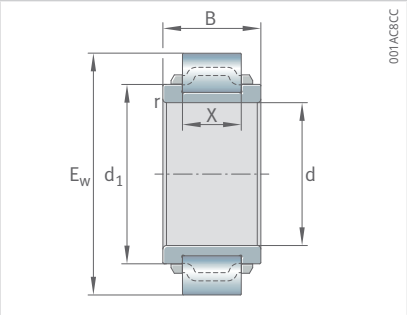
Mounting dimension on shaft

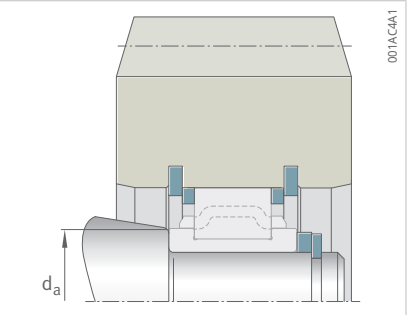
d_1 max.	d_a min.	C_r	C_{0r}	C_{ur}	m
mm	mm	N	N	N	kg
82,25	82	340000	420000	79000	1,83
82,25	82	340000	420000	79000	1,83
78,6	78,5	189000	295000	51000	0,83
78,6	78,5	189000	295000	51000	0,83
78,09	78	223000	315000	53000	0,96
78,09	78	223000	315000	53000	0,96
78,09	78	255000	375000	64000	1,09
78,09	78	255000	375000	64000	1,09
81,28	81	265000	350000	60000	1,12
81,28	81	265000	350000	60000	1,12
81,28	81	325000	455000	81000	1,36
81,28	81	325000	455000	81000	1,36
82,9	82	228000	335000	60000	0,98
82,9	82	228000	335000	60000	0,98
88,9	88,5	275000	385000	66000	1,76
88,9	88,5	275000	385000	66000	1,76
88,9	88,5	340000	500000	89000	1,64
88,9	88,5	340000	500000	89000	1,64
94,59	94,5	330000	440000	83000	1,76
94,59	94,5	330000	440000	83000	1,76

15.5 Special bearings RSL

With cage

Single row





Mounting dimension on shaft

Designation	d	E_w	B	X	r min.	d_1 max.
	mm	mm	mm	mm	mm	mm
F-683684.RN	25	42,51	16	9	0,6	34,2
F-683685.RN	30	49,6	19	10	1	39,6
F-683686.RN	35	55,52	20	11	1	44,5
F-683687.RN	40	61,74	21	12	1	50
F-683688.RN	45	66,85	23	12	1	55,2
F-680535.RN	50	72,33	23	14	1	58,8
F-683689.RN	55	83,54	26	17	1,1	68,3
F-683690.RN	60	86,74	26	17	1,1	71,45
F-683691.RN	65	93,09	26	17	1,1	77,85
F-680536.RN	70	100,28	30	18	1,1	81,2
F-680537.RN	75	107,9	30	18	1,1	88,8
F-680538.RN	80	116,99	34	20	1,1	94,6
F-683692.RN	85	121,44	34	20	1,1	99,2
F-680539.RN	90	130,11	37	22	1,5	105,5
F-687695.RN	100	139,65	37	22	1,5	115,7
F-687696.RN	110	156,13	45	26	2	127,3
F-687697.RN	120	167,58	46	26	2	138,8

d_a min.	C_r	C_{0r}	C_{ur}	m
mm	N	N	N	kg
34	27500	23500	4150	0,0755
39,5	36000	31000	5600	0,0735
44,5	44500	40000	7200	0,151
50	54000	51000	8700	0,19
55	58000	58000	9900	0,22871
58,5	73000	73000	11800	0,24159
68	96000	101000	17000	0,433
71	100000	107000	18100	0,411
77,5	107000	121000	20400	0,485
81	122000	129000	22200	0,58
88,5	132000	146000	25000	0,71
94,5	154000	163000	30500	0,92
99	160000	174000	32000	0,95
105,5	187000	207000	30500	1,22
115,5	200000	232000	33500	1,32
127	255000	290000	41500	2,01
138,5	275000	325000	45500	2,34

16 Glossary

External bearing arrangement

Within the context of planetary gears, an external bearing arrangement refers to the arrangement in which the gear is either produced as a solid design with shaft journals or mounted on a shaft by means of a shaft-hub connection. The planetary bearings are seated on the shaft journal and support the gear externally in the planetary carrier.

