Axial deep groove ball bearings

Matrix for bearing preselection 1007

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Matrix for bearing preselection

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

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

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

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

Design features and suitability			Axial deep groove ball bearings: single direction	Axial deep groove ball bearings: double direction	detailed information ➤ 1008
Load carrying capacity	radial		–	–	➤ 1010 | 1.2
	axial, one direction		++	++	➤ 1010 | 1.2
	axial, both directions		–	++	➤ 1010 | 1.2
	moments		–	–	➤ 1010 | 1.2
Compensation of angular misalignments	static		(+)[1]	(+)[1]	➤ 1010 | 1.3
	dynamic		–	–	➤ 1010 | 1.3
Bearing design	cylindrical bore		✓	✓	➤ 1008 | 1.1
	tapered bore		–	–	➤ 1008 | 1.1
	separable		✓	✓	➤ 1016 | 1.17
Lubrication	greased		–	–	➤ 1010 | 1.4
Sealing	open		✓	✓	➤ 1011 | 1.5
	non-contact		–	–	–
	contact		–	–	–
Operating temperature in °C	from to		–30 +150[1]	–30 +150[1]	➤ 1012 | 1.8
Suitability for	high speeds		+	+	➤ 1011 | 1.6
	high running accuracy		+	+	➤ 1013 | 1.11 ➤ 115
	low-noise running		(+)	(+)	➤ 1011 | 1.7 ➤ 27
	high rigidity		++	++	➤ 54
	reduced friction		+	+	➤ 56
	length compensation within bearing		–	–	–
	non-locating bearing arrangement		–	–	➤ 141
	locating bearing arrangement		+++	+++	➤ 141
X-life bearings		X-life	–	–	–
Bearing bore d in mm	from to		10 260[2]	10 190	➤ 1018 ➤ 1030
Product tables	from page ➤		1018	1030	

[1] Valid for bearings with spherical housing locating washer

[2] Larger catalogue bearings GL 1

1 Axial deep groove ball bearings

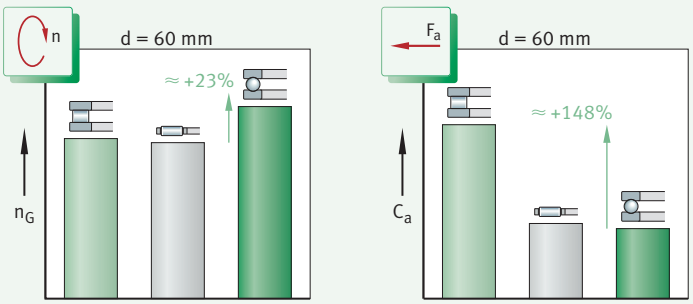
Axial deep groove ball bearings:

- are standardised, ready-to-fit units with high axial load carrying capacity ➤*1009*|*2* and ➤*1009*|*3*
- are suitable exclusively for the support of predominantly axial loads ➤*1010*|*1.2*
- are particularly suitable where the bearing position is subjected to high axial loads from one or both sides, but the requirements for axial load carrying capacity of the bearings are not so high that axial cylindrical roller bearings with even higher load carrying capacity must be used
- permit higher speeds than roller or needle roller and cage assemblies ➤*1008*|*1*
- compensate, in conjunction with a spherical housing locating washer, static misalignments between the shaft and housing ➤*1010*|*1.3*

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*1007*.

1
Axial deep groove ball bearing: comparison of speed and load carrying capacity with axial cylindrical roller bearing and axial needle roller and cage assembly

n_G = *limiting speed*
F_a = *axial load*
C_a = *basic axial dynamic load rating*



1.1 Bearing design

✎ *Design variants*

Axial deep groove ball bearings are available as:

- single direction bearings ➤*1009*|*2*
- double direction bearings ➤*1009*|*3*

Basic bearing design

✎ *Non-self-retaining, easy-to-fit bearing units*

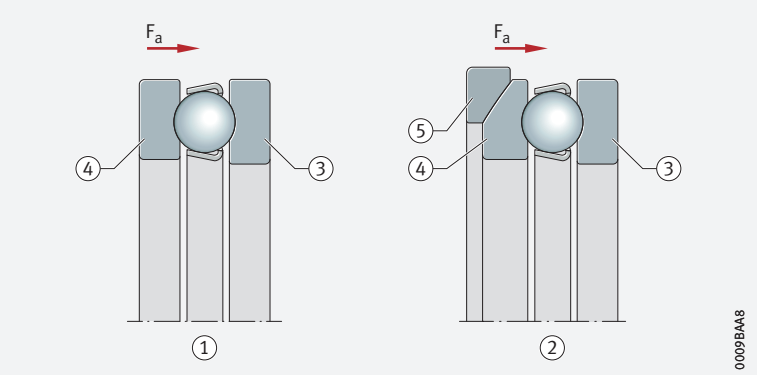
Axial deep groove ball bearings are part of the group of axial ball bearings. The bearings are of a multi-piece construction and, due to their design, are not self-retaining. As a result, it is possible to mount the bearing parts (shaft locating washer, housing locating washer, ball and cage assembly, support washer) separately from each other. In order to guide the balls, the shaft and housing locating washer have raceway grooves (formed rolling element raceways) with a defined osculation, in which the rolling elements circulate. The ball set is retained by a sheet steel cage or a solid brass cage ➤*1012*|*2*. When using these bearings, the designer does not need to produce the bearing parts for his bearing arrangement and match these to each other himself, but can instead use a standarised, ready-to-fit unit.

Single direction axial deep groove ball bearings

✎ *Ready-to-fit bearing unit for compact axial designs*

These axial deep groove ball bearings comprise a shaft locating washer, a housing locating washer and a ball and cage assembly ➤*1009*|*2*. In order to ensure centring of the washers with a precise fit, the bore of the shaft locating washer (d) is ground. In contrast, the bore of the housing locating washer (D_1) is more generously dimensioned and is turned. The housing locating washer can be flat or spherical and can be configured with or without a support washer. The support washers U2 and U3 must be ordered in addition to the bearing. Load carrying capacity of single direction bearings ➤*1010*|*1.2*.

2
Axial deep groove ball bearings, single direction



F_a = *axial load*

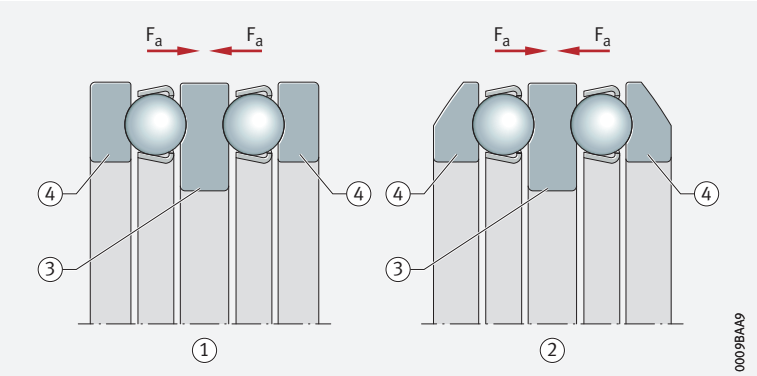
① *Axial deep groove ball bearing with flat housing locating washer*
② *Axial deep groove ball bearing with spherical housing locating washer and support washer*
③ *Shaft locating washer*
④ *Housing locating washer (flat or spherical)*
⑤ *Support washer*

Double direction axial deep groove ball bearings

✎ *Ready-to-fit bearing unit, suitable for combination with support washers*

Double direction bearings comprise a shaft locating washer, two housing locating washers and two ball and cage assemblies ➤*1009*|*3*. They can also be combined with support washers U2 and U3. The housing locating washers and ball sets correspond to the designs of the single direction bearings. Load carrying capacity of double direction bearings ➤*1010*|*1.2*.

3
Axial deep groove ball bearings, double direction



F_a = *axial load*

① *Axial deep groove ball bearing with flat housing locating washers*
② *Axial deep groove ball bearing with spherical housing locating washers, without support washer*
③ *Shaft locating washer*
④ *Housing locating washer (flat or spherical)*

1.2 Load carrying capacity

Axial deep groove ball bearings are suitable for the support of predominantly axial loads. They must not be subjected to predominantly radial loads.

✎ *Single direction bearings*

Single direction axial deep groove ball bearings can support axial forces in one direction and support the shaft on one side ➤*1009*|🗀*2*.

✎ *Double direction bearings*

Double direction axial deep groove ball bearings support axial forces in both directions and can guide the shaft on both sides ➤*1009*|🗀*3*.

1.3 Compensation of angular misalignments

Axial deep groove ball bearings react with high sensitivity to angular misalignments. In cases where the contact face for the housing locating washer is not vertical (perpendicular) to the bearing axis, the angular misalignment can be compensated by means of bearings with a spherical housing locating washer and support washer ➤*1009*|🗀*2*.

Single direction bearings

✎ *Series 511, 512, 513, 514 do not permit angular adjustment*

Bearings of series 511, 512, 513 and 514 have a flat housing locating washer. As a result, they do not permit angular misalignment or skewing between the shaft and housing.

✎ *Series 532, 533 permit angular adjustment*

Bearings of series 532 and 533 have a spherical housing locating washer. With an appropriate housing design and in conjunction with support washers U2 and U3, they are variable in angle as a result and can therefore tolerate static misalignments of the shaft relative to the housing within certain limits.

Double direction bearings

✎ *Series 522, 523 do not permit angular adjustment*

Bearings of series 522 and 523 have two flat housing locating washers and do not permit angular adjustment.

✎ *Series 542, 543 permit angular adjustment*

Bearings of series 542 and 543 have spherical housing locating washers. With an appropriate housing design and in conjunction with support washers U2 and U3, they are variable in angle as a result and can therefore tolerate static misalignments of the shaft relative to the housing within certain limits.

1.4 Lubrication

✎ *Oil or grease lubrication is possible*

The bearings are not greased. In order to prevent direct metallic contact between rolling elements, raceways and cages, they must be lubricated. Oil or grease lubrication is suitable. The lubricant reduces the wear and also protects the surfaces against corrosion. The choice of lubricant is essentially dependent on the operating temperatures and the speeds; it is also influenced, however, by the load, mounting position, osculations etc.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

1.5 Sealing

The bearings are of an open design

Axial deep groove ball bearings are supplied without seals. As a result, sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing

1.6 Speeds

Speeds in the product tables

The product tables generally give two speeds for the bearings:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

The values in the product tables are valid for oil lubrication.

Values for grease lubrication

For grease lubrication, 75% of the value stated in the product tables is permissible in each case.

Reference speeds

$n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

1.7 Noise

Schaeffler Noise Index

The Schaeffler Noise Index (SGI) is not yet available for this bearing type ➤69. The data for these bearing series will be introduced and updated in stages.

Further information:

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

1.8 Temperature range

✎ *Limiting values*

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing washers and rolling elements
- the support washers
- the cage
- the lubricant

✎ *–30 °C to +150 °C*

Possible operating temperatures for axial deep groove ball bearings ➤*1012*| ▦ *1*. The support washers are made from rolling bearing steel and are suitable for the same temperatures as the bearing washers and rolling elements. The temperature limit values of the lubricant must be observed.

▦ **1**
Permissible temperature ranges

Operating temperature	Axial deep groove ball bearings with sheet steel or brass cages
	–30 °C to +150 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

✎ *Sheet steel cages or solid brass cages are used as standard*

Standard cages for axial deep groove ball bearings ➤*1012*| ▦ *2*. Other cage designs are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages. Bearings with sheet steel cages do not have a cage suffix ➤*1012*| ▦ *2*.

If there is any uncertainty regarding cage suitability for a specific application, please consult Schaeffler.

▦ **2**
Cage, cage suffix, bore code

Bearing series	Sheet steel cage –	Solid brass cage MP
	Bore code	
511	up to 28	from 30
512	up to 28	from 30
513	up to 20	from 22
514	up to 11	from 12
522	up to 28	from 30
523	up to 20	from 22
524	06 to 11	–
532	up to 28	from 30
533	up to 20	from 22
534	06 to 11	–
542	up to 28	from 30
543	up to 20	22, 24
544	06 to 11	–

1.10 Internal clearance

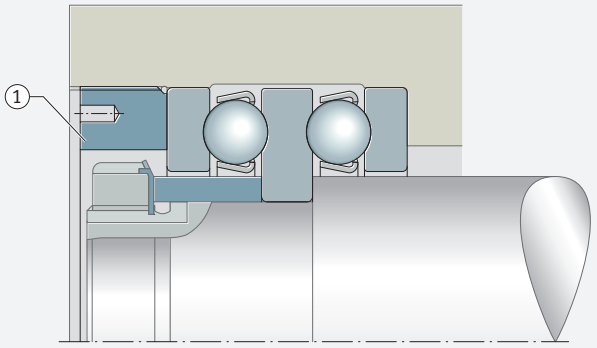
Axial clearance and preload is determined by the application

In the case of axial deep groove ball bearings, the internal clearance (axial clearance) is only achieved when the bearings are mounted. The requisite axial clearance of the bearing arrangement is dependent on the application and must take account of the conditions in the bearing arrangement while warm from operation and subjected to load. If axial deep groove ball bearings are subjected to vibrations while under predominantly static load for example, they must be lightly preloaded. Preload can be applied, for example, using housing nuts ➤*1013*|*4*. Other suitable means include shaft nuts, disc springs, calibrated sheets (shims) etc. It must always be ensured that no slippage occurs in operation between the rolling elements and raceways ➤*1015*|*1.15*. It must also be ensured that the preload does not exceed the optimum value, otherwise there will be an increase in friction and therefore in heat generation in the bearing. These will both have a negative effect on the operating life of the bearings.

If there is any uncertainty regarding the setting of the axial clearance, Schaeffler must always be consulted.

4

Setting the axial clearance of a double direction axial deep groove ball bearing by means of a housing nut



① *Housing nut*

1.11 Dimensions, tolerances

Dimension standards

Bearings with a flat locating surface on the housing locating washer correspond to ISO 104:2015 or DIN 616:2000 and DIN 711:2010 as well as DIN 715:2011.

Bearings with a spherical locating surface on the housing locating washer correspond to ISO 20516:2007 and DIN 711:2010 as well as DIN 715:2011.

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤*140*.
Nominal value of chamfer dimension ➤*1018*|▦.

Tolerances

The tolerances for the dimensional and running accuracy of axial deep groove ball bearings correspond to tolerance class Normal in accordance with ISO 199:2014. Tolerance values in accordance with ISO 199 ➤*135*|▦ *25* to ➤*137*|▦ *28*.

1.12 Suffixes

Suffixes describe the design and features of a bearing in more detail.

3 *Suffixes and corresponding descriptions*

Suffix	Description of suffix	
MP	Solid brass cage, ball-guided	Standard
P5	Bearing in tolerance class 5	Special design, available by agreement
P6	Bearing in tolerance class 6	

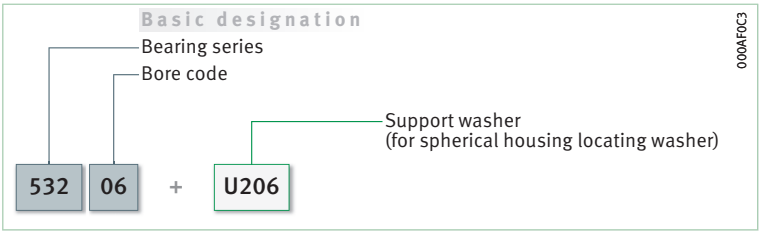
1.13 Structure of bearing designation

With ***medias*** interchange, equivalent Schaeffler bearing designations can be determined for bearing designations from other rolling bearing manufacturers *https://www.schaeffler.de/std/1B69*.

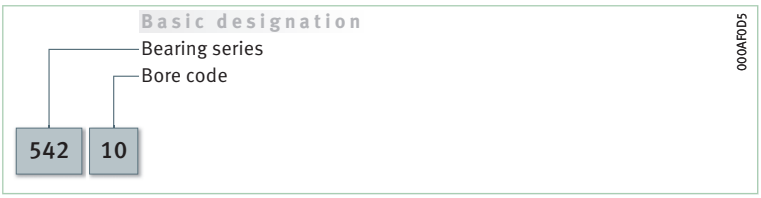
✎ *Examples of composition of bearing designation*

The designation of bearings follows a set model.
Examples ➤*1014*|*5* and ➤*1014*|*6*.
The composition of designations is subject to DIN 623-1 ➤*102*|*10*.

5 *Axial deep groove ball bearing, single direction, with spherical housing locating washer and support washer: designation structure*



6 *Axial deep groove ball bearing, double direction, with spherical housing locating washers: designation structure*



1.14 Dimensioning

Equivalent dynamic bearing load

✎ $P = F_a$

Axial deep groove ball bearings can only support axial forces ➤*1010*|*1.2*.
As a result, $P = F_a$ ➤*1014*|*f 1*.

f 1 *Equivalent dynamic load*

$$P = F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_a	N	Axial load.

Equivalent static bearing load

✎ $P_0 = F_{0a}$

Since the bearings can only support axial loads, $P_0 = F_{0a}$ ➤*1014*|*f 2*.

f 2 *Equivalent static load*

$$P_0 = F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0a}	N	Largest axial load present (maximum load).

Static load safety factor

✎ $S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤ *1015* | *f 3*.

f 3
Static load safety factor

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

Legend

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

1.15 Minimum load

✎ *In order to prevent damage due to slippage, a minimum axial load of $F_{a\,min}$ is required*

Under axial load, the balls are guided under favourable rolling conditions at the base of the groove. This deteriorates, however, if the centrifugal force occurring at higher speeds and very low loads presses the balls outwards. In this case, detrimental sliding motions can occur between the rolling elements and the raceways due to centrifugal forces and gyroscopic moments. In order to prevent these sliding motions, the bearings must be subjected to the minimum axial load $F_{a\,min}$ ➤ *1015* | *f 4*. This can also be achieved by means of preloading, for example using springs. The minimum load factor A is given in the product tables. For n_{max}, the maximum operating speed must be used.

f 4
Minimum axial load

$$F_{a\,min} = 1000 \cdot A \cdot \left(\frac{n_{max}}{1000}\right)^2$$

Legend

$F_{a\,min}$	N	Minimum axial load
A	–	Minimum load factor ➤ *1018*
n_{max}	min^{-1}	Maximum operating speed.

1.16 Design of bearing arrangements

✎ *In the case of misalignments: use spherical support washers or produce the locating surface in the housing to a spherical design*

Bearings with spherical housing locating washers can compensate, in conjunction with a spherical bearing seating surface, misalignments between the locating surface in the housing and on the shaft ➤ *1010* | *1.3*. These bearings can be mounted together with support washers also of a spherical design or directly in the housing. In this case, however, the locating surface in the housing must also be of a spherical design.

✎ *Shaft tolerances*

Single direction bearings should have the shaft tolerance j6 Ⓔ, while k6 Ⓔ should be selected for double direction bearings.

✎ *Tolerances for the housing bore*

The tolerance of the locating bore is dependent on the running accuracy to be achieved. For normal running accuracy, it should be in the tolerance class E8 Ⓔ, for high running accuracy, it should be in the tolerance class H6 Ⓔ.

Mounting dimensions for the contact surfaces of bearing rings

✎ *The contact surfaces for the washers must be of sufficient height*

The shoulders on the adjacent construction (shaft and housing) must be sufficiently high that the shaft and housing locating washers are supported over at least half their height. The abutment shoulders should be rigid, flat and perpendicular to the axis of rotation. Proven mounting dimensions for the radii and diameters of abutment shoulders are given in the product tables ➤ *1018*. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

1.17 Mounting and dismounting

✎ Do not transpose the shaft and housing locating washer

In the case of single direction bearings, it must be ensured that the shaft and housing locating washer are not exchanged with each other but are mounted in the correct position.

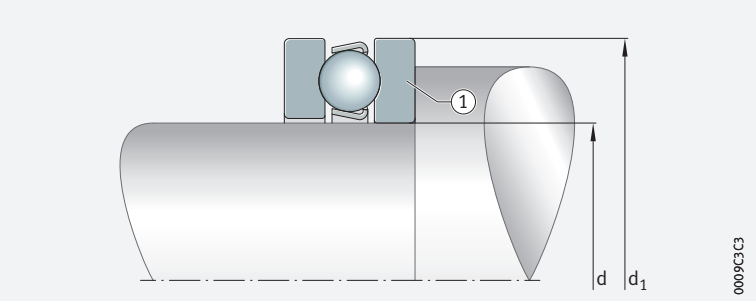
On the shaft locating washer, the bore d is ground and the outside diameter d_1 is not ground ➤ *1016* | *7*. For reliable operation, the shaft locating washer should always abut a shoulder of corresponding dimensions or a support ring securely located on the shaft.

✎ As the bearings are not self-retaining, they are easy to mount

Axial deep groove ball bearings are not self-retaining. As a result, the bearing washers and the ball and cage assembly can be mounted separately from each other ➤ *1008* | *1.1*. This gives simplified mounting of the bearings.

7
Axial deep groove ball bearing, single direction

① *Shaft locating washer, bore d ground, outside diameter d_1 not ground*



Schaeffler Mounting Handbook

✎ Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

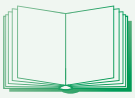
Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: *https://medias.schaeffler.com*.

