ART BEARINGS

ROLLING BEARINGS GENERAL CATALOG

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ART
Rolling Bearings
General Catalogue

V.02_2019 EN

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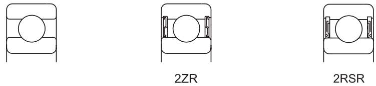
ART BEARINGS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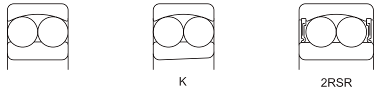
2RSR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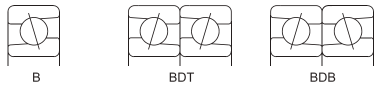
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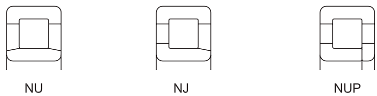
BDB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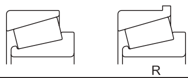
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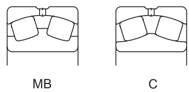
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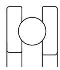

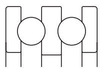

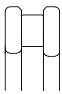

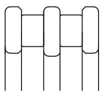

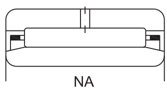
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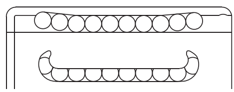

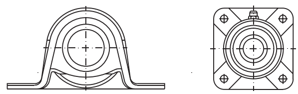

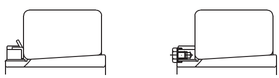

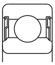
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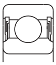
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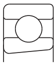
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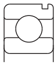
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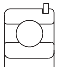
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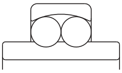
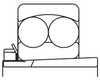

112;113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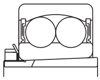
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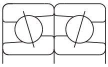
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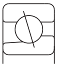
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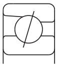
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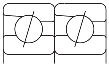
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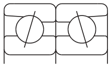
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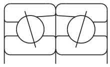
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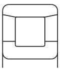
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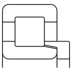
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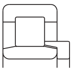
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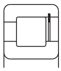
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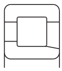
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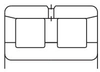
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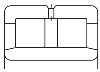
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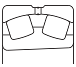
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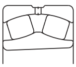
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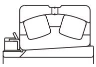
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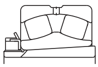
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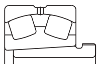
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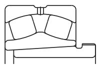
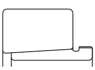

CK+AH

AH30 AH3
AH31 AH23
AH2 AH240
AH22 AH241
AH32



Measuring units of the international system SI

Lenght
1 mm = 0,039 in
1 in = 25,4 mm

Mass
1 kg = 2,205 lb

Force
1 kN = 1 000 N = 225 lbf
1 kgf = 9,81 N
1 lbf = 4,45 N

Moment
1 N mm = 0,102 kgf mm
1 kgf mm = 9,81 N mm
1 N m = 8,85 in lbf
1 in lbf = 0,113 N mm

Pressure per unit of area (surface)
1 N/mm2 = 1 MPa = 145 psi
1 psi = 0,102 kgf/mm^2
1 kgf/mm2 = 9,81 N/mm^2

Power
1 W = 1 J/s = 1 N m/s = 0,102 kgf m/s
1 kW = 1,36 CP = 102 kgf m/s
1 kgf m/s = 9,81 N m/s = 9,81 j/s

Mechanical work
1 kgf m = 9,81 W s = 9,81 N m
1 J (Joule) = 1 N m = 1 W s = 0,102 kgf m

Kinematic viscosity
1 mm2/s = 1 cSt (centiStokes)

URB GROUP

URB-ROMANIA ART-TURKEY MGM-HUNGARY URB-INDIA

Selection of bearing type

Each type of bearing displays characteristics features which make it suitable for a certain application. Therefore, many bearings types and constructive versions have been developed so that they can satisfy various demands for rolling bearings. No general rule can be given, taking into account the great number of factors to be considered when selecting a bearing type.

We give further the most important criteria to be considered when selecting the bearing type.

Selection of bearing type, considering the load magnitude and direction

Radial load

Deep groove ball bearings are the most suitable types of bearings for light and moderate pure radial loads. For heavy radial load and where large-diameter shafts are used, double row cylindrical roller bearings are the adequate choice.

Axial load

For pure axial loads, single direction thrust ball bearings are used in case of loads acting in one directions. For loads acting in both directions, double direction thrust ball bearings are used. Angular contact thrust ball bearing and single or double row angular contact ball bearings, are used in case of light or moderate pure axial loads at moderate speeds.

For light axial loads at high speeds, deep groove ball bearings are suitable. Under the axial load, a contact angle different from 0° is generated in these bearings and therefore they operate as angular contact ball bearings.

In order to increase axial load carrying capacity, a larger clearance should be selected (C3, C4). For moderate axial loads at high speed, angular contact ball bearings in tandem arrangement are used so that they can take over loads acting in both directions.

Combined load

In order to carry combined radial and axial loads acting simultaneously, bearings with a contact angle different from 0° are used. The greater the contact angle, the greater the axial load carrying capacity.

Self-aligning ball bearings, spherical roller bearings or cylindrical roller bearings (NJ, NUP, NJ + HJ types), can also accommodate combined loads of certain values. But there are some limit values of the ratio Fa/Fr, which are shown in bearing tables and cannot be exceeded. Cylindrical roller bearings can carry axial loads by means of the sliding friction on ribs. For this reason, the load is limited according to the indications on pages 158, 159.

Bearings which accomodate only one direction axial loads should always be mounted in pairs so that they can carry axial loads in both directions.

Selection of bearing type considering the alignment between shaft and housing

Angular misalignments occur generally when the shaft bends under the operating load or when bearings joint parts have deviations of form or position.

In such cases, self-aligning ball bearings, spherical roller bearings or spherical roller thrust bearings should be used.

A certain bearing bending angle which can compensate for errors of alignment and maximum angle values are shown for each type in the introductory texts of the table sections.

When misalignments should be compensated, radial and axial clearance are important. The larger the clearance, the greater the possibility of self-aligning.

If the misalignment exceeds the permissible values shown in the introductory texts of the bearing tables, the bearing rating life decreases. The greater the ratio Fr/C_{0r}, the shorter the rating life. If $0,1 < Fr/C_{0r} < 3$, the rating life decreases with about 25%.

Selection of bearing type considering the operating temperature

Bearings are generally used up to a temperature of maximum +120°C. In case of higher temperatures, bearings with special heat treatments should be used, in accordance with specifications on page 23. Sealed bearings, 2RS type, should be used at operating temperatures up to 80°C. If this temperature is exceeded, the efficiency of lubricants is considerably reduced.

Selection of bearing internal clearance

In most cases, while operating, bearings should have a small radial clearance that can be defined as “the possible value of displacement in radial direction of one bearing ring in relation to the other without parts deformations”.

While operating, bearing internal clearance is different from the one at delivery, since the latter is reduced when mounting bearings with a certain tight fit.

Under operating conditions, internal clearance change is also caused by different temperatures between the outer and inner ring. Bearings are generally delivered with a normal radial or axial clearance according to the values shown for each rolling bearing group.

The decrease in radial clearance due to the tight fit and operating temperature is considered to be between 60-80% of the tightening value, depending on bearing series and size.

After the clearance in bearings has been decreased, a large enough operational clearance should remain, so that the lubricant film shouldn’t be destroyed.

Deep groove ball bearings should have an operational clearance close to zero. There may be often a light preload, due to the point-contact between the rolling elements and raceways.

Small-sized cylindrical roller bearings should have an operational clearance of 5-10 μm and larger-sized bearings a clearance of 10-30 μm.

Bearings can also be manufactured - at request - with radial and axial clearance smaller (C1 and C2) or larger (C3, C4 and C5) than normal, so that the most favorable operating conditions for bearings should be assured.

Cylindrical roller bearings can be manufactured with non-interchangeable rings (suffix NA).

Bearings with non-interchangeable parts have a different radial clearance than bearings with interchangeable parts. Changing rings from one bearing to another is not allowed.

In case of bearings with interchangeable parts, rings may be changed and the values of radial clearance will not be altered.

Bearing types and technical characteristics

ART bearings can be manufactured in various type and size, so that they can meet the customers’ requirements assuring a proper reliability for various applications.

Table 1.1 shows suitability of each group of bearings, considering the main technical characteristics.

Bearing type is selected depending on the technical characteristics required by a certain application.

A suggestive graphic symbol has been determined for each main technical characteristic. Thus, a proper bearing for each purpose can be easily chosen. According to the specifications in this catalogue, the proper type and size of bearing can be selected, togheter with all manufacturing and operating technical conditions.

Bearing types and their characteristics

Legend: ● - excellent; ◕ - good; ◑ - fair; ◔ - poor; ○ - unsuitable; → - single direction; ↔ - double direction

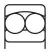
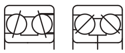
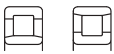
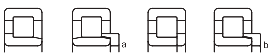
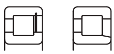
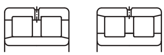
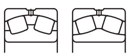
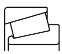
Bearing type		Purely radial load	Purely axial load	Combined load	Moment load
Deep groove ball bearings		good	fair ↔	fair	poor
Self -aligning ball bearings		fair	poor	poor	unsuitable
Angular contact ball bearings - single row		good	good → ↔ b	good	fair
- high precision		good	good → ↔ b	good	fair
- double rows		good	good ↔	good	fair
Cylindrical roller bearings - NU; N		excellent	unsuitable	unsuitable	unsuitable
- NJ, NU+HJ, NUP, NJ+HJ		excellent	fair →	fair	unsuitable
- NCF, NJ23VH		excellent	fair →	fair	unsuitable
- NNU, NN		excellent	unsuitable	unsuitable	unsuitable
Spherical roller bearings		excellent	good ↔	good	unsuitable
Tapered roller bearings - single row		excellent	excellent →	excellent	poor
Thrust ball bearing - single direction - double direction		unsuitable a	good → ↔ b	unsuitable	unsuitable

Table 1.1

Tolerance class	Quiet running	High speed	High stiffness	Compensation of misalignement	Low friction	Shock resistence	Located bearing	Non-located bearing	Axial displacement posible in bearing
◐	●	●	◐	◔	●	◐	◕	◐	○
○	◔	◕	◔	●	●	○	◐	◐	○
◐	◕	◐	◕	○	◕	◕	●	○ a	○
●	●	●	◕	○	◕	◐	●	○ a	○
◐	◔	◐	◔	○	◐	◐	◕	◐	○
◕	◐	●	◕	◔	◐	●	○	●	●
◐	◔	◕	◕	◔	◕	●	◐	◐	◔
○	○	○	●	◔	◕	●	◐	◐	◔
●	◐	●	●	○	◕	●	○	●	●
○	◔	◐	◕	●	◕	●	◕	◕	○
◕	◔	◐	◕	◔	◕	●	◕	○	○
◕	◔	◐	◐	○	◔	○	◐	○	○

Selection of bearing size

The size of a bearing is selected considering as usually factor magnitude of the load, and also selection depends on the operational rating life and prescribed operating safety.

Basic load ratings

The basic dynamic load rating Cr is used to evaluate bearing dimensions while rotating under load. It expreses the bearing admissible load which will give a basic rating life up to 1000 000 revolutions.

The basic dynamic load ratings of ART bearings have been determined in accordance with international standard ISO 281. The values are given in bearing tables.

Considering the basic dynamic load rating, can be calculated the service time until the "metal fatigue" of rolling contact surfaces appears, determining this way the rating life.

The other characteristic, basic static load rating Cor, is considered in case of low speeds, low oscilating movements or in the stationary case.

The basic static load rating is defined in accordance with ISO 76, as the load acting upon the stationary bearing. It corresponds to a calculated contact stress in the center of the contact area between the most heavily loaded rolling element and the raceway, of:

4 600 MPa for self-aligning ball bearings,

4 200 MPa for all other ball bearings,

4 000 MPa for all roller bearings.

This stress produces a permanent deformations of the rolling element and raceway which is about 0,0001 of the rolling element diameter. The loads are pure radial for radial bearings and pure axial for thrust bearings.

Bearing life

The life of a rolling bearing is defined as the number of revolutions or the number of operating hours, which the bearing is capable to endure, before the first sign of metal fatigue occurs on one of its rings, on the raceway or the rolling elements.

If we want to consider only the fatigue of the bearing operating surfaces the following conditions have to be observed:

1. The forces and speeds considered when calculating the bearing should correspond to the real operating conditions.
2. Proper lubrication should be assured during the entire operating period.
3. If the bearing carries a light load, its failure is generated by wear.
4. Experience showed that the failure of many bearings was caused by other reasons than fatigue, such as: selection of an inadequate bearing type in a bearing assembly, improper operating conditions, lubrication contamination, etc.

Basic rating life

The basic rating life of a single bearing or a group of apparently identical bearings operating under identical conditions, is the life corresponding to a reliability of 90%.

Basic rating life is marked with L_{10} (millions of revolutions) or L_{10h} (operating hours).

L_{10} can be calculated using the equation:

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

L_{10} - basic rating life, milions of revolutions,

C - basic dynamic load rating, kN,

P - equivalent dynamic bearing load, kN,

p - exponent of the life equation

p= 3 - for ball bearings

p = 10/3 - for roller bearings

The equivalent dynamic bearing load, respectively the radial and axial load, acting simultaneously can be calculated using the following equations (applicable to ball and roller radial bearings):

$P_r = F_r$, kN, - for pure radial load
$P_r = XF_r + YF_a$, kN, - for combined load

For thrust ball bearings, the following equations can be used:

$P_a = F_a$, kN, - for pure axial load
$P_a = XF_r + YF_a$, kN, - for combined load

where:
F_r = the radial component of the load, kN
F_a = the axial component of the load, kN

In the texts preceding the bearing tables, for some groups of bearings there are given details for determining the equivalent load. Values of the coefficients X and Y can be found in tables.

For bearings operating at constant speed, the basic rating life expressed in operating hours can be calculated using the equation:

$$L_{10h} = \frac{1000000}{60n}\left(\frac{C}{P}\right)^p \quad \text{or} \quad L_{10h} = \frac{16666}{n}\left(\frac{C}{P}\right)^p$$

Where:
n = rotational speed, r/min

Values of the basic rating life L_{10} (milions of revolutions) as a function of the ratio C/P can be found in the table 2.1.

Values of the basic rating life L_{10h} (operating hours) as a function of the ratio C/P and speed n can be found in table 2.2 for ball bearings and table 2.3 for roller bearings.

When determining the bearing size it is necessary to base the calculations on the rating life corresponding to the purpose of operation.

Usually it depends on the machine type, service life and the requirements regarding operational safety.

Approximate values of the service life for various classes of machines and equipments for general purposes are given in table 2.4.

The basic rating life L_{10h} of the bearings can be determined as a function of service life, using the life calculation chart on page 17.

The basic rating life of road and rail vehicle bearings, for axlebox bearings, is expressed as a function of the wheel diameter and covered distance (km), using the equation:

$$L_{10s} = \frac{\pi D}{1000} L_{10}$$

where:
L_{10} - basic rating life, millions of revolutions
L_{10s} - service life distance, millions of kilometers
D - wheel diameter, metres

Approximate values for the service life distance (kilometers covered), in case of light loaded cars and rail vehicles are given in table 2.5.

Load ratio C/P for various life L10 (milions of revolutions)

Table 2.1

L_{10}	C/P		L_{10}	C/P		L_{10}	C/P	
	Ball bearings	Roller bearings		Ball bearings	Roller bearings		Ball bearings	Roller bearings
0,5	0,793	0,812	240	6,21	5,18	2000	12,6	9,78
0,75	0,909	0,917	260	6,38	5,3	2200	13	10,1
1	1	1	280	6,54	5,42	2400	13,4	10,3
1,5	1,14	1,13	300	6,69	5,54	2600	13,8	10,6
2	1,26	1,24	320	6,84	5,64	2800	14,1	10,8
3	1,44	1,39	340	6,98	5,75	3000	14,4	11
4	1,59	1,52	360	7,11	5,85	3200	14,7	11,3
5	1,71	1,62	380	7,24	5,94	3400	15	11,5
6	1,82	1,71	400	7,37	6,03	3600	15,3	11,7
8	2	1,87	420	7,49	6,12	3800	15,6	11,9
10	2,15	2	440	7,61	6,21	4000	15,9	12
12	2,29	2,11	460	7,72	6,29	4500	16,5	12,5
14	2,41	2,21	480	7,83	6,37	5000	17,1	12,9
16	2,52	2,3	500	7,94	6,45	5500	17,7	13,2
18	2,62	2,38	550	8,19	6,64	6000	18,2	13,6
20	2,71	2,46	600	8,43	6,81	6500	18,7	13,9
25	2,92	2,63	650	8,66	6,98	7000	19,1	14,2
30	3,11	2,77	700	8,88	7,14	7500	19,6	14,5
35	3,27	2,91	750	9,09	7,29	8000	20	14,8
40	3,42	3,02	800	9,28	7,43	8500	20,4	15,1
45	3,56	3,13	850	9,47	7,56	9000	20,8	15,4
50	3,68	3,23	900	9,65	7,7	9500	21,2	15,6
60	3,91	3,42	950	9,83	7,82	10000	21,5	15,8
70	4,12	3,58	1000	10	7,94	12000	22,9	16,7
80	4,31	3,72	1100	10,3	8,17	14000	24,1	17,5
90	4,48	3,86	1200	10,6	8,39	16000	25,2	18,2
100	4,64	3,98	1300	10,9	8,59	18000	26,2	18,9
120	4,93	4,2	1400	11,2	8,79	20000	27,1	1,5
140	5,19	4,4	1500	11,4	8,97	25000	29,2	20,9
160	5,43	4,58	1600	11,7	9,15	30000	31,1	22
180	5,65	4,75	1700	11,9	9,31			
200	5,85	4,9	1800	12,2	9,48			
220	6,04	5,04	1900	12,4	9,63			

Ball bearings - load ratio C/P for various rating lives L_{10h} (operating hours) at different speed n (rpm)

Table 2.2

L_{10h}	C/P when n =										
	50	100	150	200	250	300	400	500	750	1000	1500
100	0,67	0,84	0,97	1,06	1,14	1,22	1,34	1,44	1,65	1,82	2,08
500	1,14	1,44	1,65	1,82	1,96	2,08	2,29	2,47	2,82	3,11	3,56
1000	1,44	1,82	2,08	2,29	2,47	2,62	2,88	3,11	3,56	3,91	4,48
1250	1,55	1,96	2,24	2,47	2,66	2,82	3,11	3,35	3,83	4,22	4,83
1600	1,69	2,13	2,43	2,68	2,88	3,07	3,37	3,63	4,16	4,58	5,24
2000	1,82	2,29	2,62	2,88	3,11	3,30	3,63	3,91	4,48	4,93	5,65
2500	1,96	2,47	2,82	3,11	3,35	3,56	3,91	4,22	4,83	5,31	6,08
3200	2,13	2,68	3,07	3,37	3,63	3,86	4,25	4,58	5,24	5,77	6,60
4000	2,29	2,88	3,30	3,63	3,91	4,16	4,58	4,93	5,65	6,21	7,11
5000	2,47	3,11	3,56	3,91	4,22	4,48	4,93	5,31	6,08	6,69	7,66
6300	2,66	3,36	3,84	4,23	4,55	4,84	5,33	5,74	6,57	7,23	8,28
8000	2,88	3,63	4,16	4,58	4,93	5,24	5,77	6,21	7,11	7,83	8,96
10000	3,11	3,91	4,48	4,93	5,31	5,65	6,21	6,69	7,66	8,43	9,65
12500	3,35	4,22	4,83	5,31	5,27	6,08	6,69	7,21	8,25	9,09	10,4
16000	3,63	4,58	5,24	5,77	6,21	6,60	7,27	7,83	8,96	9,86	11,3
20000	3,91	4,93	5,65	6,21	6,69	7,11	7,83	8,43	9,65	10,6	12,2
25000	4,22	5,31	6,08	6,69	7,21	7,66	8,43	9,09	10,4	11,4	13,1
32000	4,58	5,77	6,60	7,27	7,83	8,32	9,16	9,86	11,3	12,4	14,2
40000	4,93	6,21	7,11	7,83	8,43	8,96	9,86	10,6	12,2	13,4	15,3
50000	5,31	6,69	7,66	8,43	9,09	9,65	10,6	11,4	13,1	14,4	16,5
63000	5,74	7,23	8,28	9,11	9,81	10,4	11,5	12,4	14,2	15,6	17,8
80000	6,21	7,83	8,96	9,86	10,6	11,3	12,4	13,4	15,3	16,9	19,3
100000	6,69	8,43	9,65	10,6	11,4	12,2	13,4	14,4	16,5	18,2	20,8
200000	8,43	10,6	12,2	13,4	14,4	15,3	16,9	18,2	20,8	22,9	26,2

L_{10h}	C/P when n =										
	2000	2500	3000	4000	5000	6000	8000	10000	15000	20000	30000
100	2,29	2,47	2,62	2,88	3,11	3,30	3,63	3,91	4,48	4,93	5,65
500	3,91	4,22	4,48	4,93	5,31	5,65	6,21	6,69	7,66	8,43	9,65
1000	4,93	5,31	5,65	6,21	6,69	7,11	7,83	8,43	9,65	10,6	12,2
1250	5,31	5,72	6,08	6,69	7,21	7,66	8,43	9,09	10,4	11,4	13,1
1600	5,77	6,21	6,60	7,27	7,83	8,32	9,16	9,86	11,3	12,4	14,2
2000	6,21	6,69	7,11	7,83	8,43	8,96	9,86	10,6	12,2	13,4	15,3
2500	6,69	7,21	7,66	8,43	9,09	9,65	10,6	11,4	13,1	14,4	16,5
3200	7,27	7,83	8,32	9,16	9,86	10,5	11,5	12,4	14,2	15,7	17,9
4000	7,83	8,43	8,96	9,86	10,6	11,3	12,4	13,4	15,3	16,9	19,3
5000	8,43	9,09	9,65	10,6	11,4	12,2	13,4	14,4	16,5	18,2	20,8
6300	9,11	9,81	10,4	11,5	12,4	13,1	14,5	15,6	17,8	19,6	22,5
8000	9,86	10,6	11,3	12,4	13,4	14,2	15,7	16,9	19,3	21,3	24,3
10000	10,6	11,4	12,2	13,4	14,4	15,3	16,9	18,2	20,8	22,9	26,2
12500	11,4	12,3	13,1	14,4	15,5	16,5	18,2	19,6	22,4	24,7	28,2
16000	12,4	13,4	14,2	15,7	16,9	17,9	19,7	21,3	24,3	26,8	30,7
20000	13,4	14,4	15,3	16,9	18,2	19,3	21,3	22,9	26,2	28,8	33,0
25000	14,4	15,5	16,5	18,2	19,6	20,8	22,9	24,7	28,2	31,1	35,6
32000	15,7	16,9	17,9	19,7	21,3	22,6	24,9	26,8	30,7	33,7	38,6
40000	16,9	18,2	19,3	21,3	22,9	24,3	26,8	28,8	33,0	36,3	41,6
50000	18,2	19,6	20,8	22,9	24,7	26,1	28,8	31,1	35,6	39,1	44,8
63000	19,6	21,1	22,5	24,7	26,6	28,3	31,2	33,6	38,4	42,3	48,4
80000	21,3	22,9	24,3	26,8	28,8	30,7	33,7	36,3	41,6	45,8	52,4
100000	22,9	24,7	26,2	28,8	31,1	33,0	36,3	39,1	44,8	49,3	56,5
200000	28,8	31,1	33,0	36,3	39,1	41,6	45,8	49,3	56,5	62,1	71,1

ART BEARINGS

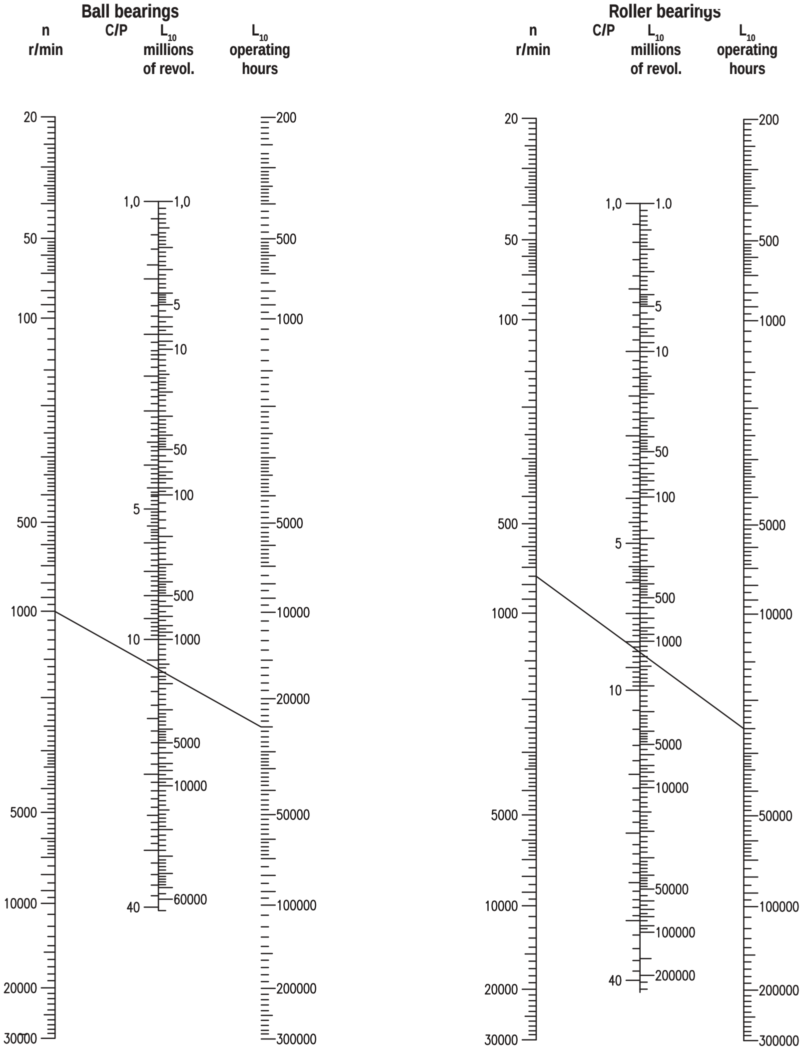
Roller bearings - load ratio C/P for various basic rating lives L_{10h} (operating hours) at various speeds n (rpm)

Table 2.3

L_{10h}	C/P when n=										
	50	100	150	200	250	300	400	500	750	1000	1500
100	0,70	0,86	0,97	1,06	1,13	1,19	1,30	1,39	1,57	1,71	1,93
500	1,13	1,39	1,57	1,71	1,83	1,93	2,11	2,25	5,24	2,77	3,13
1000	1,39	1,71	1,93	2,11	2,25	2,38	2,59	2,77	3,13	3,42	3,86
1250	1,49	1,83	2,07	2,25	2,41	2,54	2,77	2,97	3,35	3,65	4,12
1600	1,60	1,97	2,23	2,43	2,59	2,74	2,99	3,19	3,61	3,93	4,44
2000	1,71	2,11	2,38	2,59	2,77	2,93	3,19	3,42	3,86	4,20	4,75
2500	1,83	2,25	2,54	2,77	2,97	3,13	3,42	3,65	4,12	4,50	5,08
3200	1,97	2,43	2,74	2,99	3,19	3,37	3,68	3,93	4,44	4,84	5,47
4000	2,11	2,59	2,93	3,19	3,42	3,61	3,93	4,20	4,75	5,18	5,85
5000	2,25	2,77	3,13	3,42	3,65	3,86	4,20	4,50	5,08	5,54	6,25
6300	2,42	2,97	3,36	3,66	3,91	4,13	4,51	4,82	5,44	5,93	6,70
8000	2,59	3,19	3,61	3,93	4,20	4,44	4,84	5,18	5,85	6,37	7,20
10000	2,77	3,42	3,86	4,20	4,50	4,75	5,18	5,54	6,25	6,81	7,70
12500	2,97	3,65	4,12	4,50	4,81	5,08	5,54	5,92	6,68	7,29	8,23
16000	3,19	3,93	4,44	4,84	5,18	5,47	5,96	6,37	7,20	7,85	8,86
20000	3,42	4,20	4,75	5,18	5,54	5,85	6,37	6,81	7,70	8,39	9,48
25000	3,65	4,50	5,08	5,54	5,92	6,25	6,81	7,29	8,23	8,97	10,1
32000	3,93	4,84	5,47	5,96	6,37	6,73	7,34	7,85	8,86	9,66	10,9
40000	4,20	5,18	5,85	6,37	6,81	7,20	7,85	8,39	9,48	10,3	11,7
50000	4,50	5,54	6,25	6,81	7,29	7,70	8,39	8,97	10,1	11,0	12,5
63000	4,82	5,93	6,70	7,30	7,81	8,25	8,99	9,61	10,9	11,8	13,4
80000	5,18	6,37	7,20	7,85	8,39	8,86	9,66	10,3	11,7	12,7	14,4
100000	5,54	6,81	7,70	8,39	8,97	9,48	10,3	11,0	12,5	13,6	15,4
200000	6,81	8,39	9,48	10,3	11,0	11,7	12,7	13,6	15,4	16,7	18,9

L10h	C/P when n =										
	2000	2500	3000	4000	5000	6000	8000	10000	15000	20000	30000
100	2,11	2,25	2,38	2,59	2,77	2,93	3,19	3,42	3,86	4,20	4,75
500	3,42	3,65	3,86	4,20	4,50	4,75	5,18	5,54	6,25	6,81	7,70
1000	4,20	4,50	4,75	5,18	5,54	5,85	6,37	6,81	7,70	8,39	9,48
1250	4,50	4,81	5,08	5,54	5,92	6,25	6,81	7,29	8,23	8,97	10,1
1600	4,84	5,18	5,47	5,96	6,37	6,73	7,34	1,85	8,86	9,66	10,9
2000	5,18	5,54	5,85	6,37	6,81	7,20	7,85	8,39	9,48	10,3	11,7
2500	5,54	5,92	6,25	6,81	7,29	7,70	8,39	8,97	10,1	11,0	12,5
3200	5,96	6,37	6,73	7,34	7,85	8,29	9,03	9,66	10,9	11,9	13,4
4000	6,37	6,81	7,20	7,85	8,39	8,86	9,66	10,3	11,7	12,7	14,4
5000	6,81	7,29	7,70	8,39	8,97	9,48	10,3	11,0	12,5	13,6	15,4
6300	7,30	7,81	8,25	8,99	9,61	10,2	11,1	11,8	13,4	14,6	16,5
8000	7,85	8,39	8,86	9,66	10,3	10,9	11,9	12,7	14,4	15,7	17,7
10000	8,39	8,97	9,48	10,3	11,0	11,7	12,7	13,6	15,4	16,7	18,9
12500	8,97	9,59	10,1	11,0	11,8	12,5	13,6	14,5	16,4	17,9	20,2
16000	9,66	10,3	10,9	11,9	12,7	13,4	14,6	15,7	17,7	19,3	21,8
20000	10,3	11,0	11,7	12,7	13,6	14,4	15,7	16,7	18,9	20,6	23,3
25000	11,0	11,8	12,5	13,6	14,5	15,4	16,7	17,9	20,2	22,0	24,9
32000	11,9	12,7	13,4	14,6	15,7	16,5	18,0	19,3	21,8	23,7	26,8
40000	12,7	13,6	14,4	15,7	16,7	17,7	19,3	20,6	23,3	25,4	28,7
50000	13,6	14,5	15,4	16,7	17,9	18,9	20,6	22,0	24,9	27,1	30,6
63000	14,6	15,6	16,5	17,9	19,2	20,3	22,1	23,6	26,7	29,1	32,8
80000	15,7	16,7	17,7	19,3	20,6	21,8	23,7	25,4	28,7	31,2	35,3
100000	16,7	17,9	18,9	20,6	22,0	23,3	25,4	27,1	30,6	33,4	37,7
200000	20,6	22,0	23,3	25,4	27,1	28,7	31,2	33,4	37,7	41,1	46,4

Basic rating life calculation chart



Example:

1. Determine the size of a deep groove ball bearing single row, considering the following conditions:

- Basic rating life L_{10h} = 25000 operating hours
- Rotational speed n = 1000 rpm
- Radial load F_r = P = 5 kN

In the chart we find report: C/P = 11,6; C = 11,6xP = 11,6x5 = 58 kN. In the catalogue on page 100, you can select bearing 6310 type, with the following characteristics: C_r = 61,8 kN; n_{lim} = 7000 rpm.

2. What is the basic life of the bearing NU 210E, operating under radial load of 7,7 kN, at a rotational sped n = 750 rpm?

See page 172 in the calalogue and find for NU 210E type, the following values: C_r = 64,4 kN, n_{lim}= 8000 rpm. From the chart, for a roller bearing operated at 750 rpm, and C_r/P_r=64,4/7,7=8,36 result is a rating life L_{10h} = 25000 hours.

ART BEARINGS

Recommended basic rating lives for general purpose machines Table 2.4	
Application	Recommended basic rating life L_{10h} (operating hours)
Household machines, technical apparatus for medical use, instruments, agricultural machines:	300..3000
Machines used for short periods or intermittently: electric hand tools, cranes, lifting tackles in workshops, building machines:	3000..8000
Machines used intermittently or for short periods with high operational reliability: lifts, small cranes	8000..12000
Machines for use 8 hours/day but not always at full capacity: machines for general purposes, electric motors for industrial use, rotary crushes, gear drives for general purposes:	10000..25000
Machines operating 8 hours/day at full capacity: machine tools, woodworking machines, large cranes, printing equipment, ventilators, separators, centrifuges:	20000..30000
Machines for continuous use 24 hours/day: Rolling mill gear units, medium sized electrical machinery, compressors, pumps, textile machines, mine hoists:	40000..50000
Hydraulic machines, rotary furnaces, capstans, propulsion machinery for sea vessel (propellers for seat vessels):	50000..100000
Machines for continuous use 24 hour/day with high reliablity: large electric machinery, mine pumps and mine ventilators, power station plants, machines for cellulose industry, pumping units:	100000..

Values for basic rating life L_{10s} Table 2.5	
Type of vehicle	$L_{10s}/10^6$ [km]
Wheel hub bearings automotive:	
- light loaded cars	0,3
- trucks, buses	0,6
Axlebox bearings rail vehicles:	
- freight wagons (according to UIC)	0,8
- suburban vehicles, trams	1,5
- long distance passenger carriages	3
- motorailers	3…4
- Diesel and electric locomotives	3…4

In case of bearings which do not rotate, but oscillates from a central position through an angle, as shown in fig. 1, basic rating life can be determined as follows:

$$L_{10osc} = \frac{180}{2\gamma} L_{10}$$

Where:

L_{10osc} = basic rating life, milions of cycles

γ = oscillation amplitude (angle of maximum deviation from centre position), degrees

If oscillation of amplitude is very small, it can be ignored for basic dynamic rating life calculation. It will be only a static evaluation.

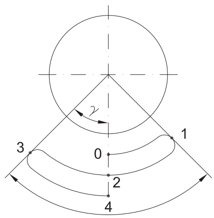


Fig. 1

Fluctuating dynamic load and speeds

In many cases, operation speed and magnitude of the load fluctuates. Therefore a mean dynamic load is to be calculated.

Complete oscillation = 4γ from point 0 to point 4. The load acting on the bearing can vary as shown in fig. 2-a and 2-b.

In this case, the mean load can be determined using the equation:

$$F_m = \sqrt[p]{\frac{F_1^p n_1 + F_2^p n_2 ......+ F_n^p n_n}{n}} ,$$

Where:

F_m - constant mean load, kN

F_1, F_2, F_n – constant load during n_1, n_2, ...n_n revolutions, kN

n - total number of revolutions ($n=n_1+n_2+...n_n$) during which loads F_1, F_2, ...F_n are acting

p - exponent,

p= 3 - for ball bearings

p = 10/3 - for roller bearings

If the bearing speed is constant and the magnitude of load is between the minimum value F_{min} and a maximum value F_{max}, as shown in fig. 3 a and b, the mean load can be obtained from:

$$F_m = \frac{F_{min}+2F_{max}}{3}, \text{ kN}$$

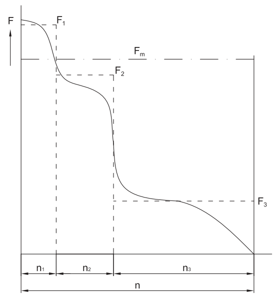


Fig. 2 a

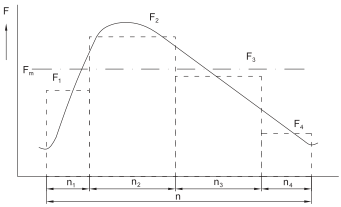


Fig. 2 b

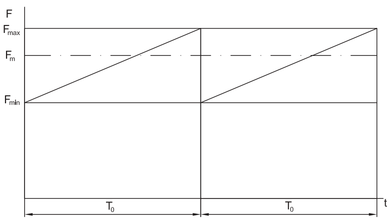


Fig. 3 a

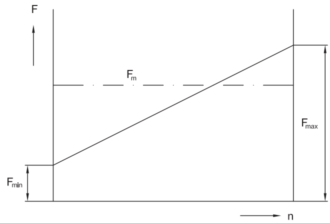


Fig. 3 b

If the external radial load consists in a load F_1 - constant as magnitude and direction) and a load F_2 - variable as direction and constant as magnitude (F_1, F_2 acting in the same plane) as shown in fig. 4, the mean load can be determined using the equation:

$$F_m=f_m(F_1 + F_2), \text{ kN}$$

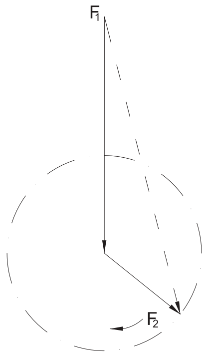


Fig. 4

Values for the factor fm can be obtained from fig.5.

In case of sinusoidal movement as it shown in fig.6, the mean lod can be obtained from equation:

$$F_m= \sqrt[p]{\frac{4}{3\pi}}F_{max}, \text{ kN}$$

$F_m \approx 0{,}75\ F_{max}$, kN, for ball bearings

$F_m \approx 0{,}77\ F_{max}$, kN, for roller bearings

In case of oscillating movements with angle γ, as shown in fig. 7, equivalent mean load can be calculated with the equation:

$$F_m = \sqrt[p]{\frac{\gamma}{90^0}}\ F_r,\ kN$$

If the fluctuating load acts in a pure radial direction for radial bearings and in a pure axial direction for thrust bearings, the equivalent dynamic bearing load will be:

$P_r = F_m$.

For combined loads, with radial load F_r and axial load F_a constant in direction and magnitude, the equivalent dynamic load can be calculated using the equation:

$P_r = X\,F_r + Y\,F_a$, kN

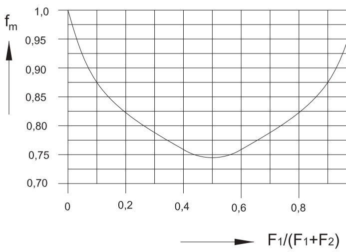


Fig. 5

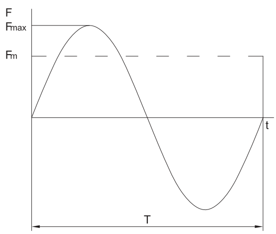


Fig. 6

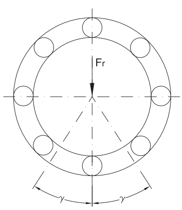


Fig. 7

In case of combined loads, with radial and axial loads changing in time, ratio F_r/F_a being constant, the equivalent dynamic load can be calculated by:

$P_m = X\,F_{rm} + Y\,F_{am}$, kN

where:

P_m - equivalent mean dynamic load, kN

F_{rm} - radial mean load, kN

F_{am} - axial mean load, kN

X,Y - factors of radial and axial load.

If direction and magnitude of load changes in time and speeds fluctuates in time, the equivalent mean dynamic load will be calculated using the equation:

$$P_m = \sqrt[p]{\frac{P_1^p n_1 + P_2^p n_2 + \cdots P_n^p n_n}{n}}$$

where:

P_m - equivalent mean dynamic load, kN

P_1 - equivalent dynamic load for n1 revolutions, kN

P_2 - equivalent dynamic load for n2 revolutions, kN

P_n - equivalent dynamic load for n_n revolutions, kN

n_1 - number of revolutions for load P_1

n_2 - number of revolutions for load P_2

n_n - number of revolutions for load P_n

n - number of revolutions ($n = n_1 + n_2 + \dots n_n$)

p - exponent: - 3 for ball bearings,

- 10/3 for roller bearings

Basic dynamic load of a bearing group

If heavy radial loads must be carried, it is required a bearing group of the same type, mounted close together, especially in case of ball and roller bearings. In order to take over the load uniformly, these bearings should be mounted with equal diameter deviations and also radial clearances. These deviations must be kept below half of the admitted tolerance class.

Basic dynamic load for a bearing group, as a function of the basic load of the single bearing, can be calculated using the equation:

$C_{ri} = C_r i^n$,

where:

C_{ri} - basic dynamic load of the bearing group, kN

Cr - basic dynamic load of the single bearing, selected from the tables,

i - number of bearings of the same type, mounted close together,

n - exponent depending on the bearing type:

0,7 - for ball bearings

7/9 - for roller bearings

Values of i^n are given in table 2.6.

Values for i^n

Table 2.6

i	$i^{0,7}$	$i^{7/9}$
2	1,62	1,71
3	2,16	2,35
4	2,64	2,94

The equivalent basic dynamic load for each group of bearings is calculated considering specifications in the introductory text preceding the respective group.

Adjusted rating life

Basic rating life L10 is often satisfactory for bearing performances. This life means a reliability of 90% for standard material and modern and usual manufacturing technologies, as well as for conventional operating conditions.

For a reliability over 90%, international standards recommends steels elaborated in better conditions, high level manufacturing technologies and specific operating conditions. In this case adjusted rated life can be calculated as follows:

$$L_{na} = a_1\, a_2\, a_3\, L_{10} \text{ or } L_{na} = a_1\, a_2\, a_3 \left(\frac{C}{P}\right)^p$$

where:

L_{na} – adjusted rating life, milions of revolutions

a_1 - life adjustement factor considering reliability

a_2 - life adjustement factor considering the material and manufacturing conditions

a_3 - life adjustement factor considering the operating conditions.

In case of life adjustement factors a_1, a_2, a_3 greater than 1, when calculating adjusted rating life, prudence is recommended, because knowledge about bearings manufacture and operating conditions (shaft bending, housing stiffness, lubrication, temperature influence, etc.).

Values of the life adjustment factor a_1 for reliabilities over 90% are given in table 2.7.

Values for factor a_1

Table 2.7

Reliability %	Lna	a1
90	L10a	1
95	L5a	0,62
96	L4a	0,53
97	L3a	0,44
98	L2a	0,33
99	L1a	0,21

Life adjustment factor a_2 for material

Life adjustement factor a_2 takes into account the material properties, heat treatment of the steel and manufacturing technologies. For ART bearings, a_2=1 is recommended.

Life adjustment factor a_{23} for operating conditions

The maximum life of a bearing can be reached in case of hydrodynamical lubrication, namely where is no direct contact between rolling elements and raceways due to the lubricant film. In this field, many studies have been done by world leading bearing manufacturers. These studies showed that there is a relationship between life adjustment factor a_2 for material and life adjustment factor a_3 for operating conditions. Preferably these factors should be unified, obtaining factor a_{23}. In this case, adjusted rating life would be:

$$L_n a = a_1 a_{23} L_{10}$$

These values of a_{23} factor depends on the lubricant used, namely on the ratio between the oil viscosity required at +40⁰C, ν (initial value) to the viscosity required for adequate lubrication at the operating temperature ν_1. The values are given in table 2.8.

Values for factor a_{23}

Table 2.8

$\frac{\nu}{\nu_1}$	0,1	0,2	0,5	1	1,5	2	3	4	5
a_{23}	0,45	0,55	0,75	1	1,3	1,6	2	2,5	2,5

The value of viscosity ν_1, as a function of the mean bearing diameter and operating speed, are given in diagram fig. 8.

Kinematic viscosity ν at the temperature of +40⁰C can be determined from diagram fig. 9, in accordance with ISO, if the bearing operating temperature is known.

In case of grease lubrication, calculation should be done considering the basic oil viscosity and the value of the life adjustment factor a_{23} will be smaller than 1.