Band effect

For planetary gears, the term “band effect” describes the elastic ovalisation of the loaded gear and its effects on load distribution and, where applicable, on the position of the planetary bearing. The tangential gearing forces resulting from the tooth contact with the sun wheel and internal gear causes significant elastic deformations, particularly in the case of thin-walled gears.

Operating clearance

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.

Bore code

The bore code is part of the bearing designation in accordance with DIN 623-1 and describes the diameter of the bearing bore.

Rib guidance of cages

The method of cage guidance used serves as a means of distinguishing between rolling bearing cage designs: a distinction is made between cages guided by ribs and cages guided by rolling elements. In rib guidance, the weight of the cage and a proportional share of the weight of a number of rolling elements is supported on the bearing rib of the inner or outer ring. If additional inertial forces are exerted as a result of high speeds, vibrations or radial accelerations, for example, rib guidance enables:

- smooth running
- reliable support of mass forces with relatively lower component stresses
- improved dimensional stability of the cage

Attention: Rib-guided cages are only suitable under certain conditions, as guidance contact between the cage and rib can strip away the lubricant.

Direct bearing arrangement

In the context of planetary gearboxes, the term direct bearing arrangement describes an arrangement in which the outer ring raceway and/or inner ring raceway is integrated into the adjacent construction. For cylindrical roller bearings RSL without an outer ring, the outer raceway is provided by the bore of the planetary gear.

Fatigue limit load C_u

The fatigue limit load C_u in accordance with DIN ISO 281:2010 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.

FKM guideline

The FKM guideline describes the “computational strength verification of machine components”. The guideline is issued by the Forschungskuratorium Maschinenbau e. V. and describes a general procedure for calculating the strength of components in mechanical engineering.

Radial acceleration

This term from technical mechanics describes an acceleration of the reference system that is the result of a guided movement. When applied to the planetary bearing, the installation position of this bearing on the planetary carrier is set as the reference system. The rotation of the carrier about the sun wheel represents an accelerated, rotating reference system. This results in guide accelerations or constraining forces in the normal direction relative to the tangential direction of movement. Radial acceleration opposes centrifugal acceleration.

Internal bearing arrangement

In the context of planetary gearboxes, an internal bearing arrangement refers to the arrangement in which the planetary gear has a bore. The planetary bearing arrangement is seated in the gear bore on the planetary pin.

Dimension series

The dimension series is part of the bearing designation in accordance with DIN 616:2022 and ISO 15:2017; for radial bearings, is composed of the width series and dimension series. Width series and diameter series are described using numbers.

Splashing loss

Rolling bearings cause splashing losses due to the movement of rolling elements and possibly cages in the oil sump. They add friction losses and occur as a function of the speed and oil level.

Condition of rotation

The conditions of rotation indicate the motion of one bearing ring with respect to the load direction and are expressed as either point load or circumferential load. If the bearing ring is stationary relative to the load direction (point load), no forces occur that could cause creep of the ring. A tight fit would be advantageous here in order to give better support. A loose fit is possible since there is no risk that the ring will undergo creep. Fretting corrosion may occur in this instance. A bearing ring that rotates relative to the load direction (circumferential load) will roll on its seat if a loose fit is present and will thus creep in a cir-

cumferential 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.

Full complement cylindrical roller bearings

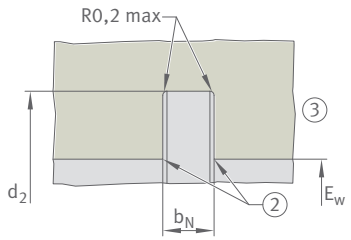
Full complement cylindrical roller bearings do not have a bearing cage to separate the rolling elements. Due to the absence of a cage, the maximum possible number of rolling elements can be accommodated in the bearing.

17 Appendix

17.1 Explanations

B	mm	Width of inner ring
B_a	mm	Thrust washer spacing
B_{AS}	mm	Width of thrust washer
b_N	mm	Bore groove width
d_2	mm	Bore groove diameter
d_{AS}	mm	Inside diameter of thrust washer
D_{AS}	mm	Outside diameter of thrust washer
$D_{AS\ max}$	mm	Max. outside diameter of thrust washer
E_w	mm	Outer enveloping circle diameter
s_{max}	mm	Max. axial clearance
s_{min}	mm	Min. axial clearance
t_{max}	mm	Max. retaining ring width
X	mm	Auxiliary dimension for configuring the axial clearance

21 Groove for retaining ring



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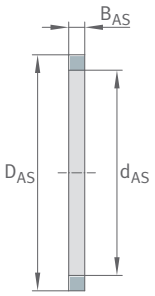
R0,2 max	Edge radius	E_w	Outer enveloping circle diameter
b_N	Bore groove width	d_2	Bore groove diameter

22 Thrust washer



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B_{AS}	Width of thrust washer	D_{AS}	Outside diameter of thrust washer
d_{AS}	Inside diameter of thrust washer		

At s_{min} and s_{max}, the tolerance of the retaining ring groove width is not taken into account.