1.19 Further information

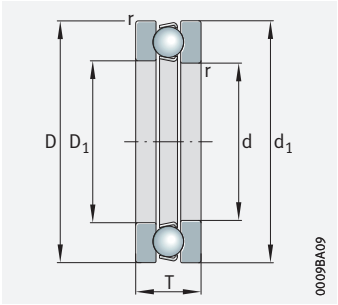


In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

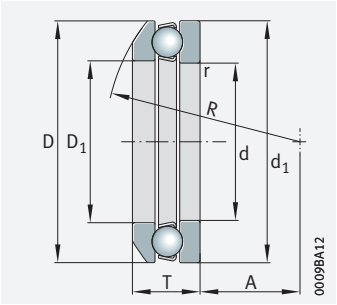
- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*185*
- Design of bearing arrangements ➤*141*
- Mounting and dismounting ➤*194*

Axial deep groove ball bearings

Single direction



511, 512, 513, 514

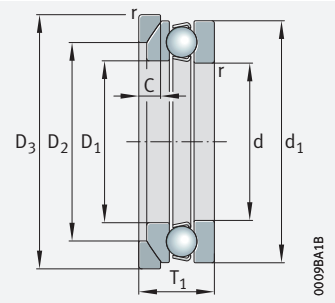


532, 533
Spherical housing locating washer

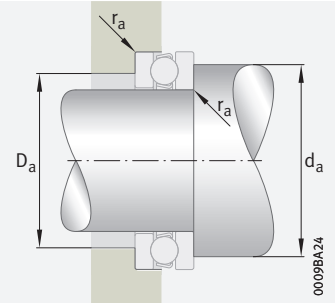
d = 10 – 30 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	Support washer ≈ kg	Bearing	Support washer
10	24	9	10 000	14 000	640	0,001	12 700	19 200	0,018	–	**51100**	**–**
	26	11	12 700	17 100	780	0,002	10 900	19 100	0,03	–	**51200**	**–**
	26	11,6	12 700	17 100	780	0,002	10 900	19 100	0,028	0,008	**53200**	**U200**
12	26	9	10 300	15 400	710	0,001	13 100	16 900	0,021	–	**51101**	**–**
	28	11	13 200	19 000	870	0,002	11 300	16 900	0,03	–	**51201**	**–**
	28	11,4	13 200	19 000	870	0,002	11 300	16 900	0,03	0,009	**53201**	**U201**
15	28	9	10 500	16 800	770	0,002	13 100	14 000	0,027	–	**51102**	**–**
	32	12	16 600	24 800	1 130	0,003	9 800	14 300	0,049	–	**51202**	**–**
	32	13,3	16 600	24 800	1 130	0,003	9 800	14 300	0,048	0,013	**53202**	**U202**
17	30	9	11 300	19 600	900	0,002	12 900	12 500	0,028	–	**51103**	**–**
	35	12	17 200	27 500	1 240	0,004	9 700	13 200	0,052	–	**51203**	**–**
	35	13,2	17 200	27 500	1 240	0,004	9 700	13 200	0,055	0,015	**53203**	**U203**
20	35	10	15 000	26 500	1 210	0,004	10 900	11 100	0,04	–	**51104**	**–**
	40	14	21 100	37 500	1 700	0,007	8 500	11 600	0,082	–	**51204**	**–**
	40	14,7	21 100	37 500	1 700	0,007	8 500	11 600	0,081	0,02	**53204**	**U204**
25	42	11	18 100	35 500	1 620	0,006	9 700	9 500	0,055	–	**51105**	**–**
	47	15	26 500	50 000	2 280	0,013	7 500	9 800	0,114	–	**51205**	**–**
	47	16,7	26 500	50 000	2 280	0,013	7 500	9 800	0,121	0,031	**53205**	**U205**
	52	18	34 500	55 000	2 500	0,019	6 000	10 400	0,154	–	**51305**	**–**
	52	19,8	34 500	55 000	2 500	0,019	6 000	10 400	0,203	0,043	**53305**	**U305**
	60	24	43 000	66 000	3 000	0,032	4 700	10 900	0,295	–	**51405**	**–**
30	47	11	18 800	40 000	1 820	0,008	9 300	8 100	0,063	–	**51106**	**–**
	52	16	23 900	46 000	2 100	0,014	7 300	8 600	0,136	–	**51206**	**–**
	52	17,8	23 900	46 000	2 100	0,014	7 300	8 600	0,147	0,032	**53206**	**U206**
	60	21	35 500	65 000	2 950	0,028	5 700	9 300	0,244	–	**51306**	**–**
	60	22,6	35 500	65 000	2 950	0,028	5 700	9 300	0,303	0,055	**53306**	**U306**
	70	28	70 000	112 000	5 200	0,077	3 850	9 100	0,49	–	**51406**	**–**

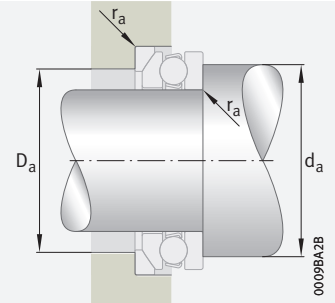
medias *https://www.schaeffler.de/std/1F9A*



532, 533
Spherical housing locating washer
Support washer U2, U3



Mounting dimensions

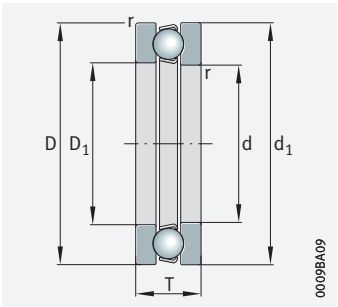


Mounting dimensions

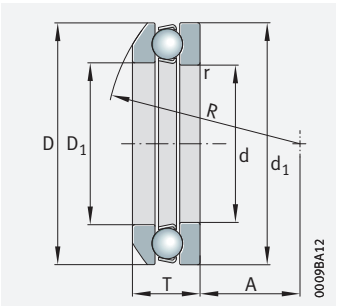
Dimensions										Mounting dimensions		
d	D_1	d_1	r min.	R	A	D_2	D_3	C	T_1	d_a min.	D_a max.	r_a max.
10	11	24	0,3	–	–	–	–	–	–	18	16	0,3
	12	26	0,6	–	–	–	–	–	–	20	16	0,6
	12	26	0,6	22	8,5	18	28	3,5	13	20	18	0,6
12	13	26	0,3	–	–	–	–	–	–	20	18	0,3
	14	28	0,6	–	–	–	–	–	–	22	18	0,6
	14	28	0,6	25	11,5	20	30	3,5	13	22	20	0,6
15	16	28	0,3	–	–	–	–	–	–	23	20	0,3
	17	32	0,6	–	–	–	–	–	–	25	22	0,6
	17	32	0,6	28	12	24	35	4	15	25	24	0,6
17	18	30	0,3	–	–	–	–	–	–	25	22	0,3
	19	35	0,6	–	–	–	–	–	–	28	24	0,6
	19	35	0,6	32	16	26	38	4	15	28	26	0,6
20	21	35	0,3	–	–	–	–	–	–	29	26	0,3
	22	40	0,6	–	–	–	–	–	–	32	28	0,6
	22	40	0,6	36	18	30	42	5	17	32	30	0,6
25	26	42	0,6	–	–	–	–	–	–	35	32	0,6
	27	47	0,6	–	–	–	–	–	–	38	34	0,6
	27	47	0,6	40	19	36	50	5,5	19	38	36	0,6
	27	52	1	–	–	–	–	–	–	41	36	1
	27	52	1	45	21	38	55	6	22	41	38	1
	27	60	1	–	–	–	–	–	–	46	39	1
30	32	47	0,6	–	–	–	–	–	–	40	37	0,6
	32	52	0,6	–	–	–	–	–	–	43	39	0,6
	32	52	0,6	45	22	42	55	5,5	20	43	42	0,6
	32	60	1	–	–	–	–	–	–	48	42	1
	32	60	1	50	22	45	62	7	25	48	45	1
	32	70	1	–	–	–	–	–	–	54	46	1

Axial deep groove ball bearings

Single direction



511, 512, 513, 514

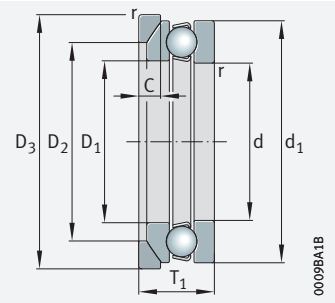


532, 533
Spherical housing locating washer

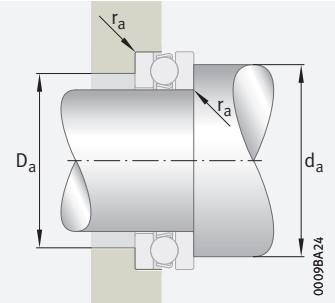
d = 35 – 55 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤*1014* | *1.12* ➤*1014* | *1.13*	
d	D	T	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	Support washer ≈ kg	Bearing	Support washer
35	52	12	20 000	46 500	2 120	0,011	8 800	6 800	0,089	–	**51107**	**–**
	62	18	35 500	67 000	3 100	0,028	6 000	8 000	0,198	–	**51207**	**–**
	62	19,9	35 500	67 000	3 100	0,028	6 000	8 000	0,265	0,057	**53207**	**U207**
	68	24	50 000	89 000	4 050	0,05	4 850	8 200	0,351	–	**51307**	**–**
	68	25,6	50 000	89 000	4 050	0,05	4 850	8 200	0,437	0,082	**53307**	**U307**
	80	32	76 000	126 000	5 700	0,11	3 600	8 500	0,709	–	**51407**	**–**
40	60	13	25 500	62 000	2 850	0,02	7 400	6 400	0,119	–	**51108**	**–**
	68	19	44 000	97 000	4 400	0,05	5 500	6 900	0,257	–	**51208**	**–**
	68	20,3	44 000	97 000	4 400	0,05	5 500	6 900	0,259	0,07	**53208**	**U208**
	78	26	61 000	112 000	5 100	0,081	4 250	7 600	0,536	–	**51308**	**–**
	78	28,5	61 000	112 000	5 100	0,081	4 250	7 600	0,561	0,114	**53308**	**U308**
	90	36	96 000	170 000	7 700	0,18	3 250	7 600	1,03	–	**51408**	**–**
45	65	14	26 500	69 000	3 100	0,025	7 100	5 800	0,15	–	**51109**	**–**
	73	20	39 000	80 000	3 650	0,043	5 500	6 600	0,279	–	**51209**	**–**
	73	21,3	39 000	80 000	3 650	0,043	5 500	6 600	0,278	0,087	**53209**	**U209**
	85	28	75 000	140 000	6 500	0,12	3 800	6 800	0,612	–	**51309**	**–**
	85	30,1	75 000	140 000	6 500	0,12	3 800	6 800	0,783	0,171	**53309**	**U309**
	100	39	123 000	222 000	10 100	0,29	2 850	6 900	1,36	–	**51409**	**–**
50	70	14	27 000	75 000	3 400	0,029	6 800	5 200	0,162	–	**51110**	**–**
	78	22	50 000	106 000	4 850	0,069	4 950	5 700	0,346	–	**51210**	**–**
	78	23,5	50 000	106 000	4 850	0,069	4 950	5 700	0,341	0,098	**53210**	**U210**
	95	31	82 000	169 000	7 700	0,18	3 550	6 400	0,932	–	**51310**	**–**
	95	34,3	82 000	169 000	7 700	0,18	3 550	6 400	0,97	0,22	**53310**	**U310**
	110	43	138 000	255 000	11 700	0,4	2 650	6 500	1,81	–	**51410**	**–**
55	78	16	30 500	75 000	3 400	0,036	6 100	5 200	0,208	–	**51111**	**–**
	90	25	58 000	133 000	6 000	0,11	4 350	5 700	0,382	–	**51211**	**–**
	90	27,3	58 000	133 000	6 000	0,11	4 350	5 700	0,609	0,152	**53211**	**U211**
	105	35	102 000	207 000	9 500	0,26	3 200	6 000	1,3	–	**51311**	**–**
	105	39,3	102 000	207 000	9 500	0,26	3 200	6 000	1,38	0,27	**53311**	**U311**
	120	48	167 000	315 000	14 400	0,59	2 340	6 000	2,83	–	**51411**	**–**

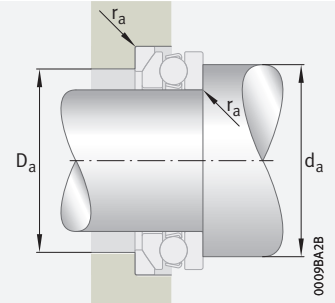
medias *https://www.schaeffler.de/std/1F9A*



532, 533
Spherical housing locating washer
Support washer U2, U3



Mounting dimensions

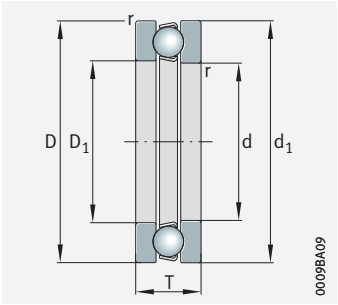


Mounting dimensions

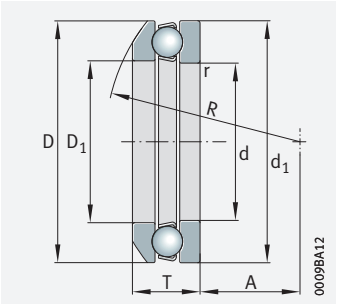
Dimensions										Mounting dimensions		
d	D_1	d_1	r min.	R	A	D_2	D_3	C	T_1	d_a min.	D_a max.	r_a max.
35	37	52	0,6	–	–	–	–	–	–	45	42	0,6
	37	62	1	–	–	–	–	–	–	51	46	1
	37	62	1	50	24	48	65	7	22	51	48	1
	37	68	1	–	–	–	–	–	–	55	48	1
	37	68	1	56	24	52	72	7,5	28	55	52	1
	37	80	1,1	–	–	–	–	–	–	62	53	1
40	42	60	0,6	–	–	–	–	–	–	52	48	0,6
	42	68	1	–	–	–	–	–	–	57	51	1
	42	68	1	56	28,5	55	72	7	23	57	55	1
	42	78	1	–	–	–	–	–	–	63	55	1
	42	78	1	64	28	60	82	8,5	31	63	60	1
	42	90	1,1	–	–	–	–	–	–	70	60	1
45	47	65	0,6	–	–	–	–	–	–	57	53	0,6
	47	73	1	–	–	–	–	–	–	62	56	1
	47	73	1	56	26	60	78	7,5	24	62	60	1
	47	85	1	–	–	–	–	–	–	69	61	1
	47	85	1	64	25	65	90	10	33	69	65	1
	47	100	1,1	–	–	–	–	–	–	78	67	1
50	52	70	0,6	–	–	–	–	–	–	62	58	0,6
	52	78	1	–	–	–	–	–	–	67	61	1
	52	78	1	64	32,5	62	82	7,5	26	67	62	1
	52	95	1,1	–	–	–	–	–	–	77	68	1
	52	95	1,1	72	28	72	100	11	37	77	72	1
	52	110	1,5	–	–	–	–	–	–	86	74	1,5
55	57	78	0,6	–	–	–	–	–	–	69	64	0,6
	57	90	1	–	–	–	–	–	–	76	69	1
	57	90	1	72	35	72	95	9	30	76	72	1
	57	105	1,1	–	–	–	–	–	–	85	75	1
	57	105	1,1	80	30	80	110	11,5	42	85	80	1
	57	120	1,5	–	–	–	–	–	–	94	81	1,5

Axial deep groove ball bearings

Single direction



511, 512, 513, 514

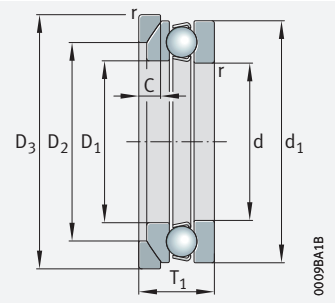


532, 533
Spherical housing locating washer

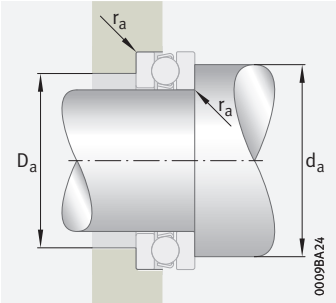
d = 60 – 80 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤*1014|1.12* ➤*1014|1.13*	
d	D	T	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G	$n_{\vartheta r}$	Bearing	Support washer	Bearing	Support washer
			N	N	N		min^{-1}	min^{-1}	≈ kg	≈ kg		
60	85	17	41 500	113 000	5 200	0,065	5 500	4 650	0,278	–	**51112**	**–**
	95	26	62 000	139 000	6 300	0,12	4 200	5 300	0,649	–	**51212**	**–**
	95	28	62 000	139 000	6 300	0,12	4 200	5 300	0,655	0,163	**53212**	**U212**
	110	35	101 000	207 000	9 500	0,28	3 150	5 700	1,36	–	**51312**	**–**
	110	38,3	101 000	207 000	9 500	0,28	3 150	5 700	1,41	0,31	**53312**	**U312**
	130	51	201 000	395 000	18 200	0,87	2 190	5 500	3,57	–	**51412-MP**	**–**
65	90	18	38 500	100 000	4 550	0,063	5 300	4 450	0,3	–	**51113**	**–**
	100	27	64 000	149 000	6 800	0,14	4 100	4 900	0,684	–	**51213**	**–**
	100	28,7	64 000	149 000	6 800	0,14	4 100	4 900	0,855	0,183	**53213**	**U213**
	115	36	105 000	220 000	10 000	0,32	3 050	5 300	1,39	–	**51313**	**–**
	115	39,4	105 000	220 000	10 000	0,32	3 050	5 300	1,78	0,34	**53313**	**U313**
	140	56	217 000	450 000	20 500	1,1	2 050	5 200	4,47	–	**51413-MP**	**–**
70	95	18	40 000	110 000	5 000	0,074	5 100	4 100	0,352	–	**51114**	**–**
	105	27	66 000	159 000	7 200	0,16	4 000	4 550	0,727	–	**51214**	**–**
	105	28,8	66 000	159 000	7 200	0,16	4 000	4 550	0,903	0,185	**53214**	**U214**
	125	40	134 000	290 000	13 300	0,51	2 750	4 950	1,9	–	**51314**	**–**
	125	44,2	134 000	290 000	13 300	0,51	2 750	4 950	2,09	0,4	**53314**	**U314**
	150	60	222 000	500 000	21 700	1,4	1 920	5 000	5,49	–	**51414-MP**	**–**
75	100	19	44 500	123 000	5 600	0,093	4 800	3 800	0,365	–	**51115**	**–**
	110	27	67 000	169 000	7 700	0,18	3 950	4 300	0,825	–	**51215**	**–**
	110	28,3	67 000	169 000	7 700	0,18	3 950	4 300	1,01	0,21	**53215**	**U215**
	135	44	163 000	360 000	15 900	0,75	2 480	4 650	2,59	–	**51315**	**–**
	135	48,1	163 000	360 000	15 900	0,75	2 480	4 650	3,19	0,54	**53315**	**U315**
	160	65	238 000	560 000	23 400	1,8	1 810	4 750	6,82	–	**51415-MP**	**–**
80	105	19	45 000	129 000	5 900	0,1	4 650	3 600	0,384	–	**51116**	**–**
	115	28	75 000	191 000	8 800	0,23	3 700	3 950	0,908	–	**51216**	**–**
	115	29,5	75 000	191 000	8 800	0,23	3 700	3 950	0,903	0,22	**53216**	**U216**
	140	44	160 000	360 000	15 500	0,79	2 460	4 450	2,69	–	**51316**	**–**
	140	47,6	160 000	360 000	15 500	0,79	2 460	4 450	2,75	0,56	**53316**	**U316**
	170	68	270 000	620 000	25 500	2,2	1 710	4 550	7,97	–	**51416-MP**	**–**

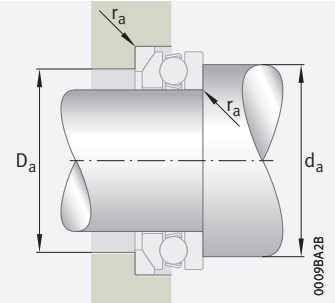
medias *https://www.schaeffler.de/std/1F9A*



532, 533
Spherical housing locating washer
Support washer U2, U3



Mounting dimensions

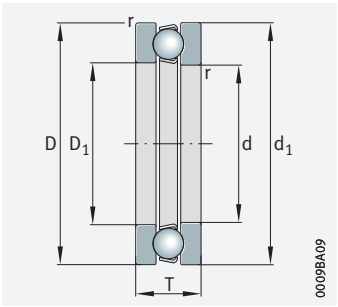


Mounting dimensions

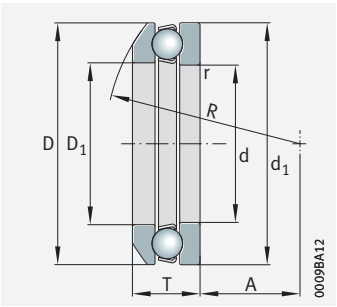
Dimensions										Mounting dimensions		
d	D_1	d_1	r min.	R	A	D_2	D_3	C	T_1	d_a min.	D_a max.	r_a max.
60	62	85	1	–	–	–	–	–	–	75	70	1
	62	95	1	–	–	–	–	–	–	81	74	1
	62	95	1	72	32,5	78	100	9	31	81	78	1
	62	110	1,1	–	–	–	–	–	–	90	80	1
	62	110	1,1	90	41	85	115	11,5	42	90	85	1
	62	130	1,5	–	–	–	–	–	–	102	88	1,5
65	67	90	1	–	–	–	–	–	–	80	75	1
	67	100	1	–	–	–	–	–	–	86	79	1
	67	100	1	80	40	82	105	9	32	86	82	1
	67	115	1,1	–	–	–	–	–	–	95	85	1
	67	115	1,1	90	38,5	90	120	12,5	43	95	90	1
	68	140	2	–	–	–	–	–	–	110	95	2
70	72	95	1	–	–	–	–	–	–	85	80	1
	72	105	1	–	–	–	–	–	–	91	84	1
	72	105	1	80	38	88	110	9	32	91	88	1
	72	125	1,1	–	–	–	–	–	–	103	92	1
	72	125	1,1	100	43	98	130	13	48	103	98	1
	73	150	2	–	–	–	–	–	–	118	102	2
75	77	100	1	–	–	–	–	–	–	90	85	1
	77	110	1	–	–	–	–	–	–	96	89	1
	77	110	1	90	49	92	115	9,5	32	96	92	1
	77	135	1,5	–	–	–	–	–	–	111	99	1,5
	77	135	1,5	100	37	105	140	15	52	111	105	1,5
	78	160	2	–	–	–	–	–	–	126	109	2
80	82	105	1	–	–	–	–	–	–	95	90	1
	82	115	1	–	–	–	–	–	–	101	94	1
	82	115	1	90	46	98	120	10	33	101	98	1
	82	140	1,5	–	–	–	–	–	–	116	104	1,5
	82	140	1,5	112	50	110	145	15	52	116	110	1,5
	83	170	2,1	–	–	–	–	–	–	134	116	2,1

Axial deep groove ball bearings

Single direction



511, 512, 513, 514

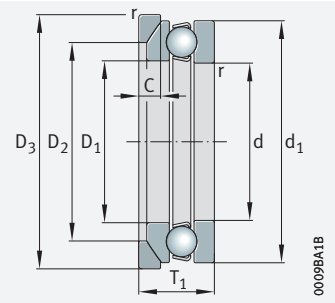


532, 533
Spherical housing locating washer

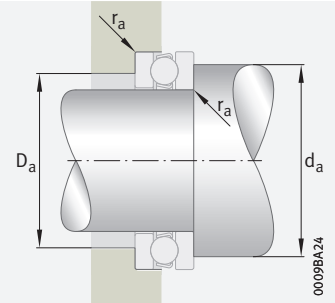
d = 85 – 120 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	Support washer ≈ kg	Bearing	Support washer
85	110	19	45 500	134 000	6 200	0,11	4 500	3 400	0,404	–	**51117**	**–**
	125	31	98 000	250 000	11 200	0,37	3 250	3 850	1,21	–	**51217**	**–**
	125	33,1	98 000	250 000	11 200	0,37	3 250	3 850	1,22	0,29	**53217**	**U217**
	150	49	186 000	420 000	17 700	1,1	2 260	4 250	3,48	–	**51317**	**–**
	150	53,1	186 000	420 000	17 700	1,1	2 260	4 250	3,51	0,8	**53317**	**U317**
	180	72	305 000	750 000	30 000	3	1 620	4 250	9,3	–	**51417-MP**	**–**
90	120	22	45 500	140 000	6 300	0,12	4 300	3 500	0,617	–	**51118**	**–**
	135	35	119 000	300 000	13 000	0,54	2 900	3 750	1,66	–	**51218**	**–**
	135	38,5	119 000	300 000	13 000	0,54	2 900	3 750	1,7	0,42	**53218**	**U218**
	155	50	193 000	455 000	18 800	1,2	2 240	4 050	3,75	–	**51318**	**–**
	155	54,6	193 000	455 000	18 800	1,2	2 240	4 050	3,81	0,82	**53318**	**U318**
	190	77	325 000	830 000	32 000	3,7	1 540	4 100	11,2	–	**51418-MP**	**–**
100	135	25	85 000	270 000	11 300	0,36	3 500	3 100	0,992	–	**51120**	**–**
	150	38	119 000	325 000	13 300	0,68	2 700	3 600	2,21	–	**51220**	**–**
	150	40,9	119 000	325 000	13 300	0,68	2 700	3 600	2,23	0,5	**53220**	**U220**
	170	55	238 000	580 000	23 200	1,9	1 970	3 650	4,94	–	**51320**	**–**
	170	59,2	238 000	580 000	23 200	1,9	1 970	3 650	4,99	0,93	**53320**	**U320**
	210	85	375 000	1 060 000	38 500	6	1 350	3 650	15	–	**51420-MP**	**–**
110	145	25	87 000	290 000	11 600	0,42	3 350	2 800	1,08	–	**51122**	**–**
	160	38	126 000	365 000	14 400	0,83	2 650	3 250	2,28	–	**51222**	**–**
	160	40,2	126 000	365 000	14 400	0,83	2 650	3 250	2,24	0,56	**53222**	**U222**
	190	63	280 000	740 000	28 000	3	1 790	3 400	7,85	–	**51322-MP**	**–**
	190	67,2	280 000	740 000	28 000	3	1 790	3 400	7,85	1,26	**53322-MP**	**U322**
	230	95	405 000	1 130 000	39 500	7,1	1 300	3 400	20	–	**51422-MP**	**–**
120	155	25	89 000	310 000	12 000	0,49	3 200	2 600	1,16	–	**51124**	**–**
	170	39	128 000	385 000	14 600	0,94	2 550	3 000	2,66	–	**51224**	**–**
	170	40,8	128 000	385 000	14 600	0,94	2 550	3 000	2,58	0,65	**53224**	**U224**
	210	70	325 000	910 000	32 500	4,4	1 610	3 200	10,7	–	**51324-MP**	**–**
	210	74,1	325 000	910 000	32 500	4,4	1 610	3 200	10,6	2,01	**53324-MP**	**U324**
	250	102	455 000	1 340 000	45 000	10	1 180	3 050	25,4	–	**51424-MP**	**–**