Example of oil kinematic viscosity calculation for bearing lubrication:

The bearing 6212 operates at a speed of 3500 rpm and a temperature of +70⁰ C.

Mean diameter wil be:

D_m= 0,5(d+D)=0,5(60+110) = 85 mm

From the diagram fig. 9, at a temperature of +70⁰ C, for a viscosity ν_1=8 mm/s², the viscosity at +40⁰ C is 20 mm/s² (Cst).

In this case should be selected an oil in accordance with ISO VG 22 with kinematic viscosity limits: ν_{min} = 19,8 mm/s² (cSt) and ν_{max} =24,2 mm/s² (cSt).

In case of bearing operating at temperatures higher than +150⁰C, an adjustment factor f_t for temperature should be added to the life adjustment factor a_{23}. Adjusted rating life will be:

$$L_{na} = a_1\, a_{23}\, f_t\, L_{10}$$

Values for the life adjustment factor f_t for temperature are given in table 2.9.

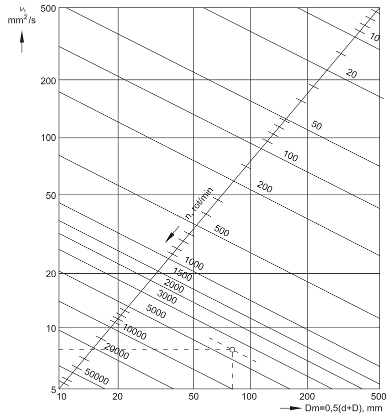


Fig. 8

Values for temperature factor f_t

Table 2.9

Operating temperature t⁰C	150	200	250	300
f_t	1	0,73	0,42	0,22

Static load

When the bearing is stationary or rotates at slow movements or very low speeds (lower than 10 rpm), basic static load is not determined by the material fatigue but by permanent deformation caused at the rolling element/raceway contact.

It is also the case of rotating bearings, when they have to sustain heavy shock loads which act during a fraction of their revolution.

Generally, the value of the load may increase up to the value of the basic static load C_0, without altering the bearing operating properties.

Equivalent static load

Combined static load (radial and axial load acting simultaneosly on bearing) must be converted into an equivalent static bearing load. This is defined as the load (radial for radial bearings and axial for thrust bearings) which is applied, and would cause the same permanent deformation in the bearing as the real load operating over it.

Equivalent static load is obtained from the general equation:

$$P_0 = X_0 F_r + Y_0 F_a, \text{ kN},$$

where:

P_0 - equivalent bearing static load, kN,
F_r - radial component of the heaviest static load, kN,
F_a - axial component of the heaviest static load, kN,
X_0 - radial load factor of the bearing,
Y_0 - axial load factor of the bearing.

Data needed to calculate equivalent static load can be found in text and in bearing tables.

Requisite basic static load rating

When determining bearing size on the basis of the static load, a static safety factor s_0 is used.

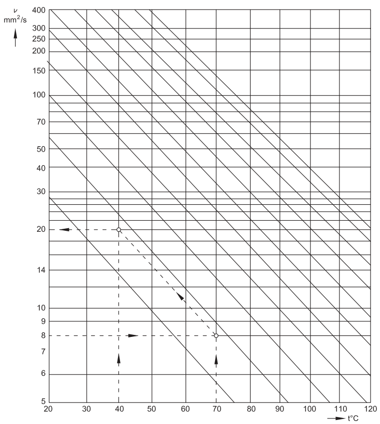


Fig. 9

The requisite basic static load is calculated using the equation:

$$C_{r0} = s_0 P_{r0} \text{ , kN}$$

where:

C_{r0} - basic static load rating, kN
s_0 - static safety factor, table 2.11
P_{r0} - equivalent static load, kN.

At high temperatures, life of the material decreases and the static load carrying capacity of bearings is reduced.

For high temperatures, basic static load is calculated using the equation:

$$C_{r0} = f_{0t}\, s_0\, P_{r0} \text{ , kN}$$

The values of factor f_{0t} depending on temperature is given in table 2.10.

Values for temperature factor f_{0t} — Table 2.10

Operating temperature t°C	150	200	250	300
f_{0t}	1	0,95	0,85	0,75

Non – rotating bearings

In case of non-rotating bearings, values of static safety factor s_0, for certain applications are given in table 2.11. These values are also valid for berings with oscillating movements.

Values for static safety factor s_0 — Table 2.11

Application	s_0
Variable pitch propeller for aircraft	0,5
Dam gates, flood gates	
Opening bridges	1,5
Crane hooks for:	
*large cranes without additional loads	1,5
*small cranes with additional dynamic loads	1,6

Rotating bearings

In case of fluctuating or oscillating loads and especially when heavy shock loads are acting during a fraction of revolution, it is necessary to check if the bearing has the proper static load carrying capacity. Heavy shock loads, higher than the basic static bearing load, produce permanent deformations not uniformly distributed on raceway, which influence negatively bearing running.

Generally, heavy shock loads cannot be exactly calculated and in certain cases they produce deformations of bearing housing and consequently an unfavorable load distribution in bearing.

When a bearing rotates under maximum load, raceway becomes uniformly deformed on all its outer surface without any imprint.

For various operating conditions, maximum load acting upon the bearing is calculated with static safety factor s_0, depending on the vibrations and shock loads.

The values of static safety factor are given in table 2.12.

Values for static safety factor s_0

Table 2.12

Type of operation	Requirements regarding quiet running					
	Unimportant		Normal		High	
	Ball bearings	Roller	Ball bearings	Roller	Ball bearings	Roller
Smooth, vibration-free	0,5	1	1	1,5	2	3
Normal	0,5	1	1	1,5	2	3,5
Heavy shock loads	>1,5	>2,5	>1,5	>3	>2	>4

For bearing with a known equivalent static load, static safety factor s_0 is necessary to be checked using the equation:

$$s_0 = \frac{C_{ro}}{P_{ro}}$$

If the value of s_0 is less than recommended in table 2.12, then a bearing with a higher basic static load carrying capacity should be selected.

Basic static load for a group of bearings

Where more bearings of the same type are mounted close toghether to take over a static load, the load magnitude supported by these bearings will be calculated from:

$$C_{0ri} = C_{0r}\, i,$$

where:

C_{0ri} - basic static load of the bearing group

C_{0r} - basic static load of the single bearing (catalogue)

i - number of bearings.

Bearing tolerances

Bearing tolerances have been internationally standardized in accordance with ISO 492, ISO 199, ISO 582, ISO 1132.

Bearings are generally manufactured to the tolerance class P0. At request, they can also be manufactured to the tolerance classes P6, P6x, P5, P4 and P2. These bearings are used for special applications, such as very accurate shaft guidance or very high speeds.

The values of the limit deviations for these tolerance classes are given for:

-the overall dimensions of:

-deep groove ball bearings, angular contact ball bearings, self-aligning ball bearings, spherical roller bearings, cylindrical roller bearings, tapered roller bearings,

-tapered roller bearing with metric (mm) and inch dimensions,

-tapered bore bearings,

thrust ball bearings, angular contact thrust ball bearings, cylindrical roller thrust bearings, needle roller thrust bearings.

-mounting chamfer.

Symbols

d - nominal bore diameter or shaft washer nominal bore diameter for thrust bearings

d_1 - nominal diameter at the theoretical large end of the tapered bore

d_2 - nominal bore diameter of the shaft washer for double directions thrust bearings

d_s - deviation of single bore diameter

d_{psmax} - maximum bore diameter, in a single radial plane

d_{psmin} - minimum bore diameter, in a single radial plane

Δd_s - deviation of a single bore diameter $\Delta d_s = d_s - d$

d_{mp} - mean bore diameter, in a single radial plane $d_{mp} = (d_{psmax} + d_{psmin})/2$

Δd_{mp} - deviation of the mean bore diameter in a single radial plane; or deviation of the mean diameter at the theoretical small end of the tapered bore, in case of tapered bore bearings; or deviation of the mean bore diameter of the shaft washer in a single direction thrust bearings $\Delta d_{mp} = d_{mp} - d$

Δd_{1mp} - deviation of the mean diameter at the theoretical large end of the tapered bore $\Delta d_{1mp} = d_{1mp} - d$

Δd_{2mp} - deviation of the mean bore diameter of the shaft washer for a double directions thrust bearings, in a single radial plane

V_{dp} - bore diameter variation in a single radial plane; or bore diameter variation of the shaft washer in a single radial place, for single thrust bearings $V_{dp} = d_{psmax} - d_{psmin}$

V_{d2p} - bore diameter variation of the shaft washer for double directions thrust bearings, in a single radial plane

V_{dmp} - mean bore diameter variation (valid only for cylindrical bore) $V_{dmp} = d_{mpmax} - d_{mpmin}$

α - nominal half-angle of the tapered bore

D - nominal outside diameter or housing washer nominal diameter

D_1 - nominal outside diameter of the outer ring rib

D_s - single outside diameter maximum

D_{psmax} - outside diameter in a single radial plane minimum outside diameter in

D_{psmin} - a single radial plane deviation of the single outside diameter $\Delta D_s = D_s - D$

ΔD_s - mean outside diameter, in a single plane $= (D_{psmax} + D_{psmin})/2$

D_{mp} - deviation of the mean outside diameter in a single radial plane; or deviation of

Δ_{Dmp} - the mean diameter of housing washer in a single radial plane, for thrust bearings $\Delta D_{mp} = D_{mp} - D$

V_{DP} - outside diameter variation in a single radial plane; or housing washer diameter variation in a single radial place for double direction thrust bearings $V_{DP} = D_{psmax} - D_{psmin}$

V_{Dmp} - mean outside diameter variation

B - nominal width of the inner ring

B_s - single width of the inner ring

ΔB_s - inner ring single width deviation $\Delta B_s = B_s - B$

V_{Bs} - inner ring single width variation

C - nominal width of the outer ring

C_s - ingle width of the outer ring

ΔC_s - deviation of the outer ring single width $\Delta C_s = C_s - C$

V_{Cs} - single width variation of the outer ring $V_{Cs} = C_{smax} - C_{smin}$

T - nominal width of tapered roller bearings

T_s - single width of tapered roller bearings

ΔT_s - deviation of the single width of taper roller bearings $\Delta T_s = T_s - T$

T_1 - nominal width of the inner ring and tapered roller assembly

T_{1s} - single width of the inner ring and tapered roller assembly

ΔT_{1s} - deviation of the single width of inner ring and tapered roller assembly $\Delta T_{1s} = T_{1s} - T_1$

T_2 - nominal width of the outer ring assembly

T_{2s} - single width of the outer ring assembly

ΔT_{2s} - deviation of the single width of outer ring assembly $\Delta T_{2s} = T_{2s} - T_2$

K_{ia} - radial runout of assembled bearing inner ring

K_{ea} - radial runout of assembled bearing outer ring

S_d - side face runout with reference to bore of the inner ring

S_D - variation in inclination of outside cylindrical surface to outer ring side face

S_{ia} - side face runout of assembled inner ring with reference to raceway

S_{ea} - side face runout of assembled outer ring with reference to raceway

S_i - thickness variation measured from middle of raceway to back seating face of shaft washer

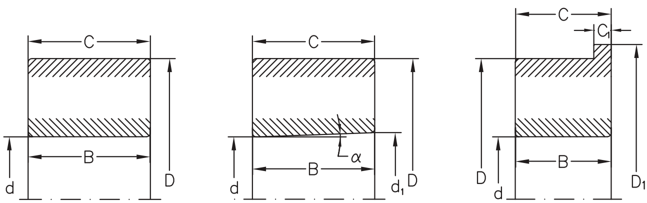
S_e - thickness variation measured from middle of raceway to back face of housing washer

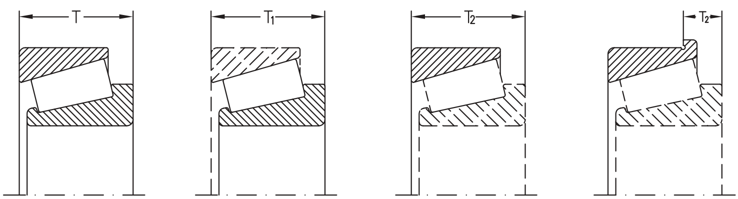
ΔH_s - deviation of mounting height of single direction thrust ball and roller bearings

ΔH_{1s} - deviation of mounting height of thrust ball bearings with sphered housing washer

ΔH_{2s} - deviation of mounting height of double direction thrust ball and roller bearings,

ΔH_{3s} - deviation of mounting height of double direction thrust ball bearings with sphered housing washer.





Radial bearings (excepting tapered roller bearings)
Tolerance class P0

Table 3.1

Inner ring

Deviations in µm

d mm		Δd_{mp}		V_{dp} Diameter series 7,8,9	0,1	2,3,4	V_{dmp}	K_{ia}	ΔB_s all	normal	modified [2]	V_{Bs}
over	up to	high	low	max.	max.	max.	max.	max.	high	low	low	max.
0,6 [1]	**2,5**	0	-8	10	8	6	6	10	0	-40	-	12
2,5	**10**	0	-8	10	8	6	6	10	0	-120	-250	15
10	**18**	0	-8	10	8	6	6	10	0	-120	-250	20
18	**30**	0	-10	13	10	8	8	13	0	-120	-250	20
30	**50**	0	-12	15	12	9	9	15	0	-120	-250	20
50	**80**	0	-15	19	19	11	11	20	0	-150	-380	25
80	**120**	0	-20	25	25	15	15	25	0	-200	-380	25
120	**180**	0	-25	31	31	19	19	30	0	-250	-500	30
180	**250**	0	-30	38	38	23	23	40	0	-300	-500	30
250	**315**	0	-35	44	44	26	26	50	0	-350	-500	35
315	**400**	0	-40	50	50	30	30	60	0	-400	-630	40
400	**500**	0	-45	56	56	34	34	65	0	-450	-	50
500	**630**	0	-50	63	63	38	38	70	0	-500	-	60
630	**800**	0	-75	-	-	-	-	80	0	-750	-	70

1) This value included,
2) If refers to isolated bearing ring for paired mounting or sets of 3 or 4 bearing.

Outer ring

Deviations in µm

Table 3.2

D mm		ΔD_{mp}		V_{Dp} [3] Open bearings, Diameter series 7,8,9	0,1	2,3,4	Shielded Bearings [2] 2,3,4	V_{Dmp} [3]	K_{ea}	ΔC_s		V_{Cs}
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	max.
2,5 [1]	**6**	0	-8	10	8	6	10	6	15	Values are identical to ΔB_s and V_s for the inner ring of the same bearing.		
6	**18**	0	-8	10	8	6	10	6	15			
18	**30**	0	-9	12	9	7	12	7	15			
30	**50**	0	-11	14	11	8	16	8	20			
50	**80**	0	-13	16	13	10	20	10	25			
80	**120**	0	-15	19	19	11	26	11	35			
120	**150**	0	-18	23	23	14	30	14	40			
150	**180**	0	-25	31	31	19	38	19	45			
180	**250**	0	-30	38	38	23	-	23	50			
250	**315**	0	-35	44	44	26	-	26	60			
315	**400**	0	-40	50	50	30	-	30	70			
400	**500**	0	-45	56	56	34	-	34	80			
500	**630**	0	-50	63	63	38	-	38	100			
630	**800**	0	-75	94	94	55	-	55	120			
800	**1000**	0	-100	125	125	75	-	75	140			

1) This value included,
2) For bearings of diameter series 7,8,9,0, and 1 values are not indicated,
3) Values are valid before mounting the snap ring or shields or after their dismounting.

Tolerance class P6

Inner ring

Deviations in µm — Table 3.3

d mm		Δd_{mp}		V_{dp} Diameter series			V_{dmp}	K_{ia}	ΔB_s			V_{Bs}
				7,8,9	0,1	2,3,4			all	normal	modified [2]	
over	up to	high	low	max.	max.	max.	max.	max.	high	low	low	max.
0	**2,5**	0	-7	9	7	5	5	5	0	-40	-	12
2,5	**10**	0	-7	9	7	5	5	6	0	-120	-250	15
10	**18**	0	-7	9	7	5	5	7	0	-120	-250	20
18	**30**	0	-8	10	8	6	6	8	0	-120	-250	20
30	**50**	0	-10	13	10	8	8	10	0	-120	-250	20
50	**80**	0	-12	15	15	9	9	10	0	-150	-380	25
80	**120**	0	-15	19	19	11	11	13	0	-200	-380	25
120	**180**	0	-18	23	23	14	14	18	0	-250	-500	30
180	**250**	0	-22	28	28	17	17	20	0	-300	-500	30
250	**315**	0	-25	31	31	19	19	25	0	-350	-500	35
315	**400**	0	-30	38	38	23	23	30	0	-400	-630	40
400	**500**	0	-35	44	44	26	26	35	0	-450	-	45
500	**630**	0	-40	50	50	30	30	40	0	-500	-	50

1) This value included,
2) It refers to isolated bearing ring for paired mounting or sets of 3 or 4 bearing.

Outer ring

Deviations in µm — Table 3.4

D mm		ΔD_{mp}		V_{Dp} [3] Open bearings			Shielded Bearings [2]	V_{Dmp} [3]	K_{ea}	ΔC_s		V_{Cs}
				Diameter series								
				7,8,9	0,1	2,3,4	2,3,4					
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	max.
2,5 [1]	**6**	0	-7	9	7	5	9	5	8	Values are identical to ΔB_s and V_{Bs} for the inner ring		
6	**18**	0	-7	9	7	5	9	5	8			
18	**30**	0	-8	10	8	6	10	6	9			
30	**50**	0	-9	11	9	7	13	7	10			
50	**80**	0	-11	14	11	8	16	8	13			
80	**120**	0	-13	16	16	10	20	10	18			
120	**150**	0	-15	19	19	11	25	11	20			
150	**180**	0	-18	23	23	14	30	14	23			
180	**250**	0	-20	25	25	15	-	15	25			
250	**315**	0	-25	31	31	19	-	19	30			
315	**400**	0	-28	35	35	21	-	21	35			
400	**500**	0	-33	41	41	25	-	25	40			
500	**630**	0	-38	48	48	29	-	29	50			
630	**800**	0	-45	56	56	34	-	34	60			
800	**1000**	0	-60	75	75	45	-	45	75			

1) This value included,
2) For bearings of diameter series 7,8 and 9 values are not indicated,
3) Values are valid before mounting the snap ring or shields or after their dismounting.

Tolerance class P5

Inner ring

Deviations in µm — Table 3.5

d mm		Δd_{mp}		V_{dp} Diameter series		V_{dmp}	K_{ia}	S_d	S_{ia} 2)	ΔB_s			V_{Bs}
				7,8,9	0,1,2,3,4					all	normal	modified 3)	
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	low	max.
0,6 1)	**2,5**	0	-5	5	4	3	4	7	7	0	-40	-250	5
2,5	**10**	0	-5	5	4	3	4	7	7	0	-40	-250	5
10	**18**	0	-5	5	4	3	4	7	7	0	-80	-250	5
18	**30**	0	-6	6	5	3	4	8	8	0	-120	-250	5
30	**50**	0	-8	8	6	4	5	8	8	0	-120	-250	5
50	**80**	0	-9	9	7	5	5	8	8	0	-150	-250	6
80	**120**	0	-10	10	8	5	6	9	9	0	-200	-380	7
120	**180**	0	-13	13	10	7	8	10	10	0	-250	-380	8
180	**250**	0	-15	15	12	8	10	11	13	0	-300	-500	10
250	**315**	0	-18	18	14	9	13	13	15	0	-350	-500	13
315	**400**	0	-25	25	18	12	15	15	20	0	-400	-630	15

1)This value included,
2) Applies only to ball bearings.
3) If refers to single bearing ring for paired mounting or sets of 3 or 4 bearing.

Outer ring

Deviations in µm — Table 3.6

D mm		ΔD_{mp}		V_{Dp} 2)		V_{Dmp} 3)	K_{ea}	S_D	S_{ea} 3)	ΔC_s		V_{Cs}
				7,8,9	0,1,2,3,4							
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	max.
2,5 1)	**6**	0	-5	5	4	3	5	8	8	Identical to ΔB_s and V_{Bs} for the inner ring		5
6	**18**	0	-5	5	4	3	5	8	8			5
18	**30**	0	-6	6	5	3	6	8	8			5
30	**50**	0	-7	7	5	4	7	8	8			5
50	**80**	0	-9	9	7	5	8	8	10			6
80	**120**	0	-10	10	8	5	10	9	11			8
120	**150**	0	-11	11	8	6	11	10	13			8
150	**180**	0	-13	13	10	7	13	10	14			8
180	**250**	0	-15	15	11	8	15	11	15			10
250	**315**	0	-18	18	14	9	18	13	18			11
315	**400**	0	-20	20	15	10	20	13	20			13
400	**500**	0	-23	23	17	12	23	15	23			15
500	**630**	0	-28	28	21	14	25	18	25			18
630	**800**	0	-35	35	26	18	30	20	30			20

1) This value included,
2) Do not apply to shielded bearings.
3) Apply to ball bearings.

ART BEARINGS

Tolerance class P4

Inner ring

Deviations in µm

Table 3.7

d mm		$\Delta d_{mp}, \Delta d_s$ 2)		V_{dp} Diameter series		V_{dmp}	K_{ia}	S_d	S_{ia} 3)	ΔB_s			V_{Bs}
				7,8,9	0,1,2,3,4					all	normal	modified 4)	
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	low	max.
0,6 1)	**2,5**	0	-4	4	3	2	2,5	3	3	0	-40	-250	2,5
2.5	**10**	0	-4	4	3	2	2,5	3	3	0	-40	-250	2,5
10	**18**	0	-4	4	3	2	2,5	3	3	0	-80	-250	2,5
18	**30**	0	-5	5	4	2,5	3	4	4	0	-120	-250	2,5
30	**50**	0	-6	6	5	3	4	4	4	0	-120	-250	3
50	**80**	0	-7	7	5	3,5	4	5	5	0	-150	-250	4
80	**120**	0	-8	8	6	4	5	5	5	0	-200	-380	4
120	**180**	0	-10	10	8	5	6	6	7	0	-250	-380	5
180	**250**	0	-12	12	9	6	8	7	8	0	-300	-500	6

1) This value included.
2) Apply only to bearings of diameter series 0,1,2,3,4.
3) Apply only to ball bearings.
4) It refers to single bearing ring for paired mounting or sets of 3 or 4 bearing.

Outer ring

Deviations in µm

Table 3.8

D mm		$\Delta D_{mp}, \Delta D_s$ 2)		V_{Dp} 3) Diameter series		V_{Dmp}	K_{ea}	S_D	S_{ea} 4)	ΔC_s		V_{Cs}
				7,8,9	0,1,2,3,4							
over	up to	high	low	max.	max.	max.	max.	max.	max.	high	low	max.
2,5 1)	**6**	0	-4	4	3	2	3	4	5	Identical to ΔB_s and V_{Bs} for the inner ring		2,5
6	**18**	0	-4	4	3	2	3	4	5			2,5
18	**30**	0	-5	5	4	2,5	4	4	5			2,5
30	**50**	0	-6	6	5	3	5	4	5			2,5
50	**80**	0	-7	7	5	3,5	5	4	5			3
80	**120**	0	-8	8	6	4	6	5	6			4
120	**150**	0	-9	9	7	5	7	5	7			5
150	**180**	0	-10	10	8	5	8	5	8			5
180	**250**	0	-11	11	8	6	10	7	10			7
250	**315**	0	-13	13	10	7	11	8	10			7
315	**400**	0	-15	15	11	8	13	10	13			8

1) This value included,
2) Apply to bearings of diameter series 0,1,2,3 and 4.
3) Do not apply to sealed and shielded bearings.
4) Apply only to ball bearings.

Tolerance class P2

Inner ring

Deviations in µm — Table 3.9

d mm		$\Delta d_{mp}, \Delta d_s$ [2]		V_{dp}	V_{dmp}	K_{ia}	S_d	S_{ia} [2] all	ΔB_s		V_{Bs}
over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.
0,6 [1]	**2,5**	0	-2,5	2,5	1,5	1,5	1,5	1,5	0	-40	1,5
2,5	**10**	0	-2,5	2,5	1,5	1,5	1,5	1,5	0	-40	1,5
10	**18**	0	-2,5	2,5	1,5	1,5	1,5	1,5	0	-80	1,5
18	**30**	0	-2,5	2,5	1,5	2,5	1,5	2,5	0	-120	1,5
30	**50**	0	-2,5	2,5	1,5	2,5	1,5	2,5	0	-120	1,5
50	**80**	0	-4	4	2	2,5	1,5	2,5	0	-150	1,5
80	**120**	0	-5	5	2,5	2,5	2,5	2,5	0	-200	2,5
120	**150**	0	-7	7	3,5	2,5	2,5	2,5	0	-250	2,5
150	**180**	0	-7	7	3,5	5	4	5	0	-300	4
180	**250**	0	-8	8	4	5	5	5	0	-350	5

1) This value included.
2) Apply only to ball bearings.

Outer ring

Deviations in µm — Table 3.10

D mm		$\Delta D_{mp}, \Delta D_s$		V_{Dp}	V_{Dmp}	K_{ea}	S_D [2), 3)]	S_{ea} [3]	ΔC_s		V_{Cs}
over	up to	high	low	max.	max.	max.	max.	max.	high	low	max.
2,5 [1]	**6**	0	-2,5	2,5	1,5	1,5	1,5	1,5	Identical to ΔB_s for the inner ring		1,5
6	**18**	0	-2,5	2,5	1,5	1,5	1,5	1,5			1,5
18	**30**	0	-4	4	2	2,5	1,5	2,5			1,5
30	**50**	0	-4	4	2	2,5	1,5	2,5			1,5
50	**80**	0	-4	4	2	4	1,5	4			1,5
80	**120**	0	-5	5	2,5	5	2,5	5			2,5
120	**150**	0	-5	5	2,5	5	2,5	5			2,5
150	**180**	0	-7	7	3,5	5	2,5	5			2,5
180	**250**	0	-8	8	4	7	4	7			4
250	**315**	0	-8	8	4	7	5	7			5
315	**400**	0	-10	10	5	8	7	8			7

1) This value included.
2) Do not apply to bearings with rib on the outer ring.
3) Apply only to ball bearings

Tolerance class SP

Inner ring

Deviations in µm — Table 3.11

d mm		Cylindrical bore			Tapered bore					ΔB_s		V_{Bs}	K_{ia}	S_d	S_{ia}
		Δd_{mp},Δd_s		V_{dp}	Δ_{ds}		V_{dp}	Δd_{1mp}-Δd_{mp}							
over	up to	low	high	max.	low	high	max.	low	high	low	high	max.	max.	max.	max.
-	**18**	-5	0	3	-	-	-	-		-100	0	5	3	8	8
18	**30**	-6	0	3	0	+10	3	0	+4	-100	0	5	3	8	8
30	**50**	-8	0	4	0	+12	4	0	+4	-120	0	5	4	8	8
50	**80**	-9	0	5	0	+15	5	0	+5	-150	0	6	4	8	8
80	**120**	-10	0	5	0	+20	5	0	+6	-200	0	7	5	9	9
120	**180**	-13	0	7	0	+25	7	0	+8	-250	0	8	6	10	10
180	**250**	-15	0	8	0	+30	8	0	+10	-300	0	10	8	11	13
250	**315**	-18	0	9	0	+35	9	0	+12	-350	0	13	10	13	15
315	**400**	-23	0	12	0	+40	12	0	+13	-400	0	15	12	15	20

Outer ring

Deviations in µm — **Table 3.12**

D mm		ΔD_{mp},ΔD_s		V_{Dp}	K_{ea}	S_D	S_{ea}	ΔC_s	V_{Cs}
over	up to	low	high	max.	max.	max.	max.		
30	**50**	-7	0	4	5	8	8	Identical to ΔB_s and V_{Bs} for the inner ring	
50	**80**	-9	0	5	5	8	10		
80	**120**	-10	0	5	6	9	11		
120	**150**	-11	0	6	7	10	13		
150	**180**	-13	0	7	8	10	14		
180	**250**	-15	0	8	10	11	15		
250	**315**	-18	0	9	11	13	18		
315	**400**	-20	0	10	13	13	20		
400	**500**	-23	0	12	15	15	23		

Tolerance class UP

Deviations in µm — **Inner ring** — Table 3.13

d mm		Cylindrical bore $\Delta d_{mp}, \Delta d_s$		Cylindrical bore V_{dp}	Tapered bore Δd_s		Tapered bore V_{dp}	Tapered bore $\Delta d_{1mp}-\Delta d_{mp}$		ΔB_s		V_{Bs}	K_{ia}	S_d	S_{ia}
over	up to	low	high	max.	low	high	max.	low	high	low	high	max.	max.	max.	max.
-	**18**	-4	0	2	0	-	-	-	-	-25	0	1,5	1,5	2	3
18	**30**	-5	0	3	0	+6	3	0	+2	-25	0	1,5	1,5	3	3
30	**50**	-6	0	3	0	+8	3	0	+3	-30	0	2	2	3	3
50	**80**	-7	0	4	0	+9	4	0	+3	-40	0	3	2	4	3
80	**120**	-8	0	4	0	+10	4	0	+4	-50	0	3	3	4	4
120	**180**	-10	0	5	0	+13	5	0	+5	-60	0	4	3	5	6
180	**250**	-12	0	6	0	+15	6	0	+7	-75	0	5	4	6	7
250	**315**	-18	0	9	0	+18	9	0	+8	-90	0	6	5	6	8
315	**400**	-23	0	12	0	+23	12	0	+9	-100	0	8	6	8	9

Deviations in µm — **Outer ring** — Table 3.14

D mm		$\Delta D_{mp}, \Delta D_s$		V_{Dp}	K_{ea}	S_D	S_{ea}	ΔC_s	V_{Cs}
over	up to	low	high	max.	max.	max.	max.	high	max.
30	**50**	-5	0	3	3	2	4	Identical to ΔB_s and V_{Bs} for the inner ring	
50	**80**	-6	0	3	3	2	4		
80	**120**	-7	0	4	3	3	5		
120	**150**	-8	0	4	4	3	6		
150	**180**	-9	0	5	4	3	7		
180	**250**	-10	0	5	5	4	9		
250	**315**	-12	0	6	6	4	9		
315	**400**	-14	0	7	7	5	12		
400	**500**	-23	0	12	8	-	12		

3.2 Tapered Roller Bearings
Tolerance class P0 and P0X

Inner ring

Deviations in µm — Table 3.15

d mm		Δd_{mp}		V_{dp}	V_{dmp}	K_{ia}
over	up to	high	low	max.	max.	max.
10 1)	**18**	0	-12	12	9	15
18	**30**	0	-12	12	9	18
30	**50**	0	-12	12	9	20
50	**80**	0	-15	15	11	25
80	**120**	0	-20	20	15	30
120	**180**	0	-25	25	19	35
180	**250**	0	-30	30	23	50
250	**315**	0	-35	35	26	60
315	**400**	0	-40	40	30	70

1) This value included.

Outer ring

Deviations in µm — Table 3.16

D mm		ΔD_{mp}		V_{Dp}	V_{Dmp}	K_{ea}
over	up to	high	low	max.	max.	max.
18 1)	**30**	0	-12	12	9	18
30	**50**	0	-14	14	11	20
50	**80**	0	-16	16	12	25
80	**120**	0	-18	18	14	35
120	**150**	0	-20	20	15	40
150	**180**	0	-25	25	19	45
180	**250**	0	-30	30	23	50
250	**315**	0	-35	35	26	60
315	**400**	0	-40	40	30	70
400	**500**	0	-45	45	34	80

1) This value included.
Note: Limit deviations of the diameter D1 of the outer ring rib for bearings with ribs are in accordance with tolerance class h9.

Tolerance class P0

Inner and outer ring

Deviations in µm — Table 3.17

d mm		$\Delta B_s, \Delta_{Cs}$		ΔT_s		ΔT_{1s}		ΔT_{2s}	
over	up to	high	low	high	low	high	low	high	low
10 1)	**18**	0	-120	+200	0	+100	0	+100	0
18	**30**	0	-120	+200	0	+100	0	+100	0
30	**50**	0	-120	+200	0	+100	0	+100	0
50	**80**	0	-150	+200	0	+100	0	+100	0
80	**120**	0	-200	+200	-200	+100	-100	+100	-100
120	**180**	0	-250	+350	-250	+150	-150	+200	-100
180	**250**	0	-300	+350	-250	+150	-150	+200	-100
250	**315**	0	-350	+350	-250	+150	-150	+200	-100
315	**400**	0	-400	+400	-400	+200	-200	+200	-200

1) This value included.

Tolerance class P6X

Inner and outer ring

Diameter limit deviations and radial runout of the inner and outer ring of this tolerance class are the same as those of tolerance class P_0

Deviations in µm — Table 3.18

d mm		ΔB_s		ΔC_s		ΔT_s		ΔT_{1s}		ΔT_{2s}	
over	up to	high	low	high	low	high	low	high	low	high	low
10 1)	**18**	0	-50	0	-100	+100	0	+50	0	+50	0
18	**30**	0	-50	0	-100	+100	0	+50	0	+50	0
30	**50**	0	-50	0	-100	+100	0	+50	0	+50	0
50	**80**	0	-50	0	-100	+100	0	+50	0	+50	0
80	**120**	0	-50	0	-100	+100	0	+50	0	+50	0
120	**180**	0	-50	0	-100	+150	0	+50	0	+100	0
180	**250**	0	-50	0	-100	+150	0	+50	0	+100	0
250	**315**	0	-50	0	-100	+200	0	+100	0	+100	0
315	**400**	0	-50	0	-100	+200	0	+100	0	+100	0

1) This value included.

Tolerance class P5

Inner ring

Deviations in µm — Table 3.19

d mm		Δd_{mp}		V_{dp}	V_{dmp}	K_{ia}	S_d	ΔB_s		ΔT_s	
over	up to	high	low	max.	max.	max.	max.	high	low	high	low
10 1)	**18**	0	-7	5	5	5	7	0	-200	+200	-200
18	**30**	0	-8	6	5	5	8	0	-200	+200	-200
30	**50**	0	-10	8	5	6	8	0	-240	+200	-200
50	**80**	0	-12	9	6	7	8	0	-300	+200	-200
80	**120**	0	-15	11	8	8	9	0	-400	+200	-200
120	**180**	0	-18	14	9	11	10	0	-500	+350	-250
180	**250**	0	-22	17	11	13	11	0	-600	+350	-250

1) This value included.

Outer ring

Deviations in µm — Table 3.20

D mm		ΔD_{mp}		V_{Dp}	V_{Dmp}	K_{ea}	S_D	ΔC_s	
over	up to	high	low	max.	max.	max.	max.	high	low
18 1)	**30**	0	-8	6	5	6	8	Identical with ΔB_s for the inner ring.	
30	**50**	0	-9	7	5	7	8		
50	**80**	0	-11	8	6	8	8		
80	**120**	0	-13	10	7	10	9		
120	**150**	0	-15	11	8	11	10		
150	**180**	0	-18	14	9	13	10		
180	**250**	0	-20	15	10	15	11		
250	**315**	0	-25	19	13	18	13		
315	**400**	0	-28	22	14	20	15		

1) This value included.

Tolerance class P4

Inner ring

Deviations in μm

Table 3.21

d mm		Δd_{mp}, Δ_{ds}		V_{dp}	V_{dmp}	K_{ia}	S_d	S_{ia}	ΔB_s		ΔT_s	
over	up to	high	low	max.	max.	max.	max.	max.	high	low	high	low
10 1)	18	0	-5	4	4	3	3	3	0	-200	+200	-200
18	30	0	-6	5	4	3	4	4	0	-200	+200	-200
30	50	0	-8	6	5	4	4	4	0	-240	+200	-200
50	80	0	-9	7	5	4	5	4	0	-300	+200	-200
80	120	0	-10	8	5	5	5	5	0	-400	+200	-200
120	180	0	-13	10	7	6	6	7	0	-500	+350	-250
180	250	0	-15	11	8	8	7	8	0	-600	+350	-250

1) This value included.

Outer ring

Deviations in μm

Table 3.22

D mm		ΔD_{mp}, Δ_{Ds}		V_{Dp}	V_{Dmp}	K_{ea}	S_D	S_{ea}	ΔC_s	
over	up to	high	low	max.	max.	max.	max.	max.	high	low
18 1)	**30**	0	-6	5	4	4	4	5	Identical with ΔB_s for the inner ring.	
30	**50**	0	-7	5	5	5	4	5		
50	**80**	0	-9	7	5	5	4	5		
80	**120**	0	-10	8	5	6	5	6		
120	**150**	0	-11	8	6	7	5	7		
150	**180**	0	-13	10	7	8	5	8		
180	**250**	0	-15	11	8	10	7	10		
250	**315**	0	-18	14	9	11	8	10		
315	**400**	0	-20	15	10	13	10	13		

1) This value included.
Note: Limit deviations of the diameter D_1 of the outer ring rib for bearings with ribs are in accordance with tolerance class h9.

Tapered roller bearings, inch-metric sizes (AFBMA)

Deviations in µm — **Inner ring- Δd_{mp}** — Table 3.23

Tolerances classes											
d mm		**4**		**2**		**3**		**0**		**00**	
over	up to	high	low	high	low	high	low	high	low	high	low
-	**76,2**	+13	0	+13	0	+13	0	+13	0	+8	0
76,2	**266,7**	+25	0	+25	0	+13	0	+13	0	+8	0
266,7	**304,8**	+25	0	+25	0	+13	0	+13	0	-	-

Deviations in µm — **Outer ring- ΔD_{mp}** — Table 3.24

Tolerances classes											
D mm		**4**		**2**		**3**		**0**		**00**	
over	up to	high	low	high	low	high	low	high	low	high	low
-	**266,7**	+25	0	+25	0	+13	0	+13	0	+8	0
266,7	**304,8**	+25	0	+25	0	+13	0	+13	0	-	-
304,8	**609,6**	+51	0	+51	0	+25	0	-	-	-	-

Table 3.25 — **Deviations** in µm — **Assembled bearing- K_{ia}, K_{ea}**

D mm		Tolerances classes				
		4	**2**	**3**	**0**	**00**
over	up to	max.	max.	max.	max.	max.
-	**266,7**	51	38	8	4	2
266,7	**304,8**	51	38	8	4	-
304,8	**609,6**	51	38	18	-	-

Tapered roller bearings, inch-metric sizes (AFBMA)

Table 3.26

Deviations in μm — **Assembled bearing - ΔT_s**

d mm		4		2		3		0		00	
over	up to	high	low	high	low	high	low	high	low	high	low
-	**101,6**	+203	-	+203	0	+203	-203	+203	-203	+203	-203
101,6	**266,7**	+356	-254	+203	0	+203	-203	+203	-203	+203	-203
266,7	**304,8**	+356	-254	+203	0	+203	-203	+203	-203	-	-

Table 3.27

Deviations in μm — **Inner ring+rollers assembly, with outer ring gauce - Δ_{T1s}**

d mm		4		2		3		0		00	
over	up to	high	low	high	low	high	low	high	low	high	low
-	**101,6**	+102	0	+102	0	+102	-102	+102	-102	+102	-102
101,6	**304,8**	+152	-152	+102	0	+102	-102	+102	-102	+102	-102

Table 3.28

Deviations in μm — **Outer ring with gauge inner ring assembly - ΔT_{2s}**

d mm		4		2		3		0		00	
over	up to	high	low	high	low	high	low	high	low	high	low
-	**101,6**	+102	0	+102	0	+102	-102	+102	-102	+102	-102
101,6	**304,8**	+203	-102	+102	0	+102	-102	+102	-102	+102	-102

Tapered bore bearings

Table 3.29

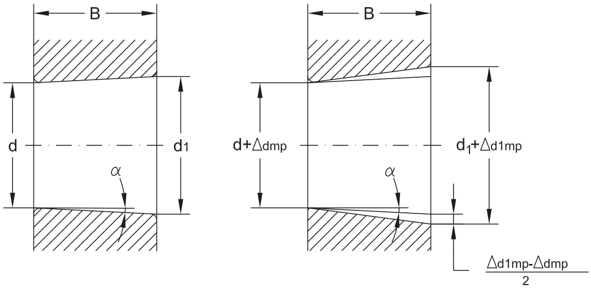
Deviations μm — **Taper 1:12**

d mm		Normal tolerance class, P6					Tolerance class P5				
		Δd_{mp}		Vd_p 1)	Δd_{1mp}-$\Delta d_{mp/2}$		Δ_{dmp}		Vd_p 1)	Δd_{1mp}-Δd_{mp}	
over	up to	high	low	max.	high	low	high	low	max.	high	low
18	**30**	+21	0	13	+21	0	+13	0	13	+13	0
30	**50**	+25	0	15	+25	0	+16	0	15	+16	0
50	**80**	+30	0	19	+30	0	+19	0	19	+19	0
80	**120**	+35	0	25	+35	0	+22	0	22	+22	0
120	**180**	+40	0	31	+40	0	+25	0	25	+25	0
180	**250**	+46	0	38	+46	0	+29	0	29	+29	0
250	**315**	+52	0	44	+52	0	+32	0	32	+32	0
315	**400**	+57	0	50	+57	0	+36	0	36	+36	0

1) Applies in all single radial planes of the bore

Deviations in µm		**Taper 1:30**				Table 3.30
d mm		**Normal tolerance class**				
		Δd_{mp}		**V_{dp} 1)**	**$\Delta d_{1mp} - \Delta d_{mp}$**	
over	up to	high	low	max.	high	low
80	**120**	+20	0	25	+40	0
120	**180**	+25	0	31	+50	0
180	**250**	+30	0	38	+55	0
250	**315**	+35	0	44	+60	0
315	**400**	+40	0	50	+65	0

1) Applies in all singular planes



Tapered bore
Half angle of taper, α

α = 2º23’9,4” (taper 1:12)
α = 0º57’17,4” (taper 1:30)

Nominal diameter, d_1 at the theoretical large end of bore

$$d_1 = d + \frac{1}{12} B \text{ (taper } 1:12)$$

$$d_1 = d + \frac{1}{30} B \text{ (taper } 1:30)$$

Deviations in µm			**Shaft washer**				Table 3.31
d and d_2 mm		**P0;P6;P5**			**P4;P2**		
		Δd_{mp} Δd_{2mp}		**V_{dp} V_{d2p}**	**Δd_{mp} Δd_{2mp}**		**V_{dp} V_{d2p}**
over	up to	high	low	max.	high	low	max.
-	**18**	0	-8	6	0	-7	5
18	**30**	0	-10	8	0	-8	6
30	**50**	0	-12	9	0	-10	8
50	**80**	0	-15	11	0	-12	9
80	**120**	0	-20	15	0	-15	11
120	**180**	0	-25	19	0	-18	14
180	**250**	0	-30	23	0	-22	17
250	**315**	0	-35	26	0	-25	19
315	**400**	0	-40	30	0	-30	23
400	**500**	0	-45	34	0	-35	26
500	**630**	0	-50	38	0	-40	30

Housing washer

Deviations in µm — Table 3.32

D mm		P0;P6;P5			P4;P2		
		ΔD_{mp}		V_{Dp}	ΔD_{mp}		V_{Dp}
over	up to	high	low	max.	high	low	max.
10[1)]	18	0	-11	8	0	-7	5
18	30	0	-13	10	0	-8	6
30	50	0	-16	12	0	-9	7
50	80	0	-19	14	0	-11	8
80	120	0	-22	17	0	-13	10
120	180	0	-25	19	0	-15	11
180	250	0	-30	23	0	-20	15
250	315	0	-35	26	0	-25	19
315	400	0	-40	30	0	-28	21
400	500	0	-45	34	0	-33	25
500	630	0	-50	38	0	-38	29
630	800	0	-75	55	0	-45	34

1) This value included.

Variation of shaft washer and housing washer thickness

Deviations in µm — Table 3.33

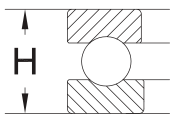
d* mm		S_i					S_e
		P0	P6	P5	P4	P2	P0,P6,P5,P4,P2
over	up to	max.	max.	max.	max.	max.	max.
-	18	10	5	3	2	1	Identical to S_i for the shaft washer
18	30	10	5	3	2	1,2	
30	50	10	6	3	2	1,5	
50	80	10	7	4	3	2	
80	120	15	8	4	3	2	
120	180	15	9	5	4	3	
180	250	20	10	5	4	3	
250	315	25	13	7	5	4	
315	400	30	15	7	5	4	
400	500	30	18	9	6	-	
500	630	35	21	11	7	-	

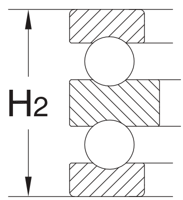
* The values of S_i and S_e admitted for double direction thrust bearings are equal to the coresponding values of the single direction thrust bearings and are functions of the bore diameter d, of the single direction bearings.