For individual bearings, the distance B_a between the thrust washers is:
$B_a = X + 2 \cdot B_{AS} + s_{min}$

For multi-row bearings constructed from individual bearings, the distance B_a between the thrust washers is:
$B_a = X + B + 2 \cdot B_{AS} + s_{min}$

The value B_a increases accordingly if the individual bearings are installed at a distance from one another ➤61|17.

B_{AS} is toleranced at (0/−0,1). $D_{AS\ max}$ have clearance to the dimension E_w.

Retaining rings for bores in accordance with DIN 472 for cylindrical roller bearings RSL18

Retaining rings for bores in accordance with DIN 9928 for cylindrical roller bearings RSL with special dimensions

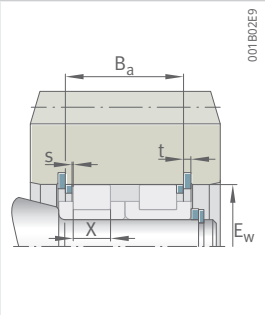
To ensure that the bearing is securely retained in the planetary gear, the edges of the grooves are produced with sharp edges and a sufficient difference between raceway dimension E_w and groove base is taken into account.

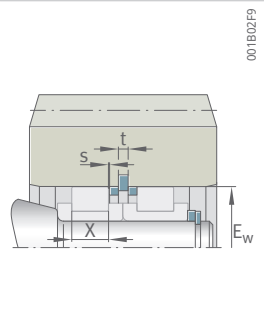
Schaeffler recommends consulting the manufacturer when selecting the snap ring.

17.2 Recommended dimensions for thrust washers RSL18 without an outer ring

Cylindrical roller bearings RSL18

Without an outer ring



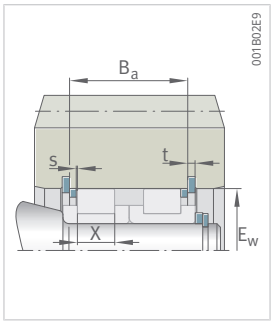


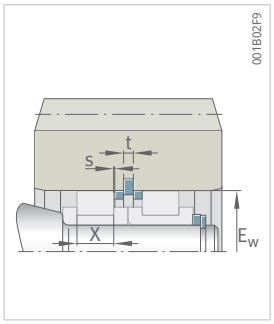
Ordering designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
RSL183004	32	36,8	2,5	9	0,2	0,8	1,5	36,810
RSL182204	35	41	1,9	12	0,2	0,8	1,75	41,470
RSL183005	38	42,5	2,4	9	0,2	0,8	1,75	42,510
RSL182205	40	46	1,9	12	0,2	0,8	1,75	46,520
RSL183006	43,5	49,5	3,25	10	0,2	0,8	2	49,600
RSL182305	47	53,5	3,3	15	0,2	0,8	2	53,717
RSL182206	48	55	1,8	14	0,2	0,8	2	55,190
RSL183007	50	55,5	3,25	11	0,2	0,8	2	55,520
RSL183008	55	61,5	3,25	12	0,2	0,8	2	61,740
RSL182306	55	62	3,3	18	0,2	0,8	2	62,300
RSL182207	55	63,5	2,5	15	0,2	0,8	2,5	63,970
RSL183009	60	66,5	4	12	0,2	0,8	2,5	66,850
RSL182208	64	70,5	2,5	15	0,2	0,8	2,5	70,940
RSL182307	64	72,5	4	20	0,2	0,8	2,5	72,680
RSL183010	65	72	3	14	0,2	0,8	2,5	72,330
RSL182209	65	74	2,5	15	0,2	0,8	2,5	74,430
RSL182210	72	81	2,5	15	0,2	0,8	2,5	81,400
RSL183011	75	83,5	2,7	17	0,3	0,9	3	83,540
RSL182308	77	83	3	24	0,2	0,8	2,5	83,124
RSL182309	79	88	4,2	24	0,3	0,9	3	88,322
RSL182211	80	88,5	1,7	18	0,2	0,8	3	88,810
RSL183012	80	86,5	2,7	17	0,3	0,9	3	86,740
RSL183013	85	93	2,7	17	0,3	0,9	3	93,090
RSL182212	90	98,5	2,15	20	0,2	0,8	3	99,170
RSL182310	90	98,5	4,2	28	0,3	0,9	3	98,718
RSL183014	90	100	4,15	18	0,3	0,9	3	100,280
RSL182213	96	105,8	2,15	22	0,2	1,1	4	106,250
RSL183015	100	107,8	3,7	18	0,3	0,9	4	107,900
RSL182311	100	109	4,2	30	0,3	0,9	4	109,110
RSL182214	101	110,5	2,15	22	0,2	1,1	4	111,010
RSL182215	105	115	2,15	22	0,2	1,1	4	115,780
RSL182312	105	115,6	5,7	30	0,3	0,9	4	115,620
RSL183016	105	116,9	4,7	20	0,3	0,9	4	116,990
RSL183017	110	121,4	4,7	20	0,3	0,9	4	121,440
RSL182216	115	125	2,15	24	0,2	1,1	4	125,810
RSL182313	117	126,5	4,7	34	0,3	0,9	4	126,690
RSL183018	120	130	5,2	22	0,3	0,9	4	130,110
RSL182217	120	132,8	2,65	26	0,2	1,1	4	133,210
RSL182314	121	132	5,2	36	0,3	0,9	4	132,140
RSL183020	126	139,5	5,2	22	0,3	0,9	4	139,650