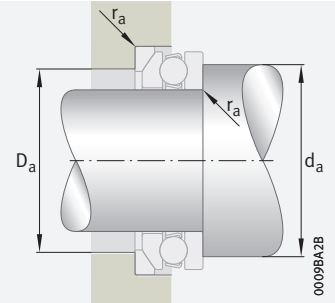
medias *https://www.schaeffler.de/std/1F9A*



532, 533
Spherical housing locating washer
Support washer U2, U3



Mounting dimensions

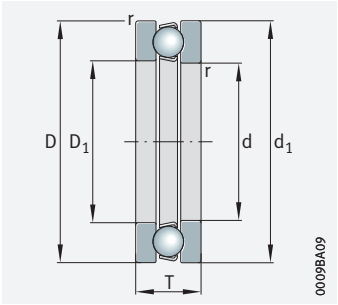


Mounting dimensions

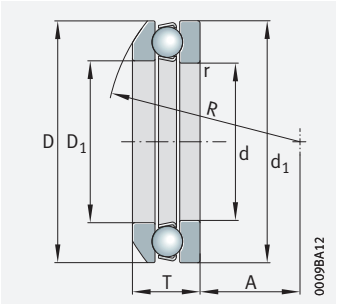
Dimensions										Mounting dimensions		
d	D_1	d_1	r min.	R	A	D_2	D_3	C	T_1	d_a min.	D_a max.	r_a max.
85	87	110	1	–	–	–	–	–	–	100	95	1
	88	125	1	–	–	–	–	–	–	109	101	1
	88	125	1	100	52	105	130	11	37	109	105	1
	88	150	1,5	–	–	–	–	–	–	124	111	1,5
	88	150	1,5	112	43	115	155	17,5	58	124	115	1,5
	88	177	2,1	–	–	–	–	–	–	142	123	2,1
90	92	120	1	–	–	–	–	–	–	108	102	1
	93	135	1,1	–	–	–	–	–	–	117	108	1
	93	135	1,1	100	45	110	140	13,5	42	117	110	1
	93	155	1,5	–	–	–	–	–	–	129	116	1,5
	93	155	1,5	112	40	120	160	18	59	129	120	1,5
	93	187	2,1	–	–	–	–	–	–	150	130	2,1
100	102	135	1	–	–	–	–	–	–	121	114	1
	103	150	1,1	–	–	–	–	–	–	130	120	1
	103	150	1,1	112	52	125	155	14	45	130	125	1
	103	170	1,5	–	–	–	–	–	–	142	128	1,5
	103	170	1,5	125	46	135	175	18	64	142	135	1,5
	103	205	3	–	–	–	–	–	–	166	144	2,5
110	112	145	1	–	–	–	–	–	–	131	124	1
	113	160	1,1	–	–	–	–	–	–	140	130	1
	113	160	1,1	125	65	135	165	14	45	140	135	1
	113	187	2	–	–	–	–	–	–	158	142	2
	113	187	2	140	51	150	195	20,5	72	158	150	2
	113	225	3	–	–	–	–	–	–	182	158	2,5
120	122	155	1	–	–	–	–	–	–	141	134	1
	123	170	1,1	–	–	–	–	–	–	150	140	1
	123	170	1,1	125	61	145	175	15	46	150	145	1
	123	205	2,1	–	–	–	–	–	–	174	156	2,1
	123	205	2,1	160	63	165	220	22	80	174	165	2,1
	123	245	4	–	–	–	–	–	–	198	172	3

Axial deep groove ball bearings

Single direction



511, 512, 513, 514

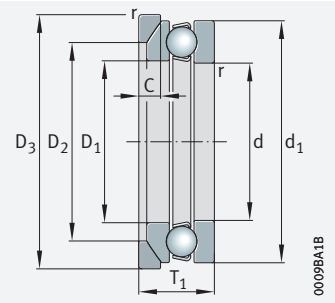


532, 533
Spherical housing locating washer

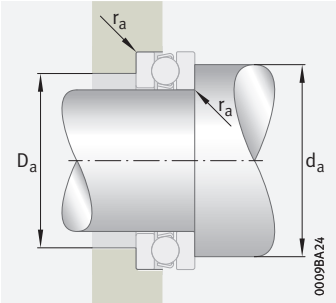
d = 130 – 180 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤*1014|1.12* ➤*1014|1.13*	
d	D	T	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G	$n_{\vartheta r}$	Bearing	Support washer	Bearing	Support washer
			N	N	N		min^{-1}	min^{-1}	≈ kg	≈ kg		
130	170	30	111 000	390 000	14 600	0,76	2 850	2 490	1,75	–	**51126**	**–**
	190	45	184 000	540 000	19 500	1,7	2 210	2 850	3,96	–	**51226**	**–**
	190	47,9	184 000	540 000	19 500	1,7	2 210	2 850	3,9	0,9	**53226**	**U226**
	225	75	360 000	1 050 000	36 000	5,9	1 490	2 950	13	–	**51326-MP**	**–**
	270	110	560 000	1 750 000	57 000	16	1 030	2 650	32	–	**51426-MP**	**–**
140	180	31	111 000	400 000	14 600	0,83	2 750	2 330	1,9	–	**51128**	**–**
	200	46	191 000	570 000	19 800	1,9	2 110	2 700	4,3	–	**51228**	**–**
	200	48,6	191 000	570 000	19 800	1,9	2 110	2 700	4,25	1,22	**53228**	**U228**
	240	80	385 000	1 240 000	41 000	8,2	1 360	2 700	15,6	–	**51328-MP**	**–**
	240	84,9	385 000	1 240 000	41 000	8,2	1 360	2 700	15,5	2,92	**53328-MP**	**U328**
150	190	31	109 000	400 000	14 200	0,89	2 650	2 200	2,17	–	**51130-MP**	**–**
	215	50	236 000	730 000	24 900	2,9	1 950	2 500	6,08	–	**51230-MP**	**–**
	215	53,3	236 000	730 000	24 900	2,9	1 950	2 500	5,95	1,69	**53230-MP**	**U230**
	250	80	395 000	1 330 000	43 000	9,3	1 340	2 480	16,2	–	**51330-MP**	**–**
	250	83,7	395 000	1 330 000	43 000	9,3	1 340	2 480	12,8	3,11	**53330-MP**	**U330**
160	200	31	112 000	425 000	14 600	1	2 550	2 060	2,29	–	**51132-MP**	**–**
	225	51	240 000	770 000	25 500	3,2	1 900	2 350	6,53	–	**51232-MP**	**–**
	225	54,7	240 000	770 000	25 500	3,2	1 900	2 350	6,45	1,8	**53232-MP**	**U232**
	270	87	445 000	1 560 000	48 500	13	1 230	2 280	21,2	–	**51332-MP**	**–**
	270	91,7	445 000	1 560 000	48 500	13	1 230	2 280	20,8	4	**53332-MP**	**U332**
170	215	34	127 000	510 000	16 700	1,4	2 330	2 010	3,02	–	**51134-MP**	**–**
	240	55	285 000	930 000	29 500	4,5	1 740	2 230	8,12	–	**51234-MP**	**–**
	240	58,7	285 000	930 000	29 500	4,5	1 740	2 230	7,91	2,14	**53234-MP**	**U234**
	280	87	440 000	1 560 000	47 500	13	1 220	2 170	22,2	–	**51334-MP**	**–**
	280	91,3	440 000	1 560 000	47 500	13	1 220	2 170	21,6	4,42	**53334-MP**	**U334**
180	225	34	127 000	520 000	16 800	1,5	2 250	1 910	3,06	–	**51136-MP**	**–**
	250	56	305 000	1 030 000	32 500	5,4	1 670	2 080	8,56	–	**51236-MP**	**–**
	250	58,2	305 000	1 030 000	32 500	5,4	1 670	2 080	8,19	2,33	**53236-MP**	**U236**
	300	95	520 000	1 830 000	54 000	18	1 130	2 000	24,8	–	**51336-MP**	**–**
	300	99,3	520 000	1 830 000	54 000	18	1 130	2 000	24,1	5,32	**53336-MP**	**U336**

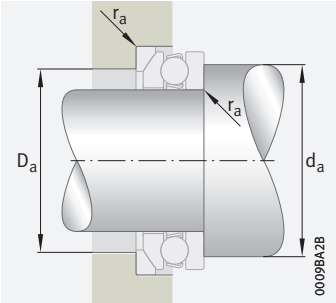
medias *https://www.schaeffler.de/std/1F9A*



532, 533
Spherical housing locating washer
Support washer U2, U3



Mounting dimensions

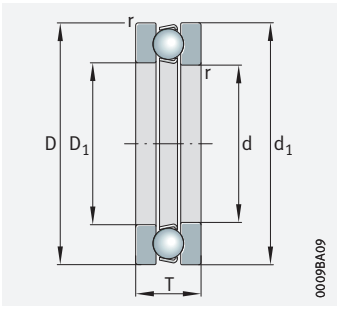


Mounting dimensions

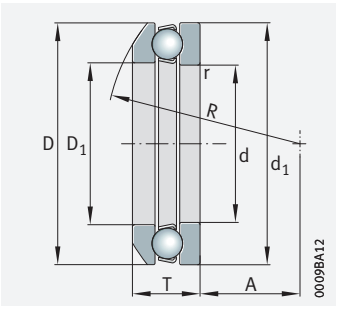
Dimensions										Mounting dimensions		
d	D_1	d_1	r min.	R	A	D_2	D_3	C	T_1	d_a min.	D_a max.	r_a max.
130	132	170	1	–	–	–	–	–	–	154	146	1
	133	187	1,5	–	–	–	–	–	–	166	154	1,5
	133	187	1,5	140	67	160	195	17	53	166	160	1,5
	134	220	2,1	–	–	–	–	–	–	187	168	2,1
	134	265	4	–	–	–	–	–	–	214	186	3
140	142	178	1	–	–	–	–	–	–	164	156	1
	143	197	1,5	–	–	–	–	–	–	176	164	1,5
	143	197	1,5	160	87	170	210	17	55	176	170	1,5
	144	235	2,1	–	–	–	–	–	–	200	180	2,1
	144	235	2,1	180	68	190	250	26	92	200	190	2,1
150	152	188	1	–	–	–	–	–	–	174	166	1
	153	212	1,5	–	–	–	–	–	–	189	176	1,5
	153	212	1,5	160	79	180	225	20,5	60	189	180	1,5
	154	245	2,1	–	–	–	–	–	–	210	190	2,1
	154	245	2,1	200	89,5	200	260	26	92	210	200	2,1
160	162	198	1	–	–	–	–	–	–	184	176	1
	163	222	1,5	–	–	–	–	–	–	199	186	1,5
	163	222	1,5	160	74	190	235	21	61	199	190	1,5
	164	265	3	–	–	–	–	–	–	226	204	2,5
	164	265	3	200	77	215	280	29	100	226	215	2,5
170	172	213	1,1	–	–	–	–	–	–	197	188	1
	173	237	1,5	–	–	–	–	–	–	212	198	1,5
	173	237	1,5	180	91	200	250	21,5	65	212	200	1,5
	174	275	3	–	–	–	–	–	–	236	214	2,5
	174	275	3	225	105	220	290	29	100	236	220	2,5
180	183	222	1,1	–	–	–	–	–	–	207	198	1
	183	245	1,5	–	–	–	–	–	–	222	208	1,5
	183	245	1,5	200	112	210	260	21,5	66	222	210	1,5
	184	295	3	–	–	–	–	–	–	252	228	2,5
	184	295	3	225	91	240	310	32	109	252	240	2,5

Axial deep groove ball bearings

Single direction



511, 512, 513

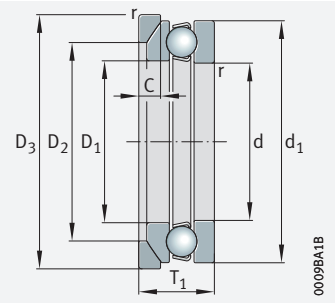


532, 533
Spherical housing locating washer

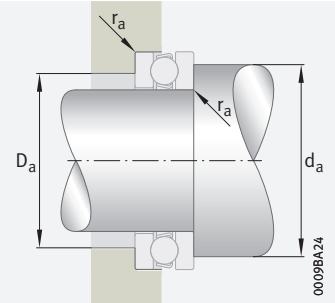
d = 190 – 260 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G	$n_{\vartheta r}$	Bearing	Support washer	Bearing	Support washer
			N	N	N		min^{-1}	min^{-1}	≈ kg	≈ kg		
190	240	37	161 000	650 000	20 200	2,3	2 040	1 850	4,06	–	**51138-MP**	**–**
	270	62	335 000	1 170 000	35 500	7,2	1 540	2 010	11,6	–	**51238-MP**	**–**
	270	65,7	335 000	1 170 000	35 500	7,2	1 540	2 010	11,5	2,63	**53238-MP**	**U238**
	320	105	590 000	2 170 000	63 000	24	1 040	1 840	36,7	–	**51338-MP**	**–**
	320	111	590 000	2 170 000	63 000	24	1 040	1 840	36,5	6,16	**53338-MP**	**U338**
200	250	37	162 000	670 000	20 400	2,5	1 980	1 760	4,12	–	**51140-MP**	**–**
	280	62	340 000	1 220 000	36 000	7,8	1 510	1 890	12	–	**51240-MP**	**–**
	280	65,3	340 000	1 220 000	36 000	7,8	1 510	1 890	11,8	2,79	**53240-MP**	**U240**
220	270	37	168 000	730 000	21 300	3	1 870	1 600	4,54	–	**51144-MP**	**–**
	300	63	335 000	1 330 000	37 500	9,6	1 420	1 690	13,1	–	**51244-MP**	**–**
	300	65,6	335 000	1 330 000	37 500	9,6	1 420	1 690	13,1	3,31	**53244-MP**	**U244**
240	300	45	237 000	990 000	27 500	5,2	1 640	1 540	7,41	–	**51148-MP**	**–**
260	320	45	245 000	1 070 000	29 000	6,1	1 560	1 390	7,89	–	**51152-MP**	**–**

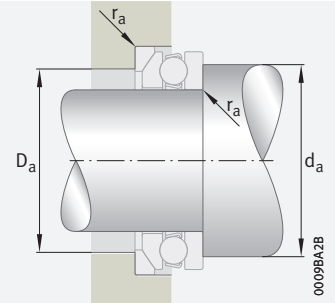
medias *https://www.schaeffler.de/std/1F9A*



532, 533
Spherical housing locating washer
Support washer U2, U3



Mounting dimensions

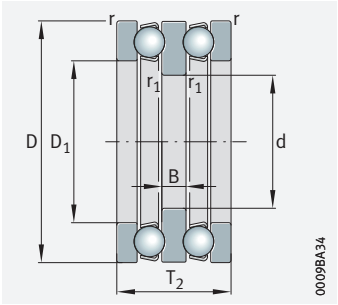


Mounting dimensions

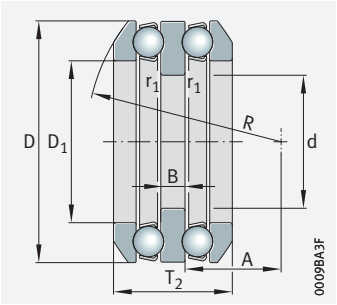
Dimensions										Mounting dimensions		
d	D_1	d_1	r min.	R	A	D_2	D_3	C	T_1	d_a min.	D_a max.	r_a max.
190	193	237	1,1	–	–	–	–	–	–	220	210	1
	194	265	2	–	–	–	–	–	–	238	222	2
	195	265	2	200	98	230	280	23	73	238	230	2
	195	315	4	–	–	–	–	–	–	268	242	3
	195	315	4	250	104	255	330	33	121	268	255	3
200	203	247	1,1	–	–	–	–	–	–	230	220	1
	204	275	2	–	–	–	–	–	–	248	232	2
	204	275	2	225	125	240	290	23	74	248	240	2
220	223	267	1,1	–	–	–	–	–	–	250	240	1
	224	295	2	–	–	–	–	–	–	268	252	2
	224	295	2	225	118	260	310	25	75	268	260	2
240	243	297	1,5	–	–	–	–	–	–	276	264	1,5
260	263	317	1,5	–	–	–	–	–	–	296	284	1,5

Axial deep groove ball bearings

Double direction



522, 523

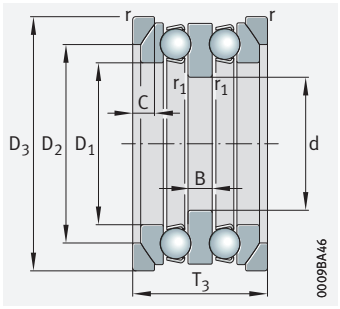


542, 543
Spherical housing locating washers

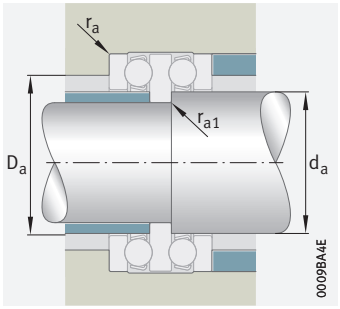
d = 10 – 40 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T_2	dyn. C_a N	stat. C_{0a} N	C_{ua} N	A	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	Bearing ≈ kg	Support washer ≈ kg	Bearing	Support washer
10	32	22	16 600	24 800	1 130	0,003	9 800	13 700	0,085	–	**52202**	**–**
15	40	26	21 100	37 500	1 700	0,007	8 500	11 100	0,15	–	**52204**	**–**
20	47	28	26 500	50 000	2 280	0,013	7 500	9 400	0,23	–	**52205**	**–**
	47	31,4	26 500	50 000	2 280	0,013	7 500	9 400	0,221	0,031	**54205**	**U205**
	52	34	34 500	55 000	2 500	0,019	6 000	9 700	0,29	–	**52305**	**–**
	52	37,6	34 500	55 000	2 500	0,019	6 000	9 700	0,303	0,043	**54305**	**U305**
	70	52	70 000	112 000	5 200	0,077	3 850	8 700	0,912	–	**52406**	**–**
25	52	29	23 900	46 000	2 100	0,014	7 300	8 200	0,249	–	**52206**	**–**
	52	32,6	23 900	46 000	2 100	0,014	7 300	8 200	0,269	0,032	**54206**	**U206**
	60	38	35 500	65 000	2 950	0,028	5 700	8 600	0,435	–	**52306**	**–**
	60	41,2	35 500	65 000	2 950	0,028	5 700	8 600	0,553	0,055	**54306**	**U306**
	80	59	76 000	126 000	5 700	0,11	3 600	8 000	1,44	–	**52407**	**–**
30	62	34	35 500	67 000	3 100	0,028	6 000	7 500	0,405	–	**52207**	**–**
	62	37,8	35 500	67 000	3 100	0,028	6 000	7 500	0,423	0,082	**54207**	**U207**
	68	36	44 000	97 000	4 400	0,05	5 500	6 900	0,54	–	**52208**	**–**
	68	44	50 000	89 000	4 050	0,05	4 850	7 600	0,63	–	**52307**	**–**
	68	38,6	44 000	97 000	4 400	0,05	5 500	6 900	0,513	0,07	**54208**	**U208**
	68	47,2	50 000	89 000	4 050	0,05	4 850	7 600	0,683	0,082	**54307**	**U307**
	78	49	61 000	112 000	5 100	0,081	4 250	7 200	1,02	–	**52308**	**–**
	78	54	61 000	112 000	5 100	0,081	4 250	7 200	1,1	0,114	**54308**	**U308**
	90	65	96 000	170 000	7 700	0,18	3 250	7 100	2,03	–	**52408**	**–**
35	73	37	39 000	80 000	3 650	0,043	5 500	6 500	0,58	–	**52209**	**–**
	73	39,6	39 000	80 000	3 650	0,043	5 500	6 500	0,537	0,087	**54209**	**U209**
	85	52	75 000	140 000	6 500	0,12	3 800	6 500	1,24	–	**52309**	**–**
	85	56,2	75 000	140 000	6 500	0,12	3 800	6 500	1,28	0,171	**54309**	**U309**
	100	72	123 000	222 000	10 100	0,29	2 850	6 500	2,71	–	**52409**	**–**
40	78	39	50 000	106 000	4 850	0,069	4 950	5 800	0,684	–	**52210**	**–**
	78	42	50 000	106 000	4 850	0,069	4 950	5 800	0,625	0,098	**54210**	**U210**
	95	58	82 000	169 000	7 700	0,18	3 550	6 100	1,76	–	**52310**	**–**
	95	64,6	82 000	169 000	7 700	0,18	3 550	6 100	1,84	0,22	**54310**	**U310**
	110	78	138 000	255 000	11 700	0,4	2 650	6 000	3,56	–	**52410**	**–**

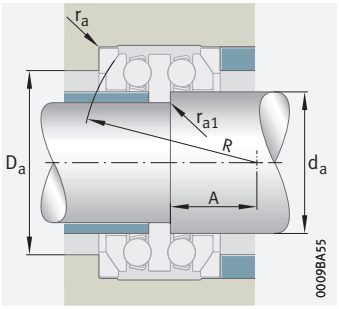
medias *https://www.schaeffler.de/std/1F9A*



542, 543
Spherical housing locating washers
Support washers U2, U3



Mounting dimensions

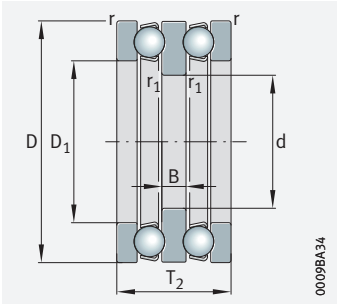


Mounting dimensions

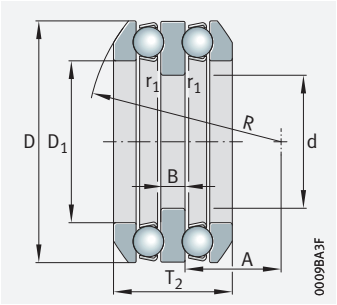
Dimensions											Mounting dimensions			
d	D_1	B	r min.	r_1 min.	R	A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.
10	17	5	0,6	0,3	–	–	–	–	–	–	15	22	0,6	0,3
15	22	6	0,6	0,3	–	–	–	–	–	–	20	28	0,6	0,3
20	27	7	0,6	0,3	–	–	–	–	–	–	25	34	0,6	0,3
	27	7	0,6	0,3	40	16,5	36	50	5,5	36	25	36	0,6	0,3
	27	8	1	0,3	–	–	–	–	–	–	25	36	1	0,3
	27	8	1	0,3	45	18	42	55	6	38	25	38	1	0,3
	32	12	1	0,6	–	–	–	–	–	–	30	46	1	0,6
25	32	7	0,6	0,3	–	–	–	–	–	–	30	39	0,6	0,3
	32	7	0,6	0,3	45	20	37	55	5,5	42	30	42	0,6	0,3
	32	9	1	0,3	–	–	–	–	–	–	30	42	1	0,3
	32	9	1	0,3	50	19,5	46	62	7	45	30	45	1	0,3
	37	14	1,1	0,6	–	–	–	–	–	–	35	53	1	0,6
30	37	8	1	0,3	–	–	–	–	–	–	35	46	1	0,3
	37	8	1	0,3	50	21	42	72	7,5	52	35	48	1	0,3
	42	9	1	0,6	–	–	–	–	–	–	40	51	1	0,6
	37	10	1	0,3	–	–	–	–	–	–	35	48	1	0,3
	42	9	1	0,6	56	25	44	72	7	55	40	55	1	0,6
	37	10	1	0,3	56	21	52	72	7,5	52	35	52	1	0,3
	42	12	1	0,6	–	–	–	–	–	–	40	55	1	0,6
	42	12	1	0,6	64	23,5	59	82	8,5	60	40	60	1	0,6
	42	15	1,1	0,6	–	–	–	–	–	–	40	60	1	0,6
35	47	9	1	0,6	–	–	–	–	–	–	45	56	1	0,6
	47	9	1	0,6	56	23	45	78	7,5	60	45	60	1	0,6
	47	12	1	0,6	–	–	–	–	–	–	45	61	1	0,6
	47	12	1	0,6	64	21	62	90	10	65	45	65	1	0,6
	47	17	1,1	0,6	–	–	–	–	–	–	45	67	1	0,6
40	52	9	1	0,6	–	–	–	–	–	–	50	61	1	0,6
	52	9	1	0,6	64	30,5	47	82	7,5	62	50	62	1	0,6
	52	14	1,1	0,6	–	–	–	–	–	–	50	68	1	0,6
	52	14	1,1	0,6	72	23	70	100	11	72	50	72	1	0,6
	52	18	1,5	0,6	–	–	–	–	–	–	50	74	1,5	0,6