Assembled thrust bearings
Bearing height

Deviations in µm — Table 3.34

d mm		ΔH_s		ΔH_{2s}	
over	up to	high	low	high	low
18	30	+20	-250	+150	-400
30	50	+20	-250	+150	-400
50	80	+20	-300	+150	-500
80	120	+25	-300	+200	-500
120	180	+25	-400	+200	-600
180	250	+30	-400	+250	-600
250	315	+40	-400	+350	-700
315	400	+40	-500	+350	-700
400	500	+50	-500	+400	-900
500	600	+60	-600	+500	-1100





Mounting chamfer dimensions tolerances

Symbols:

r_1, r_3 - chamfer dimension in radial direction,

r_2, r_4 - chamfer dimension in axial direction,

$r_{s\,min}$ - general symbol for minimum limit of r_1, r_2, r_3, r_4,

$r_{1s\,max}$, $r_{3s\,max}$ - maximum dimension in radial direction,

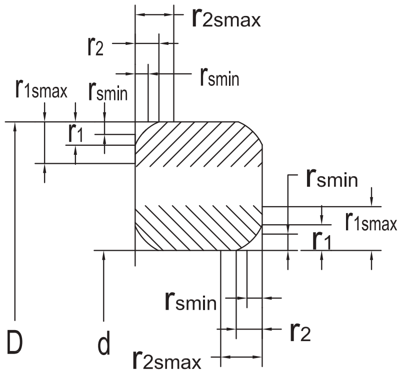
$r_{2s\,max}$, $r_{4s\,max}$ - maximum dimension in axial direction.

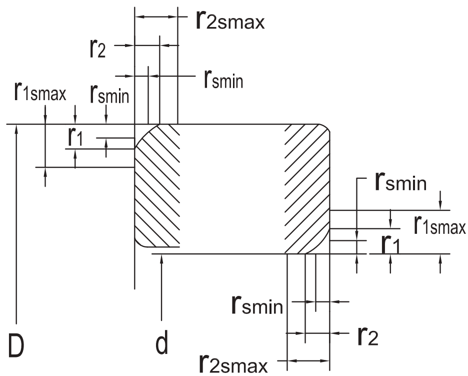
Mounting chamfer dimension limits for radial and thrust bearings

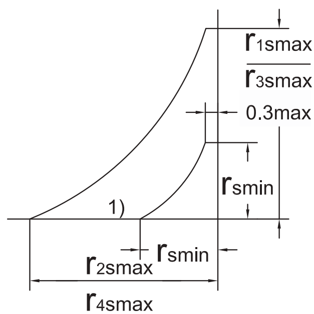
Values in mm

Table 3.35

$r_{s\,min}$	d		Radial bearings		Thrust bearings
	over	up to	r_{1s}, r_{3s} max.	r_{2s}, r_{4s} max.	r_{1s}, r_{2s} max.
0,1	-	-	0,2	0,4	0,2
0,15	-	-	0,3	0,6	0,3
0,2	-	-	0,5	0,8	0,5
0,3	-	40	0,6	1	0,8
	40	-	0,8	1	0,8
0,6	-	40	1	2	1,5
	40	-	1,3	2	1,5
1	-	50	1,5	3	2,2
	50	-	1,9	3	2,2
1,1	-	120	2	3,5	2,7
	120	-	2,5	4	2,7
1,5	-	120	2,3	4	3,5
	120	-	3	5	3,5
2	-	80	3	4,5	4
	80	220	3,5	5	4
	220	-	3,8	6	4
2,1	-	100	3,8	6	-
	-	280	4	6,5	4,5
	280	-	4,5	7	4,5
2,5	100	280	4,5	6	-
	280	-	5	7	-
3	-	280	5	8	5,5
	280	-	5,5	8	5,5
4	-	-	6,5	9	6,5
5	-	-	8	10	8
6	-	-	10	13	10
7,5	-	-	12,5	17	12,5





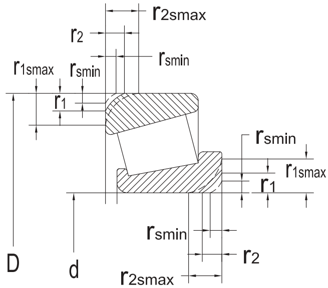


1) Only for d<30 mm

Mounting chamfer dimension limits for tapered roller bearings

Values in mm — Tab 3.36

$r_{s\,min}$	d, D over	d, D incl.	r_{1s}, r_{3s} max.	r_{2s}, r_{4s} max.
0,3	-	40	0,7	1,4
	40	-	0,9	1,6
0,6	-	40	1,1	1,7
	40	-	1,3	2
1	-	50	1,6	2,5
	50	-	1,9	3
1,5	-	120	2,3	3
	120	250	2,8	3,5
	250	-	3,5	4
2	-	120	2,8	4
	120	250	3,5	4,5
	250	-	4	5
2,5	-	120	3,5	5
	120	250	4	5,5
	250	-	4,5	6
3	-	120	4	5,5
	120	250	4,5	6,5
	250	400	5	7
	400	-	5,5	7,5
4	-	120	5	7
	120	250	5,5	7,5
	250	400	6	8
	400	-	6,5	8,5
5	-	180	6,5	8
	180	-	7,5	9
6	-	180	7,5	10
	180	-	9	11



Mounting chamfer dimension limits for tapered roller bearings

(inch-metric sizes)

Values in mm — Table 3.37

Minimum values	**Inner ring Nominal bore diameter**		**Maximum values**		**Outer ring Nominal outer diameter D**		**Maximum**	
r_{smin}	d over	d up to	r_{1smax}	r_{2smax}	D over	D up to	r_{3smax}	r_{4smax}
See bearing tables	-	50,8	$r_{smin}+0,4$	$r_{smin}+0,9$	-	101,6	$r_{smin}+0,6$	$r_{smin}+1,1$
	50,8	101,6	$r_{smin}+0,5$	$r_{smin}+1,3$	101,6	168,3	$r_{smin}+0,6$	$r_{smin}+1,2$
	101,6	254	$r_{smin}+0,6$	$r_{smin}+1,8$	168,3	266,7	$r_{smin}+0,8$	$r_{smin}+1,4$
					266,7	355,6	$r_{smin}+1,7$	$r_{smin}+1,7$
1	254	-	1,9	3	355,6	-	1,9	3
1,5	254	-	3,5	4	355,6	-	3,5	4
2,5	254	-	4,5	6	355,6	-	4,5	6
3	254	-	5,5	7,5	355,6	-	5,5	7,5
3,3	254	-	6,5	9	355,6	-	6,5	9
3,5	254	-	6,5	9	355,6	-	6.5	9
6,4	254	-	125	17	355,6	-	12,5	17
8,5	254	-	15	19	355,6	-	15	19

Bearing applications

Radial and axial loads in bearing units can be transmitted by locating and non-locating bearings.

A locating bearing is generally used for medium and large-sized shafts that can reach high temperatures during operation. It has to support radially the shaft assembly and to locate it axially in both directions.

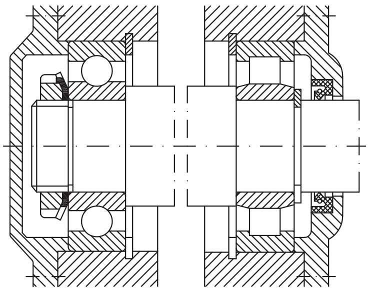
A non-locating bearing supports the shaft assembly only radially. It also allows axial displacement in relation to the housing to take place so that additional axial loading is avoided.

Axial displacement can take place either in the housing bore seating or in the bearing itself.

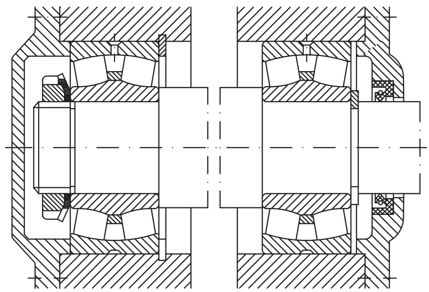
In case the shaft is supported by more than two bearings, only one of them will be a locating bearing and it will be the one with the lightest radial load.

In case of small-sized shafts, two non-locating bearings with limited displacement can be used. Each of them can accommodate axial loads in a single direction, having thus mutual location.

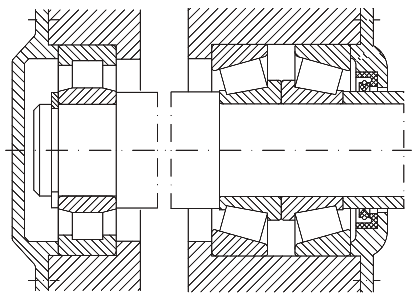
Fig. 4.1 shows a few of the most representative applications of locating and non-locating bearings, as follows:



locating bearing a) non-locating bearing



locating bearing b) non-locating bearing



locating bearing c) non-locating bearing

Fig. 4.1

a) The locating bearing is a single row deep groove ball bearing and the non-locating one is a cylindrical roller bearing with both rings tightly fitted on the shaft and into the housing, respectively.

b) Both bearings are supported by spherical roller bearings. The locating bearing is tightly fitted both on the shaft and into the housing. The non-locating bearing has the outer ring mounted with clearance into the housing and thus allows axial displacement in both directions.

c) The locating bearing consists of a cylindrical roller bearing, NUP type and the non-locating bearing consists of a cylindrical roller bearing, NU type.

d) The locating bearings consist of a cylindrical roller bearing. NU type which takes over radial loads and of a four- point contact ball bearing (unloaded on the outside). The non-locating bearing consists of a cylindrical roller bearing, NU type.

e) The locating bearings consists of a cylindrical roller bearing, NU type which take over radial loads and of a four-point contact ball bearing (unloaded on the outside). The non-locating bearing consists of a cylindrical roller bearing, NU type.

f) The locating bearing consists of a needle roller bearing, NA type which takes over radial loads and of a single row deep groove ball bearing (unloaded on the outside) which takes over axial loads in both directions. The non-locating bearing consists of a needle roller bearing, NA type.

g) The shaft bearings can also be X-type arrangement of two tapered roller bearings which can be considered mutual located bearing.

Recommendation for bearing fit selection

Three main criteria have to be considered when selecting the bearing fit:

a) Firm location and uniform support of bearings;
b) Simply mounting and dismounting;
c) Axial displacement of non-locating bearing.

The most common location is assured by tight fit.

A high tightening is recommended for roller bearings and large-sized bearings in comparison to ball bearings of the same size.

In case of a tight fit, the inner ring is supported by the entire shaft contact surface, thus bearing is used at full load carrying capacity.

The tolerance classes given in table 4.1 and 4.3 are available for bearing fits which do not exceed +120° during operation.

As a general rule, selection of the tolerance class "H" is recommended for bearings of separable design and tolerance class "J" for bearings of non-separable design.

When selecting a fit, the load of rotating ring has to consider, namely:

- If the inner ring rotates and the load is stationary, the outer ring should be mounted with clearance fit.
- If the inner ring rotates and the load is stationary, the outer ring should be mounted with a tight fit.
- If the inner ring rotates and the direction of load is not determined, both rings should be mounted with a tight fit.

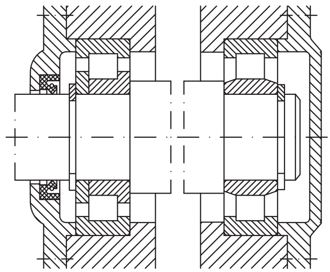
In table 4.1, there are given recommendations to select the tolerance class for shaft as function of: bearing type, loading and shaft diameter. In table 4.3, one can find recommendations to select the tolerance class for housing,

Figure 4.2 shows schematically the tolerance classes for shaft and housing and their influence over fit type i.e. clearance, transition or tight fit for housing and transition fit or tight fit for shaft, respectively.

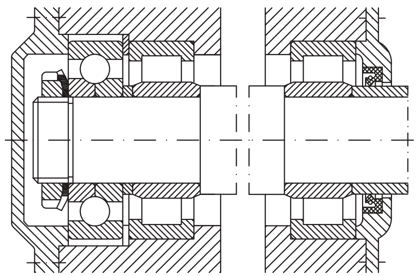
In tables 4.2 and 4.4, the deviations of the shaft diameter (4.2) and of the housing diameter (4.4) are given, considering the following:

- upper and lower limits
- theoretical minimum and maximum values of tightening (+) or clearance (0(in the fit.
- the minimum and maximum values of the probable tightening or clearance in the fit (99% of fits are between these limits).

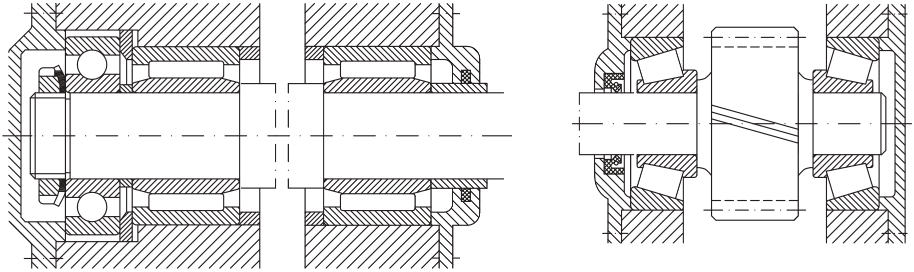
The tolerances of bore diameter dmp and outside diameter Dmp are valid for all metric sized bearings, except tapered roller bearings with d<30 mm and D<150 mm and thrust ball bearings with D≤150 mm, (see table 3.15 and 3.16 on page 34 and table 3.31 and 3.32 on page 39-40).



locating bearing d) non-locating bearing



locating bearing e) non-locating bearing



locating bearing f) non-locating bearing

g)

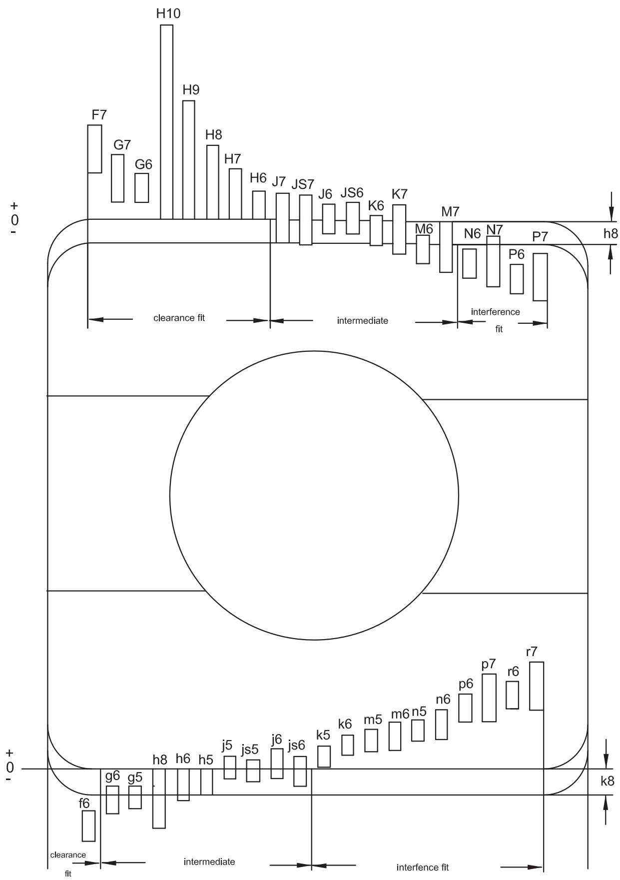
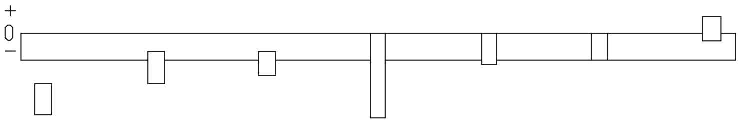


Fig. 4.2

Bearing application
Tolerance classes for shafts

Table 4.1

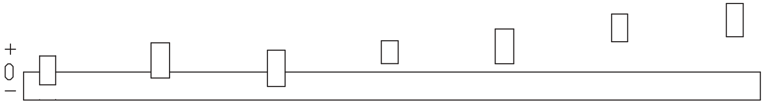
Operating conditions	Examples	Shaft diameter [mm]			Tolerance class symbol
		Ball bearings	Cylindrical needle and tapered roller bearings	Spherical roller bearings	
Radial bearings with cylindrical bore Stationary load on the inner ring					
Easy axial displacement of inner ring on shaft desirable	Wheels on non-rotating shafts (free wheels)	All diameters			g6 (f6)
Axial displacement of inner ring on shaft not necessary	Tension pullyes, sheaves				h6
Rotating inner ring load					
Light and variable loads (P<0,06C)	Conveyers, lightly loaded mechanisms	18...100	≤40		j6
		>100...140	>40...100		k6
Normal and heavy loads (P>0,06C)	General mechanical engineering electric motors, turbines, pumps, gearboxes, woodworking machines	≤18	-	-	j5
		> 18...100	≤40	≤40	k5(k6)
		>100...140	>40...100	>40...65	m5(m6)
		>140...200	>100...140	>65...100	m6
		>200...280	>140...200	>100...140	n6
		-	>200...400	>140...280	p6
		-	-	>280...500	r6
		-	-	>500	r7
Heavy loads and shock loads, ardous working conditions (P>0,12C)	Heavy duty railway vehicles axle bearings, traction motors, rolling mills	-	>50...140	>50...100	n6
		-	>140...200	>100...200	p6
		-	>200	>200	r6
High running accuracy, light loads (P<0,06C)	Machine tools	≤18	-	-	h5
		> 18...100	≤40	-	j5
		>100...200	>40...140	-	k5
		-	>140...200	-	m5
Axial loads					
	All kind of bearing application	≤250	≤250	≤250	j6
		>250	>250	>250	js6
Tapered bore bearings with withdrawal or adapter sleeve					
	Axle shaft for railway vehicles General mechanical engineering	All diameters			h9 h10
Thrust bearings Axial loads					
Thrust ball bearings		All sizes			h6
Cylindrical and needle roller thrust bearings		All sizes			h6 (h8)
Cylindrical, needle roller and cage thrust assembly		All sizes			h8
Combined loads spherical roller thrust bearings					
Stationary load on shaft washer		≤250			j6
		>250			js6
Rotating load on shaft washer or undetermined load direction		≤200			k6
		> 200...400			m6
		>400			n8



Bearing application
Shaft fits

Table 4.2

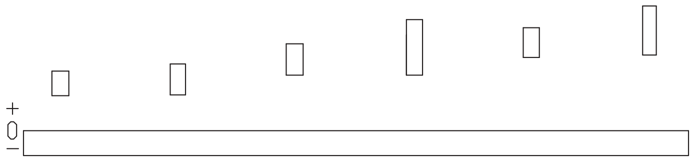
Shaft nominal diameter		Bearing Bore diameter tolerance		Deviations of shaft diameter, resultant fits Tolerances													
d		Δd_{mp}		f6		g6		g5		h8		h6		h5		j5	
over	up to	low	high	a) Deviations (shaft diameter) b) Tightening/Theoretical clearance c) Tightening/Probable clearance													
mm		µm															
1	**3**	**-8**	**0**	a) -6	-12	-2	-8	-2	-6	0	-14	0	-6	0	-4	+2	-2
				b) +2	-12	+6	-8	+6	-6	+8	-14	-8	-6	+8	-4	+10	0
				c) 0	-10	+4	-6	+5	-5	+6	-12	+6	-4	+7	-3	+9	-1
3	**6**	**-8**	**0**	-10	-18	-4	-12	-4	-9	0	-18	0	-8	0	-5	+3	-2
				-2	-18	+4	-12	+4	-9	+8	-18	+8	-8	+8	-5	+11	-2
				-4	-16	+2	-10	+3	-8	+5	-15	+6	-6	+7	-4	+10	-1
6	**10**	**-8**	**0**	-13	-22	-5	-14	-5	-11	0	-22	0	-9	0	-6	+4	-2
				-5	-22	+3	-14	+3	-11	+8	-22	+8	-9	+8	-6	+12	-2
				-7	-20	+1	-12	+1	-9	+5	-19	+6	-7	+6	-4	+10	0
10	**18**	**-8**	**0**	-16	-27	-6	-17	-6	-14	0	-27	0	-11	0	-8	+5	-3
				-8	-27	+2	-17	+2	-14	+8	-27	+8	-11	+8	-8	+13	-3
				-10	-25	0	-15	0	-12	+5	-24	+6	-9	+6	-6	+11	-1
18	**30**	**-10**	**0**	-20	-33	-7	-20	-7	-16	0	-33	0	-13	0	-9	+5	-4
				-10	-33	+3	-20	+3	-16	+10	-33	+10	-13	+10	-9	+15	-4
				-13	-30	0	-17	+1	-14	+6	-29	+7	-10	+8	-7	+13	-2
30	**50**	**-12**	**0**	-25	-41	-9	-25	-9	-20	0	-39	0	-16	0	-11	+6	-5
				-13	-41	+3	-25	+3	-20	+12	-39	+12	-16	+12	-11	+18	-5
				-17	-37	-1	-21	0	-17	+7	-34	+8	-12	+9	-8	+15	-2
50	**80**	**-15**	**0**	-30	-49	-10	-29	-10	-23	0	-46	0	-19	0	-13	+6	-7
				-15	-49	+5	-29	+5	-23	+15	-46	+15	-19	+15	-13	+21	-7
				-19	-45	+1	-25	+1	-19	+9	-40	+11	-15	+11	-9	+17	-3
80	**120**	**-20**	**0**	-36	-58	-12	-34	-12	-27	0	-54	0	-22	0	-15	+6	-9
				-16	-58	+8	-34	+8	-27	+20	-54	+20	-22	+20	-15	+26	-9
				-22	-52	+2	-28	+3	-22	-12	-46	+14	-16	+15	-10	+21	-4
120	**180**	**-25**	**0**	-43	-68	-14	-39	-14	-32	0	-63	0	-25	0	-18	+7	-11
				-18	-68	+11	-39	+11	-32	+25	-63	+25	-25	+25	-18	+32	-11
				-25	-61	+4	-32	+5	-26	+15	-53	+18	-18	+19	-12	+26	-5
180	**250**	**-30**	**0**	-50	-79	-15	-44	-15	-35	0	-72	0	-29	0	-20	+7	-13
				-20	-79	+15	-44	+15	-35	+30	-72	+30	-29	+30	-20	+37	-13
				-28	-71	+7	-36	+9	-29	+18	-60	+22	-21	+24	-14	+31	-7
250	**315**	**-35**	**0**	-56	-88	-17	-49	-17	-40	0	-81	0	-32	0	-23	+7	-16
				-21	-88	+18	-49	+18	-40	+35	-81	+35	-32	+35	-23	+42	-16
				-30	-79	+9	-40	+10	-32	+22	-68	+26	-23	+27	-15	+34	-8
315	**400**	**-40**	**0**	-62	-98	-18	-54	-18	-43	0	-89	0	-36	0	-25	+7	-18
				-22	-98	+22	-54	+22	-43	+40	-89	+40	-36	+40	-25	+47	-18
				-33	-87	+11	-43	+14	-35	+25	-74	+29	-25	+32	-17	+39	-10



Bearing application
Shaft fits

Table 4.2 (continued)

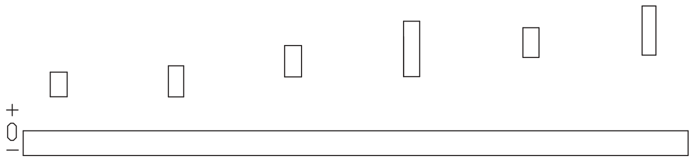
Shaft nominal diameter		Bearing Bore diameter tolerance		Deviations of shaft diameter, resultant fits Tolerances													
d		Δd_{mp}		js5		j6		js6		k5		k6		m5		m6	
over	up to	low	high	a) Deviations (shaft diameter) b) Tightening/Theoretical clearance c) Tightening/Probable clearance													
mm		μm															
1	3	-8	0	a) +2	-2	+4	-2	+3	-3	+4	0	+6	0	+6	+2	+8	+2
				b) +10	-2	+12	-2	+11	-3	+12	0	+14	0	+14	+2	+16	+2
				c) +9	-1	+10	0	+9	-1	+11	+1	+12	+2	+13	+3	+14	+4
3	6	-8	0	+2,5	-2,5	+6	-2	+4	-4	+6	+1	+9	+1	+9	+4	+12	+4
				+10,5	-2,5	+14	-2	+12	-4	+14	+1	+17	+1	+17	+4	+20	+4
				+9	-1	+12	0	+10	-2	+13	+2	+15	+3	+16	+5	+18	+6
6	10	-8	0	+3	-3	+7	-2	+4,5	-4,5	+7	+1	+10	+1	+12	+6	+15	+6
				+11	-3	+15	-2	+12,5	-4,5	+15	+1	+18	+1	+20	+6	+23	+6
				+9	-1	+13	0	+11	-3	+13	+3	+16	+3	+18	+8	+21	+8
10	18	-8	0	+4	-4	+8	-3	+5,5	-5,5	+9	+1	+12	+1	+15	+7	+18	+7
				+12	-4	+16	-3	+13,5	-5,5	+17	+1	+20	+1	+23	+7	+26	+7
				+10	-2	+14	-1	+11	-3	+15	+3	+18	+3	+21	+9	+24	+9
18	30	-10	0	+4,5	-4,5	+9	-4	+6,5	-6,5	+11	+2	+15	+2	+17	+8	+21	+8
				+14,5	-4,5	+19	-4	+16,5	-6,5	+21	+2	+25	+2	+27	+8	+31	+8
				+12	-2	+16	-1	+14	-4	+19	+4	+22	+5	+25	+10	+28	+11
30	50	-12	0	+5,5	-5,5	+11	-5	+8	-8	+13	+2	+18	+2	+20	+9	+25	+9
				+17,5	-5,5	+23	-5	+20	-8	+25	+2	+30	+2	+32	+9	+37	+9
				+15	-3	+19	-1	+16	-4	+22	+5	+26	+6	+29	+12	+33	+13
50	80	-15	0	+6,5	-6,5	+12	-7	+9,5	-9,5	+15	+2	+21	+2	+24	+11	+30	+11
				+21,5	-6,5	+27	-7	+24,5	-9.5	+30	+2	+36	+2	+39	+11	+45	+11
				+18	-3	+23	-3	+20	-5	+26	+6	+32	+6	+35	+15	+41	+15
80	120	-20	0	+7,5	-7,5	+13	-9	+11	-11	+18	+3	+25	+3	+28	+13	+35	+13
				+27,5	-7,5	+33	-9	+31	-11	+38	+3	+45	+3	+48	+13	+55	+13
				+23	-3	+27	-3	+25	-5	+33	+8	+39	+9	+43	+18	+49	+19
120	180	-25	0	+9	-9	+14	-11	+12,5	-12,5	+21	+3	+28	+3	+33	+15	+40	+15
				+34	-9	+39	-11	37,5	-12.5	+46	+3	+53	+3	+58	+15	+65	+15
				+28	-3	+32	-4	+31	-6	+40	+9	+46	+10	+52	+21	+58	+22
180	250	-30	0	+10	-10	+16	-13	+14,5	-14,5	+24	+4	+33	+4	+37	+17	+46	+17
				+40	-10	+46	-13	+44,5	-14,5	+54	+4	+63	+4	+67	+17	+76	+17
				+34	-4	+38	-5	+36	-6	+48	+10	+55	+12	+61	+23	+68	+25
250	315	-35	0	+11,5	-11,5	+16	-16	+16	-16	+27	+4	+36	+4	+43	+20	+52	+20
				+46,5	-11,5	+51	-16	+51	-16	+62	+4	+71	+4	+78	+20	+87	+20
				+39	-4	+42	-7	+42	-7	+54	+12	+62	+13	+70	+28	+78	+29
315	400	-40	0	+12,5	-12,5	+18	-18	+18	-18	+29	+4	+40	+4	+46	+21	+57	+21
				+52,5	-12,5	+58	-18	+58	-18	+69	+4	+80	+4	+89	+21	+97	+21
				+44	-4	+47	-7	+47	-7	+61	+12	+69	+15	+78	+29	+86	+32



Bearing application
Shaft fits

Table 4.2 (continued)

Shaft nominal diameter		Bearing Bore diameter tolerance		Deviations of shaft diameter, resultant fits Tolerances											
d		Δd_{mp}		n5		n6		p6		p7		r6		r7	
over	up to	low	high	a) Deviations (shaft diameter) b) Tightening/Theoretical clearance c) Tightening/Probable clearance											
mm		µm													
1	**3**	**-8**	**0**	a) +8	+4	+10	+4	+12	+6	+16	+6	+16	+10	+20	+10
				b) +16	+4	+18	+4	+20	+6	+24	+6	+24	+10	+28	+10
				c) +15	+5	+16	+6	+18	+8	+22	+8	+22	+12	+26	+12
3	**6**	**-8**	**0**	+13	+8	+16	+8	+20	+12	+24	+12	+23	+15	+27	+15
				+21	+8	+24	+8	+28	+12	+32	+12	+31	+15	+35	+15
				+20	+9	+22	+10	+26	+14	+30	+14	+29	+17	+33	+17
6	**10**	**-8**	**0**	+16	+10	+19	+10	+24	+15	+30	+15	+28	+19	+34	+19
				+24	+10	+27	+10	+32	+15	+38	+15	+36	+19	+42	+19
				+22	+12	+25	+12	+30	+17	+35	+18	+34	+21	+39	+22
10	**18**	**-8**	**0**	+20	+12	+23	+12	+29	+18	+36	+18	+34	+23	+41	+23
				+28	+12	+31	+12	+37	+18	+44	+18	+42	+23	+49	+23
				+26	+14	+29	+14	+35	+20	+41	+21	+40	+25	+46	+26
18	**30**	**-10**	**0**	+24	+15	+28	+15	+35	+22	+43	+22	+41	+28	+49	+28
				+34	+15	+38	+15	+45	+22	+53	+22	+51	+28	+59	+28
				+32	+17	+35	+18	+42	+25	+50	+25	+48	+31	+56	+31
30	**50**	**-12**	**0**	+28	+17	+33	+17	+42	+26	+51	+26	+50	+34	+59	+34
				+40	+17	+45	+17	+54	+26	+63	+26	+62	+34	+71	+34
				+37	+20	+41	+21	+50	+30	+59	+30	+58	+38	+67	+38
50	**65**	**-15**	**0**	+33	+20	+39	+20	+51	+32	+62	+32	+60	+41	+71	+41
				+48	+20	+54	+20	+66	+32	+77	+32	+75	+41	+86	+41
				+44	+24	+50	+24	+62	+36	+72	+37	+71	+45	+81	+46
65	**80**	**-15**	**0**	+33	+20	+39	+20	+51	+32	+62	+32	+62	+43	+73	+43
				+48	+20	+54	+20	+66	+32	+77	+32	+77	+43	+88	+43
				+44	+24	+50	+24	+62	+36	+72	+37	+73	+47	+83	+48
80	**100**	**-20**	**0**	+38	+23	+45	+23	+59	+37	+72	+37	+73	+51	+86	+51
				+58	+23	+65	+23	+79	+37	+92	+37	+93	+51	+106	+51
				+53	+28	+59	+29	+73	+43	+85	+44	+87	+57	+99	+58
100	**120**	**-20**	**0**	+38	+23	+45	+23	+59	+37	+72	+37	+76	+54	+89	+54
				+58	+23	+65	+23	+79	+37	+92	+37	+96	+54	+109	+54
				+53	+28	+59	+29	+73	+43	+85	+44	+90	+60	+102	+61
120	**140**	**-25**	**0**	+45	+27	+52	+27	+68	+43	+83	+43	+88	+63	+103	+63
				+70	+27	+77	+27	+93	+43	+108	+43	+113	+63	+128	+63
				+64	+33	+70	+34	+86	+50	+100	+51	+106	+70	+120	+71
140	**160**	**-25**	**0**	+45	+27	+52	+27	+68	+43	+83	+43	+90	+65	+105	+65
				+70	+27	+77	+27	+93	+43	+108	+43	+115	+65	+130	+65
				+64	+33	+70	+34	+86	+50	+100	+51	+108	+72	+122	+73
160	**180**	**-25**	**0**	+45	+27	+52	+27	+68	+43	+83	+43	+93	+68	+108	+68
				+70	+27	+77	+27	+93	+43	+108	+43	+118	+68	+133	+68
				+64	+33	+70	+34	+86	+50	+100	+51	+111	+75	+125	+76



Bearing application
Shaft fits

Table 4.2 (continued)

Shaft nominal diameter		Bearing Bore diameter tolerance		Deviations of shaft diameter, resultant fits Tolerances											
d		Δd_{mp}		n5		n6		p6		p7		r6		r7	
over	up to	low	high	a) Deviations (shaft diameter) b)Tightening/Theoretical clearance c) Tightening/Probable clearance											
mm		µm													
180	**200**	**-30**	**0**	a)+51	+31	+60	+31	+79	+50	+96	+50	+106	+77	+123	+77
				b)+81	+31	+90	+31	+109	+50	+126	+50	+136	+77	+153	+77
				c)+75	+37	+82	+39	+101	+58	+116	+60	+128	+85	+143	+87
200	**225**	**-30**	**0**	+51	+31	+60	+31	+79	+50	+96	+50	+109	+80	+126	+80
				+81	+31	+90	+31	+109	+50	+126	+50	+139	+80	+156	+80
				+75	+37	+82	+39	+101	+58	+116	+60	+131	+88	+146	+90
225	**250**	**-30**	**0**	+51	+31	+60	+31	+79	+50	+96	+50	+113	+84	+130	+84
				+81	+31	+90	+31	+109	+50	+126	+50	+143	+84	+160	+84
				+75	+37	+82	+39	+101	+58	+116	+60	+135	+92	+150	+94
250	**280**	**-35**	**0**	+57	+34	+66	+34	+88	+56	+108	+56	+126	+94	+146	+94
				+92	+34	+101	+34	+123	+56	+143	+56	+161	+94	+181	+94
				+84	+42	+92	+43	+114	+65	+131	+68	+152	+103	+169	+106
280	**315**	**-35**	**0**	+57	+34	+66	+34	+88	+56	+108	+56	+130	+98	+150	+98
				+92	+34	+101	+34	+123	+56	+143	+56	+165	+98	+185	+98
				+84	+42	+92	+43	+114	+65	+131	+68	+156	+107	+173	+110
315	**355**	**-40**	**0**	+62	+37	+73	+37	+98	+62	+119	+62	+144	+108	+165	+108
				+102	+37	+113	+37	+138	+62	+159	+62	+184	+108	+205	+108
				+94	+45	+102	+48	+127	+73	+146	+75	+173	+119	+192	+121
355	**400**	**-40**	**0**	+62	+37	+73	+37	+98	+62	+119	+62	+150	+114	+171	+114
				+102	+37	+113	+37	+138	+62	+156	+62	+190	+114	+211	+114
				+94	+45	+102	+48	+127	+73	+146	+75	+179	+125	+198	+127

Bearing application
Tolerance classes for housing bores
Radial bearings

Table 4.3

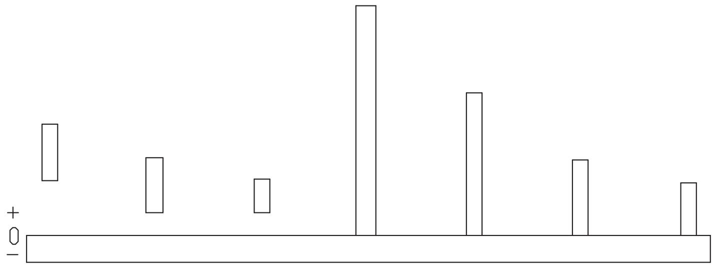
Solid housing Operating conditions	**Examples**	**Tolerance class symbol**	**Outer ring displacement**
Rotating outer ring load			
Heavy loads on bearings in thin-walled housings, heavy shock loads (P>0,12 C)	Roller bearing wheel hubs, connecting rod bearings	P7	Outer ring cannot be displaced
Normal and heavy loads (P>0,06 C)	Ball bearing wheel hubs, connecting rod bearings, crane traveling wheels	N7	
Light and variable loads (P≤0,06 C)	Conveyor rollers, rope sheaves, belt tension pulleys	M7	
Direction of load indeterminate			
Heavy shock loads	Traction motors	M7	Outer ring cannot be displaced
Normal and heavy loads (P>0,06 C) Outer ring displacement is not necessary	Electric motors, pumps, crankshaft main bearings	K7	

Split or solid housing Operating conditions	**Examples**	**Tolerance class symbol**	**Outer ring displacement**
Direction of load indeterminate			
Light and normal loads Desirable outer ring displacement (P≤0,12 C)	Medium-sized electric motors, pumps, crankshaft main bearings	J7	Outer ring cannot be displaced
Stationery outer ring load			
All kind of loads	General mechanical engineering, railway axleboxes	H7	Outer ring can be easily displaced
Light and normal loads with simple conditions (P≤0,12 C)		H8	
Heat conduction through shaft	Drying cylinders, large electrical machines with spherical roller bearings	G7	

ART BEARINGS

Bearing application Tolerance classes for housing bores Radial bearings Table 4.3 (continued)			
Split housing Operating conditions	**Examples**	**Tolerance class symbol**	**Outer ring displacement**
High accuracy rotation, quiet running			
High stiftness at variable loads	Main shafts for machine-tools with roller bearings	D≤125 M6 D>125 N6	The outer ring cannot be displaced.
Light loads, indeterminate load direction	Shaft operating surface for grinding machines with ball bearing, free bearing for high speed superchargers	K6	The outer ring cannot be displaced.
Desirable outer ring displacement	Shaft operating surface for grinding machines with ball bearing, free bearing for high speed superchargers	J6	The outer ring can be displaced.
Quiet running	Small-sized electrical machines	H6	The outer ring can be easily displaced

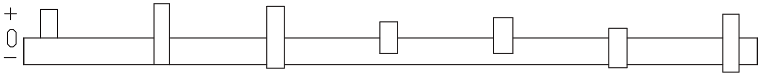
Tolerance classes for housing bores Thrust bearings Table 4.3 (continued)		
Thrust bearings Operating conditions	**Tolerance class symbol**	**Outer ring displacement**
Axial load		
Thrust ball bearings Cylindrical and needle roller thrust bearings	H8 H7 (H9)	For less accurate bearing arrangements, radial clearance in housing can be up to 0,001 D
Combined loads on spherical roller thrust bearings		
Local load on housing washer Peripheral load on housing washer	H7 (H9) M7	
Axial or combined load on spherical roller thrust bearings		
Bearing radial location is ensured by another bearing	-	Housing washer fitted with clearance up to 0,001 D



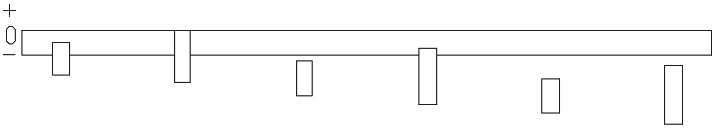
Bearing application
Housing fits

Table 4.4

Housing nominal diameter		Bearing Outside diameter tolerance		Deviations of housing bore diameter, resultant fits Tolerances														
D		Δd_{mp}			F7		G7		G6		H10		H9		H8		H7	
over	up to	low	high	a) Deviations (shaft diameter) b) Tightening/Theoretical clearance c) Tightening/Probable clearance														
mm		μm																
6	10	-8	0	a)	+13	+28	+5	+20	+5	+14	0	+58	0	+36	0	+22	0	+15
				b)	-13	-36	-5	-28	-5	-22	0	-66	0	-44	0	-30	0	-23
				c)	-16	-33	-8	-25	-7	-20	-3	-63	-3	-41	-3	-27	-3	-20
10	18	-8	0		+16	+34	+6	+24	+6	+17	0	+70	0	+43	0	+27	0	+18
					-16	-42	-6	-32	-6	-25	0	-78	0	-51	0	-35	0	-26
					-19	-39	-9	-29	-8	-23	-3	-75	-3	-48	-3	-32	-3	-23
18	30	-9	0		+20	+41	+7	+28	+7	+20	0	+84	0	+52	0	+33	0	+21
					-20	-50	-7	-37	-7	-29	0	-93	0	-61	0	-42	0	-30
					-23	-47	-10	-34	-10	-26	-4	-89	-4	-57	-3	-39	-3	-27
30	50	-11	0		+25	+50	-9	+34	+9	+25	0	+100	0	+62	0	+39	0	+25
					-25	-61	-9	-45	-9	-36	0	-111	0	-73	0	-50	0	-36
					-29	-57	-13	-41	-12	-33	-5	-106	-5	-68	-4	-46	-4	-32
50	80	-13	0		+30	+60	+10	+40	+10	+29	0	+120	0	+74	0	+46	0	+30
					-30	-73	-10	-53	-10	-42	0	-133	0	-87	0	-59	0	-43
					-35	-68	-15	-48	-14	-38	-6	-127	-5	-82	-5	-54	-5	-38
80	120	-15	0		+36	+71	+12	+47	+12	+34	0	+140	0	+87	0	+54	0	+35
					-36	-86	-12	-62	-12	-49	0	-155	0	-102	0	-69	0	-50
					-41	-81	-17	-57	-17	-44	-7	-148	-6	-96	-6	-63	-5	-45
120	150	-18	0		+43	+83	+14	+54	+14	+39	0	+160	0	+100	0	+63	0	+40
					-43	-101	-14	-72	-14	-57	0	-178	0	-118	0	-81	0	-58
					-50	-94	-21	-65	-20	-51	-8	-170	-8	-110	-7	-74	-7	-51
150	180	-25	0		+43	+83	+14	+54	+14	+39	0	+160	0	+100	0	+63	0	+40
					-43	-108	-14	-79	-14	-64	0	-185	0	-125	0	+88	0	-65
					-51	-100	-22	-71	-21	-57	-11	-174	-10	-115	-10	-78	-8	-57
180	250	-30	0		+50	+96	+15	+61	+15	+44	0	+185	0	+115	0	+72	0	+46
					-50	-126	-15	-91	-15	-74	0	-215	0	-145	0	-102	0	-76
					-60	-116	-25	-81	-23	-66	-13	-202	-13	-132	-12	-90	-10	-66
250	315	-35	0		+56	+108	-17	+69	+17	+49	0	+210	0	+130	0	+81	0	+52
					-56	-143	-17	-104	-17	-84	0	-245	0	-165	0	-116	0	-87
					-68	-131	-29	-92	-26	-75	-16	-229	-15	-150	-13	-103	-12	-75
315	400	-40	0		+62	+119	+18	+75	+18	+54	0	+230	0	+140	0	+89	0	+57
					-62	-159	-18	-115	-18	-94	0	-270	0	-180	0	-129	0	-97
					-75	-146	-31	-102	-29	-83	-18	-252	-17	-163	-15	-114	-13	-84
400	500	-45	0		+68	+131	+20	+83	+20	+60	0	+250	0	+155	0	+97	0	+63
					-68	-176	-20	-128	-20	-105	0	-295	0	-200	0	-142	0	-108
					-83	-161	-35	-113	-32	-93	-20	-275	-19	-181	-17	-125	-15	-93