17.2 Recommended dimensions for thrust washers RSL18 without an outer ring

Cylindrical roller bearings RSL18

Without an outer ring



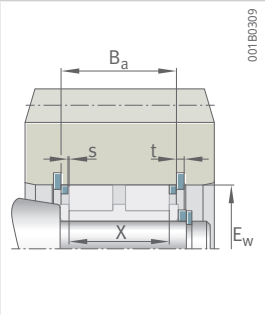


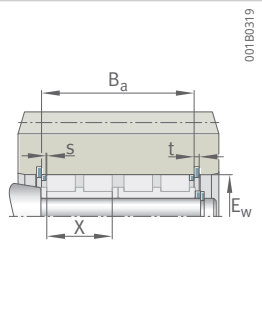
Ordering designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
RSL182218	129	140	3,7	28	0,2	1,1	4	140,610
RSL182315	132	143	5,2	40	0,3	0,9	4	143,220
RSL183022	138	156	7,2	26	0,3	0,9	4	156,130
RSL182316	144	154	4,7	44	0,3	0,9	4	154,240
RSL182220	150	162	3,7	34	0,2	1,1	4	162,810
RSL183024	150	167,5	7,7	26	0,3	0,9	4	167,580
RSL182317	151	163	5,7	44	0,2	0,9	4	163,010
RSL182318	153	165	5,7	48	0,2	0,9	4	165,260
RSL182319	160	174,5	7,2	48	0,2	0,9	4	174,660
RSL182222	165	176,5	6,2	36	0,2	1,1	4	177,000
RSL183026	165	183	6,6	34	0,3	1,1	4	183,810
RSL182224	170	192	6,7	40	0,2	1,1	4	192,320
RSL182320	173	187	6,7	55	0,2	0,9	4	187,303
RSL183028	178	197	7,1	34	0,3	1,1	4	197,820
RSL183030	188	206	8,1	34	0,3	1,1	5	206,800
RSL182226	192	206,5	7,1	44	0,3	1,5	5	207,120
RSL182322	199	218	9,2	56	0,2	0,9	4	218,270
RSL183032	200	224	9,1	36	0,3	1,1	5	224,800
RSL182228	206	221	7,1	48	0,3	1,5	5	221,920
RSL182324	214	231	8,1	64	0,3	1,1	4	231,386
RSL183034	215	242	8,6	44	0,3	1,1	5	242,850
RSL182326	228	247,5	9,6	68	0,3	1,5	4	247,900
RSL182328	240	264	12,1	72	0,3	1,5	4	264,447
RSL182330	264	286	11,1	80	0,3	1,5	5	286,490

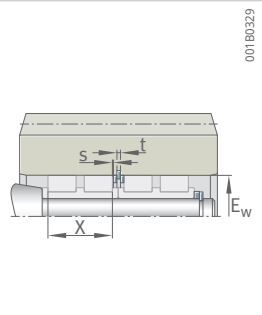
17.3 Recommended dimensions for thrust washers RSL1850 without an outer ring