Axial deep groove ball bearings

Double direction



522, 523

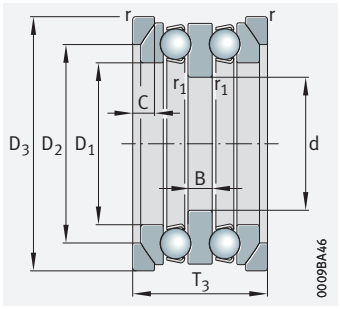


542, 543
Spherical housing locating washers

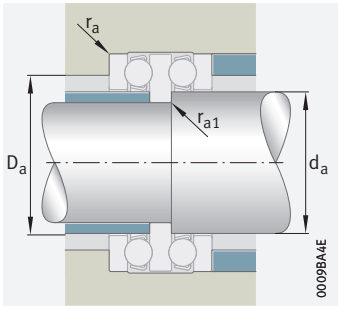
d = 45 – 70 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T_2	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G	$n_{\vartheta r}$	Bearing	Support washer	Bearing	Support washer
			N	N	N		min^{-1}	min^{-1}	≈ kg	≈ kg		
45	90	45	58 000	133 000	6 000	0,11	4 350	5 600	1,05	–	**52211**	**–**
	90	49,6	58 000	133 000	6 000	0,11	4 350	5 600	1,02	0,152	**54211**	**U211**
	105	64	102 000	207 000	9 500	0,26	3 200	5 700	2,37	–	**52311**	**–**
	105	72,6	102 000	207 000	9 500	0,26	3 200	5 700	2,53	0,27	**54311**	**U311**
	120	87	167 000	315 000	14 400	0,59	2 340	5 600	4,7	–	**52411**	**–**
50	95	46	62 000	139 000	6 300	0,12	4 200	5 200	1,1	–	**52212**	**–**
	95	50	62 000	139 000	6 300	0,12	4 200	5 200	1,17	0,163	**54212**	**U212**
	110	64	101 000	207 000	9 500	0,28	3 150	5 400	2,49	–	**52312**	**–**
	110	70,6	101 000	207 000	9 500	0,28	3 150	5 400	2,59	0,31	**54312**	**U312**
	115	70,6	101 000	207 000	9 500	0,28	3 150	5 800	2,98	0,34	**54313**	**U313**
55	100	47	64 000	149 000	6 800	0,14	4 100	4 800	1,28	–	**52213**	**–**
	100	50,4	64 000	149 000	6 800	0,14	4 100	4 800	1,53	0,183	**54213**	**U213**
	105	47	66 000	159 000	7 200	0,16	4 000	4 750	1,4	–	**52214**	**–**
	105	50,6	66 000	159 000	7 200	0,16	4 000	4 750	1,46	0,185	**54214**	**U214**
	115	65	105 000	220 000	10 000	0,32	3 050	5 000	2,68	–	**52313**	**–**
	125	72	134 000	290 000	13 300	0,51	2 750	4 800	3,55	–	**52314**	**–**
	125	80,4	134 000	290 000	13 300	0,51	2 750	4 800	3,77	0,4	**54314**	**U314**
60	110	47	67 000	169 000	7 700	0,18	3 950	4 450	1,45	–	**52215**	**–**
	110	49,6	67 000	169 000	7 700	0,18	3 950	4 450	1,87	0,21	**54215**	**U215**
	135	79	163 000	360 000	15 900	0,75	2 480	4 500	4,72	–	**52315**	**–**
	135	87,2	163 000	360 000	15 900	0,75	2 480	4 500	4,98	0,54	**54315**	**U315**
65	115	48	75 000	191 000	8 800	0,23	3 700	4 150	1,55	–	**52216**	**–**
	115	51	75 000	191 000	8 800	0,23	3 700	4 150	1,6	0,22	**54216**	**U216**
	140	79	160 000	360 000	15 500	0,79	2 460	4 350	4,82	–	**52316**	**–**
	140	86,2	160 000	360 000	15 500	0,79	2 460	4 350	5,22	0,56	**54316**	**U316**
70	125	55	98 000	250 000	11 200	0,37	3 250	3 950	2,23	–	**52217**	**–**
	125	59,2	98 000	250 000	11 200	0,37	3 250	3 950	2,25	0,29	**54217**	**U217**
	150	87	186 000	420 000	17 700	1,1	2 260	4 150	6,2	–	**52317**	**–**
	150	95,2	186 000	420 000	17 700	1,1	2 260	4 150	6,41	0,8	**54317**	**U317**

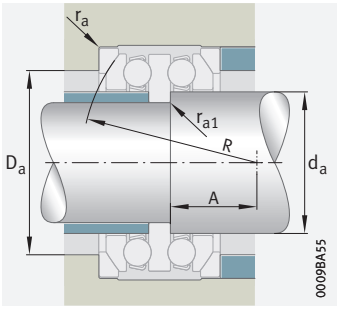
medias *https://www.schaeffler.de/std/1F9A*



542, 543
Spherical housing locating washers
Support washers U2, U3



Mounting dimensions

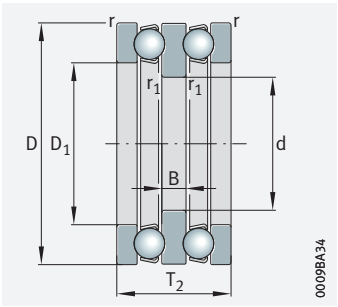


Mounting dimensions

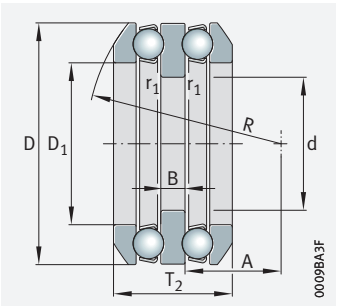
Dimensions											Mounting dimensions			
d	D_1	B	r min.	r_1 min.	R	A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.
45	57	10	1	0,6	–	–	–	–	–	–	55	69	1	0,6
	57	10	1	0,6	72	32,5	55	95	9	72	55	72	1	0,6
	57	15	1,1	0,6	–	–	–	–	–	–	55	75	1	0,6
	57	15	1,1	0,6	80	25,5	78	110	11,5	80	55	80	1	0,6
	57	20	1,5	0,6	–	–	–	–	–	–	55	81	1,5	0,6
50	62	10	1	0,6	–	–	–	–	–	–	60	74	1	0,6
	62	10	1	0,6	72	30,5	56	100	9	78	60	78	1	0,6
	62	15	1,1	0,6	–	–	–	–	–	–	60	80	1	0,6
	62	15	1,1	0,6	90	36,5	78	115	11,5	85	60	85	1	0,6
	67	15	1,1	0,6	90	34,5	79	120	12,5	90	60	85	1	0,6
55	67	10	1	0,6	–	–	–	–	–	–	65	79	1	0,6
	67	10	1	0,6	80	38,5	57	105	9	82	65	82	1	0,6
	72	10	1	1	–	–	–	–	–	–	70	84	1	1
	72	10	1	1	80	36,5	57	110	9	88	70	88	1	1
	67	15	1,1	0,6	–	–	–	–	–	–	65	85	1	0,6
	72	16	1,1	1	–	–	–	–	–	–	70	92	1	1
	72	16	1,1	1	100	39	88	130	13	98	70	98	1	1
60	77	10	1	1	–	–	–	–	–	–	75	89	1	1
	77	10	1	1	90	47,5	57	115	9,5	92	75	92	1	1
	77	18	1,5	1	–	–	–	–	–	–	75	99	1,5	1
	77	18	1,5	1	100	32,5	95	140	15	105	75	105	1,5	1
65	82	10	1	1	–	–	–	–	–	–	80	94	1	1
	82	10	1	1	90	45	58	120	10	98	80	98	1	1
	82	18	1,5	1	–	–	–	–	–	–	80	104	1,5	1
	82	18	1,5	1	112	45,5	95	145	15	110	80	110	1,5	1
70	88	12	1	1	–	–	–	–	–	–	85	101	1	1
	88	12	1	1	100	49,5	67	130	11	105	85	105	1	1
	88	19	1,5	1	–	–	–	–	–	–	85	111	1,5	1
	88	19	1,5	1	112	39	105	155	17,5	115	85	115	1,5	1

Axial deep groove ball bearings

Double direction



522, 523

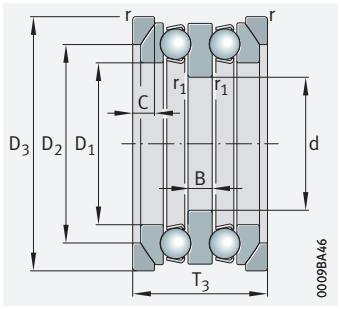


542, 543
Spherical housing locating washers

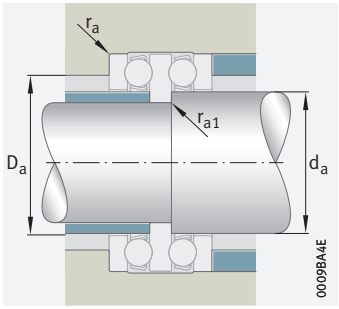
d = 75 – 130 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T_2	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G	$n_{\vartheta r}$	Bearing	Support washer	Bearing	Support washer
			N	N	N		min^{-1}	min^{-1}	≈ kg	≈ kg		
75	135	62	119 000	300 000	13 000	0,54	2 900	3 800	3,05	–	**52218**	**–**
	135	69	119 000	300 000	13 000	0,54	2 900	3 800	3,11	0,42	**54218**	**U218**
	155	88	193 000	455 000	18 800	1,2	2 240	3 900	6,62	–	**52318**	**–**
	155	97,2	193 000	455 000	18 800	1,2	2 240	3 900	6,76	0,82	**54318**	**U318**
85	150	67	119 000	325 000	13 300	0,68	2 700	3 550	3,95	–	**52220**	**–**
	150	72,8	119 000	325 000	13 300	0,68	2 700	3 550	3,87	0,5	**54220**	**U220**
	170	97	238 000	580 000	23 200	1,9	1 970	3 550	8,71	–	**52320**	**–**
	170	105,4	238 000	580 000	23 200	1,9	1 970	3 550	8,93	0,93	**54320**	**U320**
95	160	67	126 000	365 000	14 400	0,83	2 650	3 250	4,06	–	**52222**	**–**
	160	71,4	126 000	365 000	14 400	0,83	2 650	3 250	4,55	0,56	**54222**	**U222**
	190	110	280 000	740 000	28 000	3	1 790	3 300	14	–	**52322-MP**	**–**
	190	118,4	280 000	740 000	28 000	3	1 790	3 300	13,7	1,26	**54322-MP**	**U322**
100	170	68	128 000	385 000	14 600	0,94	2 550	3 100	4,82	–	**52224**	**–**
	170	71,6	128 000	385 000	14 600	0,94	2 550	3 100	4,66	0,65	**54224**	**U224**
	210	123	325 000	910 000	32 500	4,4	1 610	3 100	19,3	–	**52324-MP**	**–**
	210	131,2	325 000	910 000	32 500	4,4	1 610	3 100	18,8	2,01	**54324-MP**	**U324**
110	190	80	184 000	540 000	19 500	1,7	2 210	2 950	7,26	–	**52226**	**–**
	190	85,8	184 000	540 000	19 500	1,7	2 210	2 950	7,51	0,9	**54226**	**U226**
120	200	81	191 000	570 000	19 800	1,9	2 110	2 750	7,9	–	**52228**	**–**
	200	86,2	191 000	570 000	19 800	1,9	2 110	2 750	16,9	1,22	**54228**	**U228**
	240	140	385 000	1 240 000	41 000	8,2	1 360	2 550	28,3	–	**52328-MP**	**–**
130	215	89	236 000	730 000	24 900	2,9	1 950	2 550	11,46	–	**52230-MP**	**–**
	215	95,6	236 000	730 000	24 900	2,9	1 950	2 550	10,4	1,69	**54230-MP**	**U230**
	250	140	395 000	1 330 000	43 000	9,3	1 340	2 360	29,4	–	**52330-MP**	**–**

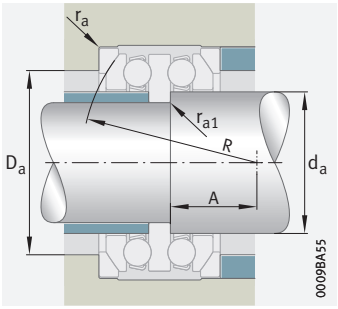
medias *https://www.schaeffler.de/std/1F9A*



542, 543
Spherical housing locating washers
Support washers U2, U3



Mounting dimensions

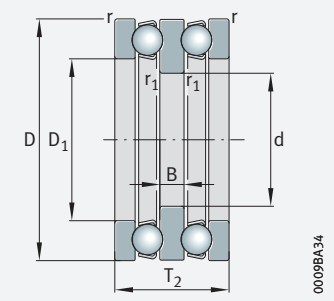


Mounting dimensions

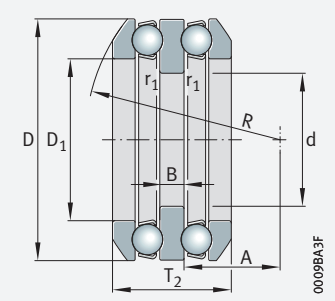
Dimensions											Mounting dimensions			
d	D_1	B	r min.	r_1 min.	R	A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.
75	93	14	1,1	1	–	–	–	–	–	–	90	108	1	1
	93	14	1,1	1	100	42	76	140	13,5	110	90	110	1	1
	93	19	1,5	1	–	–	–	–	–	–	90	116	1,5	1
	93	19	1,5	1	112	36,5	106	160	18	120	90	120	1,5	1
85	103	15	1,1	1	–	–	–	–	–	–	100	120	1	1
	103	15	1,1	1	112	49	81	155	14	125	100	125	1	1
	103	21	1,5	1	–	–	–	–	–	–	100	128	1,5	1
	103	21	1,5	1	125	42	115	175	18	135	100	135	1,5	1
95	113	15	1,1	1	–	–	–	–	–	–	110	130	1	1
	113	15	1,1	1	125	62	81	165	14	135	110	135	1	1
	113	24	2	1	–	–	–	–	–	–	110	142	2	1
	113	24	2	1	140	47	128	195	20,5	150	110	150	2	1
100	123	15	1,1	1,1	–	–	–	–	–	–	120	140	1	1
	123	15	1,1	1,1	125	58,5	82	175	15	145	120	145	1	1
	123	27	2,1	1,1	–	–	–	–	–	–	120	156	2,1	1
	123	27	2,1	1,1	160	58	143	220	22	165	120	165	2,1	1
110	133	18	1,5	1,1	–	–	–	–	–	–	130	154	1,5	1
	133	18	1,5	1,1	140	63	96	195	17	160	130	160	1,5	1
120	143	18	1,5	1,1	–	–	–	–	–	–	140	164	1,5	1
	143	18	1,5	1,1	160	83,5	99	210	17	170	140	170	1,5	1
	144	31	2,1	1,1	–	–	–	–	–	–	140	180	2,1	1
130	153	20	1,5	1,1	–	–	–	–	–	–	150	176	1,5	1
	153	20	1,5	1,1	160	74,5	109	225	20,5	180	150	180	1,5	1
	154	31	2,1	1,1	–	–	–	–	–	–	150	190	2,1	1

Axial deep groove ball bearings

Double direction



522, 523

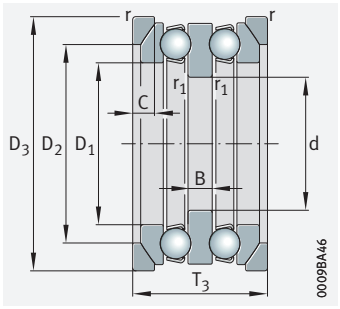


542
Spherical housing locating washers

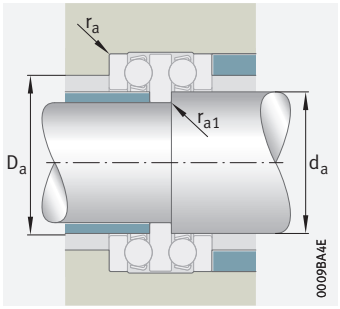
d = 140 – 190 mm

Main dimensions			Basic load ratings		Fatigue limit load	Minimum load factor	Limiting speed	Speed rating	Mass m		Designation ➤1014|1.12 ➤1014|1.13	
d	D	T_2	dyn. C_a	stat. C_{0a}	C_{ua}	A	n_G	$n_{\vartheta r}$	Bearing	Support washer	Bearing	Support washer
			N	N	N		min^{-1}	min^{-1}	≈ kg	≈ kg		
140	225	90	240 000	770 000	25 500	3,2	1 900	2 400	12,2	–	**52232-MP**	**–**
	225	97,4	240 000	770 000	25 500	3,2	1 900	2 400	11,2	1,8	**54232-MP**	**U232**
	270	153	445 000	1 560 000	48 500	13	1 230	2 160	38,2	–	**52332-MP**	**–**
150	240	97	285 000	930 000	29 500	4,5	1 740	2 210	14	–	**52234-MP**	**–**
	240	104,4	285 000	930 000	29 500	4,5	1 740	2 210	13,6	2,14	**54234-MP**	**U234**
	250	98	305 000	1 030 000	32 500	5,4	1 670	2 120	16,2	–	**52236-MP**	**–**
	250	102,4	305 000	1 030 000	32 500	5,4	1 670	2 120	15,5	2,33	**54236-MP**	**U236**
	280	153	440 000	1 560 000	47 500	13	1 220	2 060	39,9	–	**52334-MP**	**–**
160	270	109	335 000	1 170 000	35 500	7,2	1 540	1 990	21,9	–	**52238-MP**	**–**
	270	116,4	335 000	1 170 000	35 500	7,2	1 540	1 990	20	2,63	**54238-MP**	**U238**
	320	183	590 000	2 170 000	63 000	24	1 040	1 770	66,4	–	**52338-MP**	**–**
170	280	109	340 000	1 220 000	36 000	7,8	1 510	1 880	23,2	–	**52240-MP**	**–**
	280	115,6	340 000	1 220 000	36 000	7,8	1 510	1 880	21	2,79	**54240-MP**	**U240**
190	300	110	335 000	1 330 000	37 500	9,6	1 420	1 680	25,2	–	**52244-MP**	**–**
	300	115,2	335 000	1 330 000	37 500	9,6	1 420	1 680	23	3,31	**54244-MP**	**U244**

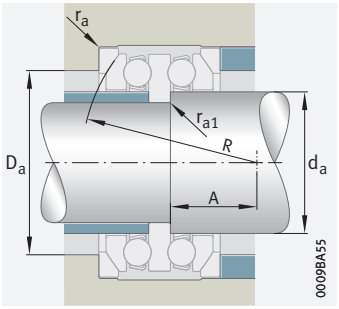
medias *https://www.schaeffler.de/std/1F9A*



542
Spherical housing locating washers
Support washers U2



Mounting dimensions



Mounting dimensions

Dimensions											Mounting dimensions			
d	D_1	B	r min.	r_1 min.	R	A	D_2	D_3	C	T_3	d_a	D_a max.	r_a max.	r_{a1} max.
140	163	20	1,5	1,1	–	–	–	–	–	–	160	186	1,5	1
	163	20	1,5	1,1	160	70	110	235	21	190	160	190	1,5	1
	164	33	3	1,1	–	–	–	–	–	–	160	204	2,5	1
150	173	21	1,5	1,1	–	–	–	–	–	–	170	198	1,5	1
	173	21	1,5	1,1	180	87	117	250	21,5	200	170	200	1,5	1
	183	21	1,5	2	–	–	–	–	–	–	180	208	1,5	1
	183	21	1,5	2	200	108,5	118	260	21,5	210	180	210	1,5	1
	174	33	3	1,1	–	–	–	–	–	–	170	214	2,5	1
160	194	24	2	2	–	–	–	–	–	–	190	222	2	2
	194,7	24	2	2	200	93,5	131	280	23	230	190	230	2	2
	195	40	4	2	–	–	–	–	–	–	190	242	3	2
170	204	24	2	2	–	–	–	–	–	–	200	232	2	2
	204	24	2	2	225	120,5	133	290	23	240	200	240	2	2
190	224	24	2	2	–	–	–	–	–	–	220	252	2	2
	224	24	2	2	225	114	134	310	25	260	220	260	2	2

Axial cylindrical roller bearings

Matrix for bearing preselection 1041

1 Axial cylindrical roller bearings 1042

1.1 Bearing design 1042
1.2 Load carrying capacity 1045
1.3 Compensation of angular misalignments 1045
1.4 Lubrication 1045
1.5 Sealing 1045
1.6 Speeds 1046

1.7 Noise *1046*
1.8 Temperature range *1046*
1.9 Cages *1047*
1.10 Internal clearance *1047*
1.11 Dimensions, tolerances *1048*
1.12 Suffixes *1048*
1.13 Structure of bearing designation *1049*
1.14 Dimensioning *1049*
1.15 Minimum load *1050*
1.16 Design of bearing arrangements *1050*
1.17 Mounting and dismounting *1051*
1.18 Legal notice regarding data freshness *1052*
1.19 Further information *1052*
Product tables *1054*
Axial cylindrical roller bearings, axial cylindrical roller and cage assemblies, axial bearing washers *1054*

Matrix for bearing preselection

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

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

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

Design features and suitability			Axial cylindrical roller bearings	
+++ extremely suitable ++ highly suitable + suitable (+) suitable with restrictions – not suitable/not applicable ✓ available				detailed information ➤ 1042
Load carrying capacity	radial		–	➤ 1045|1.2
	axial, one direction		++	➤ 1045|1.2
	axial, both directions		–	➤ 1045|1.2
	moments		–	
Compensation of angular misalignments	static		–	➤ 1045|1.3
	dynamic		–	➤ 1045|1.3
Bearing design	cylindrical bore		✓	➤ 1042|1.1
	tapered bore		–	
	separable		✓	➤ 1051|1.17
Lubrication	greased		–	➤ 1045|1.4
Sealing	open		✓	➤ 1045|1.5
	non-contact		–	1045
	contact		–	➤ 1045|1.5
Operating temperature in °C	from to		–20 +120	➤ 1046|1.8
Suitability for	high speeds		(+)	➤ 1046|1.6
	high running accuracy		++	➤ 1048|1.11 ➤ 115
	low-noise running		(+)	➤ 1046|1.7 ➤ 27
	high rigidity		++	➤ 54
	reduced friction		(+)	➤ 56
	length compensation within bearing		–	
	non-locating bearing arrangement		–	
	locating bearing arrangement		++	➤ 141
X-life bearings			–	
Bearing bore d in mm	from to		15 320[1]	➤ 1054
Product tables	from page ➤		1054	

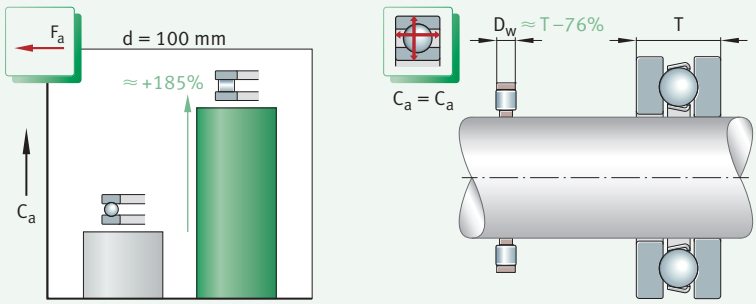
[1] Larger catalogue bearings GL 1

1 Axial cylindrical roller bearings

Single and double row axial cylindrical roller bearings are particularly suitable where:

- high axial and shock loads occur in one direction but no radial loads are present ➤*1042*|*1* and ➤*1045*|*1.2*
- the load carrying capacity of the corresponding axial deep groove ball bearings is no longer adequate (in this case, bearings of series 811 and 812 are especially suitable) ➤*1042*|*1*
- the bearing arrangement must have very high axial rigidity
- the axial space available is very small ➤*1042*|*1* and ➤*1054*|
- the bearing arrangement can be configured, where the axial space is very small, as a direct bearing arrangement ➤*1042*|*1.1*
- the bearing parts can or must be mounted separately
- the bearing arrangement is not configured in itself but, for cost reasons, ready-to-fit standard bearings are to be used

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*1041*.