Bearing application Housing fits																	Table 4.4 (continued)
Housing nominal diameter		**Bearing Outside diameter tolerance**		**Deviations of housing bore diameter, resultant fits Tolerances**													
D		**Δd$_{mp}$**		**H6**		**J7**		**JS7**		**J6**		**JS6**		**K6**		**K7**	
over	up to	low	high	a) Deviations (shaft diameter) b) Tightening/Theoretical clearance c) Tightening/Probable clearance													
mm		µm															
6	**10**	**-8**	**0**	a)0	+9	-7	+8	-7,5	+7,5	-4	+5	-4,5	+4,5	-7	+2	-10	+5
				b)0	-17	+7	+16	+7,5	-15,5	+4	-13	+4,5	-12,5	+7	-10	+10	-13
				c)-2	-15	+4	-13	+5	-13	+2	-11	+3	-11	+5	-8	+7	-10
10	**18**	**-8**	**0**	0	+11	-8	+10	-9	+9	-5	+6	-5,5	+5,5	-9	+2	-12	+6
				0	-19	+8	-18	+9	-17	+5	-14	+5,5	-13,5	+9	-10	+12	-14
				-2	-17	+5	-15	+6	-14	+3	-12	+3	-11	+7	-8	+9	-11
18	**30**	**-9**	**0**	0	+13	-9	+12	-10,5	+10,5	-5	+8	-6,5	+6,5	-11	+2	-15	+6
				0	-22	+9	-21	+10,5	-19,5	+5	-17	+6,5	-15,5	+11	-11	+15	-15
				-3	-19	+6	-18	+7	-16	+2	-14	+4	-13	+8	-8	+12	-12
30	**50**	**-11**	**0**	0	+16	-11	+14	-12,5	+12,5	-6	+10	-8	+8	-13	+3	-18	+7
				0	-27	+11	-25	-12,5	-23,5	+6	-21	+8	-19	+13	-14	+18	-18
				-3	-24	+7	-21	+9	-20	+3	-18	+5	-16	+10	-11	+14	-14
50	**80**	**-13**	**0**	0	+19	-12	+18	-15	+15	-6	+13	-9,5	+9,5	-15	+4	-21	+9
				0	-32	+12	-31	+15	-28	+6	-26	+9,5	-22,5	+15	-17	+21	-22
				-4	-28	+7	-26	+10	-23	+2	-22	+6	-19	+11	-13	+16	-17
80	**120**	**-15**	**0**	0	+22	-13	+22	-17,5	+17,5	-6	+16	-11	+11	-18	+4	-25	+10
				0	-37	+13	-37	+17,5	-32,5	+6	-31	+11	-26	+18	-19	+25	-25
				-5	-32	+8	-32	+12	-27	+1	-26	+6	-21	+13	-14	+20	-20
120	**150**	**-18**	**0**	0	+25	-14	+26	-20	+20	-7	+18	-12,5	+12,5	-21	+4	-28	+12
				0	-43	+14	-44	+20	-38	+7	-36	+12,5	-30,5	+21	-22	+28	-30
				-6	-37	+7	-37	+13	-31	+1	-30	+7	-25	+15	-16	+21	-23
150	**180**	**-25**	**0**	0	+25	-14	+26	-20	+20	-7	+18	-12,5	+12,5	-21	+4	-28	+12
				0	-50	+14	-51	+20	-45	+7	-43	+2,5	-37,5	+21	-29	+28	-37
				-7	-43	+6	-43	+12	-37	0	-36	+6	-31	+14	-22	+20	-29
180	**250**	**-30**	**0**	0	+29	-16	+30	-23	+23	-7	+22	-14,5	+14,5	-24	+5	-33	+13
				0	-59	+16	-60	+23	-53	+7	-52	+14,5	-44,5	+24	-35	+33	-43
				-8	-51	+6	-50	+13	-43	-1	-44	+6	-36	+16	-27	+23	-33
250	**315**	**-35**	**0**	0	+32	-16	+36	-26	+26	-7	+25	-16	+16	-27	+5	-36	+16
				0	-67	+16	-71	+26	-61	+7	-60	+16	+51	+27	-40	+36	-51
				-9	-58	+4	-59	+14	-49	-2	-51	+7	-42	+18	-31	+24	-39
315	**400**	**-40**	**0**	0	+36	-18	+39	-28,5	+28,5	-7	+29	-18	+18	-29	+7	-40	+17
				0	-76	+18	-79	+28,5	-68,5	+7	-69	+18	-58	+29	-47	+40	-57
				-11	-65	+5	-66	+15	-55	-4	-58	+7	-47	+18	-36	+27	-44
400	**500**	**-45**	**0**	0	+40	-20	+43	-31,5	+31,5	-7	+33	-20	+20	-32	+8	-45	+18
				0	-85	+20	-88	+31,5	-76,5	+7	-78	+20	-65	+32	-53	+45	-63
				-12	-73	+5	-73	+17	-62	-5	-66	+8	-53	+20	-41	+30	-48



Bearing application
Housing fits

Table 4.4 (continued)

Housing nominal diameter		Bearing Outside diameter tolerance		Deviations of housing bore diameter, resultant fits Tolerances											
D		Δd_{mp}		M6		M7		N6		N7		P6		P7	
over	up to	low	high	a) Deviations (shaft diameter) b)Tightening/Theoretical clearance c) Tightening/Probable clearance											
mm		µm													
6	**10**	**-8**	**0**	a)-12	-3	-15	0	-16	-7	-19	-4	-21	-12	-24	-9
				b)+12	-5	+15	-8	+16	-1	+19	-4	+21	+4	+24	+1
				c)+10	-3	+12	-5	+14	+1	+16	-1	+19	+6	+21	+4
10	**18**	**-8**	**0**	-15	-4	-18	0	-20	-9	-23	-5	-26	-15	-29	-11
				+15	-4	+18	-8	+20	+1	+23	-3	+26	+7	+29	+3
				+13	-2	+15	-5	+18	+3	+20	0	+24	+9	+26	+6
18	**30**	**-9**	**0**	-17	-4	-21	0	-24	-11	-28	-7	-31	-18	-35	-14
				+17	-5	+21	-9	+24	+2	+28	-2	+31	+9	+35	+5
				+14	-2	-18	-6	+21	+5	+25	+1	+28	+12	+32	+8
30	**50**	**-11**	**0**	-20	-4	-25	0	-28	-12	-33	-8	-37	-21	-42	-17
				+20	-7	+25	-11	+28	+1	+33	-3	+37	+10	+42	+6
				+17	-4	+21	-7	+25	+4	+29	+1	+34	+13	+38	+10
50	**80**	**-13**	**0**	-24	-5	-30	0	-33	-14	-39	-9	-45	-26	-51	-21
				+24	-8	+30	-13	+33	+1	+39	-4	+45	+13	+51	+8
				+20	-4	+25	-8	+29	+5	+34	+1	+41	+17	+46	+13
80	**120**	**-15**	**0**	-28	-6	-35	0	-38	-16	-45	-10	-52	-30	-59	-24
				+28	-9	+35	-15	+38	+1	+45	-5	+52	+15	+59	+9
				+23	-4	+30	-10	+33	+6	+40	0	+47	+20	+54	+14
120	**150**	**-18**	**0**	-33	-8	-40	0	-45	-20	-52	-12	-61	-36	-68	-28
				+33	-10	+40	-18	+45	+2	+52	-6	+61	+18	+68	+10
				+27	-4	+33	-11	+39	+8	+45	+1	+55	+24	+61	+17
150	**180**	**-25**	**0**	-33	-8	-40	0	-45	-20	-52	-12	-61	-36	-68	-28
				+33	-17	+40	-25	+45	-5	+52	-13	+61	+11	+68	+3
				+26	-10	+32	-17	+38	+2	+44	-5	+54	+18	+60	+11
180	**250**	**-30**	**0**	-37	-8	-46	0	-51	-22	-60	-14	-70	-41	-79	-33
				+37	-22	+46	-30	+51	-8	+60	-16	+70	+11	+79	+3
				+29	-14	+36	-20	+43	0	+50	-6	+62	+19	+69	+13
250	**315**	**-35**	**0**	-41	-9	-52	0	-57	-25	-66	-14	-79	-47	-88	-36
				+41	-26	+52	-35	+57	-10	+66	-21	+79	+12	+88	+1
				+32	-17	+40	-23	+48	-1	+54	-9	+70	+21	+76	+13
315	**400**	**-40**	**0**	-46	-10	-57	0	-62	-26	-73	-16	-87	-51	-98	-41
				+46	-30	+57	-40	+62	-14	+73	-24	+87	+11	+98	+1
				+35	-19	+44	-27	+51	-3	+60	-11	+76	+22	+85	+14
400	**500**	**-45**	**0**	-50	-10	-63	0	-67	-27	-80	-17	-95	-55	-108	-45
				+50	-35	+63	-45	+67	-18	+80	-28	+95	+10	+108	0
				+38	-23	+48	-30	+55	-6	+65	-13	+83	+22	+93	+15

Deviations of form and position

Permissible deviations of form and position for shaft and housing where bearings will be mounted are given in fig. 4.3 and table 4.5

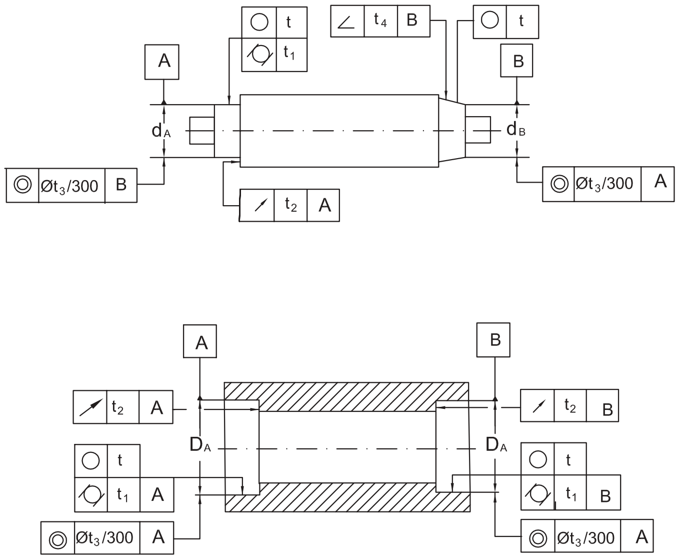


Fig. 4.3

Table 4.5

Tolerance name	Fit	Symbol of deviation	Permissible deviations depending on the tolerance class					
				P0 P6X	P6	P5	P4 (SP)	P2 (UP)
Tolerance of dimension	shaft		-	IT6(IT5)	IT5	IT4	IT4	IT3
	housing			IT7(IT6)	IT6	IT5	IT4	IT4
Tolerance of roundness and cylindricity	shaft	○ ⌭	t, t_1	IT4/2 (IT3/2)	IT3/2 (IT2/2)	IT2/2	IT1/2	IT0/2
	housing		t, t_1	IT5/2 (IT4/2)	IT4/2 (IT2/2)	IT3/2	IT2/2	IT1/2
Tolerance of face runout	shaft	↗	t_2	IT4(IT3)	IT3(IT2)	IT2	IT1	IT0
	housing			IT5(IT4)	IT4(IT3)	IT3	IT2	IT1
Tolerance of concentricity	shaft	◎	t_3	IT5	IT4	IT4	IT3	IT3
	housing			IT6	IT5	IT5	IT4	IT3
Tolerance of angularity	shaft	∠	t_4	IT7/2	IT6/2	IT4/2	IT3/2	IT2/2

In case of bearings on which adapter or withdrawal sleeves are to be mounted, the shaft tolerances for deviations of form and position should be to IT5/2 tolerance class for shafts with diameter tolerance h9 and IT7/2 for shaft tolerance h10.

Surface roughness of bearing seating is given in table 4.6.

Shaft and housing mounting surfaces roughness						Table 4.6
Bearing tolerance class	**Shaft**			**Housing**		
	Diameter d, mm			**Diameter D, mm**		
	≤ 80	**>80...500**	**> 500**	**≤ 80**	**> 80... 500**	**> 500**
Roughness Ra, [μm]						
P0, P6X and P6	0,8 (N6)	1,6 (N7)	3,2 (N8)	0,8 (N6)	1,6 (N7)	3,2 (N8)
P5, SP and P4	0,4 (N5)	0,8 (N6)	1,6 (N7)	0,8 (N6)	1,6 (N7)	1,6 (N7)
P2 and UP	0,2 (N4)	0,4 (N5)	0,8 (N6)	0,4 (N5)	0,8 (N6)	0,8 (N6)

If bearings are mounted with adapter or withdrawal sleeves, shaft surface roughness should be of max. Ra = 1,6 μm

The values of fundamental tolerances – ISO (tolerance classes IT0...IT12) are given in table 4.7.

Tolerance ISO (IT) Table 4.7													
Nominal dimension													
over	**1**	**3**	**6**	**10**	**18**	**30**	**50**	**80**	**120**	**180**	**250**	**315**	**400**	**500**
up to	**3**	**6**	**10**	**18**	**30**	**50**	**80**	**120**	**180**	**250**	**315**	**400**	**500**	**630**
mm	Tolerances in micrometers (0,001 mm)													
IT0	0,5	0,6	0,6	0,8	1	1	1,2	1,5	2	3	4	5	6	
IT1	0,8	1	1	1,2	1,5	1,5	2	2,5	3,5	4,5	6	7	8	
IT2	1,2	1,5	1,5	2	2,5	2,5	3	4	5	7	8	9	10	
IT3	2	2,5	2,5	3	4	4	5	6	8	10	12	13	15	
IT4	3	4	4	5	6	7	8	10	12	14	16	18	20	
IT5	4	5	6	8	9	11	13	15	18	20	23	25	27	29
IT6	6	8	9	11	13	16	19	22	25	29	32	36	40	44
IT7	10	12	15	18	21	25	30	35	40	46	52	57	63	70
IT8	14	18	22	27	33	39	46	54	63	72	81	89	97	110
IT9	25	30	36	43	52	62	74	87	100	115	130	140	155	175
IT10	40	48	58	70	84	100	120	140	160	185	210	230	250	280
IT11	60	75	90	110	130	160	190	220	250	290	320	360	400	440
IT12	100	120	150	180	210	250	300	350	400	460	520	570	630	700

Bearing axial location

Axial location of the bearing is necessary for a proper guiding of bearing in an assembly under operation.

A tight fit is inadequate for the axial location of bearing. In case of locating bearings, axial location for both rings is generally needed. Some important solutions of bearing axial location, on shaft or into the housing are shown in Fig. 4.4.

In case of bearings with light axial loads, bearings can be located using a lock nut and a lock washer (a), an end plate fastened by a screw at the shaft end (b) and, for bearings carrying light axial loads, by lock rings mounted in shaft and housing grooves (c).

Bearing with NR design, with groove and snap ring on the outer ring, can be easily located by the lock ring (d). Tapered roller bearings can be located by supporting the inner ring on the shaft shoulder and the outer ring with a threaded ring and a safety plate fastened by a screw (e).

Tapered bore bearings can be mounted and axially located by adapter or withdrawal sleeves (f,g).

The axial load carrying capacity of the bearings mounted with adapter or withdrawal sleeves is governed by the friction between shaft and sleeve (g).

To locate radial bearings, where axial adjustment of the shaft is required, setting washers (i) or spacer rings (i) are used between the outer rings, the width of the spacer ring being experimentally determined, during mounting.

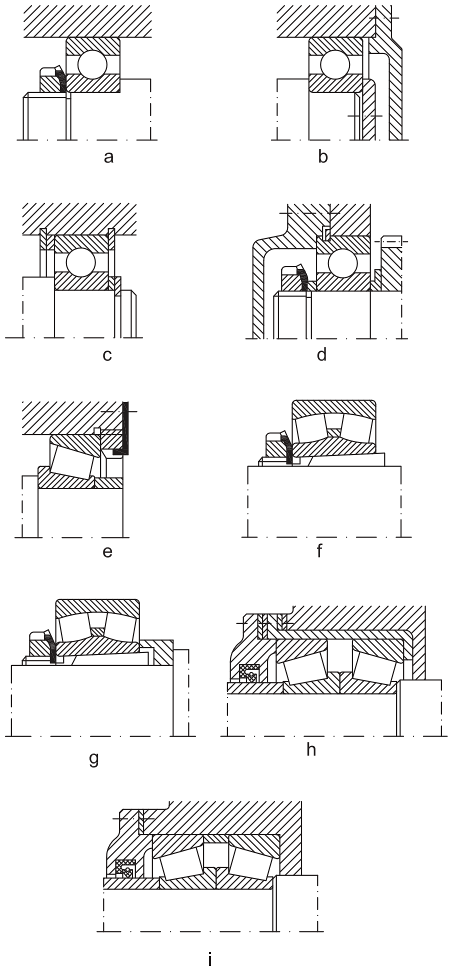


Fig. 4.4

Bearing sealing

Seals are used in most of bearing arrangements and they must ensure the conditions of a proper operation.

For such a purpose, they have to prevent solid contaminants (dust, hard particles, water, aggressive substances etc) from penetrating into the bearing and at the same time to retain the lubricant in the bearing.

Seals for rolling bearings can be classified considering some important criteria such as: design, operations, type of lubricant etc.

Considering their design and operation, seals can be: stationary seals between the stationary bearing elements (housing and cover), rotary seals, between the rotating bearing elements and they also can be rubbing seals or non-rubbing seals, which are used in special applications (surrounding conditions and loading stress).

Rotary non-rubbing seals are often used due to their simple design. They are particularly used at high speeds or temperature, both for grease and oil, and have practically no friction and do not wear.

In case of bearing grease lubrication, bearing operating temperature must be lower with 20°C than the dropping point of the grease (melting temperature).

The main constructive types of rotary non-rubbing seals have narrow gaps, labyrinths and their combinations are shown in fig 4.5 a-c.

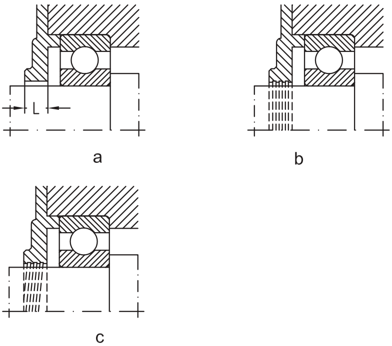


Fig. 4.5

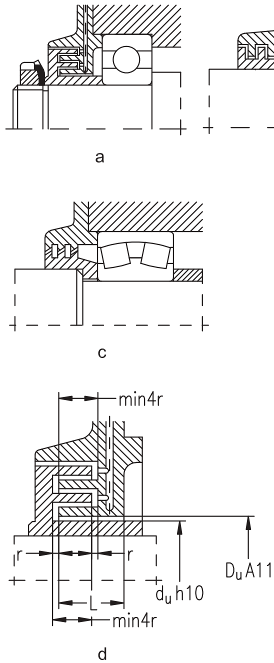


Fig. 4.6

Gap seals represent the simplest constructive solution for a rotary non-rubbing seal which have to retain grease in the bearing housing. The efficacy of sealing depends on the gap length (L) and the clearance between shaft and housing. It can be improved by providing one or more circular grooves on the shaft or in the housing, which are to be filled with grease (b). In case of oil lubrication, the grooves on the shaft must be helical (c) and their direction must be the same with the direction on the shaft rotary movement.

Experiments proved that most favorable clearance is obtained between the limits of the fit A11/h10, geometrical deviations should be IT6 and gap surface roughness Ra=12,6 µm.

Labyrinth seals are used at high peripheral speeds, in impure surroundings.

They are shows in fig. 4.6 a-d.

The labyrinths are spaces where periodically water-in-soluble grease (e.g. Lithium or Calcium base grease) is to be supplied.

The tongues of the labyrinth seals can be radially (a), axially (b) arranged or they can have inclined passages.

Details of an axial labyrinth design are given in fig. 4.6 d and values of axial clearance and length L are given in table 4.8.

In case of rotary rubbing seals there is a direct contact between elastic seal element and the rotating element. They are shown in fig. 4.8.

When selecting the proper rotary rubbing seal, the following factors have to be considered: material and its elasticity (felt, rubber, plastics, leather, graphite, asbestos etc.); resistance at various temperatures, maximum peripheral speeds on sealing surface; sealing direction etc.

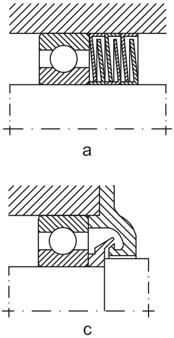


Fig. 4.7

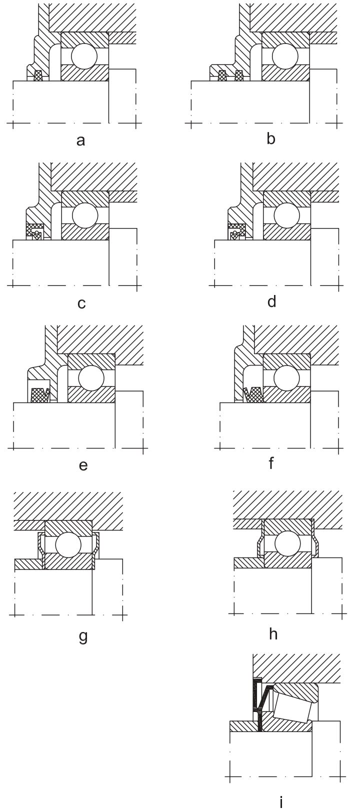


Fig. 4.8

These systems have sealing properties higher than those corresponding to non-rubbing seals. In case of grease lubrication at peripheral speeds higher than 4m/s and temperatures over +100°C, felt ring seals (a) are frequently used because of their simple design and cheapness.

Before mounting, felt rings are impregnated during one hour with a mixture of mineral oil (66%) and paraffin (34%), at a temperature of +70...+80°C so that sealing properties are improved as the friction is reduced.

At higher temperatures and peripheral speeds over 12 m/s, surface roughness is Ra=1,6 μm and the space between the ends of the seal should be filled with grease. Two felt rings can be used for sealing.

Rubbing seals with a spring incorporated are preferably to be used in case of oil lubricated bearings which are operated under peripheral speeds of 5-10 m/s, temperatures between -40°C and +20°C. Their efficacy depends on the material and operating surroundings.

In most cases, rubbing seals with a spring incorporated are made of synthetic rubber and have a metallic hardering fixture.

Inclined sealing surfaces are recommended to be ground Ra=0,8 μm and hardened at 45 HRC, when operating at peripheral speeds over 8 m/s. Lubricant outflow can be stopped by mounting the rubbing seal with incorporated spring with edge inwards (c) or outwards (d) if sealing has to prevent dust or other impurities from penetrating into the bearing.

Double sealing with these rubbing seals can also be used.

V-ring seal is used to prevent dust or contaminants from penetrating into the bearing with best results both in case of grease or oil lubrication. The elastic rubber lip of the V-ring seal is notched on the plane sealing surface, drawing the fluids in centrifugal motion. V-ring seals are used at temperatures of -40°C,,,+100°C roughness of sealing surface being Ra=1,5 – 3 μm. Generally, at peripheral speeds up to 15 m/s, the V-ring seal operates as a rubbing seal (seal lip reaches sealing surface), and at peripheral speeds over 15 m/s the seal lip will lift from the sealing surface, operating as a centrifugal sealing.

V-ring seals can also be used in case of angular misalignment of the shaft (2°C... 3°C) as they are made of high quality, elastic rubber, easy to be mounted.

The efficacy of sealing depends on the fact that the body ring acts as a flinger for dirt and fluids. Therefore, with grease lubrication the seal is generally arranged outside the housing and with oil lubrication it is placed inside the housing.

Pressed sheet washers provide simple, inexpensive and space-saving sealing especially for grease lubricated deep groove ball bearings. The washers are clamped against either the outer ring or the inner ring and exert a resilient pressure axially against the rubbing ring. In case of usual applications, the types of seals mentioned above or their combinations shown in fig. 4.9 are used, some of them becoming standard seals for rolling bearings (e.g. labyrinths, felt rings, V-rings etc). Thus, better sealing can be obtained if felt ring (a) or V-ring (b) rubbing seals are combined with radial or axial labyrinth non-rubbing seals.

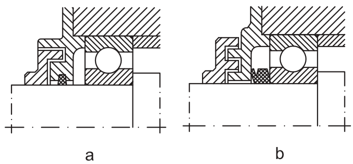


Fig. 4.9

Special seals are used in case of unusual surroundings and loading conditions (e.g. rolling mills, helm of ocean-vessels, main shaft of grinding machines etc).

Sealed bearings of the type 2RS (2RSR) (a) or shielded bearings of the type 2Z (2ZR) (b) shown in fig. 4.10 a.b. provide simple and inexpensive sealing, with upper operating results. These rolling bearings are delivered ready greased, provision for relubrication and maintenance are not needed. They are used in case of bearings with small free space where other seals cannot be used.

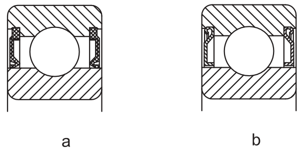


Fig. 4.10

Bearing lubrication

Safe operating and long rating life of bearings depend on the lubricant type and quality and on the lubrication method. Bearing lubrication in used for certain purposes, such as:

- to reduce friction between rolling elements and raceway, rolling elements and cage
- to reduce friction between rolling elements and raceway, rolling elements and cage, cage and guiding ribs of rings during operation;
- to ensure anticorrosive protection of bearings;
- to reduce noise in bearing within certain limits;
- to distribute heat uniformly in contact areas and to remove it outside through lubricant circulation.

Lubricants for bearings lubrication should satisfy the following conditions:

- they should have physical and chemical stability;
- foreign mechanical substances (abrasive, metallic substances etc.) are not admitted in lubricant;
- they should have a minimal coefficient of friction;
- to be non-corrosive;
- good unctuosity (lubricating capacity).

There are two categories of lubricants used for bearing lubrication:

- fluid lubricants (oils);
- plastic lubricants (greases).

Table 5.1 shows comparison between fluid and plastic lubricants.

Although fluid lubricants have better characteristics than plastic lubricants, they cannot be used in all cases because of sealing difficulties.

Comparative values for lubricants Table 5.1

Characteristics	**Lubricant**	
	Fluid	**Plastic**
speed	any value	low and medium
friction	low (reduced)	high
unctuosity	excellent	good
service life	long	short
cooling effect	high	low
replacement	easy	difficult

Selection of lubricants

When selecting lubricants, much care is needed and all operating conditions and lubricant properties should be considered.

No lubrication system can be considered universal. The most important criteria when selecting a lubricant have to be as follows:

- size of bearing
- speed
- load
- bearing operating temperature

These characteristic act upon lubricant viscosity as follows:

- the higher the bearing size, value of load and temperature, the higher the viscosity
- bearing speed acts by product $\boldsymbol{D_m * n}$, as show in table 5.2.

Corelation between $D_m * n$ and lubrificant type Table 5.2

$D_m * n$ **over**	**up to**	**Lubricant type**
-	$150x10^3$	Mineral oil and grease with medium or high viscosity
$150x10^3$	$300x10^3$	Mineral oil with medium viscosity and grease
$300x10^3$	$500x10^3$	Mineral oil with low viscosity and grease
$500x10^3$	$1200x10^3$	Mineral oil with low viscosity and lubricating equipment

Grease lubrication

Grease can be used to lubricate rolling bearings only when product $\boldsymbol{D_m * n} \leq 500x10^3$ and it offers the following advantages:

- bearing speed acts by product Dm n, as show in table 5.2.
- it is more easily retained in the bearing;
- it assures anti-corrosive protection to bearing as it is water-resistant;
- low expenses for sealing.

The grease quantity to be supplied shouldn't be excessive, otherwise rotation is bracket, friction increases and also operating temperature without extending the bearing rating life.

The quantity of grease that is to be inserted in bearing seating should be as follows, considering the free space inside the housing:

-1/2... 3/4 of the free space in the housing, in case of normal speeds;

-1/3 of the free space in the housing, in case of high speeds and speed limit;

- whole housing freespace should be free, in case of low speeds and product $\boldsymbol{D_m * n} < 10\text{x}10^3$.

The quantity of grease can be calculated as a function of bearing bore diameter using the equation:

$G = K\, d^{2,5}$, g.

where:

K= 1/900 - for ball bearings

K= 1/350 - for roller bearings

d = bore diameter, mm

Relubrication intervals in most cases can be experimentally determined and depend on:

- bearing type
- bearing size
- operating temperature
- grease properties

Grease service life and rubricating interval can be calculated from:

$$Tur = k_0 \left(\frac{14 \cdot 10^6}{n\sqrt{d}} - 4d\right) f_1 f_2,$$

where:

T_{ur} = service life or rubricating interval, in operating hours

k_0 = coefficient depending on the bearing type, table 5.3

n = speed, r/min

d = bore diameter, mm

f_1 = temperature factor, table 5.4

f_2 = factor depending on the operating conditions, table 5.5

Low values are valid for deep groove ball bearings with shields, 2Z type, or with seals, 2RS type, series 60, 62 and 63.

Bearing relubrication interval can be also determined using the chart - fig. 5.1, as a function of bearing type, bore diameter and speed.

Example:

A bearing 6208-2RSR is operated under reduced load (it is not considered for calculation), at a speed n = 1500 r/min, at a temperature of +60 deg C, light operating conditions. What is the grease service life and relubrication interval?

Grease service life will be:

$T_u = k_0 \cdot (\frac{14\times10^6}{n\sqrt{d}} \cdot 4d) f_1 f_2$ =32 893 hours.

k_0 = 25, from table 5.3

d = 40 mm

f_1 = 1, from table 5.4

f_2 = 1, from table 5.5

Relubrication interval:

$T_r = k_0 \cdot (\frac{14\times10^6}{n\sqrt{d}} \cdot 4d) f_1 f_2$ =13 157 hours.

k_0 = 10, from table 5.3

f_1, f_2 = 1, from tables 5.4, 5.5.

The grease quantity to be supplied can be determined using the equation:

G = K D B, g,

Values for coefficient k_0 — Table 5.3

Bearing type	**Value of k_0**	
	Relubrication interval	**Grease service life**
Angular contact ball bearings Tapered roller bearings Thrust ball bearings	1	2
Cylindrical roller bearings	5	15
Deep groove ball bearings	10	20...40

Values for factor f1 — Table 5.4

Temperature	70⁰C	85°C	100°C
Factor f1	1	0,5	0,25

Values for factor f_2 Table 5.5				
Operating conditions	**Light**	**Moderate**	**Heavy**	**Very heavy**
Factor f_2	1	0,7...0,9	0,4...0,7	0,1...0,4

Values for coefficient K Table 5.6	
Relubrication interval	**K**
weekly	0,0015...0,0020
monthly	0,0020...0,0030
yearly	0,0030...0,0045
after 2...3 years	0,0045...0,0055

From the diagram fig. 5.1, the value of the relubrication interval will be of 13500 operating hours.

where:

G = grease quantity, g

K = coefficient depending on the relubrication interval, table 5.6

D = bearing outside diameter, mm

B = total bearing width for radial bearings, mm and total bearing height for thrust bearings, mm

The chart in fig. 5.1 applies to operating temperatures which do not exceed +70°C. For operating temperatures over +70°C, see table 5.4. Grease service life can be defined as the period of time when it preserves physical and mechanical characteristics in time and oxidizing due to temperature and vaporization of base oil doesn't occur.

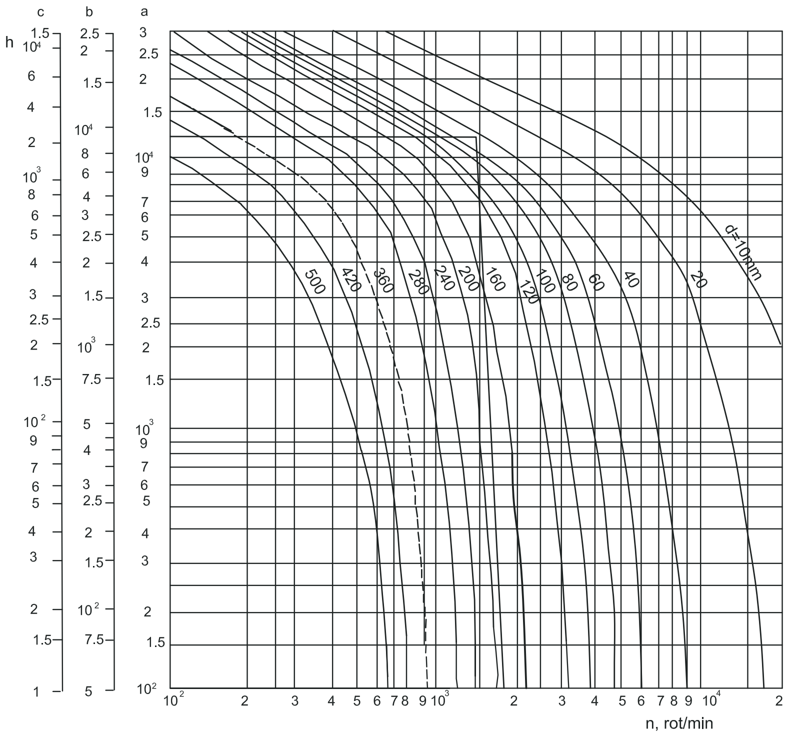


Fig. 5.1

Scale a; deep groove ball bearings
Scale b; cylindrical roller bearings
Scale c; spherical roller bearings, thrust ball bearings, cylindrical roller bearings without cage.

A more accurate calculation of grease service life, considering grease quality and bearing operating conditions (load, size, speed, temperature etc.) can be done using the equation:

$$L = 10^{a-(m_1+m_2+m_3)}$$

where:

L = service life, operating hours

a = exponent depending on the grease quality (a=5,8... 6,1)

m1... m3 = exponents which take into account the following factors:

m_1 = 4,4 x 10^{-8} $\boldsymbol{D_m * n}$,

m_2 = 2,5 (P/C - 0,05),

m_3 = (0,021 - 1,80 x 10^{-6} $\boldsymbol{D_m * n}$) t,

D_m = bearing mean diameter, mm

n = bearing speeds, r/min,

P = equivalent radial load, kN,

C = basic dynamic load, kN,

t = bearing operating temperature, °C

When calculating the values of t, $\boldsymbol{D_m * n}$ and P/C, the following have to be considered:

- when bearing operating temperature is lower than +50°C, then t = +50°C
- when speed factor $\boldsymbol{D_m * n} < 125000$, then $\boldsymbol{D_m * n} = 125000$
- when ratio P/C < 0,05, then P/C = 0,05

Grease service life, as a function of operating temperature can be approximately determined using the diagram fig. 5.2.

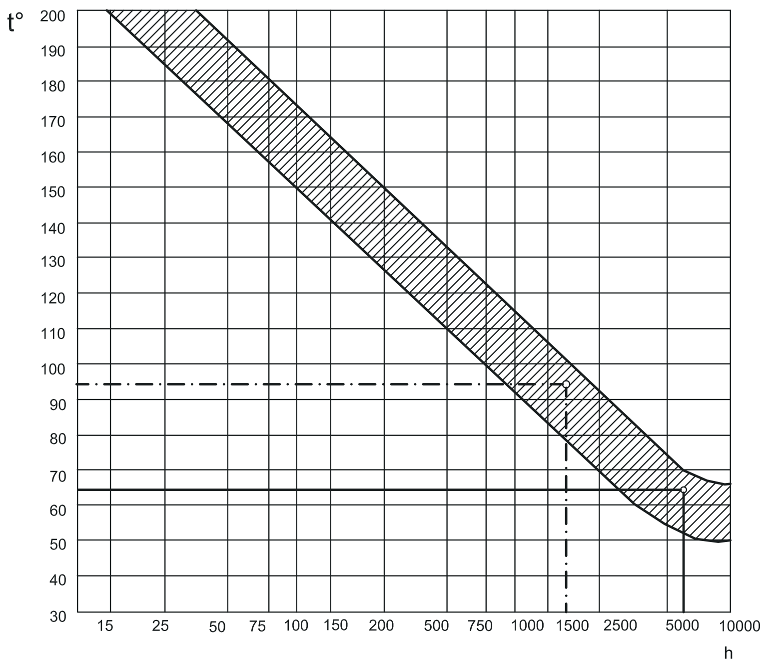


Fig. 5.2

Example 1

A bearing 6210 operates under a load Pr = 5 kN, speed n = 3000 r/min at an operating temperature t = 50^0C. What is the service life of the grease used for bearing lubrication?

Cr = 35,1 kN, tables on page 100. bearing 6210
$L = 10^{a-(m_1+m_2+m_3)} = 10^{6,1-2,273} = 6214$ hours
a = 6,1, for Mobil grease,
$D_m * n = 65x3000 = 195x10^3$
Pr/Cr = 5/35,1 = 0,143
$m_1 = 4,4 \times 10^{-6}\, D_m * n = 0,858$
$m_2 = 2,5\,(Pr/Cr - 0,05) = 0,23$
$m_3 = (0,021 - 1,80 \times 10^{-8}\, D_m * n)\, 65 = 1,119$

Example 2

For the same bearing and operating conditions as in Example 1, it is required to find the service life of the same grease at a temperature of t = 95°C.

$m_3 = 1,66$
$m_1 + m_2 + m_3 = 2,794$
$L = 10^{6,1-2,794} = 10^{3,306} = 1774$ operating hours

From the diagram fig. 5.2, we can find approximately the same value, respectively 6000 operating hours at + 65°C and 170° operating hours at +95°C.

Table 5.7 shows technical characteristics of usual grease, which are recommended for lubrication of sealed and shielded bearings, 2RS and 2Z types and also for rolling bearings in various assembled and machines.

Technical characteristics for usual greases for bearing lubrication

Table 5.7

Application	Thickener	Base Oil Viscosity @40°C	NLGI	Operating temperature range	Grease
General purpose industrial use, normal operation condition	Lithium	150	2	-30…+120	Mobilux EP2
	Lithium	100	3	-20...+130	Shell Gadus S2 V100 3
High temperatures and speeds. Long life. Low-noise performance (electric motors).	Polyureea	113	2	-20…+160	Mobil Polyrex™ EM
	Polyureea , EP	220	2	-20…+160	Shell Gadus S3 T220 2
High load, low-medium speed (cement, steel, crushers)	Lithium, EP	540	-	-20…+140	Klüberlub BE 41- 542
	Litium complex, EP	460	2	-20…+140	Mobilgrease XHP 462
	Litium complex, EP	460	2	-20…+150	Shell Gadus S3 V460 2
High temperature	Polyureea	100	2	-40…+180	Shell Gadus S5 T100 2
	Polyureea, EP	150	2	-40…+175	Mobil Polyrex EP2
	Polyureea	80	-	-40…+180	Klübersynth BQP 72-82
High-speed and spindle bearing grease	Polyureea	22	-	-50…+120	Klüberspeed BF 72-22
Low noise, high purity	Polyureea	72	-	-45…+180	Klüberquit BQ 72-72

When selecting a grease, following properties should be analyzed (thickener type, oil viscosity, operating conditions and application, NLGI grade -consistency).

Also, consult very carefully grease data sheet.

Oil lubrication

Oil lubrication can be used in any operating condition, but this kind of lubrication is compulsory when the value of the product $D_m * n$ from table 5.2 is exceeded for grease, namely $D_m * n$ >500 x 10^3 and when high temperatures occur in bearing. Then, oil has to lubricate and to remove heat from bearing.

Oils used for bearing lubrication can be:

- mineral oils, used up to a temperature of +150°C.
- synthetic oils, used up to a temperature of +220°C.

For a proper lubrication of bearings, low quantities of lubricants to reach the rolling elements are needed.

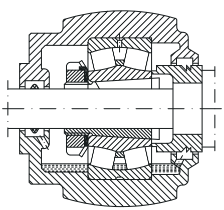
The lubricating systems must provide oil quantity necessary to prevent oil draining from bearing and heat removal in case of high speeds.

Most usual oil lubricating systems depending on factor $D_m * n$ are given in tables 5.8.

Oil lubricating systems

Table 5.8

Lubricating system	Operating conditions	Factor $D_m * n$	Oil viscosity at 40°C	Example in fig.
			m^2/s	
Oil bath	Bath is filled up to the lowest rolling element for horizontal shaft and 70-80% of bath width for vertical shaft	< 250 x 10^3	(17...300) x 10^{-6}	5.3 a), b)
Oil bath with external circulation	Central tank, oil circulates under a pressure of 1,5 MPa. High speeds.	< 600 x 10^3	(45...175) x 10^{-6}	5,4
Oil injection	Oil is injected into the operating area under a pressure of 0,1...0,5 MPa, with flow capacity of 0,5...10 l/min depending on temperature. Heavy loads and high speeds.	< 900 x 10^3	(13,5...80) x 10^{-6}	5,5
Oil spot	Oil in air current under a pressure of (0,05...0,5) MPa, flow capacity of (0,5...4) m3/hour for small and medium sized bearings, heavy loads and high speeds.	< 1200 x 10^3	(10...45) x 10^{-6}	5,6



a

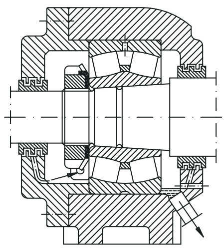
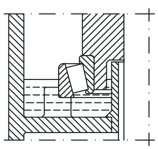


Fig. 5.4



b

Fig. 5.3

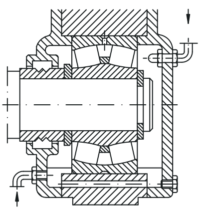


Fig. 5.5

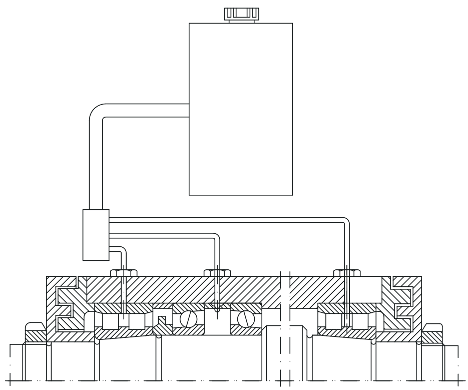


Fig. 5.6

Approximate values of oil kinematic viscosity at +40°C depending on the operating temperature are given in table 5.9.

Corelation between viscosity and temperature Table 5.9

Temperature t°C		Viscosity at 40°C, cSt
over	up to	
-	50	12...60
50	80	37...75,5
80	120	> 75,5
120	150	227

Diagram fig. 5.7 shows kinematic viscosity classes at 40°C in accordance with ISO, its variation depending on the operating temperature (t°C) in relation to speed and bearing mean diameter (Dm).

Example

A bearing 6204 is to operate under a speed n = 2000 r/min at a temperature t = +65°C.

Dm = 0,5 (d+D) = 35,5 mm.

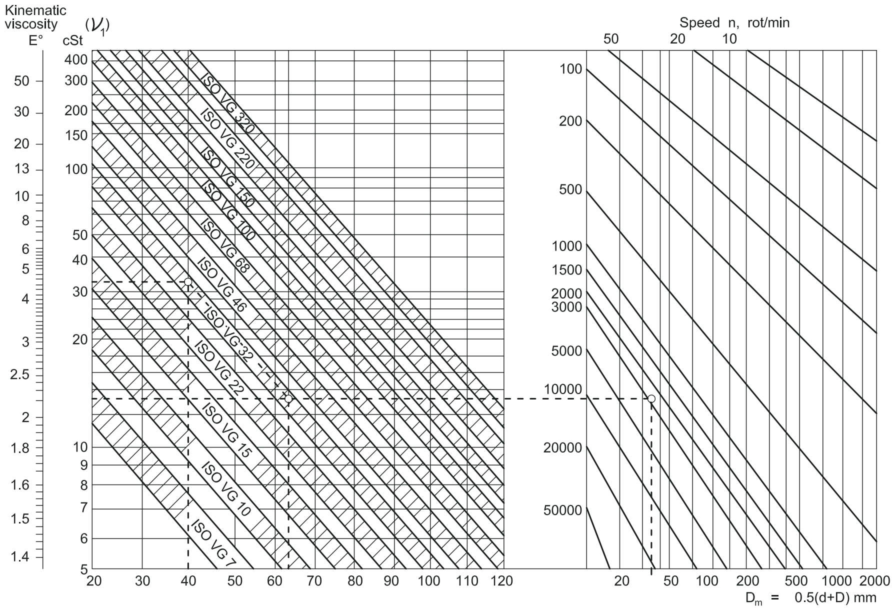
The viscosity of the oil for bearing lubrication is required.

From the diagram, for Dm = 35,5 mm, we can find viscosity at +65°C, $\nu_1 = 13$ cSt and viscosity at + 40°C, ν = 32cSt.

Table 5.10 shows oils which are recommended by ISO for bearing lubrication. Values of kinematic viscosity at +40°C, mm²/s are also given.

Recommended oils by ISO standards Table 5.10

Class ISO	Kinematic viscosity at +40°C, mm²/s (cSt)			
		mean	low	high
ISO VG	2	2,2	1,98	2,42
ISO VG	3	3,2	2,88	3,52
ISO VG	5	4,6	4,14	5,06
ISO VG	7	6,8	6,12	7,48
ISO VG	10	10	9	11
ISO VG	15	15	13,5	16,5
ISO VG	22	22	19,8	24,2
ISO VG	32	32	28,8	35,2
ISO VG	46	46	41,4	50,6
ISO VG	68	68	61,2	74,8
ISO VG	100	100	90	110
ISO VG	150	150	135	165
ISO VG	220	220	198	242
ISO VG	320	320	288	352
ISO VG	460	460	414	506
ISO VG	680	680	612	748
ISO VG	1000	1000	900	1100
ISO VG	1500	1500	1350	1650



Kinematic viscosity (ν_1)
E°
cSt
ISO VG 320
ISO VG 220
ISO VG 150
ISO VG 100
ISO VG 68
ISO VG 46
ISO VG 32
ISO VG 22
ISO VG 15
ISO VG 10
ISO VG 7
Speed n, rot/min
D_m = 0.5(d+D) mm

Fig. 5.7

Bearing designation

The purpose of designation is that of identification of bearings, so that bearings with the same designation to be interchangeable both dimensionally and operationally, no matter who the producers may be. Designation of ART rolling bearings are in accordance with those used by world-know bearing companies: SKF, FAG , INA, KOYO etc.