Cylindrical roller bearings RSL

Without an outer ring





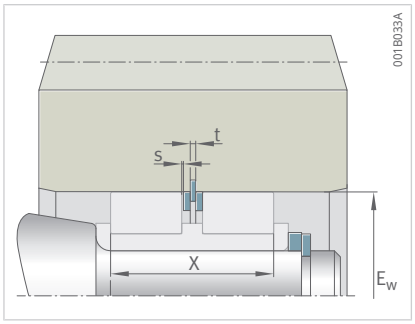


Ordering designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
RSL185004	32	36,8	2,5	23	0,4	1,3	1,5	36,810
RSL185005	38	42,5	2,4	23	0,3	1,3	1,75	42,510
RSL185006	43,5	49,5	3,25	26	0,2	1,1	2	49,600
RSL185007	50	55,5	3,25	28	0,2	1,1	2	55,520
RSL185008	55	61,5	3,25	30	0,2	1,1	2	61,740
RSL185009	60	66,5	4	30	0,2	1,1	2,5	66,850
RSL185010	65	72	3	33	0,2	1,1	2,5	72,330
RSL185011	75	83,5	2,7	39	0,2	1,2	3	83,540
RSL185012	80	86,5	2,7	39	0,2	1,2	3	86,740
RSL185013	85	93	2,7	39	0,2	1,2	3	93,090
RSL185014	90	100	4,15	42	0,5	1,5	3	100,280
RSL185015	100	107,8	3,7	42	0,5	1,5	4	107,900
RSL185016	105	116,9	4,7	47	0,2	1,3	4	116,990
RSL185017	110	121,4	4,7	47	0,3	1,3	4	121,440
RSL185018	120	130	5,2	52	0,4	1,3	4	130,110
RSL185020	126	139,5	5,2	52	0,5	1,3	4	139,650
RSL185022	138	156	7,2	62	0,5	1,3	4	156,130
RSL185024	150	167,5	7,7	62	0,4	1,3	4	167,580
RSL185026	165	183	6,6	78	0,3	1,4	4	183,810
RSL185028	178	197	7,1	78	0,3	1,4	4	197,820
RSL185030	188	206	8,1	80	0,3	1,4	5	206,800
RSL185032	200	224	9,1	86	0,3	1,4	5	224,800
RSL185034	215	242	8,6	100	0,3	1,4	5	242,850
RSL185036	230	259	10,1	110	0,6	1,7	5	260,220
RSL185038	245	268	10,5	110	0,4	1,5	5	269,760
RSL185040	260	286	12	120	0,8	1,9	5	287,750