1
Axial cylindrical roller bearing and axial ball bearing – comparison of load carrying capacity and design envelope

F_a = *axial load*
C_a = *basic dynamic load rating*
D_w = *roller diameter*
T = *axial section height of axial deep groove ball bearing*

1.1 Bearing design

✎ *Design variants*

Axial cylindrical roller bearings are available as:

- single and double row bearings
- individual bearing parts for combination, comprising
  - axial cylindrical roller and cage assembly (prefix K)
  - housing locating washer (prefix GS)
  - shaft locating washer (prefix WS)
  - bearing washers (prefix LS, alternatively for shaft and housing locating washer)

Larger catalogue bearings and other bearing designs GL 1.

Axial cylindrical roller bearings

Designed for bearing arrangements with very small axial space

Axial cylindrical roller bearings are part of the group of axial roller bearings. In contrast to the ball, the roller has a larger contact area perpendicular to the roller axis. As a result, it can transmit higher forces, has greater rigidity and allows smaller rolling element diameters under the same load. The single and double row bearings comprise flat, ribless washers (housing and shaft locating washers) between which axial cylindrical roller and cage assemblies are arranged ➤*1043*| 2 and ➤*1044*| 5. Their axial section height T corresponds only to the diameter of the rollers plus the thickness of the washers. Due to this design, the bearings are particularly small in axial height ➤*1054*|. The axial cages are made from brass or plastic and are fitted with one or two rows of cylindrical rollers. Since sliding occurs towards the ends of the rollers during rolling of the rolling elements and this increases with the length of the roller, bearings with a wide cross-section have several short rollers arranged adjacent to each other, e.g. double row designs ➤*1043*| 2.

Rollers with profiled ends increase the operating life of the bearings

The cylindrical rollers have profiled ends, i.e. they have a slight lateral curvature towards the ends. This modified line contact between the rollers and raceways prevents damaging edge stresses ➤*1043*| 3. This in turn has a positive effect on the operating life of the bearings.

The use of complete axial cylindrical roller bearings (shaft locating washer, axial cylindrical roller and cage assembly and housing locating washer) is then advisable if, for example, high speeds occur and the bearing washers must therefore be centred precisely.

Roller and cage assembly and bearing washers are also available individually

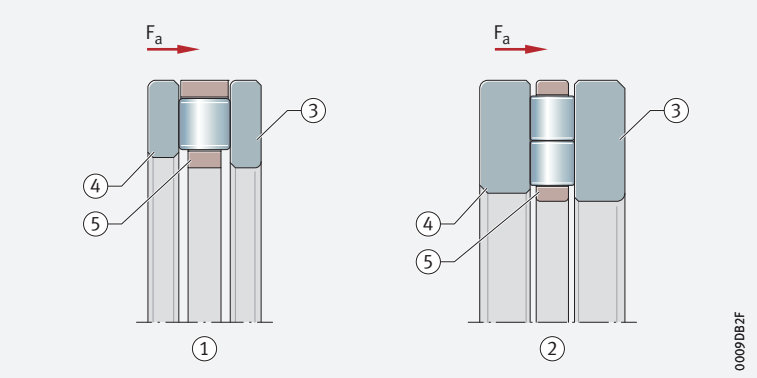
The bearing parts for axial cylindrical roller bearings are also available individually ➤*1044*| 4 and ➤*1044*| 5. Axial cylindrical roller and cage assemblies (without shaft and housing locating washers) are suitable, for example, for bearing arrangements with very small axial design space.

Cylindrical roller bearings 811 and 812 are of a single row design and correspond to DIN 722:2005 and ISO 104:2015. The bearings 893 and 894 are of a double row design and are configured in accordance with DIN 616:2000 and ISO 104:2015.

2
Axial cylindrical roller bearings

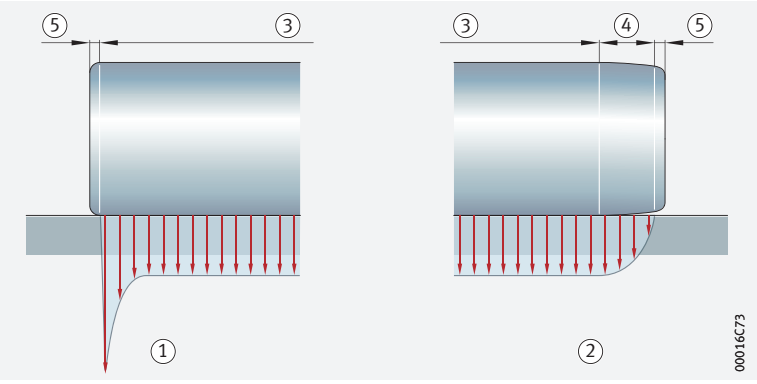
F_a = *axial load*

① *Single row bearing*
② *Double row bearing*
③ *Shaft locating washer*
④ *Housing locating washer*
⑤ *Axial cylindrical roller and cage assembly*



3
Roller profile and stress distribution

① *Cylindrical roller profile (high stress peaks)*
② *Roller with profiled ends (no stress peak)*
③ *Cylindrical outside surface region*
④ *Region of logarithmic tapering*
⑤ *Rounding of edge*



Axial cylindrical roller and cage assemblies

Very high axial load carrying capacity with low section height

The cage assemblies comprise axial cages and one or two rows of cylindrical rollers ➤*1044*| *4*. They have a particularly small axial section height and high axial load carrying capacity. The cages are made from polyamide or brass and are guided on the shaft.

For direct bearing arrangements, running surfaces must be produced as a rolling bearing raceway

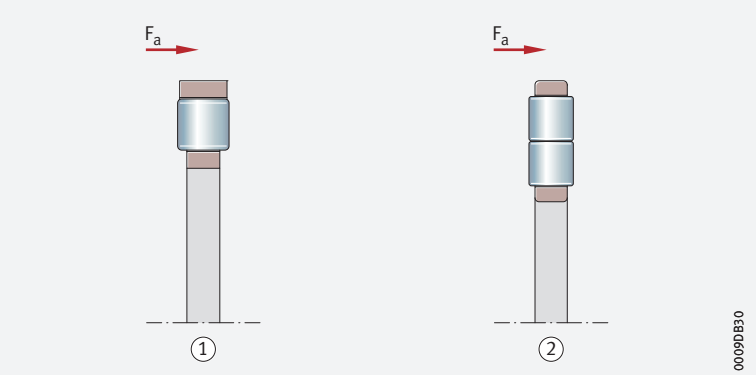
Axial cylindrical roller and cage assemblies are generally combined with one housing locating washer and one shaft locating washer. If they are to be used directly – i. e. without axial bearing washers – in the adjacent construction, the raceway for the rollers must be produced as a rolling bearing raceway ➤*1050*| *1.16*. It is also possible to use two shaft locating washers or two housing locating washers in combination with one axial cylindrical roller and cage assembly.

The diameter series 1, 2, 3, 4 of the axial cylindrical roller and cage assemblies correspond to DIN 616:2000 and ISO 104:2015.

4
Axial cylindrical roller and cage assemblies

F_a = *axial load*

① *Single row*
② *Double row*



Axial bearing washers

Housing and shaft locating washers

Housing locating washers are externally centred, shaft locating washers are internally centred ➤*1044*| *5* and ➤*1050*| *1.16*. They must be used if the adjacent construction cannot be used as a raceway for the rolling elements. The washers are made from through hardening rolling bearing steel. The bore and outside diameter are precision machined, the raceways are ground to high accuracy.

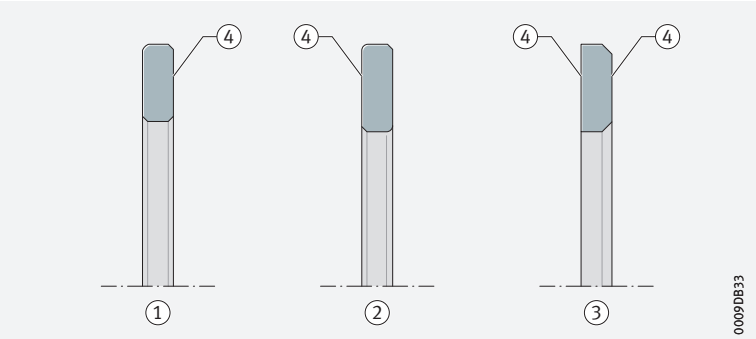
The diameter series 1, 2, 3, 4 of the axial bearing washers correspond to DIN 616:2000 and ISO 104:2015.

Bearing washers

Bearing washers are suitable for use as a housing or shaft locating washer. They are used in applications that do not require precise centring of the axial bearing washers. The raceway of the bearing washers is hardened and ground. The bearing washers are suitable for axial cylindrical roller and cage assemblies K811 and axial needle roller and cage assemblies AXK.

5
Axial bearing washers

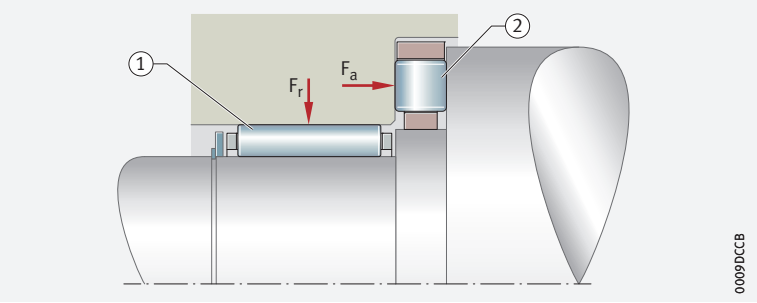
① *Housing locating washer, externally centred*
② *Shaft locating washer, internally centred*
③ *Bearing washer*
④ *Raceway*



1.2 Load carrying capacity

For very high axial loads acting in one direction

Single and double row axial cylindrical roller bearings can support high axial loads as well as axial shock loads in one direction, but must not be subjected to radial load ➤*1049*|*1.14*. If radial loads do occur, these forces must be supported by an additional bearing (e.g. by a needle roller and cage assembly) ➤*1045*|6.



6 *Axial and radial loads*

F_r = *radial load*
F_a = *axial load*

① *Needle roller and cage assembly as radial bearing (direct bearing arrangement)*

② *Axial cylindrical roller and cage assembly as axial bearing (direct bearing arrangement)*

1.3 Compensation of angular misalignments

The bearings do not permit any skewing between the shaft and the housing. If angular misalignments occur between the locating surfaces on the shaft and in the housing, this will cause damage to the bearing and considerably reduce its operating life.

1.4 Lubrication

Oil or grease lubrication is possible

Axial cylindrical roller bearings are not greased. The bearings must be lubricated with oil or grease.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

1.5 Sealing

Provide seals in the adjacent construction

The bearings are not sealed; i.e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing position

1.6 Speeds

Speeds in the product tables

The product tables generally give two speeds for the bearings:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤64.

The values in the product tables are valid for oil lubrication.

Values for grease lubrication

For grease lubrication, 25% of the value stated in the product tables is permissible in each case.

Reference speeds

$n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤64.

1.7 Noise

Schaeffler Noise Index

The Schaeffler Noise Index (SGI) is not yet available for this bearing type ➤69. The data for these bearing series will be introduced and updated in stages.

Further information:

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

1.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing washers and cylindrical rollers
- the cage
- the lubricant

Possible operating temperatures of axial cylindrical roller bearings ➤1046|▦1.

▦1
Permissible temperature range

Operating temperature	Axial cylindrical roller bearings with brass or polyamide cage PA66
	–20 °C to +120 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

Solid cages made from brass and polyamide PA66 are used as standard

Standard cages ➤*1047*| ▦ *2*. The cage design is dependent on the bearing series and the bearing size. Other cage designs are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with brass cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦ *2*
Cage, cage suffix, bore code

Bearing series	Solid cage made from polyamide PA66 TV standard	Solid brass cage M standard
	Bore code	
811, K811	up to 34	from 36
812, K812	06 to 26	from 28
893, K893	06 to 16	17 to 30
894, K894	12 to 14	from 15

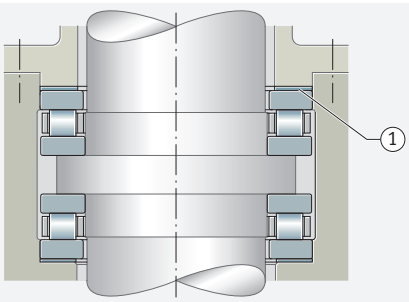
1.10 Internal clearance

Axial clearance and preload are determined by the application

In the case of axial cylindrical roller bearings, the internal clearance (axial clearance) is only achieved when the bearings are mounted. The requisite axial clearance of the bearing arrangement is dependent on the application and must take account of the conditions in the bearing arrangement while warm from operation and subjected to load.
If axial cylindrical roller bearings are subjected to vibrations while under predominantly static load, for example, they must be lightly preloaded. Preload can be applied, for example, using calibrated sheets (shims) ➤*1047*| ⧉ *7*. Other suitable means include shaft nuts, disc springs, etc. ➤*1050*| *1.15*. It must always be ensured that no slippage occurs in operation between the rolling elements and raceways ➤*1050*| *1.15*. It must also be ensured that the preload does not exceed the optimum value, otherwise there will be an increase in friction and therefore in heat generation in the bearing. These will both have a negative effect on the operating life of the bearings.

If there is any uncertainty regarding correct setting, please consult Schaeffler.

⧉ *7*
Setting the axial clearance by means of shims



① *Calibrated sheet (shim)*

1.11 Dimensions, tolerances

Dimension standards

The main dimensions of axial cylindrical roller bearings correspond to ISO 104:2015.

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤ *140*. Nominal value of chamfer dimension ➤ *1054*.

Tolerances

The dimensional and running tolerances of axial bearing washers GS and WS correspond to the tolerance class Normal in accordance with ISO 199:2014 ➤ *135* | *25* to ➤ *137* | *28*.

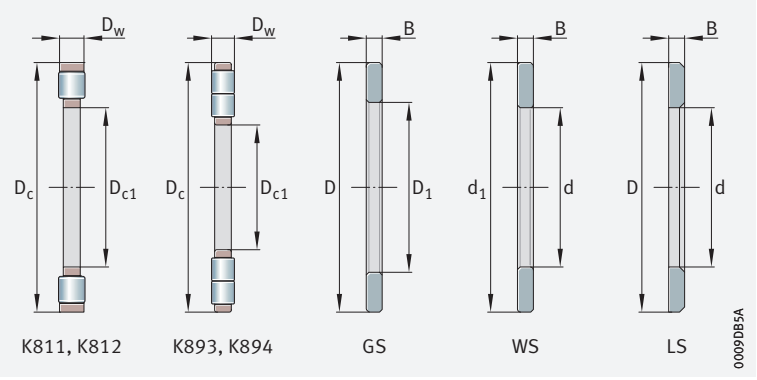
Tolerances of the bore and outside diameter as well as of the width of the bearing parts ➤ *1048* | *3* and ➤ *1048* | *8*.

3 *Dimensions and tolerances of bearing parts*

Bearing component	Dimension	Tolerance
Axial cylindrical roller and cage assembly K	D_{c1}	E11[1)]
	D_c	a13[1)]
	D_w	to DIN 5402-1
Housing locating washer GS	D_1	–
	D	to ISO 199
	B	h11
Shaft locating washer WS	d	to ISO 199
	d_1	–
	B	h11
Bearing washer LS	d	E12[1)]
	D	a12[1)]
	B	h11

1) *Deviation of the bore diameter Δ_{dmp} and deviation of the outside diameter Δ_{Dmp}* ➤ *140*.

8 *Bearing parts – axial cylindrical roller and cage assemblies and bearing washers*



1.12 Suffixes

Suffixes describe the design and features of a bearing in more detail.

4 *Suffixes and corresponding descriptions*

Suffix	Description of suffix	
M	Solid brass cage	Standard, dependent on bore code
TV	Solid cage made from glass fibre reinforced polyamide PA66	
P5	High dimensional, geometrical and running accuracy	Special design for axial bearing washers GS, WS; available by agreement

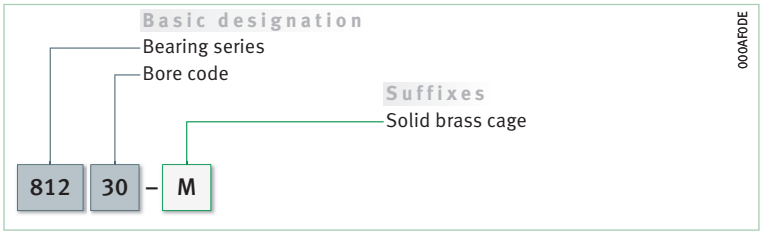
1.13 Structure of bearing designation

With ***medias*** interchange, equivalent Schaeffler bearing designations can be determined for bearing designations from other rolling bearing manufacturers *https://www.schaeffler.de/std/1B69*.

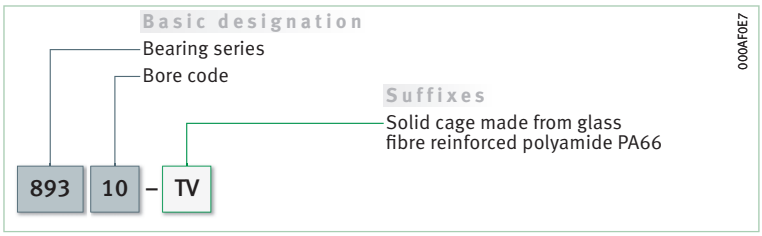
Examples of composition of bearing designation

The designation of bearings follows a set model. Examples ➤*1049*|*9* and ➤*1049*|*10*. The composition of the designation is subject to DIN 623-1 ➤*102*|*10*.

9
Single row axial cylindrical roller bearing, comprising axial roller and cage assembly, shaft locating washer and housing locating washer: designation structure



10
Double row axial cylindrical roller bearing, comprising axial roller and cage assembly, shaft locating washer and housing locating washer: designation structure



1.14 Dimensioning

Equivalent dynamic bearing load

Axial cylindrical roller bearings can only support axial forces ➤*1045*|*1.2*. In the rating life equation, P is therefore substituted by the value for F_a ➤*1049*|*1*.

1
Equivalent dynamic load

$$P = F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_a	N	Axial load.

Equivalent static bearing load

Combined loads are not possible

In relation to the direction of load, the same conditions apply as for the equivalent dynamic bearing load, i.e. combined loads are not permissible.

Since the bearings can only support axial loads, the following applies:

2
Equivalent static load

$$P_0 = F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0a}	N	Largest axial load present (maximum load).

Static load safety factor

$S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤*1049*|*3*.

3
Static load safety factor

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

Legend

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

1.15 Minimum load

Rolling bearings under low loads are particularly prone to slippage

In order to prevent slippage damage, the bearing must be subjected to a minimum axial load $F_{a\,min}$ ➤*1050*| *f 4* and ➤*1050*| *5*.
In vertical bearing arrangements in particular, the requisite minimum axial load $F_{a\,min}$ is normally achieved, however, simply by the weight of the bearing parts and the external forces. If this is not the case, the bearing arrangement must be preloaded, for example by means of springs or
a housing nut.

f 4
Minimum axial load

$$F_{a\,min} = 0{,}0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$$

Legend

$F_{a\,min}$	N	Minimum axial load
C_{0a}	N	Basic static load rating ➤*1054*|
k_a	–	Factor for determining the minimum axial load ➤*1050*| *5*
n	min^{-1}	Speed.

5
Factor k_a for calculating the minimum axial load

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

1.16 Design of bearing arrangements

Design of adjacent parts

Axial cylindrical roller bearings cannot tolerate angular misalignments ➤*1045*| *1.3*. The locating surfaces for the bearing parts on the shaft and in the housing must therefore be vertical to the shaft axis, while the adjacent parts must be rigid and flat. They must be configured such that the bearing washers are supported as far as possible over the whole circumference and over the whole raceway width; values ➤*1054*|. The radial cage guidance surfaces must be precision machined and wear-resistant (Ramax 0,8 (Rzmax 4)).

Mounting diameter on the shaft and in the housing

For the mounting dimensions, the following values apply ➤*1054*|:

- mounting diameter on the shaft ≧ d_a
- mounting diameter in the housing ≦ D_a

Tolerances for shaft and housing bore

Proven tolerances are given in ➤*1050*| *6*. If the data are observed, this will give correct radial guidance of the bearing elements.

6
Tolerances for shafts and housing bores

Bearing component		Tolerance class[1] for	
		Shaft	Bore
Axial cylindrical roller bearings	Shaft guided	h8	–
Housing locating washers	–	–	H9
Shaft locating washers	–	h8	–
Bearing washers	Externally centred as housing locating washer	Shaft released	H9
	Internally centred as shaft locating washer	h8	Bore released

[1] *The envelope requirement Ⓔ applies.*

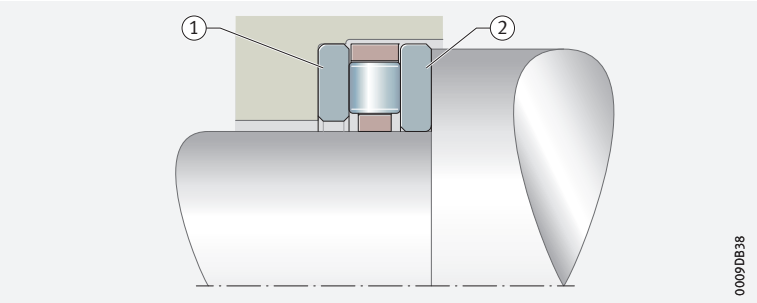
Guidance of bearing parts

Release of shaft and housing locating washers, as a function of centring

If the bearing washers are centred on the shaft, they must have radial clearance in the housing bore while, if they are centred in the housing, there must be radial clearance between the washer bore and the shaft ➤1051|11.

11
Guidance and release of shaft and housing locating washers

① *Housing locating washer (guidance in the housing), radial clearance on the shaft*
② *Shaft locating washer (guidance on the shaft), radial clearance in the housing*



Guidance of axial roller and cage assemblies

In order to achieve the lowest possible sliding speeds on the guidance surfaces, the axial cylindrical roller and cage assemblies are generally guided on the shaft. This is particularly important in the case of high speeds.