The complete designation of a bearing consists of a basic design and may include one or more supplementary designations (prefixes and suffixes), as shown in chart fig. 6.1.

Prefixes		Basic designation				**Suffixes**			
						Group I	Group II	Group III	Group IV
Materials	Special designs, component parts	Bearing type	Dimension series		Bore diameter identification	Internal design, contact angle	Constructive characteristics, taper, seals	Cages, materials, guiding surfaces	Tolerance class, clearance
		Bearing series designation							

Fig. 6.1

The basic designation consists of an identification of the type of bearing (figure or letter), the series designation, in accordance with ISO and the bore diameter identification.

The designation of the bearing type and dimension series, for main standardized bearing types, is given in table 6.1.

Bore diameter identification consist of one, two or more figures as follows:

- bore diameter from 1 to 9 mm — - one figure, representing the bore diameter (e.g. 623, 608);

- bore diameter from 10 to 495 mm — - two figures, as follows: 00 for 10 mm, 01 for 12 mm, 02 for 15 mm, 03 for 17 mm, 04 and up to 99 for bore diameter from 20 to 495 mm. (bore diameter = bore diameter identification x 5, e.g. 6230, d=150 mm);

- bore diameter of 500 mm and over 500 mm — - is stated directly separated by a slash, the same applies to the values which are not perfect multiples of 5, or if they include a decimal point (e.g. 610/560, 62/32, 62/1,5).

Tapered roller bearings with inch dimensions listed in this catalogues make an exception from this rule.

Prefixes

Prefixes are letter-identifications which indicate the material, other than steel for bearings or component parts of bearing. The prefix for material is separated by a horizontal line from the rest of designation.

Prefixes for materials

H - heat-resisting steel (e.g. H - NUP 210)
M - copper alloy (e.g. M - 6008)
S - plastics, glass, ceramics etc. (e.g. S - 6204)
T - case-hardening steel (e.g. T - 35352)

Prefixes for special designs or parts of bearings

K - cage with rolling elements of dismountable bearing (e.g. KNU205)
L - free ring of dismountable bearing (e.g. LNU205) (interchangeable ring, e.g. L30205)
R - dismountable bearing without free ring (e.g. RNU205; RN205)
E - shaft washer of thrust ball bearing (e.g. E51210)
W - housing washer of thrust ball bearing (e.g. W51216)

Suffixes

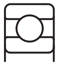
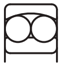
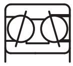
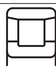
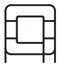
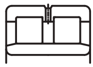
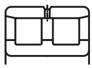
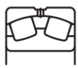
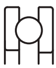
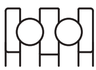
Suffixes are used to identify various constructive modifications of the bearing in comparison to normal design. They are classified in four different groups, as follows:

Group I - Modifications of internal design, design with increased basic load (e.g. A, C, E etc.), contact angle (e.g. A, B, C) and others.
Group II - Modifications of external design, tapered bore, groove on outer ring etc. (e.g. 30205A, 1210K, 6210NR, 6310-2RS)
Group III - Modifications of cage design, material, guiding surfaces etc. (e.g. 6205TN, NU310MA)
Group IV - Modifications of normal design regarding tolerance classes, bearing radial or axial clearance, stability of dimensions at high temperatures, bearing matching etc. (e.g. 6206P5, 6310P53, NU210SO, 7010CDB).

These suffixes for bearing designation are listed considering the groups they belong to, at the beginning of each bearing group.

Designation of the type and dimension series for the standardized bearings

Table 6.1

Bearing design	Bearing type identification	Series designation	Example
	6	18 10 03 19 02 23 00 22 04	61952 6208
	1	10 03 02 23 22	1205 11210
	7	10 02 03	7030C 72108
	0	32 33	3207 33160
	NU	10 02 22 03	NU208
	NJ	23 04	NU2206
	N		N310 N5161M
	NUP		NUP209
	NNU	49	NNU4920
	NN	30	NN3015
	2	30 41 13 40 22 23 31 32	22216 25130
	3	29 22 23 20 03 02 13	32010 32208 34115
	5	11 13 12 14	51115 51212
	5	22 23 24	52205 52308

Mounting and dismounting

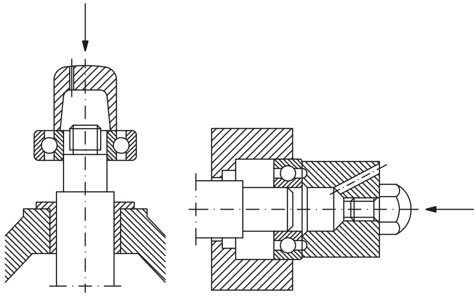
Proper operation of rolling bearings is also determined by a proper selection of the solution of mounting and dismounting, considering the type and size of bearing, fit, adequate tools for these operations, performance etc.

As being precision components, rolling bearings should be handled carefully when storing or mounting. Thus, the following conditions should be observed:

- storing in their original package, on special shelves, in dry room, temperature of +18°C...+20°C, maximum moisture degree of 60%
- handling bearings, while storing and mounting, should be carefully done so that original package to be protected and not to be deteriorated
- bearings should be unpacked only when they are to be mounted

They shouldn't be washed if original package hasn't been destroyed

- as the adjoin parts of bearing are accurate, without burrs, chips or hits, special care should be taken.



a b

Fig. 7.1

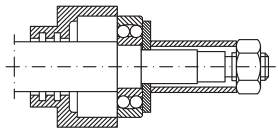


Fig. 7.2

Mounting of bearings with cylindrical bore

Bearings with cylindrical bore which are to have tight fit on shaft on in housing respectively will be mounted by mechanical, thermic or hydraulic means.

The pressing force should be transmitted only by the ring which is pressed on the shaft or into the housing bore. Transmission by rolling bearings should be avoided as they can get deformed and premature damage can occur.

Special sleeves with one or two ribs, fig. 7.1, a and b are used when mounting small and medium-sized bearings, which are to be mounted with transition fit. In case of self-aligning ball bearings or spherical roller thrust bearings, a plate is mounted for a proper location of the outer rings, as shown in fig. 7.2.

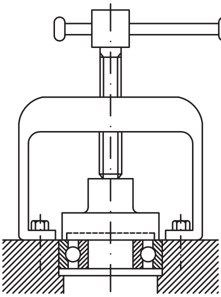
Mechanical or hydraulic presses are used as shown in fig. 7.3, in case of serial production so that force can be continuously and gradually applied.

For the mounting of bearings with clearance fit into the housing or on the shaft, the ring with transition or tight fit should be mounted first, after which the shaft-bearing assembly will be mounted into the housing as shown in fig. 7.4, a and b.

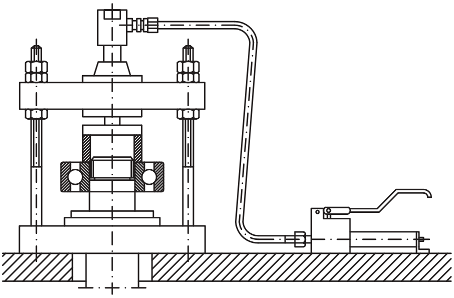
In case of dismountable bearings, rings can be mounted separately - fig. 7.5, even if a tight fit is required for both rings.

The mounting of medium (d > 50 mm) and large-sized bearings with tight fit, requires much greater pressing forces. That's why in this case heating of bearings up to +80°C...+110°C should be used instead of pressing, excepting shielded bearings, 2Z (2ZR) type and sealed bearings, 2RS (2RSR) type.

For the bearings heating, oil bath, electric range, heating device with thermic ring or induction heating device etc. can be used as shown in fig. 7.6, a-d. The device with thermic ring - fig. 7.6 c consists of a split aluminum ring with three grips and cuts which

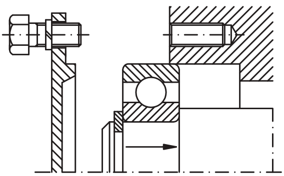


a

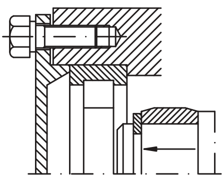


b

Fig. 7.3



a



b

Fig. 7.4

make it be elastic.

Thermic ring bore diameter is equal to inner ring raceway diameter of dismountable bearings.

The ring outside diameter can be calculated using the equation:

$$D_{ex} = \sqrt{4d_1^2 - 3d^2}$$

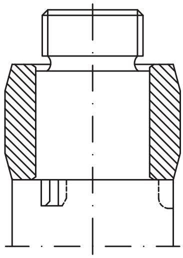


Fig. 7.5

where:

D_{ex} = outside diameter of the thermic ring, mm
d_1 = diameter of the inner ring raceway, mm
d = bearing bore diameter, mm

The mass of the thermic ring is approximately equal to the mass of the bearing inner ring.

In case of large-sized cylindrical roller bearings, heating is done with induction devices. These devices consist of a coil inductor, thermal relays for temperature adjustment and timers. 380 V voltage and 50 - 60 Hz frequency inductors are used for bearings with bore diameter up to 200 mm.

For larger sized bearings, 20... 40 V voltage and 50 - 60 Hz inductors are used.

This device is schematically shown in fig. 7.6 d.

Mounting of bearings with tapered bore

Tapered bore bearings can be mounted directly on the shaft, on adapter sleeve or withdrawal sleeve. These bearings should always be mounted only with a tight fit. The tight fit can be done by an axial displacement of the bearing inner ring which

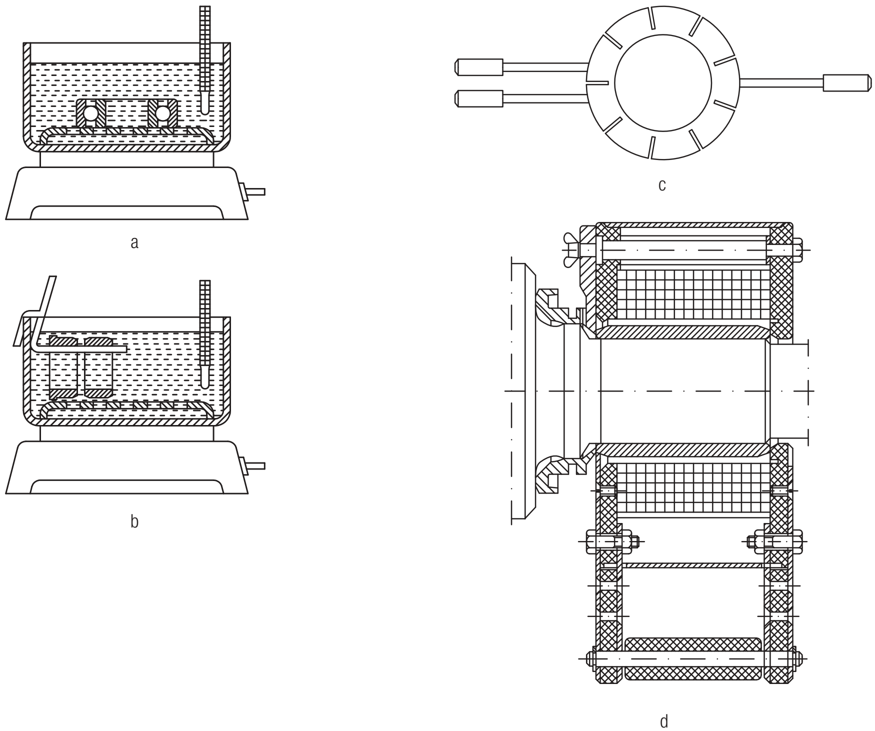


Fig. 7.6

Values for self-aligning ball bearings radial clearance, after mounting

Values in mm

Table 7.1

Bore diameter d		Reduction of radial clearance		Axial displacement „a", taper 1:12				Minimum radial clearance after mounting, in case of clearance group	
				on tapered shaft		on tapered sleeve			
over	up to	low	high	low	high	low	high	normal	C3
-	20	0,003	0,01	0,22	0,23	0,24	0,25	0,01	0,02
20	30	0,005	0,01	0,22	0,23	0,23	0,24	0,01	0,02
30	40	0,009	0,015	0,3	0,3	0,32	0,32	0,01	0,02
40	50	0,01	0,016	0,31	0,34	0,35	0,37	0,015	0,025
50	65	0,012	0,018	0,39	0,41	0,4	0,42	0,015	0,03
65	80	0,015	0,025	0,43	0,47	0,45	0,5	0,02	0,04
80	100	0,022	0,03	0,54	0,6	0,56	0,62	0,02	0,04
100	120	0,025	0,035	0,58	0,7	0,6	0,75	0,025	0,055

is mounted directly on the tapered spindle of the shaft or by an axial displacement of the adapter or withdrawal sleeve.

The values of reduction in radial clearance are given in tables 7.1 and 7.2, as function of axial displacement on shaft of self-aligning ball bearings and spherical roller thrust bearings. After mounting the initial radial clearance is to be considered.

After mounting, radial clearance of radial and self-aligning ball bearings are in accordance with table 7.1.

The values of tightening are estimated by the values of the radial clearance reduction or of axial displacement. Axial displacement of the mounted bearings is measured by means of a limit gauge, as shown in fi g. 7.7, a and b. The thickness of the limit gauge can be calculated from:

$$m = S - a$$

where:

m = thickness of the limit gauge, mm

S = distance initially measured, mm

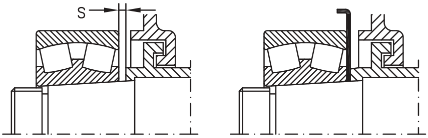
a = axial displacement, from table 7.1, mm

Values for spherical roller bearings radial clearance, after mounting

Values in mm

Table 7.2

Bore diameter d		Reduction of radial clearance		Axial displacement „a”, taper 1:12				Axial displacement „a”, taper 1:30				Minimum radial clearance after mounting, in case of clearance group		
				on tapered shaft		on tapered sleeve		on tapered shaft		on tapered sleeve				
over	up to	low	high	low	high	low	high	low	high	low	high	normal	C3	C4
30	40	0,02	0,025	0,35	0,4	0,35	0,45	-	-	-	-	0,015	0,025	0,04
40	50	0,025	0,03	0,4	0,45	0,45	0,5	-	-	-	-	0,02	0,03	0,05
50	65	0,03	0,04	0,45	0,6	0,5	0,7	-	-	-	-	0,025	0,035	0,055
65	80	0,04	0,05	0,6	0,75	0,7	0,85	-	-	-	-	0,025	0,04	0,07
80	100	0,045	0,06	0,7	0,9	0,75	1	1,7	2,2	1,8	2,4	0,035	0,05	0,08
100	120	0,05	0,07	0,7	1,1	0,8	1,2	1,9	2,7	2	2,8	0,05	0,065	0,1
120	140	0,065	0,09	1,1	1,4	1,2	1,5	2,7	3,5	2,8	3,6	0,055	0,08	0,11
140	160	0,075	0,1	1,2	1,6	1,3	1,7	3	4	3,1	4,2	0,055	0,09	0,13
160	180	0,08	0,11	1,3	1,7	1,4	1,9	3,2	4,2	3,3	4,6	0,06	0,1	0,15
180	200	0,09	0,13	1,4	2	1,5	2,2	3,5	4,5	3,6	5	0,07	0,1	0,16
200	225	0,1	0,14	1,6	2,2	1,7	2,4	4	5,5	4,2	5,7	0,08	0,12	0,18
225	250	0,11	0,15	1,7	2,4	1,8	2,6	4,2	6	4,6	6,2	0,09	0,13	0,2
250	280	0,12	0,17	1,9	2,6	2	2,9	4,7	6,7	4,8	6,9	0,1	0,14	0,22
280	315	0,13	0,19	2	3	2,2	3,2	5	7,5	5,2	7,7	0,11	0,15	0,24
315	355	0,15	0,21	2,4	3,4	2,6	3,6	6	8,2	6,2	8,4	0,12	0,17	0,26
355	400	0,17	0,23	2,6	3,6	2,9	3,9	6,5	9	6,8	9,2	0,13	0,19	0,29
400	450	0,2	0,26	3,1	4,1	3,4	4,4	7,7	10	8	10,2	0,13	0,2	0,31
450	500	0,21	0,28	3,3	4,4	3,6	4,8	8,2	11	8,4	11,2	0,16	0,23	0,35
500	560	0,24	0,32	3,7	5	4,1	5,4	9,2	12,5	9,6	12,8	0,17	0,25	0,36
560	630	0,26	0,35	4	5,4	4,4	5,9	10	13,5	10,4	14	0,2	0,29	0,41
630	710	0,3	0,4	4,6	6,2	5,1	6,8	11,5	15,5	12	16	0,21	0,31	0,45
710	800	0,34	0,45	5,3	7	5,8	7,6	13,3	17,5	13,6	18	0,23	0,35	0,51



a b

Fig. 7.7

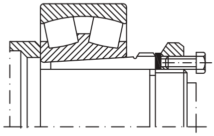


Fig. 7.9

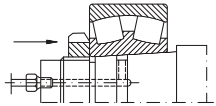
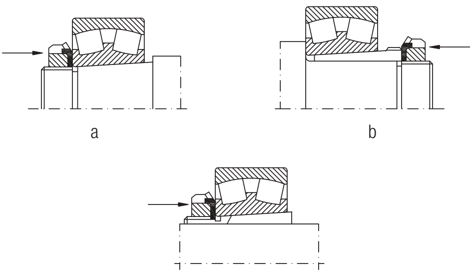


Fig. 7.10

Example

A bearing 22252, d = 260 mm, taper: 1:12, distance S = 10 mm, distance “a” from table 7.1 = 1,90 mm, m = 10 - 1,9 = 8,10 mm

Small-sized bearings with tapered bore which are to be mounted directly on the shaft or with adapter or withdrawal sleeves can be axially displaced by means of a nut as shown in fig. 7.8, a, or by means of a special sleeve as in fig. 7.8 b, c.



a b c

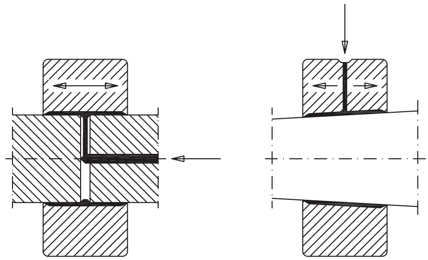
Fig. 7.8

Medium-sized bearings can be axially displaced by means of a special nut as shown in fig. 7.9 and some screws. Then, the nut is to be dismounted and replaced with a nut for axial fastening.

Special hydraulic presses - fig. 7.11 are used to mount medium and large-sized bearings.

To reduce the bearing displacing force in case of large-sized bearings, pressurized oil is to be introduced between the tapered surfaces of the shaft spindle, bearing and b, by means of oil pump - fig. 7.10 or oil injector - fig. 7.12.

One or more grooves, should be provided as shown in fig. 7.13, a and b so that oil can be distributed between the mounting surfaces.



a b

Fig. 7.11

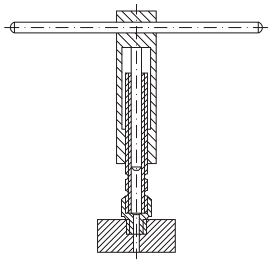
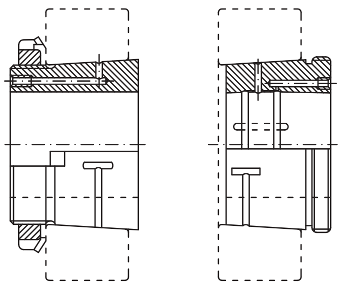


Fig. 7.12



a b

Fig. 7.13

Bearing dismounting

When bearings with tapered bore are to be dismounted from the shaft or housing, the succession of operations is inversely done than in case of mounting.

Thus, the assembly mounted with clearance fit or small tightening is to be dismounted first and then the parts mounted with greater tightening, as shown in fig. 7.14 and fi g. 7.15.

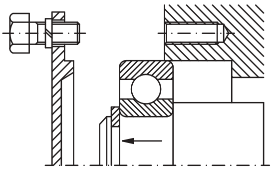


Fig. 7.14

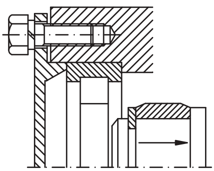
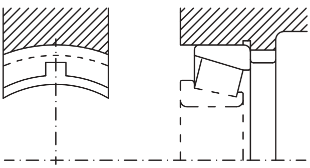
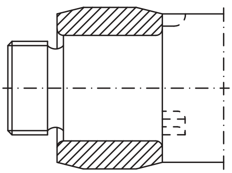


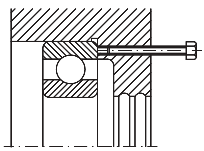
Fig. 7.15



a



b

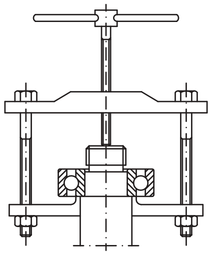


c

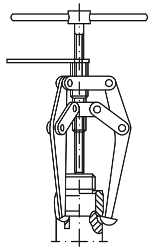
Fig. 7.16

To use mechanical or hydraulic instruments, when dismounting bearings, a special design of the shaft and housing is required, as shown in fig. 7.16, a-c: withdrawal grooves (a) and (b), threaded bores (c), grooves for oil distribution, fig. 7.13.

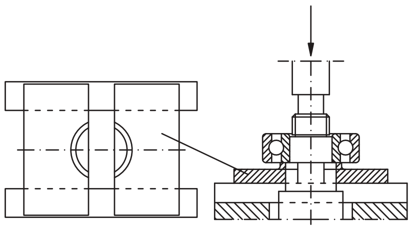
Medium and small-sized bearings which are mounted with a tight fit are dismounted from the shaft by means of a soft steel or copper mandrel or by means of mechanical or hydraulic presses fig.7.17, a-c.



a



b



c

Fig. 7.17

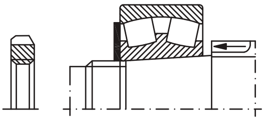
To reduce the frictional force when dismounting large sized bearings which were mounted on shaft with tight fit, pressurized oil should be introduced, as in case of mounting - fig. 7.11.

To dismount bearings with tapered bore which were mounted directly on the shaft or bearings which were mounted with withdrawal or adapter sleeves, the nut axially fastened should be first stripped. Then, dismounting is to be done by light hammering on the inner ring by means of a soft steel or copper mandrel, as shown in fi g. 7,18 a and b.

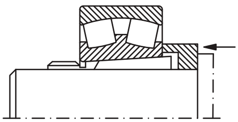
In case of bearings mounted with withdrawal sleeves, a nut is to be screwed up to the threaded part provided for this purpose, as shown in fig. 7.19, a and b.

In case of large-sized bearings, hydraulic devices are used as in case of mounting.

Some solutions for dismounting bearings with tapered bore mounted directly on the shaft spindle, with adapter or withdrawal sleeve are given in fig. 7.20, a and b.

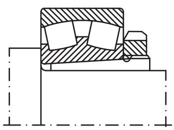


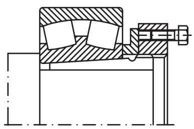
a



b

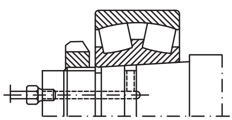
Fig. 7.18

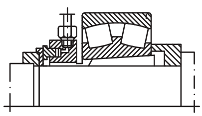




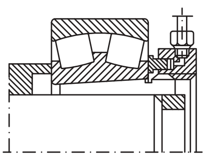
a b

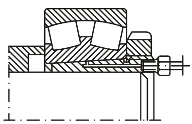
Fig. 7.19





a b





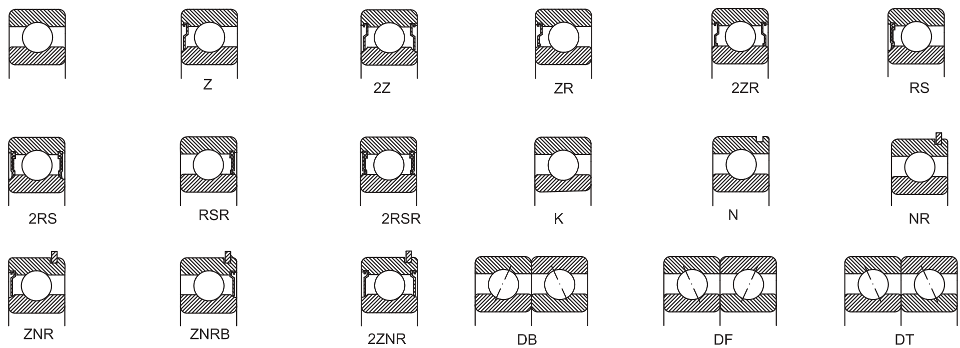
c d

Fig. 7.20

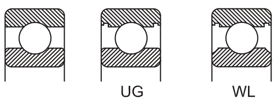
Deep groove ball bearings

Deep groove ball bearings are manufactured in a varied range, both of standard design and various constructive versions.
Deep groove ball bearings can take double direction radial and axial loads and also allow good operation at high speeds.

For these reasons, thei can be widely used. Therefor, single row deep groove ball bearings are manufactured in many constructive versions as shown below.



Besides deep groove ball bearings of basic design, bearings with UG design, with grooves on the outer ring and WL design, with grooves on both rings are also used for the purpose of mounting seals or shields on the bearings 2ZR, 2RSR or 2RS type, as shown in the bellow figure.



Suffixes

A - bearing with extended outer ring
B - bearing with extended inner ring
C2 - radial clearance smaller than normal
C3 - radial clearance larger than normal
FA - machined cage of steel or cast iron guided in the outer ring
F2 - constructive modifications
K - bearing with tapered bore
M - machined cage of brass guided on the rolling elements
MA - machined cage of brass guided in the outer ring
MB - machined cage of brass guided on the inner ring
N - circular groove for snap ring on the outer ring
NR - circular groove on the outer ring and snap ring
P0 - normal tolerance class (it is not marked)
P6 - tolerance class more accurate than normal
P63 - tolerance class P6 and radial clearance C3
P5 - tolerance class more accurate than P6
P4 - tolerance class more accurate than P5
R - rib on the outer ring
RS - bearing with seal on the side, with friction on the inner ring recess
RSA - bearing with special seal

2RS - bearing with 2 seals, friction on the inner ring recess
RSR - bearing with seal on one side, friction on the rib of the inner ring
2RSR - bearing with 2 seals, friction on the rib of the inner ring
S0 - bearing which can operate up to a temperature of +150°C
S1 - bearing which can operate up to a temperature of +200°C
SP - snap ring, diameter series 0, 2, 3, 4
SR - snap ring, diameter series 18 and 19
T30 - bearing which can operate up to a temperature of +300°C, radial clearance 0,20...0,25 mm; phosphate-treated surfaces
TN - polyamide cage
V - bearing without cage
Z - bearing with shield and recess on the inner ring
2Z - bearing with 2 shields and recess on the inner ring
ZNRB - bearing with shield and snap ring on the same side
ZR - bearing with shield, without recess on the inner ring
2ZR - bearing with 2 shields, without recess on the inner ring

Sealed and shielded deep groove ball bearings

ART manufactures two versions of sealed and shielded bearings, namely:

- bearings RS and Z type, with recess on the inner ring for sealing or shielding.
- bearings RSR and ZR type, when shielding and sealing respectively are done directly on the outside surface of the inner ring.

In case of bearings with non-rubbing shields, there is a small interstice between the shield and the rib of the inner ring; in case of bearings with seals, the gasoline and oil resistant elastic rubber lip rubs on the groove on the inner ring side or directly on the outside surface.

Bearings sealed and shielded on both sides manufactured in series are delivered filled with lithium base grease and used at temperatures between -30ºC and +110ºC, in accordance with the specifications in chapter **Bearing lubrication**. Bearings can also be greased with special greases, relubrication not being necessary. Washing or heating are not allowed before bearing mounting in the assembly.

Bearings with shields have been designed first of all for cases when the inner ring rotates.

When the outer ring rotates, the lubricant can flow out of the bearing at a certain speed. In such cases, we recommend you to consult our experts.

Deep groove ball bearings with the snap ring groove

Deep groove ball bearings, with snap ring groove on the outer ring can be located in the housing with snap rings.

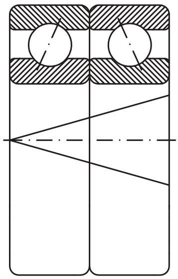
Because of their simple and space saving mounting, these bearings simplify the assembly design. The groove for the snap ring and the snap rings are in accordance with ISO 464 and tables 7 and 8 respectively.

Paired deep groove ball bearings

If the basic load of a single bearing is inadequate or the shaft has to be axially located in both directions with a certain clearance, paired deep groove ball bearings are recommended to be used.

These bearings can be delivered matched in pairs in three versions, as follows: DT (tandem arrangement), DB (back-to-back arrangement) or DF (face-to-face arrangement). They can be delivered with axial clearance or preloaded. The values of clearance or preload are given in table 2.

The producer marks “V” on the bearing outside surface as shown in next figure, so that pired bearings to be correctly mounted.



The multiple speed limit of these bearings can be calculated multiplying the speed of the basic bearing by 0,8.

Paired bearings are packed and delivered in the same box.

Dimensions

The overall dimensions of deep groove ball bearings are in accordance with the stipulations of ISO 15.

Misalignments

Deep groove ball bearings have limited abilities to compensate for bearing error of alignment. The permissible misalignment between the outer ring and the inner ring, which will not produce inadmissible high additional loads in the bearing, depends on the bearing size, operational radial clearance, inner bearing design and also on the magnitude of loads and moments acting upon the bearing.

Because of the complex relationship of these influence factors, definite and universally valid values of permissible misalignment cannot be determined. Considering the above mentioned factors, under normal operation conditions the permissible misalignments are between 2 and 10 minutes of arc, depending on the bearing series and load.

Tolerances

Deep groove ball bearings are generally manufactured to the normal tolerance class P0.

At request, they can also be manufactured to the tolerance classes P6, P5 or P4.

The values of tolerances are given in chapter **Bearing tolerances** on page 26.

Radial and axial clearance

Deep groove ball bearings are generally manufactured with normal radial clearance. At request, they can also be manufactured with radial clearance different from the normal one, according to ISO 5753. The values of radial clearance are given in table 1.

Paired bearings can be manufactured with axial clearance (suffix A) or preloaded (suffix L).
Values for axial clearance and preload are given in table 2.

If a certain axial clearance is prescribed, this has to be measured and marked on the bearing by “A”, followed by clearance actual value.

Radial clearance of deep groove ball berarings Table 1											
Bore diameter		**Clearance group symbol for bearings with cylindrical bore**									
d		**C2**		**Normal**		**C3**		**C4**		**C5**	
		Clearance group symbol for bearings with tapered bore									
		-		**C2**		**Normal**		**C3**		**C4**	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
mm		µm									
2.5	**10**	0	7	2	13	8	23	14	29	20	37
10	**18**	0	9	3	18	11	25	18	33	25	45
18	**24**	0	10	5	20	13	28	20	36	28	48
24	**30**	1	11	5	20	13	28	23	41	30	53
30	**40**	1	11	6	20	15	33	28	46	40	64
40	**50**	1	11	6	23	18	36	30	51	45	73
50	**65**	1	15	8	28	23	43	38	61	55	90
65	**80**	1	15	10	30	25	51	46	71	65	105
80	**100**	1	18	12	36	30	58	53	84	75	120
100	**120**	2	20	15	41	36	66	61	97	90	140
120	**140**	2	23	18	48	41	81	71	114	105	160
140	**160**	2	23	18	53	46	91	81	130	120	180
160	**180**	2	25	20	61	53	102	91	147	135	200
180	**200**	2	30	25	71	63	117	107	163	150	230
200	**225**	2	35	25	85	75	140	125	195	175	265
225	**250**	2	40	30	95	85	160	145	225	205	300
250	**280**	2	45	35	105	90	170	155	245	225	340
280	**315**	2	55	40	115	100	190	175	270	245	370
315	**355**	3	60	45	125	110	210	195	300	275	410
355	**400**	3	70	55	145	130	240	225	340	315	460
400	**450**	3	80	60	170	150	270	250	380	350	520
450	**500**	3	90	70	190	170	300	280	420	390	570
500	**560**	10	100	80	210	190	330	310	470	440	630
560	**630**	10	110	90	230	210	360	340	520	490	700
630	**710**	20	130	110	260	240	400	380	570	540	780
710	**750**	20	140	120	290	270	450	430	630	600	860

Axial clearance and mounting preload of paired bearings series 60, 62, 63 Table 2						
Bore diameter d		**Axial clearance (suffix A)**		**Preload (suffix L)**		
over	up to	min.	max.	Bearing series		
				60	62	63
mm		µm		N		
-	**10**	15	35	30	30	-
10	**18**	20	40	50	50	100
18	**30**	25	45	100	100	100
30	**50**	35	55	100	100	200
50	**80**	40	70	200	200	350
80	**120**	50	80	300	400	600
120	**180**	60	100	500	700	900
180	**250**	70	110	800	1000	1200

Cages

Deep groove ball bearings are generally fitted with cages of pressed steel sheet.

Cages of glass fiber reinforced polyamide 6.6 are also suitable if the operating temperature doesn't exceed +120ºC. They have reduced mass, low coefficient of friction and are noiseless in operation. Large-sized bearings are fitted with machined brass cages.

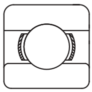
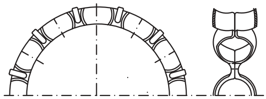
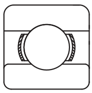
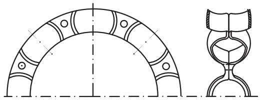
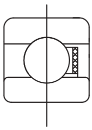
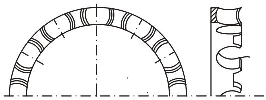
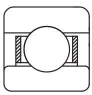
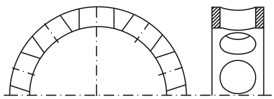
Cage design and some technical data are given in table 3.

Bearing minimum radial load

A minimum load must be applied on a deep groove ball bearing so that they can operate correctly, especially in case of operating under heavy loads.

The forces of inertia which occur in bearing as well as the friction in lubricant influence negatively the operating conditions and can cause detrimental sliding movements between balls and raceways.

Table 3

Cage	Design		Application	Max. value $D_m n$	
	bearing	cage		oil	grease
Pressed cage of sheet with fins			- General application - Bearings with d>10 mm - Low frictional moment - Low inertia - Moderate speeds	$100x10^3$	$550x10^3$
Pressed cage of riveted sheet			- General application - Bearings with d>10 mm - Low frictional moment - Low inertia - Moderate speeds	$1000x10^3$	$550x10^3$
Polyamide cage			- General application - Low frictional - High speeds	$1400x10^3$	$1100x10^3$
Brass machined cage			- General application - Bearings: 61836-618/1400 61936-619/950 16036-16072 6030-60/630 6230-6248 6320-6330	$1000x10^3$	$800x10^3$

Minimum radial load depends on the bearing size, speed and lubricant viscosity at operating temperature. It can be roughly calculated from the equation:

$F_{r\,min} = 0{,}01\ C_r$, (C_r = basic dynamic radial load).

Equivalent dynamic radial load

Deep groove ball bearing can take also radial and axial combined loads.

For deep groove ball bearings, single or paired in tandem arrangement DT, equivalent dynamic radial load can be calculated using the equation:

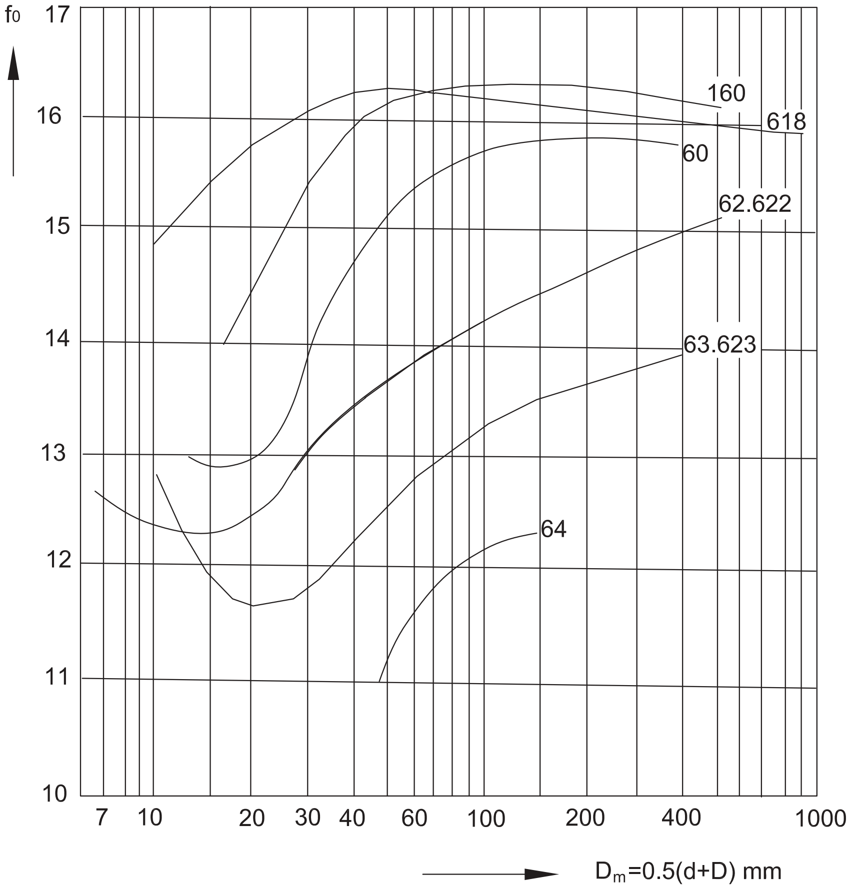
$P_r = F_r$, kN, when $F_a/F_r < e$
$P_r = XF_r + YF_a$, kN, when $F_a/F_r > e$

The greater the axial load, the greater the contact angle of these bearings.

Factor e, X and Y depend on the ratio f_0F_a/C_{0r}.

Factor f_0 can be determined using the diagram in the bellow figure, as a function of dimension series and mean diameter (d+D)/2. F_a is the axial and C_{0r} is the static basic load of the bearing.

The values of factors e, X, Y which depend on the bearing clearance can be determined from table 4, coresponding to the values of the ratio f_0F_a/C_{0r}. The values in table 4 apply to bearings mounted with normal fit, i.e. shaft manufactured to tolerance class j5 or k5 and housing in J6, respectively.



Calculation factors e, X and Z for deep groove ball bearings, single mounted or matched in tandem — Table 4									
	Normal radial clearance			Radial clearance C3			Radial clearance C4		
f_0F_a/C_{0r}	e	X	Y	e	X	Y	e	X	Y
0,2	0,19	0,56	2,25	0,32	0,46	1,77	0,38	0,44	1,44
0,4	0,22	0,56	1,95	0,34	0,46	1,63	0,42	0,44	1,36
0,8	0,26	0,56	1,68	0,38	0,46	1,44	0,45	0,44	1,25
1,6	0,31	0,56	1,4	0,43	0,46	1,27	0,48	0,44	1,16
3	0,37	0,56	1,2	0,48	0,46	1,14	0,52	0,44	1,08
6	0,44	0,56	1,02	0,54	0,,46	1	0,56	0,44	1

For bearings matched in DB or DT arrangement, equivalent dynamic radial load can be calculated using the equation:

$P_r = F_r + Y_1 F_a$, kN when $F_a/F_e < e$

$P_r = 0{,}75F_r + Y_2 F_a$, kN when $F_1/F_r > e$.

The values of factors e, Y_1 and Y_2, as functions of ratio F_a/C_{0r} are given in table 5.

Calculation factors e, Y_1, Y_2 for DB and DF arrangements

Table 5

f_0F_a/C_{0r}	e	Y_1	Y_2
0,03	0,32	2	2.8
0,1	0.4	1,55	2,2
0,25	0,47	3	1,65

Equivalent static radial load

For deep groove ball bearings, single or matched in tandem (DT), equivalent static load can be calculated using the equations:

$P_0 = Fr$, kN, when $F_a/Fr < 0{,}8$

$P_0 = 0{,}6F_r + 0{,}5\,F_a$, kN, when $F_a/F_r > 0{,}8$

For bearings matched in DB or DF arrangement, it can be calculated from

$P_0 = F_r + 1{,}7\,F_a$, kN.

Axial load

If deep groove ball bearings are pure axial loaded, the axial load should not exceed 0,5 C_{0r}. In case of small-sized bearings and bearings of light series (diameter series 8, 9, 0 and 1), the axial load should not exceed 0,25 C_{0r}.

Heavy axial loads cause a significant decrease of bearing rating life. In such cases, we recommend you to consult our experts.

Abutment dimensions

For a proper location of bearing rings on the shaft shoulder and housing, respectively, maximum shaft (housing) connection radius r_u max should be less than minimum bearing mounting chamfer r_s min.

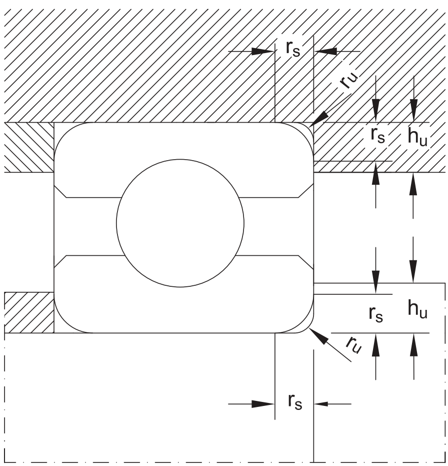
The shoulder should have the proper height corresponding to maximum bearing mounting chamfer.

The values of the connection radius (r_u) and support shoulder height (h_u) as function of mounting chamfers are given in table 6.