17.4 Recommended dimensions for thrust washers RSL without an outer ring

Cylindrical roller bearings RSL

With special dimensions

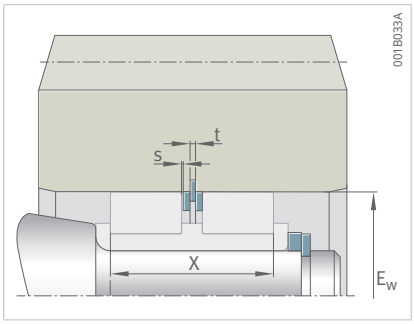


Designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
RSL20×32.17×23-XL-RV	28	32	1,75	17,2	0,2	0,8	1,5	32,170
RSL20×32.17×23-XL-RV-DP	28	32	1,75	17,2	0,2	0,8	1,5	32,170
RSL20×36.81×30-XL-RV	32,5	36,5	1,65	23	0,2	0,8	1,5	36,810
RSL20×36.81×30-XL-RV-DP	32,5	36,5	1,65	23	0,2	0,8	1,5	36,810
RSL22×35.5×24.5-XL-RV	31	35	1,65	19	0,2	0,8	1,5	35,500
RSL22×35.5×24.5-XL-RV-DP	31	35	1,65	19	0,2	0,8	1,5	35,500
RSL22×35.5×28-XL-RV	31	35	1,65	23	0,2	0,8	1,5	35,500
RSL22×35.5×28-XL-RV-DP	31	35	1,65	23	0,2	0,8	1,5	35,500
RSL22×38.75×22.5-XL-RV	35,5	38,5	1,75	17,2	0,2	0,8	1,5	38,750
RSL22×38.75×22.5-XL-RV-DP	35,5	38,5	1,75	17,2	0,2	0,8	1,5	38,750
RSL25×38.58×24.5-XL-RV	35,5	38,5	1,75	19,2	0,2	0,8	1,5	38,580
RSL25×38.58×24.5-XL-RV-DP	35,5	38,5	1,75	19,2	0,2	0,8	1,5	38,580
RSL25×38.58×30-XL-RV	35,5	38,5	1,75	23,2	0,2	0,8	1,5	38,580
RSL25×38.58×30-XL-RV-DP	35,5	38,5	1,75	23,2	0,2	0,8	1,5	38,580
RSL25×42.51×24-XL-RV	38	42	1,65	17	0,2	0,8	1,5	42,510
RSL25×42.51×24-XL-RV-DP	38	42	1,65	17	0,2	0,8	1,5	42,510
RSL25×42.51×30-XL-RV	38	42	1,65	23	0,2	0,8	1,5	42,510
RSL25×42.51×30-XL-RV-DP	38	42	1,65	23	0,2	0,8	1,5	42,510
RSL30×43.5×24.5-XL-RV	40	43	1,75	19,2	0,2	0,8	1,5	43,500
RSL30×43.5×24.5-XL-RV-DP	40	43	1,75	19,2	0,2	0,8	1,5	43,500
RSL30×43.5×30-XL-RV	40	43	1,75	23,2	0,2	0,8	1,5	43,500
RSL30×43.5×30-XL-RV-DP	40	43	1,75	23,2	0,2	0,8	1,5	43,500
RSL30×49.6×25-XL-RV	45	49,5	1,85	19,3	0,2	0,8	1,5	49,600
RSL30×49.6×25-XL-RV-DP	45	49,5	1,85	19,3	0,2	0,8	1,5	49,600
RSL30×49.6×32-XL-RV	45	49,5	1,85	25,3	0,2	0,8	1,5	49,600
RSL30×49.6×32-XL-RV-DP	45	49,5	1,85	25,3	0,2	0,8	1,5	49,600
RSL35×49.72×28-XL-RV	45	49,5	1,85	21,3	0,2	0,8	1,5	49,720
RSL35×49.72×28-XL-RV-DP	45	49,5	1,85	21,3	0,2	0,8	1,5	49,720
RSL35×49.72×36-XL-RV	45	49,5	1,85	29,3	0,2	0,8	1,5	49,720
RSL35×49.72×36-XL-RV-DP	45	49,5	1,85	29,3	0,2	0,8	1,5	49,720
RSL35×55.52×27-XL-RV	48	55	1,80	20,2	0,2	0,8	1,5	55,520
RSL35×55.52×27-XL-RV-DP	48	55	1,80	20,2	0,2	0,8	1,5	55,520
RSL35×55.52×34-XL-RV	48	55	1,80	27,2	0,2	0,8	1,5	55,520
RSL35×55.52×34-XL-RV-DP	48	55	1,80	27,2	0,2	0,8	1,5	55,520
RSL40×56.09×28-XL-RV	52	55,5	1,65	21	0,2	0,8	1,5	56,090
RSL40×56.09×28-XL-RV-DP	52	55,5	1,65	21	0,2	0,8	1,5	56,090
RSL40×56.09×36-XL-RV	52	55,5	1,65	29	0,2	0,8	1,5	56,090
RSL40×56.09×36-XL-RV-DP	52	55,5	1,65	29	0,2	0,8	1,5	56,090
RSL40×61.74×28-XL-RV	55,5	61,5	1,65	21	0,2	0,8	1,5	61,740
RSL40×61.74×28-XL-RV-DP	55,5	61,5	1,65	21	0,2	0,8	1,5	61,740