For a direct bearing arrangement of roller and cage assemblies: harden and grind the raceways for the rollers

If the axial design space is particularly small, axial cylindrical roller and cage assemblies can also run directly (without axial bearing washers) on the adjacent construction. In this case – and if the load carrying capacity of the axial cylindrical roller and cage assemblies is to be fully utilised – the raceways on the shaft and in the housing must be produced as a rolling bearing raceway or must correspond to the quality and hardness of axial bearing washers. The surface hardness of the raceway must be 670 HV to 840 HV, the hardening depth CHD or SHD must be sufficiently large ➤182. The surface roughness Ra must be $\leqq$ 0,2 µm. At a mean roughness value of Ra $>$ 0,2 µm, it is no longer possible to utilise the full load carrying capacity of the bearings. When designing the raceway on the shaft and in the housing, the raceway dimensions E_a and E_b must be observed ➤1054|▦. If the values are observed, this will ensure that the raceways for the cylindrical rollers – taking account of any possible axial offset of the roller and cage assembly – are adequately dimensioned.

1.17 Mounting and dismounting

The mounting and dismounting options for the bearings must be taken into consideration in the design of the bearing position.

As the bearings are not self-retaining, they are easy to mount

Axial cylindrical roller bearings are not self-retaining. As a result, the bearing parts (shaft locating washer, housing locating washer and axial cylindrical roller and cage assembly) can be mounted separately from each other. This gives simplified mounting of the bearings.

Mounting position of the bearing washers

The correct mounting position has a considerable influence on the function of the bearing arrangement. Axial bearing washers must always be mounted with the raceway side facing the rolling elements.

Shaft locating washers

On shaft locating washers, the raceway side is indicated by the smaller chamfer on the bore diameter of the washer.

Housing locating washers

On housing locating washers, the raceway side is indicated by the smaller chamfer on the outside diameter of the washer.

Schaeffler Mounting Handbook

Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

✎ The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

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Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: *https://medias.schaeffler.com*.

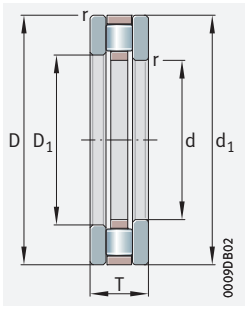
1.19 Further information

In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

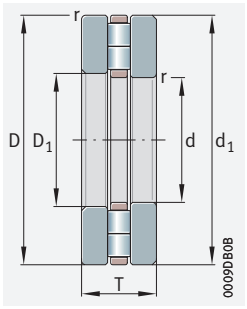
- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*185*
- Design of bearing arrangements ➤*141*
- Mounting and dismounting ➤*194*

Axial cylindrical roller bearings

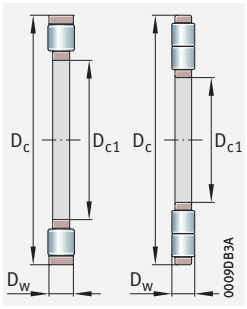
Axial cylindrical roller and cage assemblies
Axial bearing washers



811, 812



893, 894

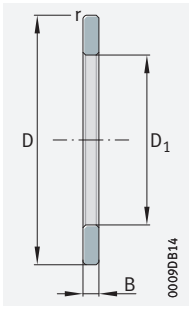


Single row: K811, K812
Double row: K893, K894

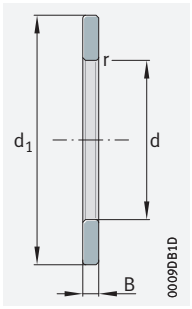
d = 15 – 60 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Axial cylindrical roller bearings		Axial cylindrical roller and cage assemblies	
								Mass	Designation ➤*1048|1.12* ➤*1049|1.13*	Mass	Designation ➤*1048|1.12* ➤*1049|1.13*
d D_{c1}	D D_c	T	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	$n_{\vartheta r}$	m		m	
			N	N	N	min^{-1}	min^{-1}	≈ kg		≈ kg	
15	28	9	14 400	28 500	4 050	13 600	6 400	0,024	**81102-TV**	0,006	**K81102-TV**
17	30	9	16 000	33 500	4 700	12 800	5 800	0,027	**81103-TV**	0,009	**K81103-TV**
20	35	10	25 000	53 000	7 500	10 800	4 500	0,037	**81104-TV**	0,013	**K81104-TV**
25	42	11	33 500	76 000	7 200	8 900	3 650	0,053	**81105-TV**	0,015	**K81105-TV**
30	47	11	35 500	86 000	8 200	7 700	3 150	0,057	**81106-TV**	0,017	**K81106-TV**
	52	16	64 000	141 000	14 400	7 200	2 700	0,123	**81206-TV**	0,033	**K81206-TV**
	60	18	69 000	197 000	19 200	6 400	2 650	0,24	**89306-TV**	0,04	**K89306-TV**
35	52	12	39 000	101 000	9 600	6 800	2 700	0,073	**81107-TV**	0,019	**K81107-TV**
	62	18	80 000	199 000	20 400	6 000	2 360	0,195	**81207-TV**	0,043	**K81207-TV**
	68	20	80 000	237 000	23 600	5 700	2 420	0,34	**89307-TV**	0,053	**K89307-TV**
40	60	13	56 000	148 000	14 800	5 900	2 240	0,105	**81108-TV**	0,031	**K81108-TV**
	68	19	107 000	265 000	23 700	5 200	1 820	0,249	**81208-TV**	0,081	**K81208-TV**
	78	22	123 000	385 000	39 500	4 850	1 770	0,484	**89308-TV**	0,098	**K89308-TV**
45	65	14	59 000	163 000	16 300	5 300	2 020	0,13	**81109-TV**	0,035	**K81109-TV**
	73	20	105 000	265 000	23 700	4 950	1 840	0,287	**81209-TV**	0,085	**K81209-TV**
	85	24	139 000	445 000	45 500	4 400	1 600	0,615	**89309-TV**	0,121	**K89309-TV**
50	70	14	62 000	177 000	17 700	4 900	1 840	0,14	**81110-TV**	0,038	**K81110-TV**
	78	22	118 000	315 000	28 000	4 550	1 570	0,356	**81210-TV**	0,098	**K81210-TV**
	95	27	168 000	560 000	59 000	3 950	1 450	0,887	**89310-TV**	0,175	**K89310-TV**
55	78	16	90 000	300 000	31 500	4 350	1 350	0,218	**81111-TV**	0,045	**K81111-TV**
	90	25	155 000	405 000	39 000	4 050	1 540	0,568	**81211-TV**	0,166	**K81211-TV**
	105	30	184 000	600 000	53 000	3 600	1 500	1,18	**89311-TV**	0,195	**K89311-TV**
60	85	17	103 000	315 000	32 500	4 000	1 360	0,266	**81112-TV**	0,082	**K81112-TV**
	95	26	172 000	480 000	46 500	3 700	1 290	0,642	**81212-TV**	0,176	**K81212-TV**
	110	30	197 000	670 000	59 000	3 400	1 350	1,26	**89312-TV**	0,21	**K89312-TV**
	130	42	390 000	1 220 000	132 000	3 050	1 080	2,818	**89412-TV**	0,538	**K89412-TV**

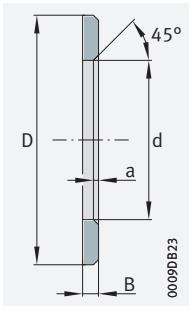
medias *https://www.schaeffler.de/std/1F9A*



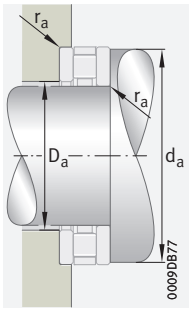
GS



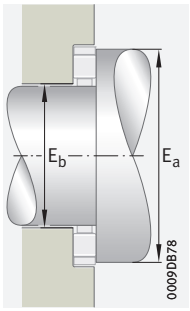
WS



LS



Mounting dimensions

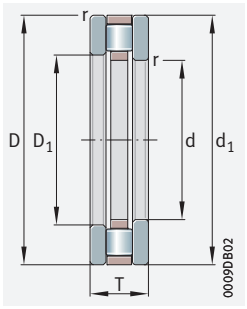


Mounting dimensions, direct bearing arrangement

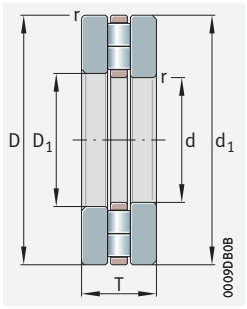
	Axial bearing washers				Dimensions					Mounting dimensions			Raceway dimensions	
	Mass	Designation ➤*1048|1.12* ➤*1049|1.13*												
d D_{c1}	m ≈ kg	Housing locating washer	Shaft locating washer	Bearing washer	D_1	d_1	D_w	B	a r min.	d_a	D_a	r_a	E_b	E_a
15	0,008	**GS81102**	**WS81102**	**LS1528**	16	28	3,5	2,75	0,3	27	16	0,3	16	27
17	0,009	**GS81103**	**WS81103**	**LS1730**	18	30	3,5	2,75	0,3	29	18	0,3	18	29
20	0,011	**GS81104**	**WS81104**	**LS2035**	21	35	4,5	2,75	0,3	34	21	0,3	21	34
25	0,019	**GS81105**	**WS81105**	**LS2542**	26	42	5	3	0,6	41	26	0,6	26	41
30	0,02	**GS81106**	**WS81106**	**LS3047**	32	47	5	3	0,6	46	31	0,6	31	46
	0,045	**GS81206**	**WS81206**	–	32	52	7,5	4,25	0,6	50	31	0,6	31	50
	0,095	**GS89306**	**WS89306**	–	32	60	5,5	6,25	1	59	33	1	33	59
35	0,027	**GS81107**	**WS81107**	**LS3552**	37	52	5	3,5	0,6	51	36	0,6	36	51
	0,076	**GS81207**	**WS81207**	–	37	62	7,5	5,25	1	58	39	1	39	58
	0,134	**GS89307**	**WS89307**	–	37	68	6	7	1	67	38	1	38	67
40	0,037	**GS81108**	**WS81108**	**LS4060**	42	60	6	3,5	0,6	58	42	0,6	42	58
	0,084	**GS81208**	**WS81208**	–	42	68	9	5	1	66	43	1	43	66
	0,193	**GS89308**	**WS89308**	–	42	78	7	7,5	1	77	44	1	44	77
45	0,047	**GS81109**	**WS81109**	**LS4565**	47	65	6	4	0,6	63	47	0,6	47	63
	0,101	**GS81209**	**WS81209**	–	47	73	9	5,5	1	70	48	1	48	70
	0,247	**GS89309**	**WS89309**	–	47	85	7,5	8,25	1	83	49	1	49	83
50	0,051	**GS81110**	**WS81110**	**LS5070**	52	70	6	4	0,6	68	52	0,6	52	68
	0,129	**GS81210**	**WS81210**	–	52	78	9	6,5	1	75	53	1	53	75
	0,356	**GS89310**	**WS89310**	–	52	95	8	9,5	1,1	92	56	1,1	56	92
55	0,082	**GS81111**	**WS81111**	**LS5578**	57	78	6	5	0,6	77	56	0,6	57	77
	0,201	**GS81211**	**WS81211**	–	57	90	11	7	1	85	59	1	59	85
	0,485	**GS89311**	**WS89311**	–	57	105	9	10,5	1,1	103	61	1,1	61	103
60	0,092	**GS81112**	**WS81112**	**LS6085**	62	85	7,5	4,75	1	82	62	1	62	82
	0,233	**GS81212**	**WS81212**	–	62	95	11	7,5	1	91	64	1	64	91
	0,55	**GS89312**	**WS89312**	–	62	110	9	10,5	1,1	108	66	1,1	66	108
	1,115	**GS89412**	**WS89412**	–	62	130	14	14	1,5	126	65	1,5	65	126

Axial cylindrical roller bearings

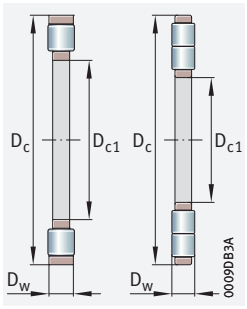
Axial cylindrical roller and cage assemblies
Axial bearing washers



811, 812



893, 894

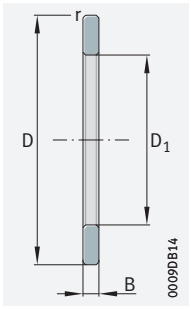


Single row: K811, K812
Double row: K893, K894

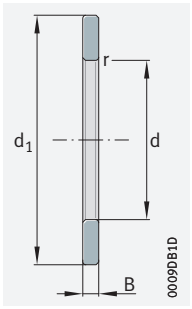
d = 65 – 100 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Axial cylindrical roller bearings		Axial cylindrical roller and cage assemblies	
								Mass	Designation ➤*1048|1.12* ➤*1049|1.13*	Mass	Designation ➤*1048|1.12* ➤*1049|1.13*
d D_{c1}	D D_c	T	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	$n_{\vartheta r}$	m		m	
			N	N	N	min^{-1}	min^{-1}	≈ kg		≈ kg	
65	90	18	107 000	340 000	34 500	3 700	1 260	0,31	**81113-TV**	0,09	**K81113-TV**
	100	27	177 000	500 000	49 000	3 550	1 250	0,721	**81213-TV**	0,185	**K81213-TV**
	115	30	194 000	670 000	59 000	3 200	1 330	1,33	**89313-TV**	0,21	**K89313-TV**
	140	45	445 000	1 410 000	151 000	2 850	1 010	3,52	**89413-TV**	0,72	**K89413-TV**
70	95	18	111 000	365 000	37 000	3 500	1 170	0,332	**81114-TV**	0,092	**K81114-TV**
	105	27	187 000	550 000	54 000	3 250	1 120	0,768	**81214-TV**	0,212	**K81214-TV**
	125	34	239 000	830 000	76 000	2 950	1 200	1,82	**89314-TV**	0,29	**K89314-TV**
	150	48	475 000	1 500 000	161 000	2 650	1 010	4,18	**89414-TV**	0,76	**K89414-TV**
75	100	19	107 000	350 000	36 000	3 300	1 190	0,393	**81115-TV**	0,096	**K81115-TV**
	110	27	173 000	500 000	49 000	3 150	1 220	0,8	**81215-TV**	0,195	**K81215-TV**
	135	36	290 000	1 010 000	94 000	2 750	1 090	2,23	**89315-TV**	0,375	**K89315-TV**
	160	51	500 000	1 580 000	163 000	2 440	1 000	5,96	**89415-M**	1,78	**K89415-M**
80	105	19	106 000	350 000	36 000	3 150	1 180	0,4	**81116-TV**	0,095	**K81116-TV**
	115	28	201 000	630 000	61 000	2 900	980	0,9	**81216-TV**	0,234	**K81216-TV**
	140	36	305 000	1 110 000	102 000	2 650	1 000	2,37	**89316-TV**	0,42	**K89316-TV**
	170	54	560 000	1 770 000	183 000	2 280	940	7,04	**89416-M**	2,04	**K89416-M**
85	110	19	113 000	385 000	39 500	3 000	1 090	0,42	**81117-TV**	0,118	**K81117-TV**
	125	31	217 000	660 000	66 000	2 800	1 080	1,26	**81217-TV**	0,28	**K81217-TV**
	150	39	325 000	1 140 000	106 000	2 450	1 030	3,39	**89317-M**	0,93	**K89317-M**
	180	58	620 000	1 980 000	203 000	2 160	890	8,65	**89417-M**	2,71	**K89417-M**
90	120	22	141 000	465 000	41 000	2 750	1 070	0,62	**81118-TV**	0,15	**K81118-TV**
	135	35	290 000	890 000	96 000	2 550	910	1,77	**81218-TV**	0,54	**K81218-TV**
	155	39	335 000	1 200 000	111 000	2 350	980	3,63	**89318-M**	0,97	**K89318-M**
	190	60	680 000	2 200 000	225 000	2 040	840	9,94	**89418-M**	3,04	**K89418-M**
100	135	25	199 000	650 000	61 000	2 480	930	0,95	**81120-TV**	0,25	**K81120-TV**
	150	38	340 000	1 080 000	113 000	2 300	840	2,2	**81220-TV**	0,6	**K81220-TV**
	170	42	380 000	1 400 000	125 000	2 130	910	4,56	**89320-M**	1,18	**K89320-M**
	210	67	850 000	2 850 000	285 000	1 830	710	13,42	**89420-M**	3,92	**K89420-M**

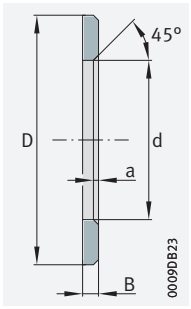
medias *https://www.schaeffler.de/std/1F9A*



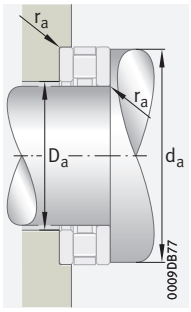
GS



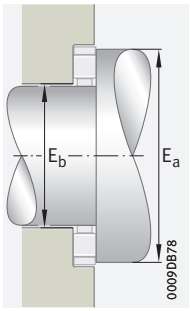
WS



LS



Mounting dimensions

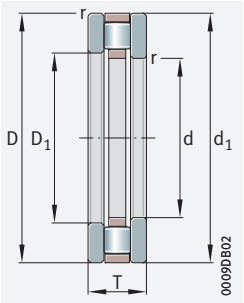


Mounting dimensions, direct bearing arrangement

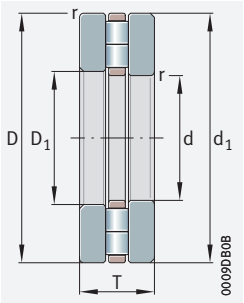
	Axial bearing washers				Dimensions					Mounting dimensions			Raceway dimensions	
	Mass	Designation ➤*1048|1.12* ➤*1049|1.13*												
d D_{c1}	m ≈ kg	Housing locating washer	Shaft locating washer	Bearing washer	D_1	d_1	D_w	B	a r min.	d_a	D_a	r_a	E_b	E_a
65	0,11	**GS81113**	**WS81113**	**LS6590**	67	90	7,5	5,25	1	87	67	1	67	87
	0,268	**GS81213**	**WS81213**	**–**	67	100	11	8	1	96	69	1	69	96
	0,535	**GS89313**	**WS89313**	**–**	67	115	9	10,5	1,1	113	71	1,1	71	113
	1,4	**GS89413**	**WS89413**	**–**	68	140	15	15	2	135	70	2	70	135
70	0,12	**GS81114**	**WS81114**	**LS7095**	72	95	7,5	5,25	1	92	72	1	72	92
	0,278	**GS81214**	**WS81214**	**–**	72	105	11	8	1	102	74	1	74	102
	0,8	**GS89314**	**WS89314**	**–**	72	125	10	12	1,1	123	76	1,1	76	123
	1,73	**GS89414**	**WS89414**	**–**	73	150	16	16	2	147	76	2	76	147
75	0,136	**GS81115**	**WS81115**	**LS75100**	77	100	7,5	5,75	1	97	78	1	78	97
	0,293	**GS81215**	**WS81215**	**–**	77	110	11	8	1	106	79	1	79	106
	0,97	**GS89315**	**WS89315**	**–**	77	135	11	12,5	1,5	132	81	1,5	81	132
	2,09	**GS89415**	**WS89415**	**–**	78	160	17	17	2	156	82	2	82	156
80	0,144	**GS81116**	**WS81116**	**LS80105**	82	105	7,5	5,75	1	102	83	1	83	102
	0,333	**GS81216**	**WS81216**	**–**	82	115	11	8,5	1	112	84	1	84	112
	1,02	**GS89316**	**WS89316**	**–**	82	140	11	12,5	1,5	137	86	1,5	86	137
	2,5	**GS89416**	**WS89416**	**–**	83	170	18	18	2,1	165	88	2,1	88	165
85	0,151	**GS81117**	**WS81117**	**LS85110**	87	110	7,5	5,75	1	108	87	1	87	108
	0,49	**GS81217**	**WS81217**	**–**	88	125	12	9,5	1	119	90	1	90	119
	1,23	**GS89317**	**WS89317**	**–**	88	150	12	13,5	1,5	147	93	1,5	93	146
	2,97	**GS89417**	**WS89417**	**–**	88	180	19	19,5	2,1	175	93	2,1	93	175
90	0,225	**GS81118**	**WS81118**	**LS90120**	92	120	9	6,5	1	117	93	1	93	117
	0,614	**GS81218**	**WS81218**	**–**	93	135	14	10,5	1,1	129	95	1,1	95	129
	1,33	**GS89318**	**WS89318**	**–**	93	155	12	13,5	1,5	152	98	1,5	98	151
	3,45	**GS89418**	**WS89418**	**–**	93	190	20	20	2,1	185	99	2,1	99	185
100	0,35	**GS81120**	**WS81120**	**LS100135**	102	135	11	7	1	131	104	1	104	131
	0,8	**GS81220**	**WS81220**	**–**	103	150	15	11,5	1,1	142	107	1,1	107	142
	1,69	**GS89320**	**WS89320**	**–**	103	170	13	14,5	1,5	167	107	1,5	109	166
	4,75	**GS89420**	**WS89420**	**–**	103	210	22	22,5	3	205	111	3	111	205

Axial cylindrical roller bearings

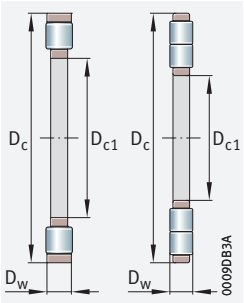
Axial cylindrical roller and cage assemblies
Axial bearing washers



811, 812



893, 894

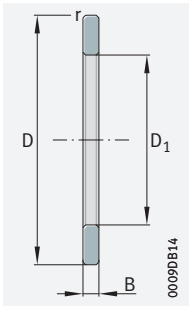


Single row: K811, K812
Double row: K893, K894

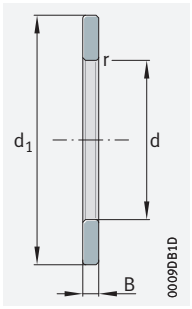
d = 110 – 170 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Axial cylindrical roller bearings		Axial cylindrical roller and cage assemblies	
								Mass	Designation ➤1048|1.12 ➤1049|1.13	Mass	Designation ➤1048|1.12 ➤1049|1.13
d D_{c1}	D D_c	T	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	$n_{\vartheta r}$	m		m	
			N	N	N	min^{-1}	min^{-1}	≈ kg		≈ kg	
110	145	25	207 000	700 000	64 000	2 280	860	1,04	**81122-TV**	0,27	**K81122-TV**
	160	38	325 000	1 030 000	106 000	2 150	870	2,29	**81222-TV**	0,53	**K81222-TV**
	190	48	500 000	1 870 000	180 000	1 900	780	6,7	**89322-M**	1,83	**K89322-M**
	230	73	1 010 000	3 400 000	340 000	1 680	640	17,41	**89422-M**	5,11	**K89422-M**
120	155	25	214 000	760 000	67 000	2 110	790	1,12	**81124-TV**	0,29	**K81124-TV**
	170	39	340 000	1 120 000	113 000	2 000	800	2,54	**81224-TV**	0,58	**K81224-TV**
	210	54	640 000	2 420 000	228 000	1 730	690	9,44	**89324-M**	2,64	**K89324-M**
	250	78	1 170 000	4 000 000	395 000	1 540	570	21,9	**89424-M**	6,37	**K89424-M**
130	170	30	255 000	900 000	81 000	1 940	770	1,67	**81126-TV**	0,38	**K81126-TV**
	190	45	480 000	1 520 000	154 000	1 820	720	3,98	**81226-TV**	0,92	**K81226-TV**
	225	58	720 000	2 700 000	255 000	1 620	650	11,2	**89326-M**	2,09	**K89326-M**
	270	85	1 330 000	4 600 000	435 000	1 420	520	27,1	**89426-M**	7,96	**K89426-M**
140	180	31	260 000	960 000	84 000	1 820	720	1,9	**81128-TV**	0,4	**K81128-TV**
	200	46	455 000	1 450 000	143 000	1 690	730	5,07	**81228-M**	1,8	**K81228-M**
	240	60	820 000	3 200 000	300 000	1 520	570	13,2	**89328-M**	2,57	**K89328-M**
	280	85	1 390 000	4 950 000	460 000	1 350	480	29,8	**89428-M**	8,53	**K89428-M**
150	190	31	270 000	1 020 000	88 000	1 710	670	2,2	**81130-TV**	0,43	**K81130-TV**
	215	50	590 000	1 940 000	191 000	1 580	610	7,17	**81230-M**	2,81	**K81230-M**
	250	60	840 000	3 350 000	310 000	1 440	540	13,9	**89330-M**	3,75	**K89330-M**
	300	90	1 580 000	5 700 000	530 000	1 250	440	35,4	**89430-M**	10,4	**K89430-M**
160	200	31	270 000	1 050 000	89 000	1 610	640	2,12	**81132-TV**	0,44	**K81132-TV**
	225	51	600 000	2 030 000	197 000	1 500	580	7,6	**81232-M**	3,01	**K81232-M**
	320	95	1 780 000	6 500 000	600 000	1 170	400	42	**89432-M**	12,4	**K89432-M**
170	215	34	360 000	1 380 000	126 000	1 510	570	2,41	**81134-TV**	0,66	**K81134-TV**
	240	55	680 000	2 340 000	226 000	1 400	540	9,3	**81234-M**	3,5	**K81234-M**
	340	103	1 990 000	7 400 000	670 000	1 100	365	51,9	**89434-M**	14,9	**K89434-M**