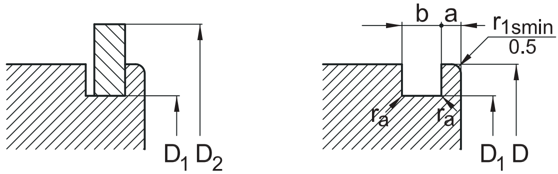
Abutment dimension

Table 6

r_s min	r_u max	h_u min		
		Bearing series		
		618	161, 60,	64
		619, 160	62, 63	
0,15	0,15	0,4	0,7	-
0,2	0,2	0,7	0,9	-
0,3	0,3	1	1,2	-
0,6	0,6	1,6	2,1	-
1	1	2,3	2,8	-
1,1	1	3	3,5	4,5
1,5	1,5	3,5	4,5	5,5
2	2	4,4	5,5	6,5
2,1	2,1	5,1	6	7
3	2,5	6,2	7	8
4	3	7,3	8,5	10
5	4	9	10	12
6	5	11,5	13	15
7,5	6	14	-	-



Snap ring groove and snap ring dimensions and tolerances



Snap ring groove

Table 7

Outer diameter D	Dimensions series									
	18				19					
	D_1		a		a		b		r_0	
	nom.	toler.	nom.	toler.	nom.	toler.	nom.	toler.	nom.	toler.
	mm									
22	20,8	-0,3	-	-	1,05	-0,15	0,8	+0,25	0,2	-0,1
24	22,8	-0,3	-	-	1,05	-0,15	0,8	+0,25	0,2	-0,1
28	26,7	-0,3	-	-	1,3	-0,15	0,95	+0,25	0,25	-0,12
30	28,7	-0,3	-	-	1,3	-0,15	0,95	+0,25	0,25	-0,12
32	30,7	-0,3	1,3	-0,15	-	-	0,95	+0,25	0,25	-0,12
34	32,7	-0,3	1,3	-0,15	-	-	0,95	+0,25	0,25	-0,12
37	35,7	-0,3	1,3	-0,15	1,7	-0,15	0,95	+0,25	0,25	-0,12
39	37,7	-0,3	-	-	1,7	-0,15	0,95	+0,25	0,25	-0,12
40	38,7	-0,3	1,3	-0,15	-	-	0,95	+0,25	0,25	-0,12
42	40,7	-0,3	1,3	-0,15	1,7	-0,15	0,95	+0,25	0,25	-0,12
44	42,7	-0,3	1,3	-0,15	-	-	0,95	+0,25	0,25	-0,12
45	43,7	-0,3	-	-	1,7	-0,15	0,95	+0,25	0,25	-0,12
47	45,7	-0,3	1,3	-0,15	1,7	-0,15	0,95	+0,25	0,25	-0,12
52	50,7	-0,3	1,3	-0,15	1,7	-0,15	0,95	+0,25	0,25	-0,12
55	53,7	-0,3	-	-	1,7	-0,15	0,95	+0,25	0,25	-0,12
58	56,7	-0,3	1,3	-0,15	-	-	0,95	+0,25	0,25	-0,12
62	60,7	-0,3	-	-	1,7	-0,15	0,95	+0,25	0,25	-0,12
65	63,7	-0,4	1,3	-0,15	-	-	0,95	+0,25	0,25	-0,12
68	66,7	-0,4	-	-	1,7	-0,15	0,95	+0,25	0,25	-0,12
72	70,7	-0,4	1,7	-0,15	1,7	-0,15	0,95	+0,25	0,25	-0,12
78	76,2	-0,4	1,7	-0,15	-	-	1,3	+0,3	0,4	-0,2
80	77,9	-0,4	-	-	2,1	-0,2	1,3	+0,3	0,4	-0,2
85	82,9	-0,4	1,7	-0,15	2,1	-0,2	1,3	+0,3	0,4	-0,2
90	87,9	-0,4	1,7	-0,15	2,1	-0,2	1,3	+0,3	0,4	-0,2
95	92,9	-0,4	1,7	-0,15	-	-	1,3	+0,3	0,4	-0,2
100	97,9	-0,4	1,7	-0,15	2,5	-0,2	1,3	+0,3	0,4	-0,2
105	102,6	-0,5	-	-	2,5	-0,2	1,3	+0,3	0,4	-0,2
110	107,6	-0,5	2,1	-0,2	2,5	-0,2	1,3	+0,3	0,4	-0,2
115	112,6	-0,5	2,1	-0,2	-	-	1,3	+0,3	0,4	-0,2
120	117,6	-0,5	2,1	-0,2	3,3	-0,2	1,3	+0,3	0,4	-0,2
125	122,6	-0,5	2,1	-0,2	3,3	-0,2	1,3	+0,3	0,4	-0,2
130	127,6	-0,5	2,1	-0,2	3,3	-0,2	1,3	+0,3	0,4	-0,2
140	137,6	-0,5	2,5	-0,2	3,3	-0,2	1,9	+0,3	0,6	-0,2
145	142,7	-0,5	-	-	3,3	-0,2	1,9	+0,3	0,6	-0,3
150	147,6	-0,5	2,5	-0,2	3,3	-0,2	1,9	+0,3	0,6	-0,3
165	161,8	-0,5	3,3	-0,2	3,7	-0,2	1,9	+0,3	0,6	-0,3
175	171,8	-0,5	3,3	-0,2	-	-	1,9	+0,3	0,6	-0,3
180	176,8	-0,5	-	-	3,7	-0,2	1,9	+0,3	0,6	-0,3
190	186,8	-0,5	3,3	-0,2	3,7	-0,2	1,9	+0,3	0,6	-0,3
200	196,8	-0,5	3,3	-0,2	-	-	1,9	+0,3	0,6	-0,3

The outer ring chamfer on the side of snap ring groove should allow a housing connection radius of:
0,3 mm for dimensions series 18, up to D = 78 mm included and for dimensions series 19, up to D = 47 mm included;
0,5 mm for dimensions series 18, for D > 78 mm and for dimensions series 19, for D > 47 mm

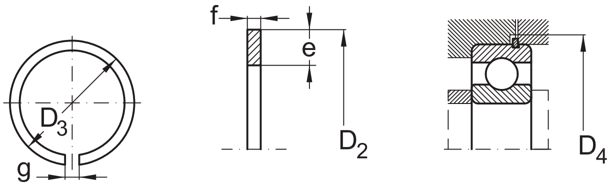
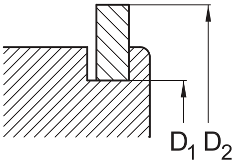


Table 7 (continue)

Snap ring										
Outer diameter D	D_2 [1]	D_3 [2]		D_4	e	f	g	r	Mass	Snap ring designation
	max.	nom.	toler.	min.	nom.	nom.	nom.	min.		
	mm								g	-
22	24,8	20,5	-0,3	25	2	0,7	2	0,2	0,812	**SR22**
24	26,8	22,5	-0,3	28	2	0,7	2	0,2	0,886	**SR24**
28	30,8	26,4	-0,3	32	2,05	0,85	3	0,2	1,269	**SR28**
30	32,8	28,3	-0,3	34	2,05	0,85	3	0,2	1,39	**SR30**
32	34,8	30,3	-0,3	36	2,05	0,85	3	0,2	1,483	**SR32**
34	36,8	32,3	-0,3	38	2,05	0,85	3	0,2	1,577	**SR34**
37	39,8	35,3	-0,3	41	2,05	0,85	3	0,2	1,718	**SR37**
39	41,8	37,3	-0,3	43	2,05	0,85	3	0,2	1,811	**SR39**
40	42,8	38,3	-0,3	44	2,05	0,85	3	0,2	1,858	**SR40**
42	44,8	40,3	-0,4	46	2,05	0,85	3	0,2	1,952	**SR42**
44	46,8	42,3	-0,4	48	2,05	0,85	4	0,2	2,032	**SR44**
45	47,8	43,3	-0,4	49	2,05	0,85	4	0,2	2,079	**SR45**
47	49,8	45,3	-0,4	51	2,05	0,85	4	0,2	2,173	**SR47**
52	54,8	50,3	-0,4	56	2,05	0,85	4	0,2	2,407	**SR52**
55	57,8	53,3	-0,4	59	2,05	0,85	4	0,2	2,547	**SR55**
58	60,8	56,3	-0,6	62	2,05	0,85	4	0,2	2,688	**SR58**
62	64,8	60,2	-0,6	66	2,05	0,85	4	0,2	2,938	**SR62**
65	67,8	63,2	-0,6	69	2,05	0,85	4	0,2	3,081	**SR65**
68	70,8	66,2	-0,6	72	2,05	0,85	5	0,2	3,212	**SR68**
72	74,8	70,2	-0,6	76	2,05	0,85	5	0,2	3,403	**SR72**
78	82,7	75,7	-0,6	84	3,25	1,12	5	0,4	7,462	**SR78**
80	84,4	77,4	-0,6	86	3,25	1,12	5	0,4	7,625	**SR80**
85	89,4	82,4	-0,6	91	3,25	1,12	5	0,4	8,105	**SR85**
90	94,4	87,4	-0,6	96	3,25	1,12	5	0,4	8,585	**SR90**
95	99,4	92,4	-0,6	101	3,25	1,12	5	0,4	9,065	**SR95**
100	104,4	97,4	-0,6	106	3,25	1,12	5	0,4	9,545	**SR100**
105	110,7	101,9	-0,8	112	4,04	1,12	5	0,4	12,653	**SR105**
110	115,7	106,9	-0,8	117	4,04	1,12	5	0,4	13,257	**SR110**
115	120,7	111,9	-0,8	122	4,04	1,12	5	0,4	13,861	**SR115**
120	125,7	116,9	-0,8	127	4,04	1,12	7	0,4	14,393	**SR120**
125	130,7	121,8	-0,8	132	4,04	1,12	7	0,4	15,164	**SR125**
130	135,7	126,8	-0,8	137	4,04	1,12	7	0,4	15,774	**SR130**
140	145,7	136,8	-1	147	4,04	1,7	7	0,4	25,796	**SR140**
145	150,7	141,8	-1	152	4,04	1,7	7	0,6	26,722	**SR145**
150	155,7	146,8	-1,2	157	4,04	1,7	7	0,6	27,648	**SR150**
165	171,5	161	-1,2	173	4,85	1,7	7	0,6	35,89	**SR165**
175	181,5	171	-1,2	183	4,85	1,7	10	0,6	37,883	**SR175**
180	186,5	176	-1,2	187	4,85	1,7	10	0,6	38,976	**SR180**
190	196,5	186	-1,4	198	4,85	1,7	10	0,6	41,162	**SR190**
200	206,5	196	-1,4	208	4,85	1,7	10	0,6	43,348	**SR200**

[1] D_2 dimensions refers to the mounted snap ring
[2] D_3 represents dimensions before mounting

Snap ring groove and snap ring dimensions and tolerances



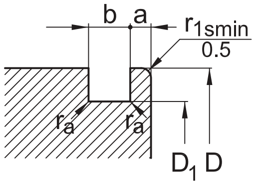
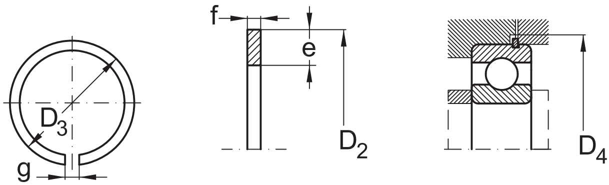


Table 8

Snap ring groove										
Outer diameter D	Dimensions series									
	60				62, 63, 64					
	D_1		a		a		b		r_0	
	nom.	toler.	nom.	toler.	nom.	toler.	nom.	toler.	nom.	toler.
mm										
30	28,17	-0,25	-	-	2,06	-0,16	1.35	+0,3	0,4	-0,2
32	30,15	-0,25	2,06	-0,16	2,06	-0,16	1.35	+0,3	0,4	-0,2
35	33,17	-0,25	2,06	-0,16	2,06	-0,16	1.35	+0,3	0,4	-0,2
40	38,1	-0,25			2,06	-0,16	1.35	+0,3	0,4	-0,2
42	39,75	-0,25	2,06	-0,16	2,06	-0.16	1.35	+0,3	0,4	-0,2
47	44,6	-0,25	2,06	-0,16	2,46	-0,15	1.35	+0,3	0,4	-0,2
52	49,73	-0,25	2,06	-0,16	2,46	-0,15	1.35	+0,3	0,4	-0,2
55	52,6	-0,25	2,08	-0,2	-	-	1.35	+0,3	0,4	-0,2
62	59,61	-0,5	2,08	-0,2	3,28	-0,21	1.9	+0,3	0,6	-0,3
68	64,82	-0,5	2,49	-0,2	3,28	-0,21	1.9	+0,3	0,6	-0,3
72	68,81	-0,5	-	-	3,28	-0,21	1.9	+0,3	0,6	-0,3
75	71,83	-0,5	2,49	-0,2	3,28	-0,21	1.9	+0,3	0,6	-0,3
80	76,81	-0,5	2,49	-0,2	3,28	-0,21	1.9	+0,3	0,6	-0,3
85	81,81	-0,5	-	-	3,28	-0,21	1.9	+0,3	0,6	-0,3
90	86,79	-0,5	2,87	-0,2	3,28	-0,21	2.7	+0,3	0,6	-0,3
95	91,82	-0,5	2,87	-0,2	-	-	2.7	+0,3	0,6	-0,3
100	96,8	-0,5	2,87	-0,2	3,28	-0,21	2.7	+0,3	0,6	-0,3
110	106,81	-0,5	2,87	-0,2	3,28	-0,21	2.7	+0,3	0,6	-0,3
115	111,81	-0,5	2,87	-0,2	-	-	2.7	+0,3	0,6	-0,3
120	115,21	-0,5	-	-	4,06	-0,21	3.1	+0,3	0,6	-0,3
125	120,22	-0,5	2,87	-0,2	4,06	-0,2	3.1	+0,3	0,6	-0,3
130	125,22	-0,5	2,87	-0,2	4,06	-0,2	3.1	+0,3	0,6	-0,3
140	135,23	-0,5	3,71	-0,26	4,9	-0,25	3.1	+0,3	0,6	-0,3
145	140,23	-0,5	3,71	-0,26	-	-	3.1	+0,3	0,6	-0,3
150	145,24	-0,5	3,71	-0,26	4,9	-0,25	3.1	+0,3	0,6	-0,3
160	155,22	-0,5	3,71	-0,26	4,9	-0,25	3.1	+0,3	0,6	-0,3
170	163,65	-0,5	3,71	-0,26	5,69	-0,25	3.5	+0,3	0,6	-0,3
180	173,66	-0,5	3,71	-0,26	5,69	-0,25	3.5	+0,3	0,6	-0,3
200	193,65	-0,5	5,69	-0,25	5,69	-0,25	3.5	+0,3	0,6	-0,3

The outer ring chamfer on the side of snap ring groove should allow a housing connection radius of:
0,3 mm for dimensions series 18, up to D = 78 mm included and for dimensions series 19, up to D = 47 mm included;
0,5 mm for dimensions series 18, for D > 78 mm and for dimensions series 19, for D > 47 mm

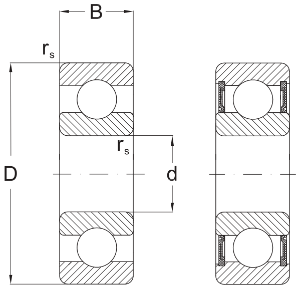


Snap ring										Table 8 (continue)
Outer diameter D	**D_2**[1]	**D_3**[2]		**D_4**	**e**	**f**	**g**	**r**	**Mass**	**Snap ring designation**
	max.	nom.	toler.	min.	nom.	nom.	nom.	min.		
mm									g	-
30	34,7	27,9	-0,4	36	3,25	1,12	3	0,4	2,78	**SP30**
32	36,7	29,9	-0,4	38	3,25	1,12	3	0,4	2,98	**SP32**
35	39,7	32,9	-0,4	41	3,25	1,12	3	0,4	3,22	**SP35**
40	44,6	37,8	-0,4	46	3,25	1,12	3	0,4	3,6	**SP40**
42	46,3	39,5	-0,5	47	3,25	1,12	3	0,4	3,75	**SP42**
47	52,7	44,3	-0,5	54	4,04	1,12	4	0,4	5,3	**SP47**
52	57,9	49,4	-0,5	59	4,04	1,12	4	0,4	5,92	**SP52**
55	60,7	52,3	-0,5	62	4,04	1,12	4	0,4	6,17	**SP55**
62	67,7	59	-0,6	69	4,04	1,7	4	0,6	10,5	**SP62**
68	74,6	64,2	-0,6	76	4,85	1,7	5	0,6	12,6	**SP68**
72	78,6	68,2	-0,6	80	4,85	1,7	5	0,6	14,7	**SP72**
75	81,6	71,2	-0,6	83	4,85	1,7	5	0,6	15,3	**SP75**
80	86,6	76,2	-0,6	88	4,85	1,7	5	0,6	16,3	**SP80**
85	91,6	81,2	-0,6	93	4,85	1,7	5	0,6	17,5	**SP85**
90	96,5	86,2	-0,6	98	4,85	2,46	5	0,6	26,6	**SP90**
95	101,6	91,2	-0,6	103	4,85	2,46	5	0,6	28,2	**SP95**
100	106,5	96,2	-0,8	108	4,85	2,46	5	0,6	29,2	**SP100**
110	116,6	106,2	-0,8	118	4,85	2,46	5	0,6	32,8	**SP110**
115	121,6	111,2	-0,8	123	4,85	2,46	5	0,6	34,4	**SP115**
120	129,7	114,6	-0,8	131	7,21	2,82	7	0,6	60,6	**SP120**
125	134,7	119,6	-0,8	136	7,21	2,82	7	0,6	63	**SP125**
130	139,7	124,6	-0,8	141	7,21	2,82	7	0,6	65,6	**SP130**
140	149,7	134,6	-1,2	151	7,21	2,82	7	0,6	70,6	**SP140**
145	154,7	139,6	-1,2	156	7,21	2,82	7	0,6	73	**SP145**
150	159,7	144,5	-1,2	161	7,21	2,82	7	0,6	77,2	**SP150**
160	169,7	154,5	-1,2	172	7,21	2,82	7	0,6	81	**SP160**
170	182,9	162,9	-1,2	185	9,6	3,1	10	0,6	122	**SP170**
180	192,9	172,8	-1,2	195	9,6	3,1	10	0,6	128	**SP180**
200	212,9	192,8	-1,4	215	9,6	3,1	10	0,6	148	**SP200**

[1] D_2 dimensions refers to the mounted snap ring
[2] D_3 represents dimensions before mounting

ART BEARINGS

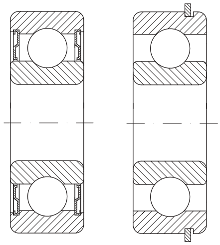
Single Row Deep Groove Ball Bearings



2RSR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
3	10	4	0,1	0,64	0,23	40000	48000	**623**		0,002
	10	4	0,1	0,64	0,23	40000		**623 2ZR**		0,002
4	13	5	0,2	1,3	0,49	38000	45000	**624**		0,003
	13	5	0,2	1,3	0,49	38000		**624 2ZR**		0,003
	16	5	0,3	1,2	0,5	34000	40000	**634**		0,005
	16	5	0,3	1,2	0,5	34000		**634 2ZR**		0,005
5	11	3	0,1	0,64	0,26	55000	65000	**618/5**		0,001
	16	5	0,3	1,9	0,69	34000	40000	**625**		0,005
	16	5	0,3	1,9	0,69	34000		**625 2ZR**		0,005
	16	5	0,3	1,9	0,69	22000		**625 2RSR**		0,005
	19	6	0,3	1,7	0,72	32000	38000	**635**		0,009
	19	6	0,3	1,7	0,72	32000		**635 2ZR**		0,009
6	13	3,5	0,1	1	0,44	50000	59000	**618/6**		0,002
	15	5	0,2	1,45	0,6	47000	56000	**619/6**		0,004
	19	6	0,3	2,2	0,89	32000	38000	**626**		0,008
	19	6	0,3	2,2	0,89	32000		**626 2ZR**		0,008
	19	6	0,3	2,2	0,89	22000		**626 2RSR**		0,008
7	14	3,5	0,1	0,96	0,4	47000	56000	**618/7**		0,002
	17	5	0,3	2,1	0,8	44000	51000	**619/7 Y**		0,005
	19	6	0,3	2,25	0,89	32000	38000	**607**		0,008
	19	6	0,3	2,25	0,89	32000		**607 2ZR**		0,008
	19	6	0,3	2,25	0,89	22000		**607 2RSR**		0,008
	22	7	0,3	3,3	1,35	30000	36000	**627**		0,012
	22	7	0,3	3,3	1,35	30000		**627 2ZR**		0,012
	22	7	0,3	3,3	1,35	20000		**627 2RSR**		0,012
8	16	4	0,2	1,35	0,57	44000	51000	**618/8**		0,003
	19	6	0,3	1,6	0,74	40000	47000	**619/8**		0,007
	22	7	0,3	3,3	1,35	30000	36000	**608**		0,015
	22	7	0,3	3,3	1,35	30000		**608 2ZR**		0,015
	22	7	0,3	3,3	1,35	20000		**608 2RSR**		0,015
9	17	4	0,2	1,45	0,64	40000	47000	**618/9**		0,003
	20	6	0,3	2,65	1,1	37000	43000	**619/9**		0,007
	24	7	0,3	3,35	1,4	30000	36000	**609**		0,018
	24	7	0,3	3,35	1,4	30000		**609 2ZR**		0,018

Single Row Deep Groove Ball Bearings

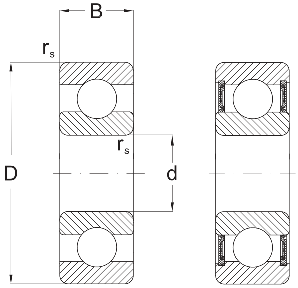


2ZR NR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
9	24	7	0,3	3,35	1,4	20000		**609 2RSR**		0,018
	26	8	0,3	4,55	1,95	28000	34000	**629**		0,02
	26	8	0,3	4,55	1,95	28000		**629 2ZR**		0,02
	26	8	0,3	4,55	1,95	18000		**629 2RSR**		0,02
10	19	5	0,3	1,7	0,83	37000	43000	**61800**		0,005
	22	6	0,3	1,95	0,75	34000	41000	**61900 TN**		0,01
	26	8	0,3	4,6	1,95	28000	34000	**6000 TN**		0,02
	26	8	0,3	4,6	1,95	28000		**6000 2ZR**		0,02
	26	8	0,3	4,6	1,95	17000		**6000 2RSR**		0,02
	28	8	0,3	4,6	1,95	28000	34000	**16100**		0,023
	30	9	0,6	5,1	2,4	26000	32000	**6200 TN**		0,032
	30	9	0,6	5,1	2,4	26000		**6200 2ZR**		0,032
	30	9	0,6	5,1	2,4	17000		**6200 2RSR**		0,032
	30	14	0,6	5,1	2,4	17000		**62200 2RSR**		0.047
	35	11	0,6	8,1	3,45	20000	26000	**6300**		0,057
	35	11	0,6	8,2	3,5	20000		**6300 2ZR**		0,057
	35	11	0,6	8,2	3,5	15000		**6300 2RSR**		0,057
	35	17	0,6	8,2	3,5	10000		**62300 2RSR**		0.063
12	21	5	0,3	1,8	0,95	33000	39000	**61801**		0,006
	21	5	0,3	1,45	0,67	33000	39000	**61801 NR**	SR21	0,006
	24	6	0,3	2,9	1,45	31000	36000	**61901**		0,011
	24	6	0,3	2,9	1,45	31000	36000	**61901 NR**	SR24	0,011
	28	8	0,3	5,1	2,4	26000	32000	**6001**		0,022
	28	8	0,3	5,1	2,4	26000	32000	**6001 TN**		0,022
	28	8	0,3	5,1	2,4	26000		**6001 2ZR**		0,022
	28	8	0,3	5,1	2,4	17000		**6001 2RSR**		0,022
	30	8	0,3	5,1	2,4	26000	32000	**16101**		0,026
	32	10	0,6	6,9	3,1	22000	28000	**6201**		0,037
	32	10	0,6	6,9	3,1	22000	28000	**6201 TN**		0,037
	32	10	0,6	6,9	3,1	22000		**6201 2ZR**		0,037
	32	10	0,6	6,9	3,1	15000		**6201 2RSR**		0,037
	32	14	0,6	6,9	3,1	22000		**62201 2RSR**		0,049
	37	12	1	9,8	4,2	19000	24000	**6301**		0,065
	37	12	1	9,8	4,2	19000		**6301 2ZR**		0,065
	37	12	1	9,8	4,2	12000		**6301 2RSR**		0,065

ART BEARINGS

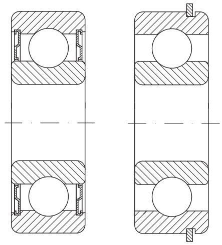
Single Row Deep Groove Ball Bearings



2RSR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
12	37	17	1	9,8	4,2	12000		**62301 2RSR**		0,07
15	24	5	0,3	2	1,25	28000	33000	**61802**		0,007
	24	5	0,3	2	1,25	28000	33000	**61802 NR**	SR24	0,007
	28	7	0,3	4	2,05	26000	30000	**61902**		0,017
	28	7	0,3	4	2,05	26000	30000	**61902 NR**	SR28	0,017
	30	8	0,3	4	2,05	22000	28000	**16002**		0,037
	32	9	0,3	5,6	2,9	22000	28000	**6002**		0,031
	32	9	0,3	5,6	2,9	22000		**6002 2ZR**		0,031
	32	9	0,3	5,6	2,9	14000		**6002 2RSR**		0,031
	35	11	0,6	7,8	3,8	19000	24000	**6202**		0,046
	35	11	0,6	7,8	3,8	19000		**6202 2ZR**		0,046
	35	11	0,6	7,65	3,75	19000	24000	**6202 TN**		0,046
	35	11	0,6	7,8	3,8	13000		**6202 2RSR**		0,046
	35	14	0,6	7,8	3,8	13000		**62202 2RSR**		0,053
	42	13	1	11,5	5,5	17000	20000	**6302**		0,092
	42	13	1	11,5	5,5	17000		**6302 2ZR**		0,092
	42	13	1	11,5	5,5	11000		**6302 2RSR**		0,092
	42	17	1	11,5	5,5	17000		**62302 2RSR**		0,099
17	26	5	0,3	2,2	1,4	26000	32000	**61803**		0,009
	30	7	0,3	4,35	2,3	26000	30000	**61903**		0,018
	35	8	0,3	6	3,25	20000	26000	**16003**		0,04
	35	10	0,3	6	3,3	20000	26000	**6003**		0,042
	35	10	0,3	6	3,3	20000		**6003 2ZR**		0,042
	35	10	0,3	6	3,3	12000		**6003 2RSR**		0,042
	40	12	0,6	9,6	4,8	17000	20000	**6203**		0,07
	40	12	0,6	9,6	4,8	17000	20000	**6203 TN**		0,07
	40	12	0,6	9,6	4,8	17000		**6203 2ZR**		0,07
	40	12	0,6	9,6	4,8	11000		**6203 2RSR**		0,07
	40	12	0,6	9,6	4,8	17000	20000	**6203 NR**	SP40	0,07
	40	16	1	9,6	4,8	17000		**62203 2RSR**		0,082
	47	14	1	13,7	6,7	16000	19000	**6303**		0,12
	47	14	1	13,7	6,7	16000		**6303 2ZR**		0,12
	47	14	1	13,7	6,7	10000		**6303 2RSR**		0,12
	47	19	1	13,4	6,55	16000		**62303 2RSR**		0,145
	62	17	1,1	22,7	11	12000	15000	**6403**		0,285

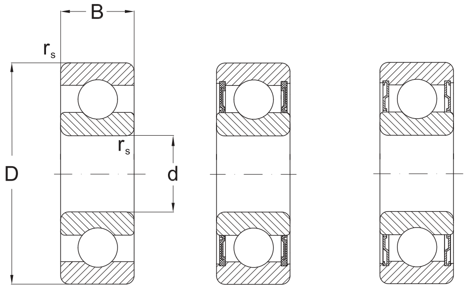
Single Row Deep Groove Ball Bearings



2ZR NR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
17	62	17	1,1	22,7	11	12000	15000	**6403 NR**	SP62	0,285
20	37	9	0,3	6,55	3,65	19000	23000	**61904**		0,036
	37	9	0,3	6,55	3,65	19000	23000	**61904 NR**	SR37	0,036
	42	8	0,3	7,95	4,5	17000	20000	**16004**		0,05
	42	12	0,6	9,4	5,1	17000	20000	**6004**		0,07
	42	12	0,6	9,4	5,1	17000		**6004 2ZR**		0,07
	42	12	0,6	9,4	5,1	11000		**6004 2RSR**		0,07
	47	14	1	12,8	6,7	15000	18000	**6204**		0,118
	47	14	1	12,8	6,7	15000	18000	**6204 TN**		0,118
	47	14	1	12,8	6,7	15000		**6204 2ZR**		0,118
	47	14	1	12,8	6,7	10000		**6204 2RSR**		0,118
	47	14	1	12,8	6,7	15000	18000	**6204 NR**	SP47	0,118
	47	18	1	12,8	6,7	15000		**62204 2RSR**		0,131
	52	15	1,1	15,9	7,9	13000	16000	**6304**		0,158
	52	15	1,1	15,9	7,9	13000	16000	**6304 TN**		0,158
	52	15	1,1	15,9	7,9	13000	16000	**6304 MAP5**		0,158
	52	15	1,1	15,9	7,9	13000		**6304 2ZR**		0,158
	52	15	1,1	15,9	7,9	8000		**6304 2RSR**		0,158
	52	15	1,1	15,9	7,9	13000	16000	**6304 NR**	SP52	0,158
	52	21	1,1	15,9	7,9	13000		**62304 2RSR**		0,197
	72	19	1,1	31	15,2	10000	13000	**6404**		0,42
22	50	14	1	12,9	6,8	15000	18000	**62/22**		0,118
	50	14	1	12,9	6,8	15000		**62/22 2ZR**		0,118
	50	14	1	12,9	6,8	15000		**62/22 2RSR**		0,118
	56	16	1,1	18,5	9,5	13000	16000	**63/22**		0,201
	56	16	1,1	18,5	9,5	13000		**63/22 2ZR**		0,201
	56	16	1,1	18,5	9,5	13000		**63/22 2RSR**		0,201
25	37	7	0,3	4,35	2,6	18000	25000	**61805**		0,022
	42	9	0,3	6,65	4,1	16000	19000	**61905**		0,041
	47	8	0,3	8,4	5,1	15000	18000	**16005**		0,058
	47	12	0,6	10,1	5,9	15000	18000	**6005 TN**		0,086
	47	12	0,6	10,1	5,9	15000		**6005 2ZR**		0,086
	47	12	0,6	10,1	5,9	9500		**6005 2RSR**		0,086
	52	15	1	14	7,9	12000	15000	**6205**		0,142
	52	15	1	14	7,9	12000		**6205 2ZR**		0,142

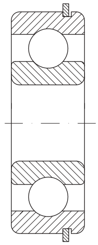
Single Row Deep Groove Ball Bearings



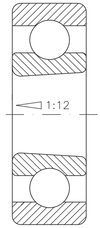
2RSR 2ZR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
25	52	15	1	14	7,9	8000		**6205 2RSR**		0,142
	52	15	1	14	7,9	12000	15000	**6205 NR**	SP52	0,142
	52	18	1	14	7,9	12000		**62205 2RSR**		0,148
	62	17	1,1	20,6	11,3	11000	14000	**6305**		0,25
	62	17	1,1	20,6	11,3	11000	14000	**6305 MAP5**		0,25
	62	17	1,1	20,6	11,3	11000		**6305 2ZR**		0,25
	62	17	1,1	20,6	11,3	7500		**6305 2RSR**		0,25
	62	17	1,1	20,6	11,3	11000	14000	**6305 NR**	SP62	0,25
	62	24	1,1	20,6	11,3	11000		**62305 2RSR**		0,317
	80	21	1,5	37,6	19	9000	11000	**6405**		0,575
	80	21	1,5	37,6	19	9000	11000	**6405 NR**	SP80	0,575
28	58	16	1	10,7	6,65	14000	16000	**62/28**		0,173
	58	16	1	10,7	6,65	14000		**62/28 2ZR**		0,173
	58	16	1	10,7	6,65	14000		**62/28 2RSR**		0,173
	68	18	1,1	19,5	11,5	10000	12000	**63/28**		0,328
	68	18	1,1	19,5	11,5	10000		**63/28 2ZR**		0,328
	68	18	1,1	19,5	11,5	10000		**63/28 RSR**		0,328
30	42	7	0,3	4,4	2,9	15000	18000	**61806**		0,027
	42	7	0,3	4,4	2,9	15000	18000	**61806 NR**	SR42	0,027
	47	9	0,3	7,8	4,7	14000	17000	**61906**		0,045
	47	9	0,3	7,8	4,7	14000	17000	**61906 NR**	SR47	0,045
	55	9	3	11,2	7,35	12000	15000	**16006**		0,087
	55	13	1	13,2	8,25	12000	15000	**6006 TN**		0,129
	55	13	1	13,2	8,25	12000		**6006 2ZR**		0,129
	55	13	1	13,2	8,25	8000		**6006 2RSR**		0,129
	55	13	1	13,2	8,25	12000	15000	**6006 NR**	SP55	0,129
	62	16	1	19,5	11,3	10000	13000	**6206**		0,21
	62	16	1	19,5	11,3	10000		**6206 2ZR**		0,21
	62	16	1	19,5	11,3	7500		**6206 2RSR**		0,21
	62	16	1	19,5	11,3	10000	13000	**6206 NR**	SP62	0,21
	62	20	1	19,5	11,3	10000		**62206 2RSR**		0,236
	72	19	1,1	29,5	15,8	9000	11000	**6306**		0,371
	72	19	1,1	29,5	15,8	9000	11000	**6306 MAP5**		0,371
	72	19	1,1	29,5	15,8	9000		**6306 2ZR**		0,371
	72	19	1,1	29,5	15,8	7000		**6306 2RSR**		0,371

Single Row Deep Groove Ball Bearings



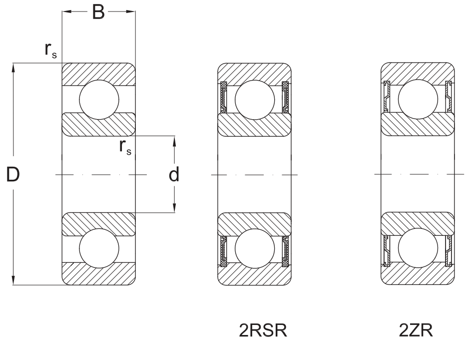
NR



K

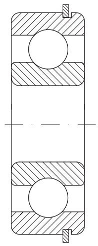
Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
30	72	19	1,1	29,5	15,8	9000	11000	**6306 NR**	SP72	0,371
	72	27	1,1	26,6	14,9	9000		**62306 2RSR**		0,473
	90	23	1,5	47,3	24,5	8500	10000	**6406**		0,785
	90	23	1,5	47,3	24,5	8500	10000	**6406 NR**	SP90	0,785
32	65	17	1	23	13	10000	13000	**62/32**		0,228
	65	17	1	23	13	10000		**62/32 2ZR**		0,228
	65	17	1	23	13	10000		**62/32 2RSR**		0,228
	75	20	1,1	30	16	9000	11000	**63/32**		0,437
	75	20	1,1	30	16	9000		**63/32 2ZR**		0,437
	75	20	1,1	30	16	9000		**63/32 2RSR**		0,437
35	47	7	0,3	4	3,25	13000	16000	**61807**		0,031
	55	10	0,6	9,5	6,2	12000	14000	**61907**		0,073
	62	9	0,3	12,2	8,85	10000	13000	**16007**		0,111
	62	14	1	15,9	10,3	10000	13000	**6007**		0,164
	62	14	1	15,9	10,3	10000		**6007 2ZR**		0,164
	62	14	1	15,9	10,3	7000		**6007 2RSR**		0,164
	62	14	1	15,9	10,3	10000	13000	**6007 NR**	SP62	0,164
	72	17	1,1	25,7	15,6	9000	11000	**6207 K**		0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 TN**		0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 MAP6**		0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 P6**		0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 P5**		0,315
	72	17	1,1	25,7	15,6	9000		**6207 2ZR**		0,315
	72	17	1,1	25,7	15,6	6000		**6207 2RSR**		0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 NR**	SP72	0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 NRP6**	SP72	0,315
	72	17	1,1	25,7	15,6	9000	11000	**6207 MA**		0,315
	72	23	1,1	25,7	15,6	9000		**62207 2RSR**		0,375
	80	21	1,5	33,5	19,2	8500	10000	**6307**		0,45
	80	21	1,5	33,5	19,2	8500	10000	**6307 K**		0,45
	80	21	1,5	33,5	19,2	8500	10000	**6307 P6**		0,45
	80	21	1,5	33,5	19,2	8500	10000	**6307 P5**		0,45
	80	21	1,5	33,5	19,2	8500		**6307 2ZR**		0,45
	80	21	1,5	33,5	19,2	8500		**6307 2ZRP5**		0,45
	80	21	1,5	33,5	19,2	6500		**6307 2RSR**		0,45

Single Row Deep Groove Ball Bearings



Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
35	80	21	1,5	33,5	19,2	6500		**6307 2RSRP6**		0,45
	80	21	1,5	33,5	19,2	6500		**6307 2RSRP5**		0,45
	80	31	1,5	33,5	19,2	8500	10000	**6307 NR**	SP80	0,45
	80	31	1,5	33,5	19,2	8500		**62307 2RSR**		0,658
	100	25	1,5	55,5	29,4	7000	8500	**6407**		0,954
	100	25	1,5	55,5	29,4	7000	8500	**6407 NR**	SP100	0,954
40	52	7	0,3	4,5	4,05	11000	14000	**61808 P5**		0,034
	52	7	0,3	4,5	4,05	11000	14000	**61808 NR**	SR52	0,034
	62	12	0,6	14,5	10,2	11000	13000	**61908**		0,11
	62	12	0,6	14,5	10,2	11000	13000	**61908 NR**	SR62	0,11
	68	9	0,3	13,3	9,8	9500	12000	**16008**		0,13
	68	15	1	16,8	11,6	9500	12000	**6008**		0,21
	68	15	1	16,8	11,6	9500		**6008 2ZR**		0,21
	68	15	1	16,8	11,6	6000		**6008 2RSR**		0,21
	68	15	1	16,8	11,6	9500	12000	**6008 NR**	SP68	0,21
	80	18	1,1	32,6	20	8500	10000	**6208**		0,402
	80	18	1,1	32,6	20	8500	10000	**6208 K**		0,402
	80	18	1,1	32,6	20	8500	10000	**6208 P6**		0,402
	80	18	1,1	32,6	20	8500	10000	**6208 P5**		0,402
	80	18	1,1	32,6	20	8500		**6208 2ZR**		0,402
	80	18	1,1	32,6	20	8500		**6208 2ZRP5**		0,402
	80	18	1,1	32,6	20	5600		**6208 2RSR**		0,402
	80	18	1,1	32,6	20	5600		**6208 2RSRP5**		0,402
	80	18	1,1	32,6	20	8500	10000	**6208 NR**	SP80	0,402
	80	18	1,1	32,6	20	8500	10000	**6208 MB**		0,402
	80	18	1,1	32,6	20	8500	10000	**6208 NMA**		0,402
	80	23	1,1	32,6	20	8500		**62208 2RSR**		0,46
	90	23	1,5	40,8	24	7500	9000	**6308**		0,635
	90	23	1,5	40,8	24	7500	9000	**6308 K**		0,635
	90	23	1,5	40,8	24	7500	9000	**6308 TN**		0,635
	90	23	1,5	40,8	24	7500	9000	**6308 P6**		0,635
	90	23	1,5	40,8	24	7500	9000	**6308 P5**		0,635
	90	23	1,5	40,8	24	7500		**6308 2ZR**		0,635
	90	23	1,5	40,8	24	7500		**6308 2ZRP5**		0,635
	90	23	1,5	40,8	24	5500		**6308 2RSR**		0,635

Single Row Deep Groove Ball Bearings



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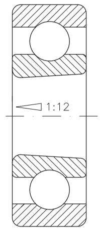
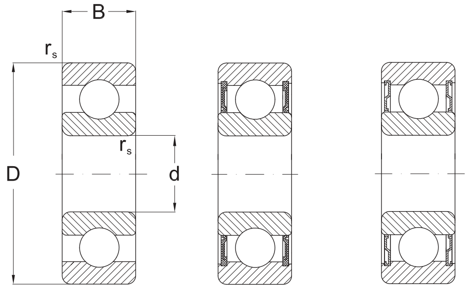


K

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
40	90	23	1,5	40,8	24	7500	9000	**6308 NMA**		0,635
	90	23	1,5	40,8	24	7500	9000	**6308 NR**	SP90	0,635
	90	33	1,5	40,8	24	7500		**62308 2RSR**		0,874
	110	27	2	64	35	6700	7500	**6408**		1,23
	110	27	2	64	35	6700	7500	**6408 NR**	SP110	1,23
45	58	7	0,3	6,4	5,6	9500	12000	**61809**		0,043
	68	12	0,6	14	9,8	9700	12000	**61909**		0,12
	75	10	0,6	15,5	12,3	9000	11000	**16009**		0,17
	75	16	1	21	15	9000	11000	**6009**		0,261
	75	16	1	21	15	9000	11000	**6009 P5**		0,261
	75	16	1	21	15	9000	11000	**6009 P4**		0,261
	75	16	1	21	15	9000		**6009 2ZR**		0,261
	75	16	1	21	15	9000		**6009 2ZRP4**		0,261
	75	16	1	21	15	5600		**6009 2RSR**		0,261
	75	16	1	21	15	9000	11000	**6009 NR**	SP75	0,261
	85	19	1,1	32,7	20,6	7500	9000	**6209**		0,414
	85	19	1,1	32,7	20,6	7500	9000	**6209 K**		0,414
	85	19	1,1	32,7	20,6	7500	9000	**6209 P6**		0,414
	85	19	1,1	32,7	20,6	7500	9000	**6209 P5**		0,414
	85	19	1,1	32,7	20,6	7500		**6209 2ZR**		0,414
	85	19	1,1	32,7	20,6	7500		**6209 2ZRP5**		0,414
	85	19	1,1	32,7	20,6	5000		**6209 2RSR**		0,414
	85	19	1,1	32,7	20,6	5000		**6209 2RSRP6**		0,414
	85	19	1,1	32,7	20,6	5000		**6209 2RSRP5**		0,414
	85	19	1,1	32,7	20,6	7500	9000	**6209 NR**	SP85	0,414
	85	23	1,1	32,7	20,6	5600		**62209 2RSR**		0,481
	100	25	1,5	52,8	31,7	6700	8000	**6309**		0,838
	100	25	1,5	52,8	31,7	6700	8000	**6309 K**		0,838
	100	25	1,5	52,8	31,7	6700	8000	**6309 MB**		0,838
	100	25	1,5	52,8	31,7	6700	8000	**6309 MAP6**		0,838
	100	25	1,5	52,8	31,7	6700	8000	**6309 P6**		0,838
	100	25	1,5	52,8	31,7	6700	8000	**6309 P5**		0,838
	100	25	1,5	52,8	31,7	6700		**6309 2ZR**		0,838
	100	25	1,5	52,8	31,7	6700		**6309 2ZRP5**		0,838
	100	25	1,5	52,8	31,7	4500		**6309 2RSR**		0,838

ART BEARINGS

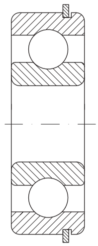
Single Row Deep Groove Ball Bearings



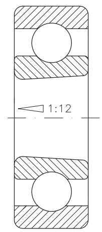
2RSR 2ZR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
45	100	25	1,5	52,8	31,7	4500		**6309 2RSRP6**		0,838
	100	25	1,5	52,8	31,7	4500		**6309 2RSRP5**		0,838
	100	25	1,5	52,8	31,7	6700	8000	**6309 NR**	SP100	0,838
	100	36	1,5	52,8	31,7	4500		**62309 2RSR**		1,18
	120	29	2	76,8	44,9	5600	6700	**6409**		1,54
	120	29	2	76,8	44,9	5600	6700	**6409 NR**	SP120	1,54
50	65	7	0,3	6,8	6,3	9000	11000	**61810**		0,057
	65	7	0,3	6,8	6,3	9000	11000	**61810 NR**	SR65	0,057
	72	12	0,6	14,5	10,4	9000	11000	**61910**		0,13
	72	12	0,6	14,5	10,4	9000	11000	**61910 NR**	SR72	0,13
	80	10	0,6	16,3	13,1	8500	10000	**16010**		0,188
	80	16	1	21,8	16,6	8500	10000	**6010 K**		0,26
	80	16	1	21,8	16,6	8500		**6010 2ZR**		0,26
	80	16	1	21,8	16,6	5300		**6010 2RSR**		0,26
	80	16	1	21,8	16,6	8500	10000	**6010 NR**	SP80	0,26
	90	20	1,1	35,1	23,2	7000	8500	**6210**		0,46
	90	20	1,1	35,1	23,2	7000	8500	**6210 K**		0,46
	90	20	1,1	35,1	23,2	7000	8500	**6210 M**		0,46
	90	20	1,1	35,1	23,2	7000	8500	**6210 MAP6**		0,46
	90	20	1,1	35,1	23,2	7000	8500	**6210 P6**		0,46
	90	20	1,1	35,1	23,2	7000	8500	**6210 P5**		0,46
	90	20	1,1	35,1	23,2	7000		**6210 2ZR**		0,46
	90	20	1,1	35,1	23,2	7000		**6210 2ZRP5**		0,46
	90	20	1,1	35,1	23,2	4500		**6210 2RSR**		0,46
	90	20	1,1	35,1	23,2	4500		**6210 2RSRP6**		0,46
	90	20	1,1	35,1	23,2	4500		**6210 2RSRP5**		0,46
	90	20	1,1	35,1	23,2	7000	8500	**6210 NR**	SP90	0,46
	90	23	1,1	35,1	23,2	7000		**62210 2RSR**		0,514
	110	27	2	61,8	37,9	6300	7000	**6310**		1,06
	110	27	2	61,8	37,9	6300	7000	**6310 K**		1,06
	110	27	2	61,8	37,9	6300	7000	**6310 MAP6**		1,06
	110	27	2	61,8	37,9	6300		**6310 2ZR**		1,06
	110	27	2	61,8	37,9	4000		**6310 2RSR**		1,06
	110	27	2	61,8	37,9	6300	7000	**6310 NR**	SP110	1,06
	110	40	2	61,8	37,9	4000		**62310 2RSR**		1,65