17.4 Recommended dimensions for thrust washers RSL without an outer ring

Cylindrical roller bearings RSL

With special dimensions

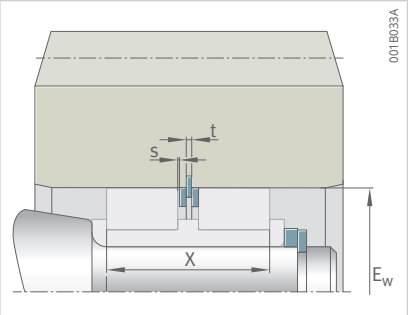


Designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
RSL40×61.74×36-XL-RV	55,5	61,5	1,65	29	0,2	0,8	1,5	61,740
RSL40×61.74×36-XL-RV-DP	55,5	61,5	1,65	29	0,2	0,8	1,5	61,740
RSL45×61.55×30-XL-RV	56,5	61	1,75	23,2	0,2	0,8	1,5	61,550
RSL45×61.55×30-XL-RV-DP	56,5	61	1,75	23,2	0,2	0,8	1,5	61,550
RSL45×61.55×36-XL-RV	56,5	61	1,75	29,2	0,2	0,8	1,5	61,550
RSL45×61.55×36-XL-RV-DP	56,5	61	1,75	29,2	0,2	0,8	1,5	61,550
RSL45×66.85×28-XL-RV	60	66,5	1,75	21,2	0,2	0,8	1,5	66,850
RSL45×66.85×28-XL-RV-DP	60	66,5	1,75	21,2	0,2	0,8	1,5	66,850
RSL45×66.85×40-XL-RV	60	66,5	1,75	33,2	0,2	0,8	1,5	66,850
RSL45×66.85×40-XL-RV-DP	60	66,5	1,75	33,2	0,2	0,8	1,5	66,850
RSL45×74.43×44-XL-RV	65	74	2,50	37,1	0,2	0,8	2,0	74,430
RSL45×74.43×44-XL-RV-DP	65	74	2,50	37,1	0,2	0,8	2,0	74,430
RSL50×69.67×32-XL-RV	64	69,5	1,75	25,2	0,2	0,8	1,5	69,670
RSL50×69.67×32-XL-RV-DP	64	69,5	1,75	25,2	0,2	0,8	1,5	69,670
RSL50×69.67×40-XL-RV	64	69,5	1,75	33,2	0,2	0,8	1,5	69,670
RSL50×69.67×40-XL-RV-DP	64	69,5	1,75	33,2	0,2	0,8	1,5	69,670
RSL50×72.33×30-XL-RV	65	72	1,60	23,4	0,2	0,8	2,0	72,330
RSL50×72.33×30-XL-RV-DP	65	72	1,60	23,4	0,2	0,8	2,0	72,330
RSL50×72.33×40-XL-RV	65	72	1,60	33,4	0,2	0,8	2,0	72,330
RSL50×72.33×40-XL-RV-DP	65	72	1,60	33,4	0,2	0,8	2,0	72,330
RSL50×72.33×48-XL-RV	65	72	1,60	41,1	0,2	0,8	2,0	72,330
RSL50×72.33×48-XL-RV-DP	65	72	1,60	41,1	0,2	0,8	2,0	72,330
RSL50×81.4×44-XL-RV	72	81	2,50	37,1	0,2	0,8	2,0	81,400
RSL50×81.4×44-XL-RV-DP	72	81	2,50	37,1	0,2	0,8	2,0	81,400
RSL55×77.07×42-XL-RV	70	77	2,25	34,6	0,2	0,8	2,0	77,070
RSL55×77.07×42-XL-RV-DP	70	77	2,25	34,6	0,2	0,8	2,0	77,070
RSL55×83.54×48-XL-RV	75	83,5	2,70	41,6	0,2	0,8	2,0	83,540
RSL55×83.54×48-XL-RV-DP	75	83,5	2,70	41,6	0,2	0,8	2,0	83,540
RSL55×83.54×55-XL-RV	75	83,5	2,70	47,6	0,2	0,8	2,0	83,540
RSL55×83.54×55-XL-RV-DP	75	83,5	2,70	47,6	0,2	0,8	2,0	83,540
RSL55×88.81×50-XL-RV	80	88,5	1,70	42	0,2	0,8	2,5	88,810
RSL55×88.81×50-XL-RV-DP	80	88,5	1,70	42	0,2	0,8	2,5	88,810
RSL60×83.83×44-XL-RV	75	83,5	2,70	35,5	0,2	0,8	2,0	83,830
RSL60×83.83×44-XL-RV-DP	75	83,5	2,70	35,5	0,2	0,8	2,0	83,830
RSL60×86.74×50-XL-RV-DP	80	86,5	2,70	42	0,2	0,8	2,5	86,740
RSL60×86.74×50-XL-RVV	80	86,5	2,70	42	0,2	0,8	2,5	86,740
RSL60×86.74×55-XL-RV	80	86,5	2,70	48	0,2	0,8	2,5	86,740
RSL60×86.74×55-XL-RV-DP	80	86,5	2,70	48	0,2	0,8	2,5	86,740
RSL60×99.17×55-XL-RV	90	98,5	2,15	47	0,2	0,8	2,5	99,170
RSL60×99.17×55-XL-RV-DP	90	98,5	2,15	47	0,2	0,8	2,5	99,170