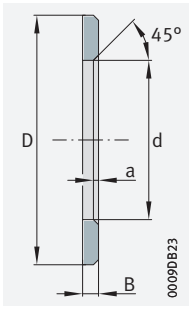
medias *https://www.schaeffler.de/std/1F9A*



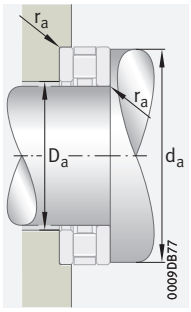
GS



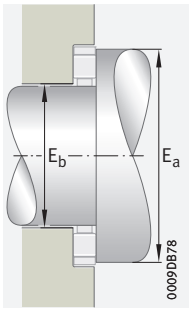
WS



LS



Mounting dimensions

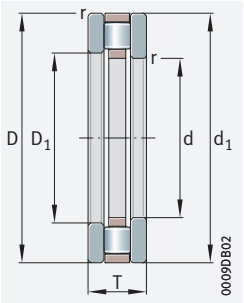


Mounting dimensions, direct bearing arrangement

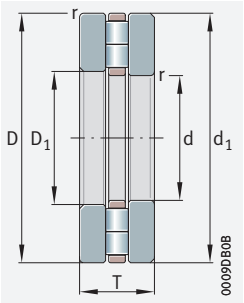
	Axial bearing washers				Dimensions					Mounting dimensions			Raceway dimensions	
	Mass	Designation ➤*1048|1.12* ➤*1049|1.13*												
d D_{c1}	m ≈ kg	Housing locating washer	Shaft locating washer	Bearing washer	D_1	d_1	D_w	B	a r min.	d_a	D_a	r_a	E_b	E_a
110	0,385	**GS81122**	**WS81122**	**LS110145**	112	145	11	7	1	141	114	1	114	141
	0,88	**GS81222**	**WS81222**	**–**	113	160	15	11,5	1,1	152	117	1,1	117	152
	2,44	**GS89322**	**WS89322**	**–**	113	190	15	16,5	2	186	120	2	120	185
	6,15	**GS89422**	**WS89422**	**–**	113	230	24	24,5	3	223	121	3	121	223
120	0,415	**GS81124**	**WS81124**	**LS120155**	122	155	11	7	1	151	124	1	124	151
	0,98	**GS81224**	**WS81224**	**–**	123	170	15	12	1,1	162	127	1,1	127	162
	3,4	**GS89324**	**WS89324**	**–**	123	210	17	18,5	2,1	206	130	2,1	132	205
	7,7	**GS89424**	**WS89424**	**–**	123	250	26	26	4	243	133	4	133	243
130	0,643	**GS81126**	**WS81126**	**LS130170**	132	170	12	9	1	165	135	1	135	165
	1,53	**GS81226**	**WS81226**	**–**	133	187	19	13	1,5	181	137	1,5	137	181
	4,045	**GS89326**	**WS89326**	**–**	134	225	18	20	2,1	220	141	2,1	141	219
	9,5	**GS89426**	**WS89426**	**–**	134	270	28	28,5	4	263	145	4	145	263
140	0,749	**GS81128**	**WS81128**	**LS140180**	142	178	12	9,5	1	175	145	1	145	175
	1,635	**GS81228**	**WS81228**	**–**	143	197	19	13,5	1,5	191	147	1,5	151	195
	4,8	**GS89328**	**WS89328**	**–**	144	240	19	20,5	2,1	235	152	2,1	152	234
	10,6	**GS89428**	**WS89428**	**–**	144	280	28	28,5	4	273	155	4	155	273
150	0,796	**GS81130**	**WS81130**	**LS150190**	152	188	12	9,5	1	185	155	1	155	185
	2,18	**GS81230**	**WS81230**	**–**	153	212	21	14,5	1,5	211	158	1,5	162	210
	5,06	**GS89330**	**WS89330**	**–**	154	250	19	20,5	2,1	245	162	2,1	162	244
	12,5	**GS89430**	**WS89430**	**–**	154	300	30	30	4	293	167	4	167	293
160	0,842	**GS81132**	**WS81132**	**LS160200**	162	198	12	9,5	1	195	165	1	165	195
	2,3	**GS81232**	**WS81232**	**–**	163	222	21	15	1,5	220	168	1,5	171	219
	14,8	**GS89432**	**WS89432**	**–**	164	320	32	31,5	5	313	179	5	179	313
170	1,1	**GS81134**	**WS81134**	**–**	172	213	14	10	1,1	209	176	1,1	176	209
	2,9	**GS81234**	**WS81234**	**–**	173	237	22	16,5	1,5	235	180	1,5	184	233
	18,5	**GS89434**	**WS89434**	**–**	174	340	34	34,5	5	333	191	5	191	333

Axial cylindrical roller bearings

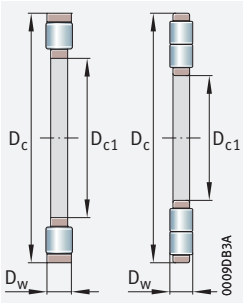
Axial cylindrical roller and cage assemblies
Axial bearing washers



811, 812



893, 894

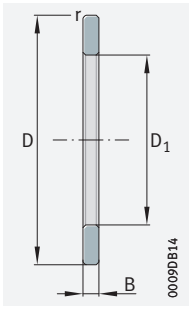


Single row: K811, K812
Double row: K893, K894

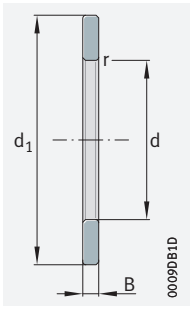
d = 180 – 320 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Axial cylindrical roller bearings		Axial cylindrical roller and cage assemblies	
								Mass	Designation ➤1048|1.12 ➤1049|1.13	Mass	Designation ➤1048|1.12 ➤1049|1.13
d D_{c1}	D D_c	T	dyn. C_a	stat. C_{0a}	C_{ua}	n_G	$n_{\vartheta r}$	m		m	
			N	N	N	min^{-1}	min^{-1}	≈ kg		≈ kg	
180	225	34	340 000	1 300 000	117 000	1 430	590	3,3	**81136-M**	1,46	**K81136-M**
	250	56	700 000	2 440 000	232 000	1 340	520	9,9	**81236-M**	3,67	**K81236-M**
	360	109	2 210 000	8 200 000	730 000	1 050	345	60	**89436-M**	17,6	**K89436-M**
190	240	37	390 000	1 500 000	134 000	1 340	570	4,74	**81138-M**	1,84	**K81138-M**
	270	62	880 000	3 000 000	290 000	1 250	475	12,8	**81238-M**	5,17	**K81238-M**
	380	115	2 460 000	9 200 000	820 000	1 010	330	72,1	**89438-M**	20,9	**K89438-M**
200	250	37	395 000	1 550 000	136 000	1 290	550	4,95	**81140-M**	1,93	**K81140-M**
	280	62	900 000	3 150 000	300 000	1 190	450	14,2	**81240-M**	5,4	**K81240-M**
	400	122	2 700 000	10 200 000	900 000	960	305	82,6	**89440-M**	24	**K89440-M**
220	270	37	420 000	1 730 000	149 000	1 180	490	5,22	**81144-M**	2,04	**K81144-M**
	300	63	950 000	3 450 000	320 000	1 100	405	15,3	**81244-M**	5,8	**K81244-M**
	420	122	2 900 000	11 500 000	990 000	880	265	90,1	**89444-M**	25,7	**K89444-M**
240	300	45	600 000	2 500 000	216 000	1 070	420	8,45	**81148-M**	3,32	**K81148-M**
	340	78	1 370 000	5 000 000	450 000	970	330	26,2	**81248-M**	9,94	**K81248-M**
	440	122	3 000 000	12 200 000	1 040 000	850	250	95,9	**89448-M**	27,3	**K89448-M**
260	320	45	620 000	2 650 000	223 000	990	390	9,08	**81152-M**	3,55	**K81152-M**
	360	79	1 440 000	5 400 000	480 000	910	305	28,6	**81252-M**	10,8	**K81252-M**
	480	132	3 600 000	14 700 000	1 220 000	780	224	125	**89452-M**	36,8	**K89452-M**
280	350	53	870 000	3 650 000	310 000	910	330	12,6	**81156-M**	5,31	**K81156-M**
	380	80	1 460 000	5 600 000	490 000	860	290	31	**81256-M**	11,5	**K81256-M**
	520	145	4 250 000	17 600 000	1 440 000	700	195	159	**89456-M**	48,5	**K89456-M**
300	380	62	1 070 000	4 500 000	380 000	840	295	19,4	**81160-M**	7,6	**K81160-M**
	420	95	1 930 000	7 300 000	630 000	780	255	48,25	**81260-M**	17,8	**K81260-M**
	540	145	4 350 000	18 500 000	1 500 000	670	184	170	**89460-M**	49,8	**K89460-M**
320	400	63	1 100 000	4 750 000	395 000	800	280	20,7	**81164-M**	8,04	**K81164-M**
	580	155	5 500 000	19 900 000	1 490 000	640	184	203	**89464-M**	80,3	**K89464-M**

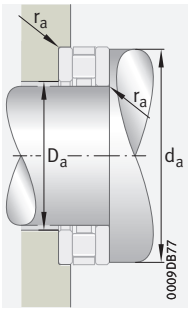
medias *https://www.schaeffler.de/std/1F9A*



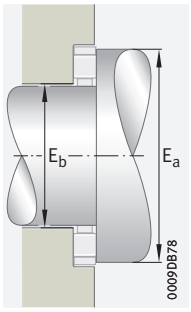
GS



WS



Mounting dimensions



Mounting dimensions, direct bearing arrangement

	Axial bearing washers			Dimensions					Mounting dimensions			Raceway dimensions	
	Mass	Designation ➤1048|1.12 ➤1049|1.13											
d D_{c1}	m ≈ kg	Housing locating washer	Shaft locating washer	D_1	d_1	D_w	B	a r min.	d_a	D_a	r_a	E_b	E_a
180	1,12	**GS81136**	**WS81136**	183	222	14	10	1,1	219	185	1,1	186	220
	3,13	**GS81236**	**WS81236**	183	247	22	17	1,5	245	190	1,5	194	243
	21,3	**GS89436**	**WS89436**	184	360	36	36,5	5	351	200	5	200	351
190	1,45	**GS81138**	**WS81138**	193	237	15	11	1,1	233	197	1,1	198	234
	3,835	**GS81238**	**WS81238**	194	267	26	18	2	265	200	2	205	263
	25,6	**GS89438**	**WS89438**	195	380	38	38,5	5	373	214	5	212	371
200	1,51	**GS81140**	**WS81140**	203	247	15	11	1,1	243	206	1,1	208	244
	4,41	**GS81240**	**WS81240**	204	277	26	18	2	275	210	2	215	273
	29,3	**GS89440**	**WS89440**	205	400	40	41	5	393	226	5	224	391
220	1,59	**GS81144**	**WS81144**	223	267	15	11	1,1	263	226	1,1	228	264
	4,75	**GS81244**	**WS81244**	224	297	26	18,5	2	296	230	2	236	294
	32,2	**GS89444**	**WS89444**	225	420	40	41	6	411	244	6	244	411
240	2,57	**GS81148**	**WS81148**	243	297	18	13,5	1,5	296	248	1,5	253	294
	8,15	**GS81248**	**WS81248**	244	335	32	23	2,1	335	261	2,1	263	333
	34,3	**GS89448**	**WS89448**	245	440	40	41	6	433	266	6	264	431
260	2,765	**GS81152**	**WS81152**	263	317	18	13,5	1,5	316	268	1,5	272	314
	8,9	**GS81252**	**WS81252**	264	355	32	23,5	2,1	353	280	2,1	281	351
	44,25	**GS89452**	**WS89452**	265	480	44	44	6	472	288	6	286	468
280	3,65	**GS81156**	**WS81156**	283	347	22	15,5	1,5	346	288	1,5	294	344
	9,75	**GS81256**	**WS81256**	284	375	32	24	2,1	373	300	2,1	301	371
	55,6	**GS89456**	**WS89456**	285	520	48	48,5	6	512	311	6	309	508
300	5,92	**GS81160**	**WS81160**	304	376	25	18,5	2	373	315	2	316	372
	15,2	**GS81260**	**WS81260**	304	415	38	28,5	3	413	328	3	329	412
	60,15	**GS89460**	**WS89460**	305	540	48	48,5	6	533	331	6	329	528
320	6,35	**GS81164**	**WS81164**	324	396	25	19	2	394	334	2	336	392
	61,5	**GS89464**	**WS89464**	325	575	68	43,5	6	573	340	6	343	566

Axial needle roller bearings

Matrix for bearing preselection ____ 1065

1 Axial needle roller bearings ____ 1066

1.1 Bearing design ____ 1066
1.2 Load carrying capacity ____ 1069
1.3 Compensation of angular misalignments ____ 1069
1.4 Lubrication ____ 1069
1.5 Sealing ____ 1069
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1.7 Noise *1070*
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1.16 Design of bearing arrangements *1073*
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1.18 Legal notice regarding data freshness *1075*
1.19 Further information *1075*
Product tables *1076*
Axial needle roller and cage assemblies, axial bearing washers *1076*
Axial needle roller bearings with centring spigot *1078*

Matrix for bearing preselection

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

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

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

Design features and suitability			Axial needle roller bearings	
+++ extremely suitable ++ highly suitable + suitable (+) suitable with restrictions – not suitable/not applicable ✓ available				detailed information ➤ **1066**
Load carrying capacity	radial		–	➤ *1069|1.2*
	axial, one direction		++	➤ *1069|1.2*
	axial, both directions		–	
	moments		–	
Compensation of angular misalignments	static		–	➤ *1069|1.3*
	dynamic		–	➤ *1069|1.3*
Bearing design	cylindrical bore		✓	➤ *1066|1.1*
	tapered bore		–	
	separable		✓	➤ *1066|1.1*
Lubrication	greased		–	➤ *1069|1.4*
Sealing	open		✓	➤ *1069|1.5*
	non-contact		–	
	contact		–	
Operating temperature in °C	from to		–20 +120	➤ *1070|1.8*
Suitability for	high speeds		++	➤ *1069|1.6*
	high running accuracy		–	➤ *1071|1.11* ➤ *115*
	low-noise running		+	➤ *1070|1.7* ➤ *27*
	high rigidity		+++	➤ *54*
	reduced friction		+++	➤ *56*
	length compensation within bearing		(+)	
	non-locating bearing arrangement		–	
	locating bearing arrangement		–	
X-life bearings		X-life	–	
Inner cage diameter D_{c1} in mm	from to		4 160	➤ *1076* ➤ *1078*
Product tables	from page ➤		**1076**	

1 Axial needle roller bearings

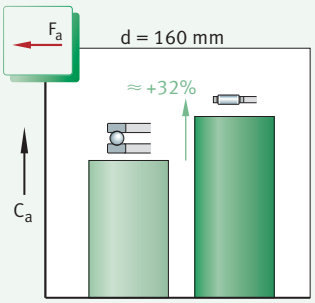
Axial needle roller bearings are particularly suitable where:

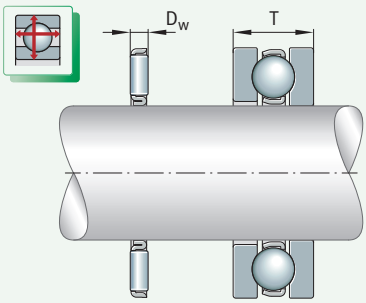
- high axial forces occur in one direction but no radial loads are present (the bearings may only be subjected to axial load ➤*1069*| *1.2*)
- the load carrying capacity of comparable axial deep groove ball bearings is no longer adequate and the very high axial load carrying capacity of axial cylindrical roller bearings is not yet necessary ➤*1066*| 🗀 *1*
- higher speeds occur in addition to high axial loads
- the bearing arrangement must have very high axial rigidity
- the axial space available is extremely small ➤*1066*| 🗀 *1*
- the bearing parts can or must be mounted separately
- the bearing arrangement is not configured but, for cost reasons, ready-to-fit standard bearings are to be used

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*1065*.

🗀 **1**
Axial needle roller bearing and axial deep groove ball bearing – comparison of load carrying capacity and design envelope

F_a = *axial load*
C_a = *basic dynamic load rating*
D_w = *diameter of needle roller*
T = *axial section height of axial deep groove ball bearing*





1.1 Bearing design

✎ *Design variants*

Axial needle roller bearings are available as:

- complete axial needle roller bearings (comprising a needle roller and cage assembly and axial bearing washers) ➤*1067*| 🗀 *2*
- individual bearing parts for combination, comprising:
  - axial needle roller and cage assembly (prefix AXK)
  - axial bearing washers (prefix AS) ➤*1068*| 🗀 *3*
- bearings with centring spigot (prefix AXW) ➤*1068*| 🗀 *4* and ➤*1068*| 🗀 *5*

Furthermore, Schaeffler supplies axial needle roller bearings by agreement for specific applications, for example with tabs to prevent rotation. Such bearings are used, due to their low axial section height, in applications such as automotive manual gearshift transmissions.

Axial needle roller bearings

Ready-to-fit bearing units with very small axial space

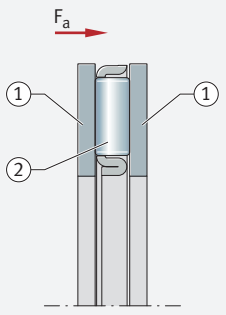
Axial needle roller bearings are part of the group of axial roller bearings. In contrast to the ball, the roller has a larger contact area perpendicular to the roller axis. As a result, it can transmit higher forces, has greater rigidity and allows smaller rolling element diameters under the same load. The single row, ready-to-fit bearings comprise flat, ribless axial bearing washers between which axial needle roller and cage assemblies are arranged ➤*1067*|*2*. Their axial section height corresponds only to the diameter of the needle rollers plus the thickness of the washers. Due to this design, the bearings are extremely small in axial height ➤*1078*|. The rolling elements are retained and guided by axial cages. The needle rollers are made from through hardened rolling bearing steel 100Cr6. They have a hardness of at least 670 HV and profiled ends, i.e. they have a slight lateral curvature towards the ends. The modified line contact between the needle rollers and raceways prevents damaging edge stresses. This in turn has a positive effect on the operating life of the bearings.

Due to the extensive possible combinations, the bearing parts for axial needle roller bearings are always supplied individually, i.e. the corresponding axial needle roller and cage assemblies and axial bearing washers in the product tables must always be ordered together ➤*1067*|*2*, ➤*1068*|*3*, ➤*1072*|*1.13* and ➤*1078*|.

2
Axial needle roller bearing

F_a = *axial load*

① *Axial bearing washers*
② *Axial needle roller and cage assembly*



Axial needle roller and cage assemblies

The axial section height corresponds to the needle roller diameter

Axial needle roller and cage assemblies AXK comprise geometrically stable plastic or metal cages fitted with a large number of needle rollers ➤*1067*|*2*. Due to the high uniformity of diameter (the needle rollers are sorted to very small diameter tolerances) of the needle rollers with each other, this gives very uniform loading of the rolling elements ➤*1071*|*3*. Since the axial section height of the cage assemblies is determined purely by the needle roller diameter, the bearings require only an extremely small axial design space.

Suitable as a direct bearing arrangement or in conjunction with axial bearing washers

The axial needle roller and cage assemblies are generally combined with axial bearing washers ➤*1067*|*2* and ➤*1068*|*3*. If they are to be used directly – i.e. without these washers – in the adjacent construction, the raceway for the needle rollers must be produced as a rolling bearing raceway ➤*1073*|*1.16*.

Axial bearing washers

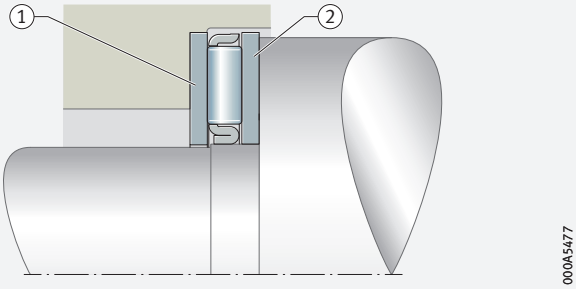
Suitable as shaft or housing locating washers

Axial bearing washers AS are suitable for axial needle roller and cage assemblies AXK. They are punched, through hardened, polished and suitable for use as shaft or housing locating washers. Housing locating washers are externally centred, shaft locating washers are internally centred ➤*1068*|*3* and ➤*1073*|*1.16*. They are used if the adjacent machine parts cannot be used as a raceway for the rolling elements but are sufficiently rigid and geometrically precise.

The use of complete axial needle roller bearings (axial needle roller and cage assembly AXK with axial bearing washers AS) is only appropriate, for example, if high speeds occur and the bearing washers must therefore be precisely centred or the running surfaces for the rolling elements cannot be configured as a rolling bearing raceway.

3
Axial bearing washers

① *Axial needle roller bearing, housing locating washer externally centred*
② *Axial needle roller bearing, shaft locating washer internally centred*



Axial bearings with centring spigot

The centring spigot gives simplified mounting of the bearings

Axial needle roller bearings AXW comprise a housing locating washer with a centring spigot into which an axial needle roller and cage assembly AXK is inserted. With the aid of the centring spigot, the housing locating washer can be precisely centred in the housing bore. This gives easier mounting of the bearings. The running surface for the needle roller and cage assembly must be produced as a rolling bearing raceway, i. e. it must be hardened and ground.

Suitable for the support of axial loads only

Axial bearings with a centring spigot can only support axial loads in one direction. In order to support combined radial/axial loads, however, these bearings can be combined with the following radial needle roller bearings:

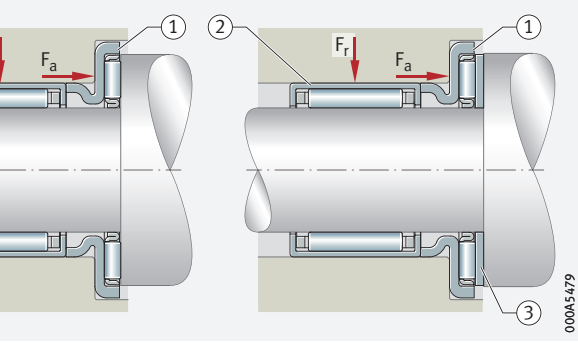
- drawn cup needle roller bearings with open ends and with closed end (direct bearing arrangement) ➤ *1068* | *4*
- needle roller bearings with or without inner ring ➤ *1068* | *5*

Such combinations give very compact and economical bearing arrangements.