Single Row Deep Groove Ball Bearings



NR

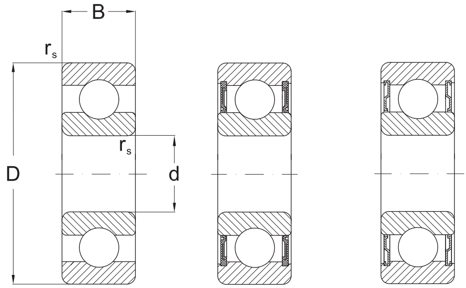


K

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
50	130	31	2,1	87,1	52	5000	6000	**6410**		1,89
	130	31	2,1	87,1	52	5000	6000	**6410 NR**	SP130	1,89
55	72	9	0,3	9	8,5	8500	10000	**61811**		0,083
	90	11	0,6	19,3	16,3	7500	9000	**16011**		0,26
	90	18	1,1	28,3	21,3	7500	9000	**6011 MB**		0,39
	90	18	1,1	28,3	21,3	7500		**6011 2ZR**		0,39
	90	18	1,1	28,3	21,3	4500		**6011 2RSR**		0,39
	90	18	1,1	28,3	21,3	7500	9000	**6011 NR**	SP90	0,39
	100	21	1,5	43,4	29,4	6300	7500	**6211**		0,611
	100	21	1,5	43,4	29,4	6300	7500	**6211 K**		0,611
	100	21	1,5	43,4	29,4	6300	7500	**6211 MA**		0,611
	100	21	1,5	43,4	29,4	6300		**6211 2ZR**		0,611
	100	21	1,5	43,4	29,4	4000		**6211 2RSR**		0,611
	100	21	1,5	43,4	29,4	6300	7500	**6211 NR**	SP100	0,611
	100	25	1,5	43,4	29,4	4000		**62211 2RSR**		0,7
	120	29	2	71,7	45	5300	6300	**6311**		1,38
	120	29	2	71,7	45	5300	6300	**6311 K**		1,38
	120	29	2	71,7	45	5300	6300	**6311 MA**		1,38
	120	29	2	71,7	45	5300		**6311 2ZR**		1,38
	120	29	2	71,7	45	3600		**6311 2RSR**		1,38
	120	29	2	71,7	45	5300	6300	**6311 NR**	SP120	1,38
	120	43	2	71,7	45	3600		**62311 2RSR**		2,04
	140	33	2,1	100	62	4800	5600	**6411**		2,3
	140	33	2,1	100	62	4800	5600	**6411 NR**	SP140	2,3
60	78	10	0,3	8,7	6,7	8000	9500	**61812**		0,12
	95	11	0,6	20	17,6	7000	8500	**16012**		0,28
	95	18	1,1	29,4	23,3	7000	8000	**6012**		0,42
	95	18	1,1	29,4	23,3	6700		**6012 2ZR**		0,42
	95	18	1,1	29,4	23,3	4300		**6012 2RSR**		0,42
	95	18	1,1	29,4	23,3	7000	8000	**6012 NR**	SP95	0,42
	110	22	1,5	52,4	36,3	6000	7000	**6212**		0,78
	110	22	1,5	52,4	36,3	6000	7000	**6212 K**		0,78
	110	22	1,5	52,4	36,3	6000	7000	**6212 MA**		0,78
	110	22	1,5	52,4	36,3	6000		**6212 2ZR**		0,78
	110	22	1,5	52,4	36,3	3800		**6212 2RSR**		0,78

![ART BEARINGS]

Single Row Deep Groove Ball Bearings

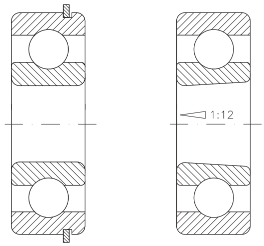


2RSR 2ZR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
60	110	22	1,5	52,4	36,3	6000	7000	**6212 NR**	SP110	0,78
	110	28	1,5	52,4	36,3	6000	7000	**62212**		0,97
	130	31	2,1	81,9	52,2	5000	6000	**6312**		1,72
	130	31	2,1	81,9	52,2	5000	6000	**6312 K**		1,72
	130	31	2,1	81,9	52,2	5000		**6312 2ZR**		1,72
	130	31	2,1	81,9	52,2	3400		**6312 2RSR**		1,72
	130	31	2,1	81,9	52,2	5000	6000	**6312 NR**	SP130	1,72
	130	46	2.1	81.9	52.2	3400		**62312 2RSR**		2.55
	150	35	2,1	110	70,8	4300	5000	**6412**		2,76
	150	35	2,1	110	70,8	4300	5000	**6412 NR**	SP150	2,76
62	110	22	1,5	47,5	28	6000	7000	**62/62**		0,6
65	85	10	0,6	12,2	12	7000	8500	**61813**		0,13
	100	11	0,6	22,9	19,6	6300	7500	**16013**		0,3
	100	18	1,1	30,5	25,4	6300	7500	**6013 K**		0,44
	100	18	1,1	30,5	25,4	6300		**6013 2ZR**		0,44
	100	18	1,1	30,5	25,4	4000		**6013 2RSR**		0,44
	100	18	1,1	30,5	25,4	6300	7500	**6013 NR**	SP100	0,44
	120	23	1,5	57,2	40	5300	6300	**6213**		0,995
	120	23	1,5	57,2	40	5300	6300	**6213 M**		0,995
	120	23	1,5	57,2	40	5300	6300	**6213 MA**		0,995
	120	23	1,5	57,2	40	5300		**6213 2ZR**		0,995
	120	23	1,5	57,2	40	3600		**6213 2RSR**		0,995
	120	23	1,5	57,2	40	5300	6300	**6213 NR**	SP120	0,995
	140	33	2,1	92,7	59,7	4800	5600	**6313**		2,1
	140	33	2,1	92,7	59,7	4800	5600	**6313 MA**		2,1
	140	33	2,1	92,7	59,7	4800	5600	**6313 MB**		2,1
	140	33	2,1	92,7	59,7	4800		**6313 2ZR**		2,1
	140	33	2,1	92,7	59,7	3000		**6313 2RSR**		2,1
	140	33	2,1	92,7	59,7	4800	5600	**6313 NR**	SP140	2,1
	160	37	2,1	118	79	4000	4800	**6413**		3,3
	160	37	2,1	118	79	4000	4800	**6413 NR**	SP160	3,3
70	90	10	0,6	12,5	10	6700	8000	**61814**		0,16
	110	13	0,6	27,9	25	6000	7000	**16014**		0,433
	110	20	1,1	38,1	30,9	6000	7000	**6014**		0,6
	110	20	1,1	38,1	30,9	6000	7000	**6014 MAP5**		0,6

ART BEARINGS

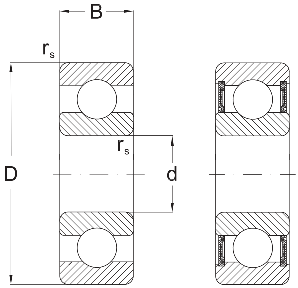
Single Row Deep Groove Ball Bearings



NR K

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
70	110	20	1,1	38,1	30,9	6000		**6014 2ZR**		0,6
	110	20	1,1	38,1	30,9	3800		**6014 2RSR**		0,6
	110	20	1,1	38,1	30,9	6000	7000	**6014 NR**	SP110	0,6
	125	24	1,5	62,2	44,1	5000	6000	**6214**		1,07
	125	24	1,5	62,2	44,1	5000	6000	**6214 MA**		1,07
	125	24	1,5	62,2	44,1	5000		**6214 2ZR**		1,07
	125	24	1,5	62,2	44	3400		**6214 2RSR**		1,07
	125	24	1,5	62,2	44	5000	6000	**6214 NR**	SP125	1,07
	125	31	1.5	62.2	44	3400		**62214 2RSR**		1.36
	150	35	2,1	104	68,1	4500	5300	**6314**		2,5
	150	35	2,1	104	68,1	4500	5300	**6314 K**		2,5
	150	35	2,1	104	68,1	4500	5300	**6314 MAP6**		2,5
	150	35	2,1	104	68,1	4500		**6314 2ZR**		2,5
	150	35	2,1	104	68,1	2900		**6314 2RSR**		2,5
	150	35	2,1	104	68,1	4500	5300	**6314 NR**	SP150	2,5
	150	51	2.1	104	68.1	2900		**62314 2RSR**		3.55
	180	42	3	144	104	3800	4500	**6414**		4,85
75	95	10	0,6	12,8	12,1	6300	7500	**61815 P5**		0,16
	95	10	0,6	12,8	12,1	4000		**61815 2RSR**		0,16
	115	13	0,6	28,5	26,8	5600	6700	**16015**		0,46
	115	20	1,1	39,7	33,5	5600	6700	**6015 M**		0,64
	115	20	1,1	39,7	33,5	5600	6700	**6015 MAP5**		0,64
	115	20	1,1	39,7	33,5	5600		**6015 2ZR**		0,64
	115	20	1,1	39,7	33,5	3600		**6015 2RSR**		0,64
	115	20	1,1	39,7	33,5	5600	6700	**6015 NR**	SP115	0,64
	130	25	1,5	67,4	49,3	4800	5600	**6215**		1,18
	130	25	1,5	67,4	49,3	4800	5600	**6215 K**		1,18
	130	25	1,5	67,4	49,3	4800		**6215 2ZR**		1,18
	130	25	1,5	67,4	49,3	3200		**6215 2RSR**		1,18
	130	25	1,5	67,4	49,3	4800	5600	**6215 NR**	SP130	1,18
	160	37	2,1	113	77	4000	4800	**6315**		3,03
	160	37	2,1	113	77	4000	4800	**6315 MP6**		3,03
	160	37	2,1	113	77	4000		**6315 2ZR**		3,03
	160	37	2,1	113	77	2800		**6315 2RSR**		3,03
	160	37	2,1	113	77	4000	4800	**6315 NR**	SP160	3,03

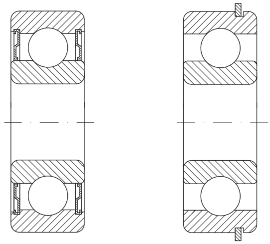
Single Row Deep Groove Ball Bearings



2RSR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
75	190	45	3	154	115	3600	4300	**6415**		6,5
80	100	10	0,6	12,9	13,7	6000	7000	**61816**		0,16
	110	16	1	25,1	20,5	5600	6700	**61916**		0,38
	125	14	0,6	31,9	29,7	5300	6300	**16016**		0,6
	125	22	1,1	47,6	39,8	5300	6300	**6016 MA**		0,85
	125	22	1,1	47,6	39,8	5300		**6016 2ZR**		0,85
	125	22	1,1	47,6	39,8	3400		**6016 2RSR**		0,85
	125	22	1,1	47,6	39,8	5300	6300	**6016 NR**	SP125	0,85
	140	26	2	72,7	53	4500	5300	**6216**		1,4
	140	26	2	72,7	53	4500	5300	**6216 K**		1,4
	140	26	2	72,7	53	4500	5300	**6216 MA**		1,4
	140	26	2	72,7	53	4500		**6216 2ZR**		1,4
	140	26	2	72,7	53	3000		**6216 2RSR**		1,4
	140	26	2	72,7	53	4500	5300	**6216 NR**	SP140	1,4
	140	33	2	72.7	53	3000		**62216 2RSR**		1.7
	170	39	2,1	123	86,5	3800	4500	**6316 K**		3,6
	170	39	2,1	123	86,5	3800	4500	**6316 M**		3,6
	170	39	2,1	123	86,5	3800		**6316 2ZR**		3,6
	170	58	2.1	123	86.5	2500		**62316 2RSR**		4.2
	170	39	2,1	123	86,5	3800	4500	**6316 NR**	SP170	3,6
	200	48	3	164	125	3400	4000	**6416**		7,5
85	110	13	1	19,3	20	5300	6300	**61817**		0,29
	130	14	1	33,8	33,5	5000	6000	**16017**		0,63
	130	22	1,1	49,5	43,1	5000	6000	**6017**		0,89
	130	22	1,1	49,5	43,1	5000		**6017 2ZR**		0,89
	130	22	1,1	49,5	43,1	3200		**6017 2RSR**		0,89
	130	22	1,1	49,5	43,1	5000	6000	**6017 NR**	SP130	0,89
	150	28	2	84	61,9	4300	5000	**6217**		1,8
	150	28	2	84	61,9	4300	5000	**6217 K**		1,8
	150	28	2	84	61,9	4300	5000	**6217 MP6**		1,8
	150	28	2	84	61,9	4300		**6217 2ZR**		1,8
	150	28	2	84	61,9	2800		**6217 2RSR**		1,8
	150	28	2	84	61,9	4300	5000	**6217 NR**	SP150	1,8
	150	36	2	84	61.9	2800		**62217 2RSR**		2.1
	180	41	3	133	96,9	3600	4300	**6317**		4,2

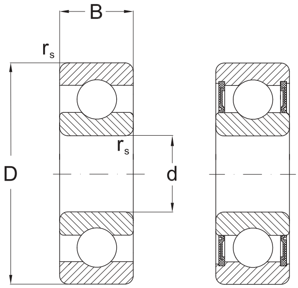
Single Row Deep Groove Ball Bearings



2ZR NR

Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
85	180	41	3	133	96,9	3600	4300	**6317 K**		4,2
	180	41	3	133	96,9	3600	4300	**6317 MA**		4,2
	180	41	3	133	96,9	3600	4300	**6317 MB**		4,2
	180	41	3	133	96,9	3600		**6317 2ZR**		4,2
	180	41	3	133	96,9	3600	4300	**6317 NR**	SP180	4,2
	180	60	3	133	96.9	2300		**62317 2RSR**		4.8
	210	52	4	173	136	3200	3800	**6417**		9
90	115	13	1	19,6	20,4	5300	6300	**61818**		0,3
	140	16	1	41,9	40,4	4500	5300	**16018**		0,85
	140	24	1,5	58,2	49,7	4500	5300	**6018 MA**		1,16
	140	24	1,5	58,2	49,7	4500	5300	**6018 MP6**		1,16
	140	24	1,5	58,2	49,7	4500		**6018 2ZR**		1,16
	140	24	1,5	58,2	49,7	3000		**6018 2RSR**		1,16
	140	24	1,5	58,2	49,7	4500	5300	**6018 NR**	SP140	1,6
	160	30	2	96	71,5	3800	4500	**6218**		2,16
	160	30	2	96	71,5	3800	4500	**6218 K**		2,16
	160	30	2	96	71,5	3800	4500	**6218 MA**		2,16
	160	30	2	96	71,5	3800	4500	**6218 MP6**		2,16
	160	30	2	96	71.5	2600		**6218 2RSR**		2.16
	160	30	2	96	71,5	3800		**6218 2ZR**		2,16
	160	30	2	96	71,5	3800	4500	**6218 NR**	SP160	2,16
	160	40	2	96	71.5	2600		**62218 2RSR**		2.4
	190	43	3	143	107	3400	4000	**6318**		4,9
	190	43	3	143	107	3400	4000	**6318 K**		4,9
	190	43	3	143	107	3400	4000	**6318 M**		4,9
	190	43	3	143	107	3400		**6318 2ZR**		4,9
	190	43	3	143	107	3400	4000	**6318 NR**	SP190	4,9
	190	64	3	143	107	2100		**62318 2RSR**		5.5
	225	54	4	190	160	3000	3600	**6418**		11,5
	145	16	1	42,3	41,5	4300	5000	**16019**		0,89
	145	24	1,5	60,5	53,6	4300	5000	**6019**		1,2
95	145	24	1,5	60,5	53,6	4300		**6019 2ZR**		1,2
	145	24	1,5	60,5	53,6	2900		**6019 2RSR**		1,2
	145	24	1,5	60,5	53,6	4300	5000	**6019 NR**	SP145	1,2
	170	32	2,1	109	81,9	3600	4300	**6219 MBP6**		2,6

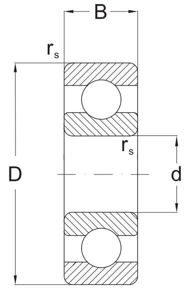
Single Row Deep Groove Ball Bearings



2RSR

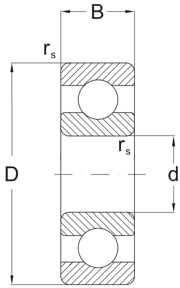
Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
95	170	32	2.1	109	81.9	2400		**6219 2RSR**		2.6
	170	32	2.1	109	81.9	3600		**6219 2ZR**		2.6
	170	32	2,1	109	81,9	3600	4300	**6219 NR**	SP170	2,6
	170	43	2.1	109	81.9	2400		**62219 2RSR**		2.8
	200	45	3	153	118	3200	3800	**6319**		5,6
	200	45	3	153	118	3200	3800	**6319 MAP6**		5,6
	200	67	3	153	118	2000		**62319 2RSR**		6.5
100	125	13	1	19,6	21,2	4800	5600	**61820 MAP5**		0,32
	150	16	1	45	44	4300	5000	**16020**		0,91
	150	24	1,5	60,5	54	4300	5000	**6020 MAP6**		1,25
	150	24	1,5	60,5	54	4300		**6020 2ZR**		1,25
	150	24	1,5	60,5	54	2800		**6020 2RSR**		1,25
	150	24	1,5	60,5	54	4300	5000	**6020 NR**	SP150	1,25
	180	34	2,1	124	93	3400	4000	**6220**		3,1
	180	34	2.1	124	93	2200		**6220 2RSR**		3.1
	180	34	2.1	124	93	3400		**6220 2ZR**		3.1
	180	34	2,1	124	93	3400	4000	**6220 MA**		3,15
	180	34	2,1	124	93	3400	4000	**6220 MP6**		3,15
	180	34	2,1	124	93	3400	4000	**6220 NR**	SP180	3,15
	180	46	2.1	124	93	2200		**62220 2RSR**		?
	215	47	3	173	140	3000		**6320 2ZR**		7
	215	47	3	173	140	3000	3600	**6320 MAP6**		7
105	130	13	1	20,8	19	4500	5300	**61821 MAP5**		0,35
	160	18	1	52	51	4000	4800	**16021**		1,2
	160	26	2	72,3	65,8	3800	4500	**6021 M**		1,6
	160	26	2	72.3	65.8	2400		**6021 2RSR**		1.6
	160	26	2	72.3	65.8	3800		**6021 2ZR**		1.6
	160	26	2	72.3	65.8	3800	4500	**6021 NR**	SP160	1.6
	190	36	2,1	133	104	3200	3800	**6221**		3,7
	190	36	2.1	133	104	2100		**6221 2RSR**		3.7
	190	36	2.1	133	104	3200		**6221 2ZR**		3.7
	190	36	2,1	133	104	3200	3800	**6221 MA**		3,7
	225	49	3	184	153	2800	3400	**6321 MA**		8
110	140	16	1	28,1	29	4300	5000	**61822**		0,6
	170	19	1	57,5	56,7	3800	4500	**16022**		1,46

Single Row Deep Groove Ball Bearings



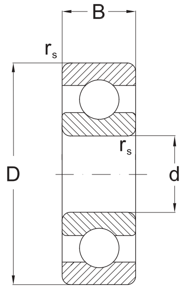
Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
110	170	28	2	82	73	3600	4300	**6022**		1,95
	170	28	2	82	73	2300		**6022 2RSR**		1.95
	170	28	2	82	73	3600		**6022 2ZR**		1.95
	170	28	2	82	73	3600	4300	**6022 NR**	SP170	1.95
	200	38	2,1	143	118	3000	3600	**6222**		4,35
	200	38	2.1	143	118	1900		**6222 2RSR**		4.35
	200	38	2.1	143	118	3000		**6222 2ZR**		4.35
	200	38	2,1	143	118	3000	3600	**6222 M**		4,35
	200	38	2,1	143	118	3000	3600	**6222 NR**	SP200	4,35
	240	50	3	203	178	2600	3200	**6322**		9,58
	240	50	3	203	178	2600	3200	**6322 MA**		9,58
120	150	16	1	29,1	32,5	3800	4500	**61824**		0,65
	180	19	1	63,2	63,3	3400	4000	**16024**		1,7
	180	28	2	85	79,3	3400	4000	**6024 MP6**		2,09
	180	28	2	85	79.3	2100		**6024 2RSR**		2.09
	180	28	2	85	79.3	3400		**6024 2ZR**		2.09
	180	28	2	85	79.3	3400	4000	**6024 NR**	SP180	2.09
	215	40	2,1	155	131	2800	3400	**6224**		5,15
	215	40	2,1	155	131	2800	3400	**6224 MB**		5,15
	215	40	2,1	155	131	2800	3400	**6224 MAP6**		5,15
	215	40	2,1	155	131	2800		**6224 2ZR**		5,15
	215	40	2,1	155	131	2800	3400	**6224 NR**	SP215	5,15
	260	55	3	212	190	2400	3000	**6324 MA**		13,6
130	165	18	1,1	38	43	3600	4300	**61826 MAP5**		0,93
	200	22	1,1	79	81	3200	3800	**16026**		2,5
	200	33	2	106	101	3000	3600	**6026**		3,25
	200	33	2	106	101	1900		**6026 2RSR**		3.25
	200	33	2	106	101	3000		**6026 2ZR**		3.25
	200	33	2	106	101	3000	3600	**6026 NR**	SP200	3.25
	230	40	3	167	146	2600	3200	**6226**		6
	230	40	3	167	146	2600	3200	**6226 M**		6
	280	58	4	229	214	2200	2800	**6326 MA**		17
140	175	18	1,1	39	46	3400	4000	**61828 MAP5**		1
	210	22	1,1	80,5	86	2800	3400	**16028**		2,7
	210	33	2	110	109	2800	3400	**6028 MP6**		3,35

Single Row Deep Groove Ball Bearings



Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
140	250	42	3	176	164	2400	3000	**6228**		7,5
	250	42	3	176	164	2400	3000	**6228 MA**		7,5
	300	62	4	253	246	2000	2600	**6328 MA**		21
150	190	20	1,1	48,8	61	3000	3600	**61830**		1,4
	225	24	1,1	92,3	98	2600	3200	**16030**		3,4
	225	35	2,1	125	126	2600	3200	**6030 MA**		4,75
	270	45	3	176	170	2000	2600	**6230 MA**		9,6
	320	65	4	275	284	1900	2400	**6330 MA**		25
160	200	20	1,1	52	62	2800	3400	**61832**		1,49
	240	25	1,5	99,4	107	2400	3000	**16032**		3,6
	240	38	2,1	140	143	2400	3000	**6032 MA**		5,85
	290	48	3	185	186	1900	2400	**6232 MA**		15
170	215	22	1,1	61,8	73,5	2600	3200	**61834 P6**		2
	260	28	1,5	118	127	2200	2800	**16034**		5,7
	260	42	2,1	168	172	2200	2800	**6034 MA**		7,8
	310	52	4	212	224	1900	2400	**6234 MA**		17,5
180	225	22	1,1	62,3	78,5	2400	3000	**61836 P5**		2
	250	33	2	128	137	2200	2800	**61936 MA**		4,9
	280	31	2	140	146	2000	2600	**16036 MA**		7
	280	46	2,1	186	194	2000	2600	**6036**		10,5
	320	52	4	227	242	1800	2200	**6236**		18,5
190	240	24	1,5	74,1	92	2200	2800	**61838**		2,6
	290	31	2	148	162	2000	2600	**16038**		7,9
	290	46	2,1	194	210	2000	2600	**6038 MA**		11
	290	46	2,1	194	210	2000	2600	**6038 MB**		11
	290	46	2,1	194	210	2000	2600	**6038 MBP6**		11
	290	46	2,1	194	210	2000	2600	**6038 MBP5**		11
	340	55	4	255	278	1700	2000	**6238 MA**		23
	340	55	4	255	278	1700	2000	**6238 MB**		23
200	250	24	1,5	78	93	2200	2800	**61840 MB**		2,7
	280	38	2,1	151	160	2200	2800	**61940 MB**		7,25
	310	34	2	168	187	1900	2400	**16040 MBP6**		9
	310	34	2	168	187	1900	2400	**16040 MBP5**		9
	310	51	2,1	208	226	1900	2400	**6040 MA**		13,5
	310	51	2,1	208	226	1900	2400	**6040 MB**		13,5

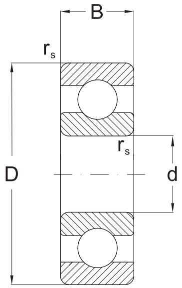
Single Row Deep Groove Ball Bearings



Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
200	310	51	2,1	208	226	1900	2400	**6040 MBP52**		13,5
	360	58	4	280	314	1700	2000	**6240 M**		28
	360	58	4	280	314	1700	2000	**6240 MB**		27
220	270	24	1,5	78	110	1900	2400	**61844 M**		3
	300	38	2,1	151	180	1900	2400	**61944 M**		8
	340	37	2,1	174	204	1800	2200	**16044 M**		12
	340	56	3	245	290	1700	2000	**6044 M**		18
	400	65	4	290	354	1500	1800	**6244 M**		36,9
	460	88	5	410	520	1300	1600	**6344 M**		74,5
240	300	28	2	108	150	1800	2200	**61848 M**		4,5
	320	38	2,1	159	200	1800	2200	**61948 M**		8,6
	360	37	2,1	185	228	1600	1900	**16048**		14,3
	360	56	3	255	315	1600	1900	**6048 M**		19,9
	440	72	4	358	475	1400	1700	**6248 M**		50,2
	500	95	5	442	585	1100	1400	**6348 M**		96
260	320	28	2	96	125	1700	2000	**61852 M**		4,8
	360	46	2,1	212	270	1600	1900	**61952 M**		14,5
	400	44	3	238	310	1500	1800	**16052 M**		21,2
	400	65	4	300	390	1400	1700	**6052 MA**		31,1
	480	80	5	390	530	1100	1400	**6252 M**		66,6
	540	102	6	507	710	1000	1300	**6352 M**		119
280	350	33	2	125	170	1600	1900	**61856 MA**		7,4
	380	46	2,1	216	285	1500	1800	**61956 M**		15,5
	420	44	3	240	325	1400	1700	**16056**		23,1
	420	65	4	305	425	1400	1700	**6056 M**		33
	500	80	5	423	600	1100	1400	**6256 M**		70,5
	580	108	6	572	850	950	1200	**6356 M**		146
300	380	38	2,1	150	195	1400	1700	**61860 M**		10,5
	420	56	3	270	375	1300	1600	**61960 M**		24,5
	460	50	4	295	415	1300	1600	**16060 M**		32,7
	460	74	4	360	510	1200	1500	**6060 M**		43,2
320	400	38	2,1	172	255	1300	1600	**61864 M**		11
	440	56	3	276	400	1200	1500	**61964 M**		25,5
	480	50	4	305	446	1200	1500	**16064 M**		34,4
	480	74	4	375	550	1200	1500	**6064 M**		49,4

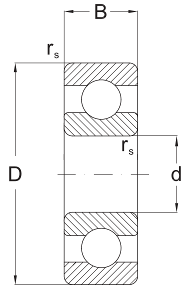
ART BEARINGS

Single Row Deep Groove Ball Bearings



Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
340	420	38	2,1	178	275	1200	1500	**61868 M**		11,5
	460	56	3	281	425	1100	1400	**61968 M**		26,5
	520	57	4	347	528	1100	1400	**16068 MA**		47,3
	520	74	5	440	658	1100	1400	**6068 M**		61,4
360	440	38	2,1	182	285	1100	1400	**61872 MA**		12
	480	56	3	291	450	1100	1400	**61972 M**		28
	540	57	4	351	550	1000	1300	**16072 M**		49,5
	540	82	5	455	735	1000	1300	**6072 M**		64,4
380	480	38	2,1	242	390	1000	1300	**61876 M**		20
	520	56	4	338	540	1000	1300	**61976 M**		40
	560	57	4	377	620	950	1200	**16076 M**		50,5
	560	82	5	450	723	1000	1300	**6076 M**		67,6
400	500	46	2,1	220	335	1000	1300	**61880 M**		20,5
	540	65	4	345	570	950	1200	**61980 M**		41,5
	600	90	5	523	857	900	1100	**6080 M**		87,2
420	520	46	2,1	224	345	950	1200	**61884 M**		21,5
	560	65	4	351	600	900	1100	**61984 M**		43
	620	90	5	507	880	900	1100	**6084 M**		93
440	540	46	2,1	228	355	900	1100	**61888 M**		22,5
	600	74	4	410	720	900	1100	**61988 M**		60,5
	650	94	6	553	965	850	1000	**6088 M**		105
460	580	56	3	319	570	900	1100	**61892 M**		35
	620	74	4	423	750	850	1000	**61992 M**		62,5
	680	100	6	580	1056	800	950	**6092 M**		121
480	600	56	3	325	600	850	950	**61896 M**		36,5
	650	78	5	449	815	800	950	**61996 M**		74
	700	100	6	615	1130	750	900	**6096 M**		126
500	620	56	3	332	620	850	950	**618/500 M**		37,5
	670	78	5	462	865	750	900	**619/500 M**		77
	720	100	6	607	1138	740	890	**60/500 M**		135
530	650	56	3	332	655	850	950	**618/530 M**		39,5
	710	82	5	488	930	700	850	**619/530 M**		90,5
	780	112	6	670	1290	670	800	**60/530 M**		186
560	680	56	3	345	695	700	850	**618/560 M**		42
	750	85	5	494	980	670	800	**619/560 M**		105

Single Row Deep Groove Ball Bearings



Dimensions				Basical radial load		Speed limit		Designation		Mass
d	D	B	r_s min	dyn. C_r	stat. C_{0r}	grease	oil	bearing	snap ring	
mm				kN		min^{-1}		-		kg
560	820	115	6	720	1400	630	750	**60/560 M**		208
600	870	118	6	826	1753	630	750	**60/600 M**		236
630	920	128	7,5	819	1760	560	670	**60/630 M**		285
670	820	69	4	442	1000	560	670	**618/670 M**		77,5
	900	103	6	676	1500	530	630	**619/670 M**		185
	980	136	7,5	904	2040	500	600	**60/670 M**		345
750	920	78	5	527	1250	500	600	**618/750 M**		110
	1000	112	6	663	1500	500	600	**619/750 M**		255

ART BEARINGS

Double Row Deep Groove Ball Bearings

Standards, Boundary dimensions

Standard plans	DIN 616
Deep groove ball bearing	DIN 625

General

Double Row Deep groove ball bearings feature higher load ratings when compared to single row bearings.

This two row bearing gives a very rigid arrangement, but they are very sensitive to misalignments.

Tolerances

ART Double Row Deep groove bearings are produced in normal tolerance class (**PN**) as standard.

Internal clearance

ART Double Row Deep groove ball bearings are produced with **normal internal clearance**, (**CN**) as standard. Other internal clearance groups may be produced upon request.

Design variants, Cages

ART Double Row Deep groove ball bearings have the latest design (suffix B) without filling slots.

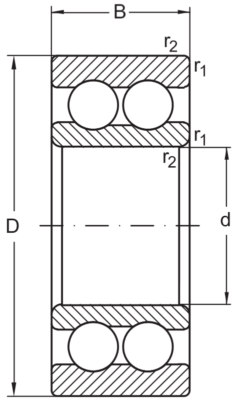
Thus they are able to support thrust loads equally well in both directions. These bearings are fitted with **polyamide cages**, (suffix **TN**) as standard.

These bearing sizes are also available with **pressed steel cages**.

But, it must be considered that some of these bearings may have filling slots which limit the ability to support thrust loads in the direction of these filling slots.

ART BEARINGS

Double Row Deep Groove Ball Bearings



Dimensions				Basical load ratings		Speed rating		Designation	Mass
d	D	B	r_1, r_2 min.	dyn. C_r	stat. C_{0r}	grease	oil		
mm				kN		min^{-1}			kg
10	30	14	0,6	9,2	5,2	18000	22000	**4200 BTN**	0,049
12	32	14	0,6	10,6	6,2	17000	20000	**4201 BTN**	0,053
15	35	14	0,6	11,9	7,5	14000	17000	**4202 BTN**	0,059
	42	17	1	14,8	9,5	12000	15000	**4302 BTN**	0,12
17	40	16	0,6	14,8	9,5	12000	15000	**4203 BTN**	0,09
	47	19	1	19,5	13,5	10000	13000	**4303 BTN**	0,16
20	47	18	1	17,8	12,5	10000	13000	**4204 BTN**	0,14
	52	21	1,1	23,4	16	9500	12000	**4304 BTN**	0,21
25	52	18	1	19	14,5	9000	11000	**4205 BTN**	0,16
	62	24	1,1	31,9	22,5	8500	10000	**4305 BTN**	0,34
30	62	20	1	26	20,5	8000	9500	**4206 BTN**	0,26
	72	27	1,1	41,2	30	7000	8500	**4306 BTN**	0,5
35	72	23	1,1	35,1	28,5	6700	8000	**4207 BTN**	0,4
	80	31	1,5	50,5	38	6300	7500	**4307 BTN**	0,69
40	80	23	1,1	37,05	32,5	6000	7000	**4208 BTN**	0,5

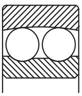
Double Row Deep Groove Ball Bearings

Dimensions				Basical load ratings		Speed rating		Designation	Mass
d	D	B	r_1, r_2 min.	dyn. C_r	stat. C_{0r}	grease	oil		
mm				kN		min^{-1}			kg
40	90	33	1,5	55,7	45	5600	6700	**4308 BTN**	0,95
45	85	23	1,1	39	36	5600	6700	**4209 BTN**	0,54
	100	36	1,5	68,5	56	5000	6000	**4309 BTN**	1,25
50	90	23	1,1	40,5	40	5000	6000	**4210 BTN**	0,58
	110	40	2	81,5	70	4500	5300	**4310 BTN**	1,7
55	100	25	1,5	45	44	4800	5600	**4211 BTN**	0,8
	120	43	2	97,5	83	4300	5000	**4311 BTN**	2,15
60	110	28	1,5	57	55	4500	5300	**4212 BTN**	1,1
	130	46	2,1	112	98	3800	4500	**4312 BTN**	2,65
65	120	31	1,5	67,5	67	4000	4800	**4213 BTN**	1,45
70	125	31	1,5	70	73,5	3600	4300	**4214 BTN**	1,5
75	130	31	1,5	72,5	80	3400	4000	**4215 BTN**	1,6
80	140	33	2	80,5	90	3200	3800	**4216 BTN**	2
85	150	36	2	93,6	102	3000	3600	**4217 BTN**	2,55
90	160	40	2	112	122	2800	3400	**4218 BTN**	3,2

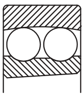
Self-aligning ball bearings

Self-aligning ball bearings have a common sphered raceway in the outer ring. This feature allows angular misalignment of the shaft relative to the housing. Therefore self-aligning ball bearings are particularly used in case of bearings where misalignment can occur from errors in mounting or from shaft bending.

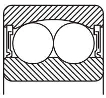
Double row self-aligning ball bearings are manufactured both with cylindrical bore and tapered bore (taper 1:12). Self-aligning bearings with tapered bore can be delivered, at request, with adapter sleeves.



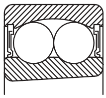
12
13
22
23



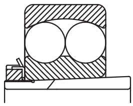
12 K
13 K
22 K
23 K



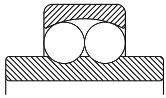
22 2RSR
23 2RSR



22 K2RSR
23 K2RSR



K+H



112
113

Suffixes

C2 - radial clearance smaller than normal
C3 - radial clearance larger than normal
H - adapter sleeve
K - tapered bore bearings
M - machined brass cage, ball guided
MB - machined brass cage, guided on the inner ring
P6 - tolerance class more accurate than normal
P63 - tolerance class P6 with radial clearance C3
2RSR - bearing with two seals
TN - polyamide cage

Sealed self-aligning ball bearings

Self-aligning ball bearings are also available in a sealed version with seals at both sides. The seals are made of gasoline, oil and wear-resistant synthetic rubber. Sealed bearings are delivered filled with a certain grease quantity. Sealed bearing operating temperatures are between -30°C and +80°C. Grease service life is much reduced if bearing operates at a temperature higher than +80°C (see page 63).

Sealed bearings are greased for the entire operating period, relubrication not being necessary. Sealed bearings washing or heating before mounting in assembly is not allowed.

Self-aligning ball bearings with extended inner ring

Self-aligning ball bearings with extended inner ring of series 112 and 113 are used in applications where high accuracy is not necessary and generally, they can be mounted directly on rolled shafts. The bore manufactured to tolerance class J7 allows fast mounting and dismounting. The inner ring has a groove for bearing axial location which can be done by means of a screw or pin.

Dimensions

Overall dimensions of self-aligning ball bearings are in accordance with ISO 15.

Misalignment

Self-aligning ball bearings allow within certain limits an angular misalignment of the outer ring in relation to the inner ring, without detrimental effects in bearing unit.

Approximate values for permissible misalignment, under normal operating conditions are given in table 1.

Permissible misalignment Table 1	
Bearing series	**Permissible misalignment**
	degrees
108, 126, 127, 129, 135	3
12, 112	2,5
13, 113	3
22	2,5
22-2RSR	1,5
23	3
23-2RSR	1,5

Tolerances and radial clearance

Bearings of serial production are manufactured to normal tolerance class and with normal radial clearance. Tapered bore bearings of serial production are also manufactured with radial clearance C3.

Self-aligning ball bearings with extended inner ring are manufactured with radial clearance C2 and normal clearance.

At request, these bearings can also be manufactured to other tolerance classes and with smaller or larger radial clearance.

The bore of self-aligning ball bearings with extended inner ring is manufactured to tolerance class J7.

Bearing tolerances are given on page 27 and the values of radial clearance are given in tables 2 and 3.

Radial clearance of self-aligning ball bearings
With cylindrical bore

Table 2

Bore diameter d		**Designation of clearance group**									
		C2		**Normal**		**C3**		**C4**		**C5**	
		Bearing radial clearance									
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
mm		µm									
2,5	**6**	1	8	5	15	10	20	15	25	21	33
6	**10**	2	9	6	17	12	25	19	33	27	42
10	**14**	2	10	6	19	13	26	21	35	30	48
14	**18**	3	12	8	21	15	28	23	37	32	50
18	**24**	4	14	10	23	17	30	25	39	34	52
24	**30**	5	16	11	24	19	35	29	46	40	58
30	**40**	6	18	13	29	23	40	34	53	46	66
40	**50**	6	19	14	31	25	44	37	57	50	71
50	**65**	7	21	16	36	30	50	45	69	62	88
65	**80**	8	24	18	40	35	60	54	83	76	108
80	**100**	9	27	22	48	42	70	64	96	89	124
100	**120**	10	31	25	56	50	83	75	114	105	145
120	**140**	10	38	30	68	60	100	90	135	125	175
140	**160**	15	44	35	80	70	120	110	161	150	210
With tapered bore Table 3											
18	**24**	7	17	13	26	20	33	28	42	37	55
24	**30**	9	20	15	28	23	39	33	50	44	62
30	**40**	12	24	19	35	29	46	40	59	52	72
40	**50**	14	27	22	39	33	52	45	65	58	79
50	**65**	18	32	27	47	41	61	56	80	73	99
65	**80**	23	39	35	57	50	75	69	98	91	123
80	**100**	29	47	42	68	62	90	84	116	109	144
100	**120**	35	56	50	81	75	108	100	139	130	170
120	**140**	40	68	60	98	90	130	120	165	155	205
140	**160**	45	74	65	110	100	150	140	191	180	240

Equivalent dynamic radial load

$P_r = F_r + Y_1 F_a$, kN, when $F_a/F_r \le e$,
$P_r = 0{,}65\ F_r + Y_2 F_a$, kN when $F_a/F_r > e$,

The values of factors e, Y_1 and Y_2 which depend on bearings are given in bearing tables.

Equivalent static radial load

$P_{0r} = F_r + Y_0 F_a$, kN

The values of the factor Y_0 which depends on bearing are given in bearing tables.

Axial load on bearings with adapter sleeves

If self-aligning ball bearings are mounted with adapter sleeves on smooth shafts, without side location, their axial carrying capacity depends on the friction between the sleeve bore and shaft.

Permissible axial load can be precisely enough determined using the equation:

$F_{a\ max} = 3\ B\ d$,

where:

$F_{a\ max}$ - maximum permissible axial load, N

B - bearing width, mm

d - bearing bore diameter, mm

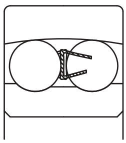
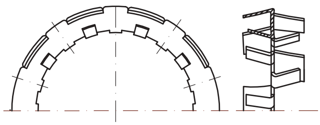
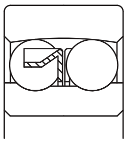
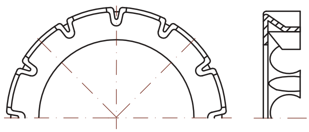
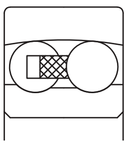
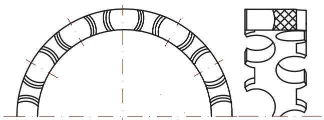
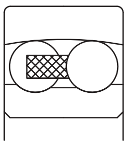
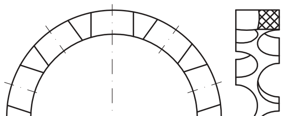
Cages

Self-aligning ball bearings are generally fitted with presses cages of sheet. At special request, when bearings operate under fluctuating loads, at high speeds and where large sizes are required, machined brass cages are recommended to be used. Glass fiber reinforced polyamide 6.6 cages are also suitable if the operating temperatures do not exceed +120°C. They have low mass, a low coefficient of friction and are noiseless while running.

Cage design and technical data are given in table 4.

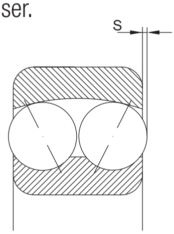
Cage design and technical data

Table 4

Cage	Design		Application	Max. value $D_m n$	
	bearing	cage		oil	grease
Pressed sheet cage			- General application - Moderate speeds - Sealed bearings series 12, 13, 22, 23	$600x10^3$	$450x10^3$
Pressed sheet cage			- General application - Moderate speeds - Bearings series 22, 23	$600x10^3$	$450x10^3$
Polyamide cage TN			- High speeds - Bearings series 12, 13, 22, 23	$1000x10^3$	$800x10^3$
Machined brass cage M			- High speeds - Bearings: 1220-1222; 1317-1322; 2217-2222; 2317-2320	$900x10^3$	$700x10^3$

Special characteristics

In case of some dimensions of self-aligning ball bearings series 12 and 13, the balls protrude somewhat from the bearing, as shown in the adjacent design and table. This should be considered both by designer and user.



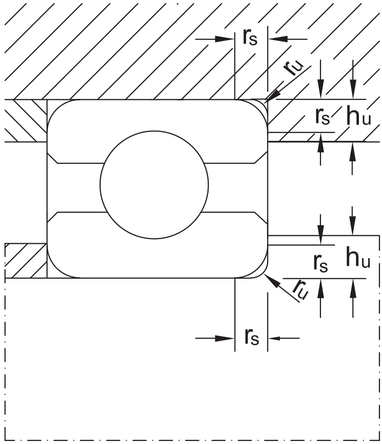
Values of dimension S Table 5	
Bearing	**S** mm
1224	1,3
1226	0,7
1318	1
1319	1,5
1320	2,5
1321	2,6
1322	2,6

Abutment dimensions

For a proper location of bearing rings on the shaft shoulder and housing shoulder respectively, maximum connection radius $r_{u\ max.}$ of shaft (housing) should be less than minimum mounting chamfer $r_{s\ min}$ of bearing.

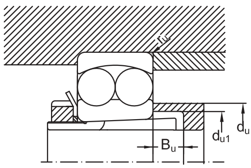
Shoulder height should also be properly sized in case of bearing maximum mounting chamfer.

In case of self-aligning ball bearings with tapered bore which are mounted directly on a tapered shaft or with an adapter sleeve, proper tightening and minimum radial clearance of 10-20 µm should be assured for normal clearance and of 20-55 µm for clearance C3, depending on bearing size and series. The values of the connection radius and support shoulder height are given in table 6 and mounting dimensions for bearings mounted with adapter sleeves are given in table 7.