17.4 Recommended dimensions for thrust washers RSL without an outer ring

Cylindrical roller bearings RSL

With special dimensions

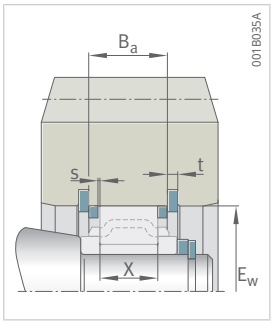


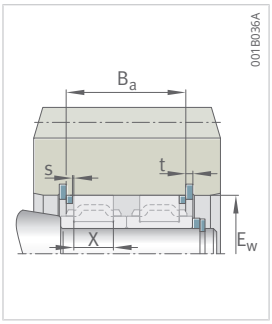
Designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
RSL65×106.25×60-XL-RV	96	106	1,85	50,4	0,2	1,1	2,5	106,250
RSL65×106.25×60-XL-RV-DP	96	106	1,85	50,4	0,2	1,1	2,5	106,250
RSL65×89.8×48-XL-RV	83	89,5	2,90	40,5	0,2	1,1	2,5	89,800
RSL65×89.8×48-XL-RV-DP	83	89,5	2,90	40,5	0,2	1,1	2,5	89,800
RSL65×93.09×50-XL-RV	85	93	2,70	42	0,2	1,1	2,5	93,090
RSL65×93.09×50-XL-RV-DP	85	93	2,70	42	0,2	1,1	2,5	93,090
RSL65×93.09×55-XL-RV	85	93	2,70	48,1	0,2	1,1	2,5	93,090
RSL65×93.09×55-XL-RV-DP	85	93	2,70	48,1	0,2	1,1	2,5	93,090
RSL70×100.28×54-XL-RV	90	100	2,65	44	0,2	1,1	2,5	100,280
RSL70×100.28×54-XL-RV-DP	90	100	2,65	44	0,2	1,1	2,5	100,280
RSL70×100.28×62-XL-RV	90	100	2,65	54	0,2	1,1	2,5	100,280
RSL70×100.28×62-XL-RV-DP	90	100	2,65	54	0,2	1,1	2,5	100,280
RSL70×95.29×54-XL-RV	87	95	2,65	44	0,2	1,1	2,5	95,290
RSL70×95.29×54-XL-RV-DP	87	95	2,65	44	0,2	1,1	2,5	95,290
RSL75×107.9×54-XL-RV	100,5	107,5	2,65	44	0,2	1,1	2,5	107,900
RSL75×107.9×54-XL-RV-DP	100,5	107,5	2,65	44	0,2	1,1	2,5	107,900
RSL75×107.9×62-XL-RV	100,5	107,5	2,65	54	0,2	1,1	2,5	107,900
RSL75×107.9×62-XL-RV-DP	100,5	107,5	2,65	54	0,2	1,1	2,5	107,900
RSL80×116.99×58-XL-RV	107,5	116,5	2,65	48	0,2	1,1	2,5	116,990
RSL80×116.99×58-XL-RV-DP	107,5	116,5	2,65	48	0,2	1,1	2,5	116,990

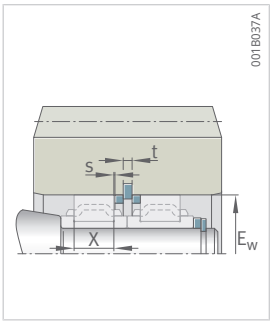
17.5 Recommended dimensions for thrust washers Special bearings RSL

Special bearings RSL

With cage







Ordering designation	d_{AS}	D_{AS}	B_{AS}	X min	s_{min}	s_{max}	t_{max}	E_w
	mm	mm	mm	mm	mm	mm	mm	mm
F-683684.RN	38	42,5	2,40	9	0,2	0,8	1,75	42,510
F-683685.RN	43,5	49,5	3,25	10	0,2	0,8	2	49,600
F-683686.RN	50	55,5	3,25	11	0,2	0,8	2	55,520
F-683687.RN	55	61,5	3,25	12	0,2	0,8	2	61,740
F-683688.RN	60	66,5	4,00	12	0,2	0,8	2,5	66,850
F-680535.RN	65	72	3,00	14	0,2	0,8	2,5	72,330
F-683689.RN	75	83,5	2,70	17	0,3	0,9	3	83,540
F-683690.RN	80	86,5	2,70	17	0,3	0,9	3	86,740
F-683691.RN	85	93	2,70	17	0,3	0,9	3	93,090
F-680536.RN	90	100	4,15	18	0,3	0,9	3	100,280
F-680537.RN	100	107,8	3,70	18	0,3	0,9	4	107,900
F-680538.RN	105	116,9	4,70	20	0,3	0,9	4	116,990
F-683692.RN	110	121,4	4,70	20	0,3	0,9	4	121,440
F-680539.RN	120	130	5,20	22	0,3	0,9	4	130,110
F-687695.RN	126	139,5	5,20	22	0,3	0,9	4	139,650
F-687696.RN	138	156	7,20	26	0,3	0,9	4	156,130
F-687697.RN	150	167,5	7,70	26	0,3	0,9	4	167,580

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