4
Needle roller axial bearings with centring spigot, combined with drawn cup needle roller bearings with open ends

F_a = *axial load*
F_r = *radial load*

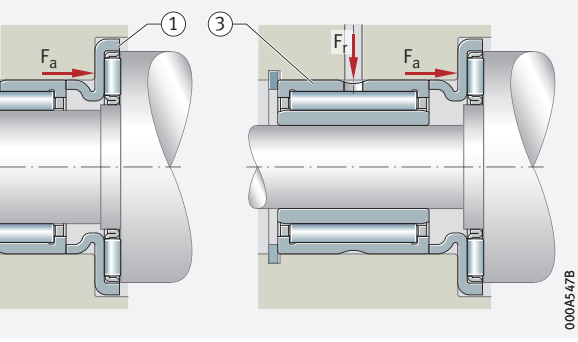
① *Needle roller axial bearing AXW*
② *Drawn cup needle roller bearing with open endsHK (radial bearing)*
③ *Axial bearing washer AS*



5
Needle roller axial bearings with centring spigot, combined with needle roller bearings

F_a = *axial load*
F_r = *radial load*

① *Needle roller axial bearing AXW*
② *Needle roller bearing without inner ring (radial bearing)*
③ *Needle roller bearing with inner ring (radial bearing)*



1.2 Load carrying capacity

For high axial loads acting in one direction

Single row axial needle roller bearings can support high axial loads as well as axial shock loads in one direction, but must not be subjected to radial load ➤*1072*|*1.14*. Radial loads must be supported by means of an additional bearing ➤*1068*|⧉*4* and ➤*1068*|⧉*5*.

1.3 Compensation of angular misalignments

The bearings do not permit any skewing between the shaft and housing. If angular misalignments occur between the locating surfaces on the shaft and in the housing, this will cause damage to the bearing and a reduction in its operating life.

1.4 Lubrication

Oil or grease lubrication is possible

Axial needle roller bearings and axial needle roller and cage assemblies are not greased. The bearings must be lubricated with oil or grease.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

If there is any uncertainty regarding the suitability of the selected lubricant for the application, please consult Schaeffler or the lubricant manufacturer.

Observe oil change intervals

Aged oil and additives in the oil can impair the operating life of plastics at high temperatures. As a result, stipulated oil change intervals must be strictly observed.

1.5 Sealing

Provide seals in the adjacent construction

The bearings are not sealed; i.e. sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing position

1.6 Speeds

Speeds in the product tables

The product tables generally give two speeds for the bearings:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of the bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤*64*.

The values in the product tables are valid for oil lubrication.

Values for grease lubrication

For grease lubrication, 25% of the value stated in the product tables is permissible in each case.

Reference speeds

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

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_{ϑ} ➤*64*.

1.7 Noise

Schaeffler Noise Index

The Schaeffler Noise Index (SGI) is not yet available for this bearing type ➤*69*. The data for these bearing series will be introduced and updated in stages.

Further information:

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

1.8 Temperature range

✎ Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing washers and needle rollers
- the cage
- the lubricant

Possible operating temperatures of axial needle roller bearings ➤*1070*|▦ *1*.

▦ **1**
Permissible temperature ranges

Operating temperature	Corrosion-resistant design (with Corrotect coating) or polyamide PA66	Bearings with sheet steel cage
	–20 °C to +120 °C	–20 °C to +120 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

1.9 Cages

✎ The standard cages are made from sheet steel

Standard cages ➤*1070*|▦ *2*. Other cage designs are available by agreement. With such cages, however, suitability for high speeds and temperatures as well as the basic load ratings may differ from the values for the bearings with standard cages.

For high continuous temperatures and applications with difficult operating conditions, bearings with sheet metal cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

▦ **2**
Cage, cage suffix, inner cage diameter

Bearing series	Solid cage made from polyamide PA66 TV	Sheet steel cage	Corrosion-resistant design (with Corrotect coating) RR
	Inner cage diameter		
AXK	up to 8	from 10	Available by agreement
AXW	–	from 10	Available by agreement

1.10 Internal clearance

✎ Axial clearance and preload are determined by the application

In the case of axial needle roller bearings, the internal clearance (axial clearance) is only achieved when the bearings are mounted. The requisite axial clearance of the bearing arrangement is dependent on the application and must take account of the conditions in the bearing arrangement while warm from operation and subjected to load. If axial needle roller bearings are subjected to vibrations while under predominantly static load, for example, they must be lightly preloaded. Preload can be applied, for example, using calibrated sheets (shims). Other suitable means include shaft nuts, disc springs etc. ➤*1073*|*1.15*. It must always be ensured that no slippage occurs in operation between the rolling elements and raceways ➤*1073*|*1.15*.

If there is any uncertainty regarding correct setting, please consult Schaeffler.

1.11 Dimensions, tolerances

Dimension standards

The main dimensions of axial needle roller bearings correspond to ISO 104:2015. The main dimensions of axial needle roller and cage assemblies correspond to DIN 5405-2:2016, while those of axial bearing washers correspond to DIN 5405-3:2016. Axial needle roller bearings with centring spigot are not standardised.

Tolerances

Axial bearing washers adapt to the accuracy of the abutment surface. They are flat under a minimum concentric load of 200 N.

Tolerances for the bore and outside diameter as well as for the width of the bearing parts ➤1071 | 3 and ➤1071 | 6.

The sort tolerances and sort intervals of the needle roller diameters correspond to ISO 3096:1996 or DIN 5402-3:2012, grade G2.

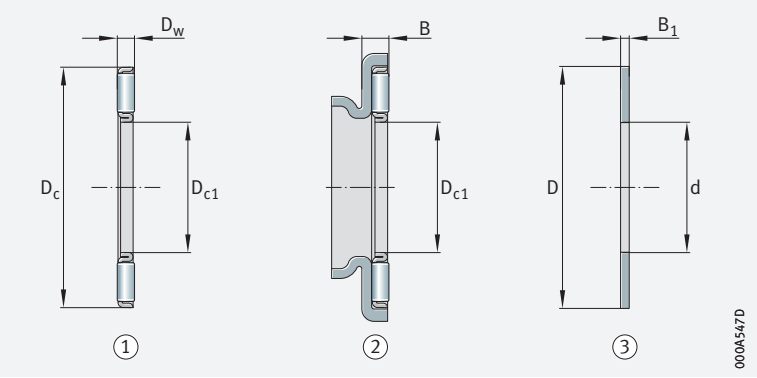
The diameter sort tolerance of the needle rollers in the axial needle roller and cage assemblies AXW is 2 µm.

3 *Tolerances of bearing parts*

Series	Bore		Outside diameter		Height	
		Tolerance class		Tolerance class		Deviations mm
AXK	D_{c1}	E11	D_c	c12	D_w	0 −0,01
AXW	D_{c1}	E12	–	–	B	0 −0,2
AS	d	E12	D	e12	B_1	±0,05

6 *Bearing parts*

① *Axial needle roller and cage assembly AXK*
② *Axial needle roller bearing AXW*
③ *Axial bearing washer AS*



1.12 Suffixes

Suffixes describe the design and features of a bearing in more detail.

4 *Suffixes and corresponding descriptions*

Suffix	Description of suffix	
RR	Corrosion-resistant design, with Corrotect coating	Special design, available by agreement
TV	Plastic cage made from glass fibre reinforced polyamide PA66	Standard

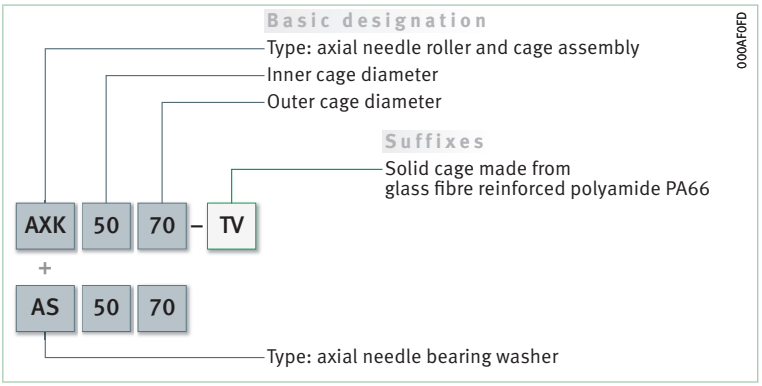
1.13 Structure of bearing designation

With ***medias*** interchange, equivalent Schaeffler bearing designations can be determined for bearing designations from other rolling bearing manufacturers *https://www.schaeffler.de/std/1B69*.

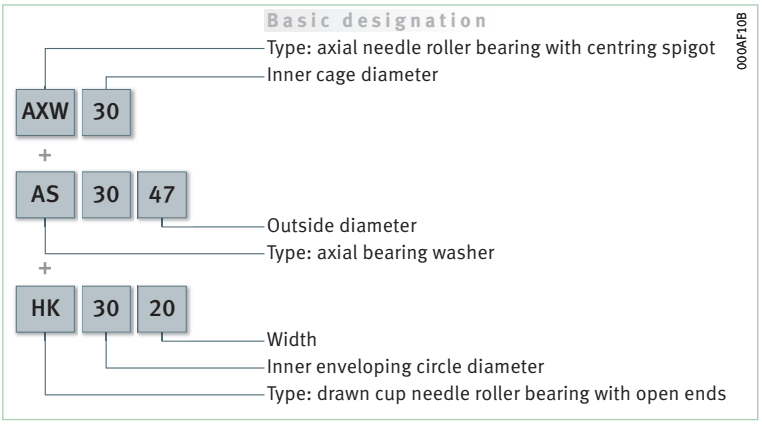
✎ *Examples of composition of bearing designation*

The designation of bearings follows a set model. Examples ➤*1072*|🗀*7* and ➤*1072*|🗀*8*. The composition of designations for axial needle roller and cage assemblies and axial bearing washers is subject to DIN 623-1 ➤*102*|🗀*10*.

🗀**7**
Axial needle roller bearing, comprising axial needle roller and cage assembly and axial bearing washers



🗀**8**
Axial needle roller bearing with centring spigot, combined with axial bearing washer and drawn cup needle roller bearing with open ends



1.14 Dimensioning

Equivalent dynamic bearing load

Axial needle roller bearings can only support axial forces ➤*1069*|*1.2*. In the rating life equation, P is therefore substituted by the value for F_a ➤*1072*|𝑓⃞*1*.

𝑓⃞**1**
Equivalent dynamic load

$$P = F_a$$

Legend

P	N	Equivalent dynamic bearing load
F_a	N	Axial load.

Equivalent static bearing load

✎ *Combined loads are not possible*

In relation to the direction of load, the same conditions apply as for the equivalent dynamic bearing load, i. e. combined loads are not permissible. In the rating life equation, P_0 is therefore substituted by the value for F_{0a} ➤*1073*|𝑓⃞*2*.

*f*2
Equivalent static load

$$P_0 = F_{0a}$$

Legend

P_0	N	Equivalent static bearing load
F_{0a}	N	Largest axial load present (maximum load).

Static load safety factor

✎ $S_0 = C_0/P_0$

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤*1073| f 3*.

*f*3
Static load safety factor

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

Legend

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

1.15 Minimum load

✎ Rolling bearings under low loads are particularly prone to slippage

In order to prevent slippage damage, the bearing must be subjected to a minimum axial load $F_{a\,min}$ ➤*1073| f 4*. In vertical bearing arrangements in particular, the requisite minimum axial load $F_{a\,min}$ is normally achieved, however, simply by the weight of the bearing parts and the external forces. If this is not the case, the bearing arrangement must be preloaded, for example by means of springs or a shaft nut ➤*1070| 1.10*.

*f*4
Minimum axial load

$$F_{a\,min} = 0{,}0005 \cdot C_{0a} + k_a \left(\frac{C_{0a} \cdot n}{10^8} \right)^2$$

Legend

$F_{a\,min}$	N	Minimum axial load
C_{0a}	N	Basic static load rating, axial
k_a	–	Factor for determining the minimum load; $k_a = 3$
n	min^{-1}	Speed.

1.16 Design of bearing arrangements

Design of adjacent parts

Axial needle roller bearings cannot tolerate angular misalignments ➤*1069| 1.3*. The locating surfaces for the bearing parts on the shaft and in the housing must therefore be vertical to the shaft axis, while the adjacent parts must be rigid and flat. They must be configured such that the bearing washers are supported as far as possible over the whole circumference and over the whole raceway width.

Running surfaces of rolling elements in direct bearing arrangements with needle roller and cage assemblies

✎ Produce the running surfaces as a rolling bearing raceway

For the very smallest axial design space, axial needle roller and cage assemblies can also run directly (i. e. without axial bearing washers) on the adjacent construction. In this case – and if the load carrying capacity of the axial needle roller and cage assemblies is to be fully utilised – the raceways on the shaft and in the housing must be produced as a rolling bearing raceway or must correspond to the quality and hardness of axial bearing washers. When designing the raceway on the shaft and in the housing, the raceway dimensions E_a and E_b of axial needle roller and cage assemblies must be observed ➤*1076|*. If the values are observed, this will ensure that the raceways for the needle rollers – taking account of any possible axial offset of the needle roller and cage assembly – are adequately dimensioned.

Raceway design

Design of running surfaces:
- raceway hardness 670 HV to 840 HV
- radial cage guidance surfaces Ramax 0,8 (Rzmax 4)
- surface hardening depth SHD ≧ 140 · $D_w/R_{p0,2}$
  - SHD = surface hardening depth in mm
  - D_w = rolling element diameter in mm
  - $R_{p0,2}$ = proof stress in N/mm²
- roughness Ramax 0,2 (Rzmax 1)
- raceway dimensions E_a and E_b according to the product tables must be observed
- total axial runout tolerances to ISO tolerance grade IT5 (for special requirements IT4) relative to the inside diameter of the axial needle roller and cage assemblies D_{c1} must be observed

Tolerances for shaft and housing bore

Proven tolerances are given in ➤*1074*|▦ *5*. If the data are observed, this will give correct radial guidance of the bearing elements.

▦ **5**
Tolerances for shafts and housing bores

Bearing component		Tolerance class[1] for	
		Shaft	Bore
AXK	Shaft guided	h8	–
AS	Externally centred as housing locating washer	Shaft released	H9
	Internally centred as shaft locating washer	h8	Bore released

[1] *The envelope requirement Ⓔ applies.*

Tolerances for the centring spigot in the housing bore

Where axial needle roller bearings AXW are to be combined with drawn cup needle roller bearings with open ends or closed end, or with needle roller bearings, the bore tolerances selected for the bore of the centring spigot in the housing must be the same as for the radial bearings ➤*1066*|*1.1*, ➤*1068*|⧉ *4* and ➤*1068*|⧉ *5*.

Release and guidance of bearing parts

Release of shaft and housing locating washers

If the bearing washers are centred on the shaft, they must have radial clearance in the housing bore while, if they are centred in the housing, there must be radial clearance between the washer bore and the shaft ➤*1074*|▦ *5*.

Guidance of axial needle roller and cage assemblies

In order to achieve the lowest possible sliding speeds on the guidance surfaces, the axial needle roller and cage assemblies are generally guided on the shaft. This is particularly important in the case of high speeds.

1.17 Mounting and dismounting

The mounting and dismounting options for the bearings must be taken into consideration in the design of the bearing position.

As the bearings are not self-retaining, they are easy to mount

Axial needle roller bearings are not self-retaining. As a result, the bearing parts can be mounted separately from each other. This gives simplified mounting of the bearings.

Mounting position of bearing washers

The axial bearing washers AS must be suitable as a raceway on both sides, i.e. either side of the washer can face towards the needle rollers.

Schaeffler Mounting Handbook

Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings *https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

1.18 Legal notice regarding data freshness

The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

We therefore reserve the right to make changes to the data and illustrations in this catalogue. This catalogue reflects the status at the time of printing. More recent publications released by us (as printed or digital media) will automatically precede this catalogue if they involve the same subject. Therefore, please always use our electronic product catalogue to check whether more up-to-date information or modification notices exist for your desired product.

Link to electronic product catalogue

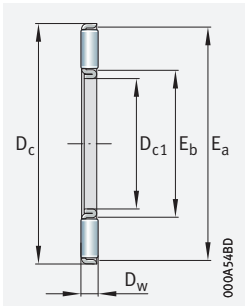
The following link will take you to the Schaeffler electronic product catalogue: *https://medias.schaeffler.com*.

1.19 Further information

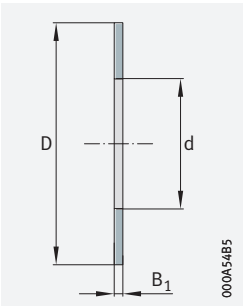
In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤*34*
- Rigidity ➤*54*
- Friction and increases in temperature ➤*56*
- Speeds ➤*64*
- Bearing data ➤*97*
- Lubrication ➤*70*
- Sealing ➤*185*
- Design of bearing arrangements ➤*141*
- Mounting and dismounting ➤*194*

Axial needle roller and cage assemblies
Axial bearing washers



AXK

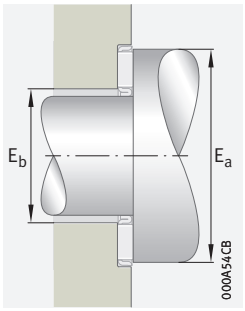


AS

D_{c1} = 4 – 160 mm

Main dimensions				Basic load ratings		Fatigue limit load	Limiting speed	Speed rating
D_{c1} d	D_c D	D_w	B_1	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}
4	14	2	1	4 400	8 000	960	21 500	15 100
5	15	2	1	4 750	9 200	1 090	20 600	13 100
6	19	2	1	6 800	15 500	1 610	18 900	11 000
8	21	2	1	7 800	19 400	2 010	17 800	8 900
10	24	2	1	9 200	25 500	2 550	16 900	7 400
12	26	2	1	9 900	29 000	2 950	15 200	6 500
15	28	2	1	11 300	36 000	3 650	13 200	4 950
17	30	2	1	11 900	39 500	4 000	12 100	4 500
20	35	2	1	13 100	46 500	4 800	10 500	4 350
25	42	2	1	14 700	58 000	6 000	8 400	3 700
30	47	2	1	16 300	70 000	7 200	7 300	3 100
35	52	2	1	17 800	81 000	8 400	6 500	2 700
40	60	3	1	28 000	114 000	12 100	5 600	2 340
45	65	3	1	30 000	128 000	13 600	5 100	2 100
50	70	3	1	32 000	143 000	15 100	4 700	1 890
55	78	3	1	38 000	186 000	20 700	4 250	1 730
60	85	3	1	44 500	234 000	27 000	3 900	1 550
65	90	3	1	46 500	255 000	29 000	3 650	1 430
70	95	4	1	54 000	255 000	27 000	3 450	1 400
75	100	4	1	55 000	265 000	28 500	3 250	1 340
80	105	4	1	56 000	280 000	30 000	3 100	1 260
85	110	4	1	58 000	290 000	31 000	2 950	1 200
90	120	4	1	73 000	405 000	45 000	2 700	1 100
100	135	4	1	91 000	560 000	59 000	2 420	970
110	145	4	1	97 000	620 000	64 000	2 230	880
120	155	4	1	102 000	680 000	69 000	2 070	800
130	170	5	1	133 000	840 000	77 000	1 900	750
140	180	5	1	138 000	900 000	80 000	1 780	700
150	190	5	1	143 000	960 000	84 000	1 680	660
160	200	5	1	148 000	1 020 000	88 000	1 590	620

medias *https://www.schaeffler.de/std/1F9A*

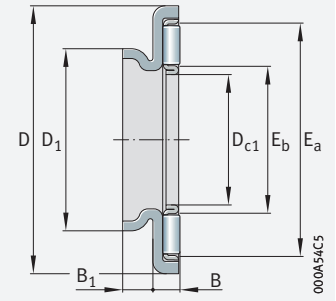


Mounting dimensions/raceway dimensions for direct bearing arrangement

	Axial needle roller and cage assemblies		Axial bearing washers		Raceway dimensions	
	Mass	Designation ➤*1071|1.12* ➤*1072|1.13*	Mass	Designation ➤*1071|1.12* ➤*1072|1.13*		
d D_{c1}	m ≈ g		m ≈ g		E_b	E_a
4	0,7	**AXK0414-TV**	1	**AS0414**	5	13
5	0,8	**AXK0515-TV**	1	**AS0515**	6	14
6	1	**AXK0619-TV**	2	**AS0619**	7	18
8	2	**AXK0821-TV**	2	**AS0821**	9	20
10	3	**AXK1024**	3	**AS1024**	12	23
12	3	**AXK1226**	3	**AS1226**	14	25
15	4	**AXK1528**	3	**AS1528**	17	27
17	4	**AXK1730**	4	**AS1730**	19	29
20	5	**AXK2035**	5	**AS2035**	22	34
25	7	**AXK2542**	7	**AS2542**	29	41
30	8	**AXK3047**	8	**AS3047**	34	46
35	10	**AXK3552**	9	**AS3552**	39	51
40	16	**AXK4060**	12	**AS4060**	45	58
45	18	**AXK4565**	13	**AS4565**	50	63
50	20	**AXK5070**	14	**AS5070**	55	68
55	28	**AXK5578**	18	**AS5578**	60	76
60	33	**AXK6085**	22	**AS6085**	65	83
65	35	**AXK6590**	24	**AS6590**	70	88
70	60	**AXK7095**	25	**AS7095**	74	93
75	61	**AXK75100**	27	**AS75100**	79	98
80	63	**AXK80105**	28	**AS80105**	84	103
85	67	**AXK85110**	29	**AS85110**	89	108
90	86	**AXK90120**	39	**AS90120**	94	118
100	104	**AXK100135**	50	**AS100135**	105	133
110	122	**AXK110145**	55	**AS110145**	115	143
120	131	**AXK120155**	59	**AS120155**	125	153
130	205	**AXK130170**	65	**AS130170**	136	167
140	219	**AXK140180**	79	**AS140180**	146	177
150	232	**AXK150190**	84	**AS150190**	156	187
160	246	**AXK160200**	89	**AS160200**	166	197

Axial needle roller bearings

With centring spigot



AXW

D_{c1} = 10 – 50 mm

Main dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Speed rating	Mass	Designation
D_{c1}	D	B	dyn. C_a N	stat. C_{0a} N	C_{ua} N	n_G min^{-1}	$n_{\vartheta r}$ min^{-1}	m ≈ g	➤*1071* | *1.12* ➤*1072* | *1.13*
10	27	3,2	9 200	25 500	2 550	16 900	9 300	8,3	**AXW10**
12	29	3,2	9 900	29 000	2 950	15 200	8 100	9,1	**AXW12**
15	31	3,2	11 300	36 000	3 650	13 200	6 200	10	**AXW15**
17	33	3,2	11 900	39 500	4 000	12 100	5 600	11	**AXW17**
20	38	3,2	13 100	46 500	4 800	10 500	5 300	14	**AXW20**
25	45	3,2	14 700	58 000	6 000	8 400	4 350	20	**AXW25**
30	50	3,2	16 300	70 000	7 200	7 300	3 650	22	**AXW30**
35	55	3,2	17 800	81 000	8 400	6 500	3 150	27	**AXW35**
40	63	4,2	28 000	114 000	12 100	5 600	2 700	39	**AXW40**
45	68	4,2	30 000	128 000	13 600	5 100	2 400	43	**AXW45**
50	73	4,2	32 000	143 000	15 100	4 700	2 160	49	**AXW50**

medias *https://www.schaeffler.de/std/1F9A*