Abutment dimensions Table 6		
		h_{umin} min.
r_s min.	**r_u max.**	Bearing series 12, 13, 112, 22, 23, 113
mm		
0,3	0,2	1,2
0,6	0,6	2,1
1	1	2,8
1,1	1	3,5
1,5	1,5	4,5
2	2	5,5
2,1	2,1	6

Self-aligning ball bearings with adapter sleeves
Abutment dimensions



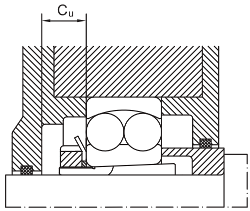
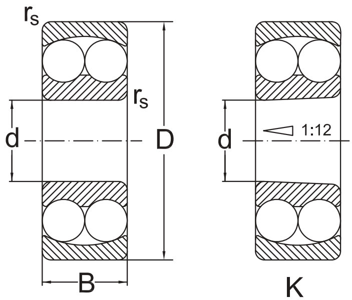


Table 7

Bore symbol	Shaft diameter	Bearing series												
		12K			22K			13K			23K			All series
		d_{u1} min.	d_u max.	B_u min.	d_{u1} min.	d_u max.	B_u min.	d_{u1} min.	d_u max.	B_u min.	d_{u1} min.	d_u max.	B_u min.	C_u min.
		mm												
04	**17**	23	27	5	23	27	5	23	30	8	24	28	5	
05	**20**	28	32	6	28	32	5	28	35	6	30	34	5	15
06	**25**	33	38	6	33	38	5	33	42	6	35	40	5	15
07	**30**	38	45	5	39	44	5	39	49	7	40	45	5	17
08	**35**	43	52	5	44	50	5	44	55	5	45	51	5	17
09	**40**	48	57	5	50	56	7	50	61	5	50	57	5	17
10	**45**	53	62	5	55	61	9	50	61	5	56	63	5	19
11	**50**	60	69	6	60	68	10	60	74	6	61	69	6	19
12	**55**	64	75	6	65	73	9	65	83	6	66	74	6	20
13	**60**	70	83	6	70	79	8	70	89	6	72	82	6	21
14	**60**	75	86	6	75	85	11	75	94	6	77	88	6	21
15	**65**	80	92	6	80	90	12	80	100	6	82	94	6	23
16	**70**	85	99	6	85	96	12	85	107	6	88	100	6	25
17	**75**	90	105	7	91	102	12	91	114	7	94	106	7	27
18	**80**	95	110	7	96	108	10	96	120	7	100	112	7	28
19	**85**	100	117	7	102	114	9	102	126	7	105	117	7	29
20	**90**	106	124	7	108	120	8	108	132	7	110	125	7	30
21	**95**	111	131	7										31
22	**100**	116	138	7										32

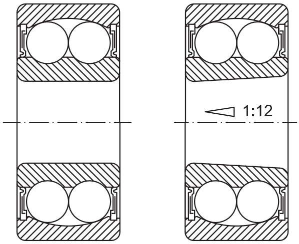
ART BEARINGS

Self-aligning ball bearings



Dimensions				Basic radial load. Factors						Speed limit		Designation	Mass
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}	Y_0	grease	oil		
mm				kN	-			kN	-	min^{-1}		-	Kg
5	19	6	0,3	2,55	0,33	1,9	3	0,48	2	30000	36000	**135**	0,01
6	19	6	0,3	2,5	0,33	1,9	3	0,48	2	30000	36000	**126**	0,01
7	22	7	0,3	2,65	0,33	1,9	3	0,56	2	30000	36000	**127**	0,01
8	22	7	0,3	2,65	0,33	1,9	3	0,56	2	30000	36000	**108**	0,01
9	26	8	0,6	3,8	0,33	1,9	3	0,8	2	26000	32000	**129**	0,02
10	30	9	0,6	5,5	0,33	1,9	3	1,2	2	24000	30000	**1200**	0,03
	30	14	0,6	7,2	0,54	1,2	1,8	1,6	1,2	22000	28000	**2200**	0,04
	35	11	0,6	7,2	0,34	1,9	2,9	1,6	1,9	20000	26000	**1300**	0,62
12	32	10	0,6	5,6	0,37	1,7	2,6	1,25	1,8	22000	28000	**1201**	0,04
	32	14	0,6	7,6	0,53	1,2	1,8	1,75	1,2	20000	26000	**2201**	0,05
	37	12	1	9,4	0,35	1,8	2,8	2,15	1,9	18000	22000	**1301**	0,06
	37	17	1	9,4	0,54	1,2	1,8	2,3	1,2	17000	20000	**2301**	0,09
15	35	11	0,6	7,5	0,36	1,8	2,7	1,75	1,9	19000	24000	**1202**	0,04
	35	14	0,6	7,7	0,5	1,3	2	1,85	1,3	18000	22000	**2202**	0,06
	42	13	1	9,55	0,35	1,8	2,8	2,3	1,9	17000	20000	**1302**	0,09
	42	17	1	12,1	0,5	1,3	2	2,9	1,3	15000	18000	**2302**	0,11
17	40	12	0,6	7,9	0,32	1,9	3	2,05	2	18000	22000	**1203**	0,07
	40	16	0,6	9,8	0,5	1,3	2	2,4	1,3	17000	20000	**2203**	0,08
	47	14	1	12,5	0,34	1,8	2,9	3,15	2	14000	17000	**1303**	0,13
	47	19	1	14,5	0,49	1,3	2	3,6	1,3	13000	16000	**2303**	0,16
20	47	14	1	9,9	0,28	2,2	3,5	2,65	2,4	15000	18000	**1204**	0,12
	47	14	1	9,9	0,28	2,2	3,5	2,65	2,4	15000	18000	**1204 K**	0,12
	47	18	1	12,6	0,28	2,2	3,5	3,3	2,4	14000	17000	**2204**	0,14
	47	18	1	12,6	0,28	2,2	3,5	3,3	2,4	14000	17000	**2204 K**	0,14
	52	15	1,1	12,4	0,3	2,1	3,3	3,35	2,2	12000	15000	**1304**	0,16
	52	15	1,1	12,4	0,3	2,1	3,3	3,35	2,2	12000	15000	**1304 K**	0,16
	52	21	1,1	18,2	0,52	1,2	1,9	4,7	1,3	11000	14000	**2304**	0,21
	52	21	1,1	18,2	0,52	1,2	1,9	4,7	1,3	11000	14000	**2304 K**	0,21
25	52	15	1	12,2	0,29	2,2	3,4	3,3	2,3	13000	16000	**1205**	0,14
	52	15	1	12,2	0,29	2,2	3,4	3,3	2,3	13000	16000	**1205 K**	0,14
	52	15	1	12,2	0,29	2,2	3,4	3,3	2,3	13000	16000	**1205 M**	0,14
	52	18	1	12,5	0,43	1,5	2,3	3,45	1,6	11000	14000	**2205**	0,16
	52	18	1	12,5	0,43	1,5	2,3	3,45	1,6	11000	14000	**2205 K**	0,16
	52	18	1	12,2	0,29	2,2	3,4	3,3	2,3	7000		**2205 2RSR**	0,16
	52	18	1	12,2	0,29	2,2	3,4	3,3	2,3	7000		**2205 K2RSR**	0,16
	62	17	1,1	17,8	0,28	2,2	3,5	4,9	2,4	9500	12000	**1305**	0,26
	62	17	1,1	17,8	0,28	2,2	3,5	4,9	2,4	9500	12000	**1305 K**	0,26
	62	24	1,1	24,5	0,44	1,4	2,2	6,55	1,5	9500	12000	**2305**	0,34

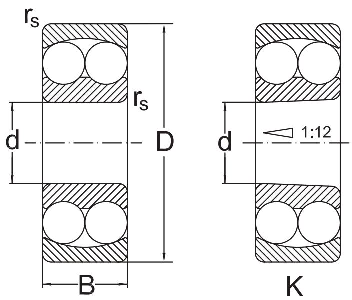
Self-aligning ball bearings



2RSR K2RSR

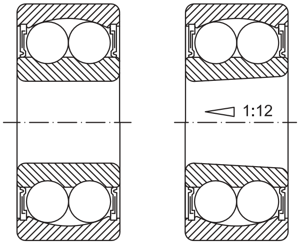
Dimensions				Basic radial load. Factors						Speed limit		Designation	Mass
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}	Y_0	grease	oil		
mm				kN	-			kN	-	min^{-1}		-	Kg
25	62	24	1,1	24,5	0,44	1,4	2,2	6,55	1,5	9500	12000	**2305 K**	0,34
	62	24	1,1	17,8	0,28	2,2	3,5	4,9	2,4	6300		**2305 2RSR**	0,33
30	62	16	1	15,7	0,25	2,5	3,9	4,7	2,7	10000	13000	**1206**	0,22
	62	16	1	15,7	0,25	2,5	3,9	4,7	2,7	10000	13000	**1206 K**	0,22
	62	20	1	15,3	0,4	1,6	2,5	4,6	1,7	9500	12000	**2206**	0,26
	62	20	1	15,3	0,4	1,6	2,5	4,6	1,7	9500	12000	**2206 K**	0,26
	62	20	1	15,3	0,4	1,6	2,5	4,6	1,7	9500	12000	**2206 M**	0,26
	62	20	1	15,7	0,25	2,5	3,9	4,7	2,7	5600		**2206 2RSR**	0,26
	62	20	1	15,7	0,25	2,5	3,9	4,7	2,7	5600		**2206 K2RSR**	0,26
	72	19	1,1	21,4	0,24	2,6	4,1	6,35	2,8	9000	11000	**1306**	0,38
	72	19	1,1	21,4	0,24	2,6	4,1	6,35	2,8	9000	11000	**1306 K**	0,38
	72	27	1,1	31,4	0,4	1,6	2,5	8,7	1,7	8500	10000	**2306**	0,5
	72	27	1,1	31,4	0,4	1,6	2,5	8,7	1,7	8500	10000	**2306 K**	0,5
	72	27	1,1	21,4	0,24	2,6	4,1	6,35	2,8	5600		**2306 2RSR**	0,5
35	72	17	1,1	15,8	0,23	2,8	4,2	5,15	2,9	9000	11000	**1207**	0,32
	72	17	1,1	15,8	0,23	2,8	4,2	5,15	2,9	9000	11000	**1207 K**	0,32
	72	17	1,1	15,8	0,23	2,8	4,2	5,15	2,9	9000	11000	**1207 M**	0,32
	72	23	1,1	21,7	0,37	1,7	2,6	6,7	1,8	8500	10000	**2207**	0,4
	72	23	1,1	21,7	0,37	1,7	2,6	6,7	1,8	8500	10000	**2207 K**	0,4
	72	23	1,1	15,8	0,23	2,8	4,2	5,15	2,9	5300		**2207 RSR**	0,4
	72	23	1,1	15,8	0,23	2,8	4,2	5,15	2,9	5300		**2207 K2RSR**	0,4
	80	21	1,5	25,1	0,25	2,5	3,9	7,95	2,7	7500	9000	**1307**	0,51
	80	21	1,5	25,1	0,25	2,5	3,9	7,95	2,7	7500	9000	**1307 K**	0,51
	80	31	1,5	39,7	0,43	1,5	2,3	12,9	1,6	7000	8500	**2307**	0,67
	80	31	1,5	39,7	0,43	1,5	2,3	12,9	1,6	7000	8500	**2307 K**	0,67
	80	31	1,5	25,1	0,25	2,5	3,9	7,95	2,7	4500		**2307 2RSR**	0,67
40	80	18	1,1	19,2	0,22	2,9	4,5	6,5	3	8500	10000	**1208**	0,41
	80	18	1,1	19,2	0,22	2,9	4,5	6,5	3	8500	10000	**1208 K**	0,41
	80	23	1,1	22,4	0,33	1,9	3	7,4	2	7500	9000	**2208**	0,5
	80	23	1,1	22,4	0,33	1,9	3	7,4	2	7500	9000	**2208 K**	0,5
	80	23	1,1	22,4	0,33	1,9	3	7,4	2	7500	9000	**2208 M**	0,5
	80	23	1,1	19,2	0,22	2,9	4,5	6,5	3	4800		**2208 2RSR**	0,5
	80	23	1,1	19,2	0,22	2,9	4,5	6,5	3	4800		**2208 K2RSR**	0,5
	90	23	1,5	29,5	0,24	2,6	4,1	9,75	2,8	6700	8000	**1308**	0,71
	90	23	1,5	29,5	0,24	2,6	4,1	9,75	2,8	6700	8000	**1308 K**	0,71
	90	33	1,5	44,9	0,39	1,6	2,5	15,1	1,7	6300	7500	**2308**	0,92
	90	33	1,5	44,9	0,39	1,6	2,5	15,1	1,7	6300	7500	**2308 K**	0,92
	90	33	1,5	44,9	0,39	1,6	2,5	15,1	1,7	6300	7500	**2308 M**	0,92
	90	33	1,5	29,5	0,24	2,6	4,1	9,75	2,8	4000		**2308 2RSR**	0,92
45	85	19	1,1	21,8	0,21	3	4,7	7,4	3,2	7500	9000	**1209**	0,46
	85	19	1,1	21,8	0,21	3	4,7	7,4	3,2	7500	9000	**1209 K**	0,46

Self-aligning ball bearings



Dimensions				Basic radial load. Factors						Speed limit		Designation	Mass
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}	Y_0	grease	oil		
mm				kN	-			kN	-	min^{-1}		-	Kg
45	85	23	1,1	23,3	0,31	2	3,1	8,15	2,1	7000	8500	**2209**	0,54
	85	23	1,1	23,3	0,31	2	3,1	8,15	2,1	7000	8500	**2209 K**	0,54
	85	23	1,1	21,8	0,21	3	4,7	7,4	3,2	4500		**2209 2RSR**	0,54
	85	23	1,1	21,8	0,21	3	4,7	7,4	3,2	4500		**2209 K2RSR**	0,54
	100	25	1,5	37,7	0,24	2,6	4,1	12,9	2,8	6300	7500	**1309**	0,95
	100	25	1,5	37,7	0,24	2,6	4,1	12,9	2,8	6300	7500	**1309 K**	0,95
	100	36	1,5	54,1	0,31	2	3,1	16,5	2,1	5600	6700	**2309**	1,23
	100	36	1,5	54,1	0,31	2	3,1	16,5	2,1	5600	6700	**2309 K**	1,23
	100	36	1,5	37,7	0,24	2,6	4,1	12,9	2,8	3600		**2309 2RSR**	1,23
50	90	20	1,1	22,9	0,21	3	4,7	8,16	3,2	7000	8500	**1210**	0,52
	90	20	1,1	22,9	0,21	3	4,7	8,16	3,2	7000	8500	**1210 K**	0,52
	90	23	1,1	23,3	0,29	2,2	3,4	8,5	2,3	6300	7500	**2210**	0,59
	90	23	1,1	23,3	0,29	2,2	3,4	8,5	2,3	6300	7500	**2210 K**	0,59
	90	23	1,1	22,9	0,21	3	4,6	8,1	3,2	4000		**2210 2RSR**	0,59
	90	23	1,1	22,9	0,21	3	4,6	8,1	3,2	4000		**2210 K2RSR**	0,59
	110	27	2	43,4	0,24	2,6	4,1	14,2	2,8	5600	6700	**1310**	1,21
	110	27	2	43,4	0,24	2,6	4,1	14,2	2,8	5600	6700	**1310 K**	1,21
	110	40	2	64,4	0,42	1,5	2,3	20	1,6	5300	6300	**2310**	1,23
	110	40	2	64,4	0,42	1,5	2,3	20	1,6	5300	6300	**2310 K**	1,23
	110	40	2	43,4	0,24	2,6	4,1	14,2	2,8	3400		**2310 2RSR**	1,64
55	100	21	1,5	26,6	0,2	3,2	4,9	10,1	3,3	6300	7500	**1211**	0,7
	100	21	1,5	26,6	0,2	3,2	4,9	10,1	3,3	6300	7500	**1211 K**	0,7
	100	25	1,5	26,5	0,27	2,3	3,6	9,9	2,5	6000	7000	**2211**	0,81
	100	25	1,5	26,5	0,27	2,3	3,6	9,9	2,5	6000	7000	**2211 K**	0,81
	120	29	2	51,3	0,23	2,8	4,2	18,1	2,9	5000	6000	**1311**	1,58
	120	29	2	51,3	0,23	2,8	4,2	18,1	2,9	5000	6000	**1311 K**	1,58
	120	43	2	75,3	0,41	1,5	2,4	23,8	1,6	4800	5600	**2311**	2,1
	120	43	2	75,3	0,41	1,5	2,4	23,8	1,6	4800	5600	**2311 K**	2,1
60	110	22	1,5	30,2	0,19	3,4	5,2	11,6	3,5	5600	6700	**1212**	0,9
	110	22	1,5	30,2	0,19	3,4	5,2	11,6	3,5	5600	6700	**1212 K**	0,9
	110	28	1,5	33,8	0,28	2,2	3,5	12,6	2,4	5300	6300	**2212**	1,1
	110	28	1,5	33,8	0,28	2,2	3,5	12,6	2,4	5300	6300	**2212 K**	1,1
	130	31	2,1	57,1	0,23	2,8	4,2	20,8	2,9	4500	5300	**1312**	1,96
	130	31	2,1	57,1	0,23	2,8	4,2	20,8	2,9	4500	5300	**1312 K**	1,96
	130	46	2,1	87,1	0,41	1,5	2,4	28	1,6	4300	5000	**2312**	2,6
	130	46	2,1	87,1	0,41	1,5	2,4	28	1,6	4300	5000	**2312 K**	2,6
65	120	23	1,5	31	0,17	3,7	5,7	12,4	3,9	5300	6300	**1213**	1,15
	120	23	1,5	31	0,17	3,7	5,7	12,4	3,9	5300	6300	**1213 K**	1,15
	120	31	1,5	43,6	0,28	2,2	3,5	16,4	2,4	5000	6000	**2213**	1,45
	120	31	1,5	43,6	0,28	2,2	3,5	16,4	2,4	5000	6000	**2213 K**	1,45
	140	33	2,1	62	0,23	2,8	4,2	22,9	2,8	4300	5000	**1313**	2,45

Self-aligning ball bearings

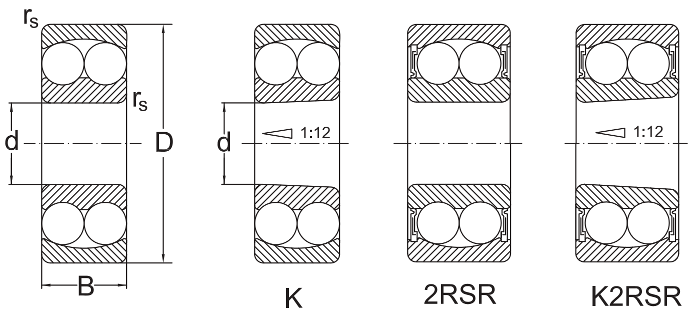


2RSR K2RSR

Dimensions				Basic radial load. Factors						Speed limit		Designation	Mass
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}	Y_0	grease	oil		
mm				kN	-			kN	-	min^{-1}		-	Kg
65	140	33	2,1	62	0,23	2,8	4,2	22,9	2,8	4300	5000	**1313 K**	2,45
	140	48	2,1	95,6	0,38	1,7	2,6	32,5	1,7	4000	4800	**2313**	3,25
	140	48	2,1	95,6	0,38	1,7	2,6	32,5	1,7	4000	4800	**2313 K**	3,25
70	125	24	1,5	34,6	0,18	3,5	5,4	13,7	3,7	5000	6000	**1214**	1,25
	125	24	1,5	34,6	0,18	3,5	5,4	13,7	3,7	5000	6000	**1214 K**	1,25
	125	31	1,5	44,2	0,27	2,3	3,6	17,1	2,5	4800	5600	**2214**	1,5
	125	31	1,5	44,2	0,27	2,3	3,6	17,1	2,5	4800	5600	**2214 K**	1,5
	150	35	2,1	74,1	0,22	2,9	4,5	27,7	3	4000	4800	**1314**	3
	150	35	2,1	74,1	0,22	2,9	4,5	27,7	3	4000	4800	**1314 K**	3
	150	51	2,1	111	0,35	1,8	2,8	31,7	1,9	3600	4300	**2314**	3,9
	150	51	2,1	111	0,35	1,8	2,8	31,7	1,9	3600	4300	**2314 K**	3,9
75	130	25	1,5	38,9	0,18	3,5	5,4	15,6	3,7	4800	5600	**1215**	1,35
	130	25	1,5	38,9	0,18	3,5	5,4	15,6	3,7	4800	5600	**1215 K**	1,35
	130	31	1,5	44	0,25	2,5	3,9	17,8	2,7	4500	5300	**2215**	1,6
	130	31	1,5	44	0,25	2,5	3,9	17,8	2,7	4500	5300	**2215 K**	1,6
	160	37	2,1	79,2	0,22	2,9	4,5	30	3	3600	4300	**1315**	3,55
	160	37	2,1	79,2	0,22	2,9	4,5	30	3	3600	4300	**1315 K**	3,55
	160	55	2,1	123	0,38	1,7	2,6	42,8	1,7	3400	4000	**2315**	4,7
	160	55	2,1	123	0,38	1,7	2,6	42,8	1,7	3400	4000	**2315 K**	4,7
	160	55	2,1	123	0,38	1,7	2,6	42,8	1,7	3400	4000	**2315 KM**	4,7
80	140	26	2	39,8	0,16	3,9	6,1	17	4,1	4300	5000	**1216**	1,65
	140	26	2	39,8	0,16	3,9	6,1	17	4,1	4300	5000	**1216 K**	1,65
	140	33	2	48,8	0,26	2,4	3,7	19,9	2,5	4000	4800	**2216**	2
	140	33	2	48,8	0,26	2,4	3,7	19,9	2,5	4000	4800	**2216 K**	2
	170	39	2,1	88,4	0,22	2,9	4,5	33	3	3400	4000	**1316**	4,2
	170	39	2,1	88,4	0,22	2,9	4,5	33	3	3400	4000	**1316 K**	4,2
	170	58	2,1	136	0,34	1,9	2,9	48,5	2	3200	3800	**2316**	6,1
	170	58	2,1	136	0,34	1,9	2,9	48,5	2	3200	3800	**2316 K**	6,1
	170	58	2,1	136	0,34	1,9	2,9	48,5	2	3200	3800	**2316 M**	6,1
85	150	28	2	48,2	0,17	3,7	5,7	20,8	3,9	4000	4800	**1217**	2,05
	150	28	2	48,2	0,17	3,7	5,7	20,8	3,9	4000	4800	**1217 K**	2,05
	150	36	2	58,5	0,25	2,5	3,9	23,8	2,7	3800	4800	**2217**	2,5
	150	36	2	58,5	0,25	2,5	3,9	23,8	2,7	3800	4800	**2217 K**	2,5
	180	41	3	97,5	0,22	2,9	4,5	37,9	3	3200	3800	**1317**	5
	180	41	3	97,5	0,22	2,9	4,5	37,9	3	3200	3800	**1317 K**	5
	180	60	3	140	0,37	1,7	2,6	51,5	1,8	3000	3600	**2317**	7,05
	180	60	3	140	0,37	1,7	2,6	51,5	1,8	3000	3600	**2317 K**	7,05
90	160	30	2	57	0,17	3,7	5,7	23,1	3,9	3800	4500	**1218**	2,5
	160	30	2	57	0,17	3,7	5,7	23,1	3,9	3800	4500	**1218 K**	2,5
	160	40	2	70,2	0,27	2,3	3,6	27,2	2,5	3600	4300	**2218**	3,4
	160	40	2	70,2	0,27	2,3	3,6	27,2	2,5	3600	4300	**2218 K**	3,4

ART BEARINGS

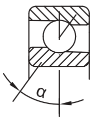
Self-aligning ball bearings



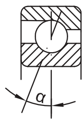
Dimensions				Basic radial load. Factors						Speed limit		Designation	Mass
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}	Y_0	grease	oil		
mm				kN	-			kN	-	min^{-1}		-	Kg
90	190	43	3	117	0,22	2,9	4,5	44,5	3	3000	3600	**1318**	5,8
	190	43	3	117	0,22	2,9	4,5	44,5	3	3000	3600	**1318 K**	5,8
	190	64	3	153	0,38	1,7	2,6	57,7	1,7	2800	3400	**2318**	8,45
	190	64	3	153	0,38	1,7	2,6	57,7	1,7	2800	3400	**2318 K**	8,45
95	170	32	2,1	63,7	0,17	3,7	5,7	24,3	3,9	3400	4000	**1219**	3,1
	170	32	2,1	63,7	0,17	3,7	5,7	24,3	3,9	3400	4000	**1219 K**	3,1
	200	45	3	133	0,23	2,8	4,2	50,8	2,9	2800	3400	**1319**	6,7
	200	45	3	133	0,23	2,8	4,2	50,8	2,9	2800	3400	**1319 K**	6,7
100	180	34	2,1	68,9	0,17	3,7	5,7	29,7	3,9	3200	3800	**1220**	3,7
	180	34	2,1	68,9	0,17	3,7	5,7	29,7	3,9	3200	3800	**1220 K**	3,7
	180	46	2,1	97,5	0,24	2,6	4,1	34	2,8	3200	3800	**2220**	5
	180	46	2,1	97,5	0,24	2,6	4,1	34	2,8	3200	3800	**2220 K**	5
	215	47	3	143	0,24	2,6	4,1	57,3	2,8	2600	3200	**1320**	8,3
	215	47	3	143	0,24	2,6	4,1	57,3	2,8	2600	3200	**1320 K**	8,3
	215	73	3	193	0,34	1,9	2,9	73,4	2	2400	3000	**2320**	12,2
	215	73	3	193	0,34	1,9	2,9	73,4	2	2400	3000	**2320 K**	12,5
110	200	38	2,1	88	0,17	3,7	5,7	35,2	3,9	2800	3400	**1222**	5,15
	200	38	2,1	88	0,17	3,7	5,7	35,2	3,9	2800	3400	**1222 K**	5,15
	200	53	2,1	124	0,26	2,4	3,7	48,9	2,5	2800	3400	**2222**	7,1
	200	53	2,1	124	0,26	2,4	3,7	48,9	2,5	2800	3400	**2222 K**	7,1
	240	50	3	163	0,22	2,9	4,5	67,5	3	2400	3000	**1322**	12
	240	50	3	163	0,22	2,9	4,5	67,5	3	2400	3000	**1322 K**	12

Angular contact ball bearings, single row

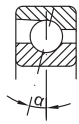
Single row angular contact bearings are manufactured in various constructive versions, with various contact angles, depending on the application. Bearings series 72B and 73B for general applications have a contact angle a = 40°. Bearings series 718, 719, 70 and 72 generally used for tool-holders, have phenol resins (textolite) cages or machined brass cages. Those with bore diameters up to d = 100 mm are manufactured to tolerance classes P5, P4 and P2 and have a contact angle of 15°(C) and 25°(A) respectively.



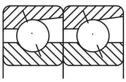
Series 72B, 73B
Contact angle α= 40°



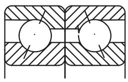
Series 70A, 72A
Contact angle α= 25°



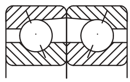
Series 70C, 72C
Contact angle α= 15°



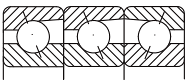
DT arrangement (Tandem)



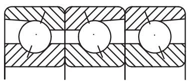
DB arrangement
(Back-to-back)



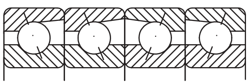
DF arrangement
(Face-to-face)



TFT arrangement



TBT arrangement



QFC arrangement

Suffixes

A - bearing with extended outer ring
A - bearing with contact angle a = 25°
B - bearing with extended outer ring
B - bearing with contact angle a= 40°
BB - bearing with a = 40° and extended inner ring
C - bearing with contact angle a= 15°
CA - bearing with radial clearance smaller than normal
CB - bearing with normal radial clearance
CC - radial bearing with axial clearance larger than normal
D - two bearings set D - bearing with two-pieces inner ring
DB - two bearings set in back-to-back arrangement, (O)
DF - two bearings set in face-to-face arrangement, (X)
DT - two bearings set in tandem arrangement
E - bearing with contact angle a= 20°
FA - bearing with machined cage of steel or cast iron, guided in the outer ring
FB - bearing with machined cage of steel or cast iron, guided on the inner ring
GA - light preload, bearings series 72B, 73B
GB - moderate preload, bearings series 72B, 73B
GC - heavy preload, bearings series 72B, 73B
L - light preload, bearings series 70C, 70A, 72A
M - moderate preload, bearings series 70C, 70A, 72A
M - machined brass cage, ball guided
MA - machined brass cage, guided in the outer ring
MB - machined brass cage, guided in the inner ring
O - bearing set without axial clearance
P0 - normal tolerance class
P6 - tolerance class more accurate than normal
P5 - tolerance class more accurate than P6
P4 - tolerance class more accurate than P5
P2 - tolerance class more accurate than P4
Q - four bearings set
QFC- tandem pairs in X arrangement
S - heavy preload, bearings series 70C, 70A, 72A
S0 - bearings operating up to a temperature of + 150°C
S1 - bearings operating up to a temperature of + 200°C
T - three bearings set
T - bearing set total width (T168, T200)
TBT - three bearings set in O arrangement, plus T
TFT - three bearings set in X arrangement, plus T
TN - polyamide cage
V - full complement bearing
U - bearings of universal design, with deviations of d and D and K_i, K_e in P2 class
UA - bearings with small axial clearance at DB and DF arrangements
UL - bearings with light preload at DB and DF arrangements
UO - bearings without small axial clearance at DB and DF arrangements
UP - tolerance class with deviations of d and D in P4 class and of K_i and K_e in P2 class.

Single row angular contact ball bearings can take only one direction axial loads. When being radially loaded, in bearing occurs an axially acting load which has to be compensated.

For this reason, a bearing or paired bearings are mounted on each shaft end.

Single row angular contact ball bearings with B suffix have a contact angle a= 40° and are suitable in case of heavy loads.

These bearings are not dismountable and their use at relatively high speeds is allowed.

Pair mounting of bearings as shown in figures on page 133 is used when the load carrying capacity of a single bearing is inadequate (tandem arrangement), respectively when axial loads have to be taken in both directions (DB or DF arrangements).

In case of DT tandem arrangement, the contact lines are in parallel. Radial and axial loads are uniformly distributed on both bearings. The bearing pair can take axial loads in only one direction. Therefore, a third bearing should take axial loads in the opposite direction.

DB arrangement is considered to be a relatively stiff arrangement and can also take tilting moments.

The contact lines of DF arrangement converge towards the bearing axis and form letter “X”. Axial loads are taken in the same way as in case of DB arrangement, but the arrangement is not so stiff and it is less suitable for taking tilting moments.

Universal design

Single row angular contact ball bearings of universal design are suitable for DB, DF and DT arrangements.

Bearings of universal design are manufactured to more accurate tolerance classes and can be matched if the mounting conditions UA, UO and UL are observed.

The values of clearance or preload are obtained when the shaft is manufactured to tolerance class J5 and the housing bore to tolerance class J6.

Dimensions

Main dimensions of bearings given in tables are in accordance with ISO 15.

Misalignment

In case of single row angular contact ball bearings the conditions regarding the permissible error of alignment of the outer ring relative to the inner ring are as complex as for single row deep groove ball bearings.

When the bearings are paired in DB arrangement, angular misalignments of the outer ring in relation to the inner ring can only be accommodated between the balls and raceways by force, leading to a reduction in bearing life.

Tolerances

Single row angular contact ball bearings of series 72B and 73B, with a contact angle a= 40° (B) are generally manufactured to the normal tolerance class.

At request, they also can be manufactured to normal tolerance classes P6 and P5.

The deviations of bore diameter, outside diameter and width of high accuracy single row angular contact ball bearings of universal design (UL) are given in table 1.

In case of single row angular contact ball bearings manufactured and delivered in sets of 2, 3 or 4 bearings, outside and bore diameter should be chosen considering the mean tolerance values, which are given on the package.

Deviations in µm

Deviations of main dimensions of high accuracy row angular contact bearings

Table 1

Bore									
d		Δd_{mp}, ΔD_{mp}						ΔB_s	
over	up to	low	high	low	high	low	high	low	high
(mm)		P4		UP		P2			
-	**18**	-3		-3		-2	0	-250	0
18	**30**	-3,5	-1,5	-3		-2	0	-250	0
30	**50**	-4	-1,5	-3		-2	0	-250	0
50	**80**	-5	-2	-3,5	-1,5	-3		-250	0
80	**120**	-5,5	-2			-3,5	-1,5	-380	0

Contact angle

In case of single row angular contact ball bearings, the efforts between rings and rolling elements (contact points of rolling elements / outer or inner ring) are transmitted at an angle a (<90°) to a plane perpendicular to the bearing axis.

The value of this angle depends on the magnitude of the raceway radius, rolling element diameter and radial clearance in bearing, when the curvature centres of the raceway in the outer or in the inner ring are in the same plane.

Axial clearance - preload

Axial clearance or preload can be obtained only when single row angular contact ball bearings is mounted in the assembly and depends on the location of the second bearing which assures the shaft axial guiding.

Single row angular contact ball bearings series 72B and 73B, paired mounted in DB and DF arrangements are manufactured with normal axial clearance CB, smaller than normal, CA, larger than normal, CC, or with light preload, GA, moderate preload GB, or heavy preload, GC, according to the values given in table 2.

Axial clearance or preload of single row angular contact ball bearings series 72B and 73B, pair mounted in DB or DF arrangements

Table 2

Bore		Axial clearance						Preload										
d		CA		CB		CC		GA			GB				GC			
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	min.	max.	min.	max.	min.	max	min.	max.
mm	µm									N	µm		N		µm		N	
-	**10**	4	12	14	22	22	30	-	-	-	-	-	-	-	-	-	-	-
10	**18**	5	13	15	23	24	32	4	-4	80	-2	-10	30	330	-8	-16	230	260
18	**30**	7	15	18	26	32	40	4	-4	120	-2	-10	40	480	-8	-16	340	970
30	**50**	9	17	22	30	40	48	4	-4	160	-2	-10	60	630	-8	-16	450	1280
50	**80**	11	23	26	38	48	60	6	-6	380	-3	-15	140	1500	-12	-24	1080	3050
80	**120**	14	26	32	44	55	67	6	-6	410	-3	-15	150	1600	-12	-24	1150	3250
120	**180**	17	29	35	47	62	74	6	-6	540	-3	-15	200	2150	-12	-24	1500	4300
180	**250**	21	37	45	61	74	90	8	-8	940	-4	-20	330	3700	-16	-32	2650	7500
250	**315**	26	42	52	68	90	106	8	-8	1080	-4	-20	380	4250	-16	-32	3000	8600

High accuracy single row angular contact ball bearings series 70C, 70A and 72A, with a contact angle a = 15° (C) and a = 25° (A), which are generally used for grinding stone holders, paired mounted in DB and DF arrangement, are manufactured with an initial preload. It can be: light (L), moderate (M), heavy (S). The values of these preloads are given in table 3.

Values of axial preload of bearings of series 70C, in DB and DF arrangements

Table 3

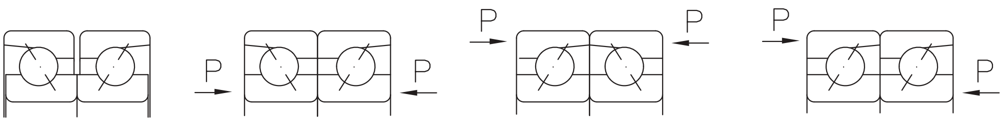
Bore		Axial preload											
		Series 70C			Series 72C			Series 70A			Series 72A		
d	Symbol	L	M	S	L	M	S	L	M	S	L	M	S
mm	-	N											
10	**0**	15	30	60	20	40	80	25	50	100	35	70	140
12	**1**	15	30	60	20	40	80	25	50	100	35	70	140
15	**2**	20	40	80	30	60	120	30	60	120	45	90	180
17	**3**	25	50	100	35	70	140	40	80	160	60	120	240
20	**4**	35	70	140	45	90	180	50	100	200	70	140	280
25	**5**	35	70	140	50	100	200	60	120	240	80	160	320
30	**6**	50	100	200	90	180	360	90	180	360	150	300	600
35	**7**	60	120	240	120	240	480	90	180	360	190	380	760
40	**8**	60	120	240	150	300	600	100	200	400	240	480	960
45	**9**	110	220	440	160	320	640	170	340	680	260	520	1040
50	**10**	110	220	440	170	340	680	180	360	720	260	520	1040
55	**11**	150	300	600	210	420	840	230	460	920	330	660	1320
60	**12**	150	300	600	250	500	1000	240	480	960	400	800	1600

Values of axial preload of bearings of series 70C, in DB and DF arrangements Table 3 (continued)													
Bore		Axial preload											
		Series 70C			Series 72C			Series 70A			Series 72A		
d	Symbol	L	M	S	L	M	S	L	M	S	L	M	S
mm	-	N											
65	**13**	160	320	640	290	580	1160	240	480	960	450	900	1800
70	**14**	200	400	800	300	600	1200	300	600	1200	480	960	1920
75	**15**	200	400	800	310	620	1240	310	620	1240	500	1000	2000
80	**16**	240	480	960	370	740	1480	390	780	1560	580	1160	2320
85	**17**	250	500	1000	370	740	1480	400	800	1600	600	1200	2400
90	**18**	300	600	1200	480	960	1920	460	920	1840	750	1500	3000
95	**19**	310	620	1240	520	1040	2080	480	960	1920	850	1700	3400
100	**20**	310	620	1240	590	1180	2360	500	1000	2000	950	1900	3800
105	**21**	360	720	1440	650	1300	2600	560	1120	2240	1000	2000	4000
110	**22**	420	840	1680	670	1340	2680	650	1300	2600	1050	2100	4200
120	**24**	430	860	1720	750	1500	3000	690	1380	2760	1200	2400	4800
130	**26**	560	1120	2240	800	1600	3200	900	1800	3600	1250	2500	5000
140	**28**	570	1140	2280	-	-	-	900	1800	3600	-	-	-
150	**30**	650	1300	2600	-	-	-	1000	2000	4000	-	-	-
160	**32**	730	1460	2920	-	-	-	1150	2300	4600	-	-	-
170	**34**	800	1600	3200	-	-	-	1250	2500	5000	-	-	-
180	**36**	900	1800	3600	-	-	-	1450	2900	5800	-	-	-
190	**38**	950	1900	3800	-	-	-	1450	2900	5800	-	-	-

Designs of single row angular contact ball bearings with clearance or initial preload are given in the figures below:

Before mounting (preload)

After mounting (preload)



Cages

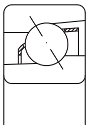
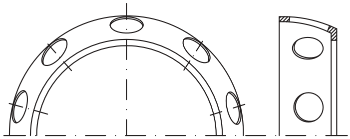
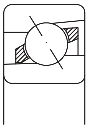
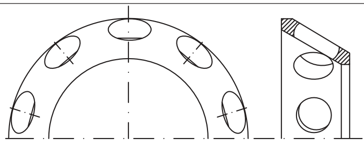
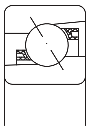
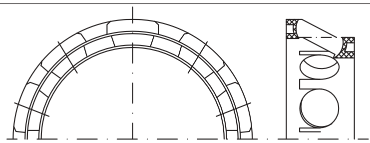
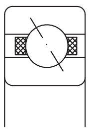
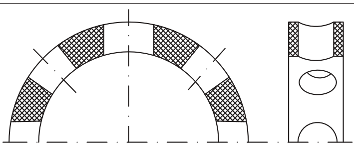
Single row angular contact ball bearings series 72B and 73B are generally fitted with pressed sheet cages.

At special request (high speeds, large sizes), bearing series 70C, 72C, 70A and 72A are fitted with machined brass cages. Cages of glass fibre reinforced polyamide 6.6 are also used with good results if operating temperature doesn't exceed +120°C.

Cages design and some technical data are given in table 4.

Cage design and technical data

Table 4

Cage	Design		Application	Max. value $D_m n$	
	bearing	cage		oil	grease
mm	-	N			
Pressed sheet cage			- General application - Moderate speeds - Bearing series - 72B, 73B	$600x10^3$	$450x10^3$
Machined brass cage M, MA, MB			- General application - High speeds - Bearings 7231B-7238B 7310B-7338B	$1100x10^3$	$800x10^3$
Polyamide cage TN			- General application - Low friction moments - High speeds	$1100x10^3$	$900x10^3$
Textolite cage T, TA, TB			- High accuracy bearing series 70C, 72C, 70A, 72A - High speeds - Low vibration level	$1200x10^3$	$900x10^3$

Equivalent dynamic radial load

For single row angular contact ball bearings series 72B and 73B, single and in tandem arrangement the following equations are used:

$P_r = F_r$, kN, when $F_a/F_r < 1{,}14$,
$P_r = 0{,}35\ F_r + 0{,}57\ F_a$, kN, when $F_a/F_r > 1{,}14$

For bearings in DB or DF arrangement
$Pr = Fr + 0{,}65\ Fa$, kN when $Fa/Fr < 1{,}14$
$Pr = 0{,}57\ Fr + 0{,}93\ Fa$, kN, when $Fa/Fr > 1{,}14$

In case of paired bearings, F_r and F_a are the loads acting upon the bearings pair.

As the load is transmitted from one raceway to the other under a certain angle to the bearings axis, the actual load will cause an axial load. This has to be considered when calculating the equivalent dynamic load, in case of two single bearings or tandem arrangements. The equations needed for calculation are given in table 5, for various arrangements and loading versions.

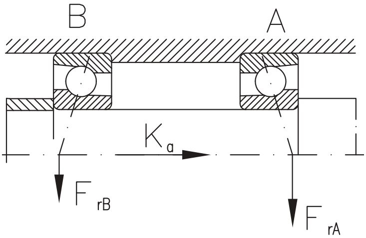
These equations are available for bearings mounted without clearance and without preload (clearance equal to zero).

For single row angular contact ball bearings series 70C and 72C with a contact angle a = 15°(C), single or in DT arrangement, the following equations are available:

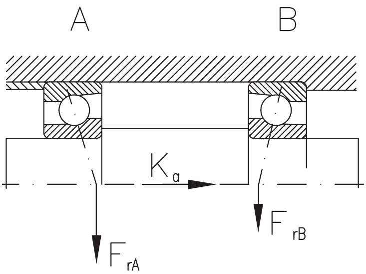
$P_r = F_r$, kN, for $F_a/F_r < e$,
$P_r = 0{,}44\ F_r + Y\ F_a$, kN, for $F_a/F_r > e$

The values of factor Y depend on the values of the ratio $f_0 iF_a/C_{0r}$ and are given in table 6. Factor f_0 can be found in diagram in page 140 as a function of dimensions series and bearing mean diameter. “i” represents the number of bearings or bearings pairs in a bearing join.

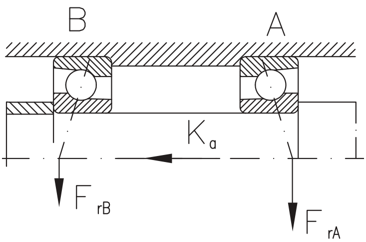
Back to back arrangement
DB



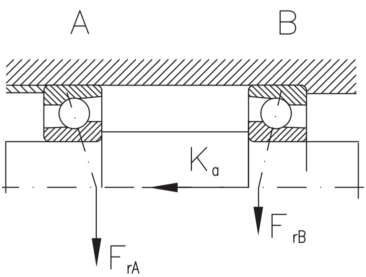
Face to face arrangement
DF



Back to back arrangement
DB



Face to face arrangement
DF



For bearings in DB and DF arrangements, the following equations are available:

$$P_r = F_r + Y_1 F_a, \text{ kN}, \qquad \text{for } F_a/F_r < e,$$
$$P_r = 0{,}72\, F_r + Y_2 F_a, \text{ kN}, \qquad \text{for } F_a/F_r > e$$

The values of factors Y_1 and Y_2 depend on the ratio $f_0 i F_a / C_{0r}$ and are given in table 6 (f_0 from diagram below).

Determination of axial loads — Table 5

Loading version	Axial load
1a) $F_{rA} \geq F_{rB}$ $K_a \geq 0$	$F_{aA} = 1{,}14\, F_{rA}$ $F_{aB} = F_{aA} + K_a$
1b) $F_{rA} < F_{rB}$ $K_a \geq 1{,}14\, (F_{rB} - F_{rA})$	$F_{aA} = 1{,}14\, F_{rA}$ $F_{aB} = F_{aA} + K_a$
1c) $F_{rA} < F_{rB}$ $K_a \leq 1{,}14\, (F_{rB} - F_{rA})$	$F_{aB} = F_{aB} - K_a$ $F_{aB} = 1{,}14\, F_{rB}$
2a) $F_{rA} \leq F_{rB}$ $K_a \geq 0$	$F_{aB} = F_{aB} + K_a$ $F_{aB} = 1{,}14\, F_{rB}$
2b) $F_{rA} > F_{rB}$ $K_a \geq 1{,}14\, (F_{rA} - F_{rB})$	$F_{aB} = F_{aB} + K_a$ $F_{aB} = 1{,}14\, F_{rB}$
2c) $F_{rA} > F_{rB}$ $K_a < 1{,}14\, (F_{rA} - F_{rB})$	$F_{aA} = 1{,}14\, F_{rA}$ $F_{aB} = F_{aA} - K_a$

For single row angular contact ball bearings series 70A and 72A, with a contact angle a= 25°, single or in DT arrangement, the following equation are available:

$P_r = F_r$, kN, for $F_a/F_r < 0{,}68$
$Pr = 0{,}41\ F_r + 0{,}87\ F_a$, kN, for $F_a/F_r > 0{,}68$

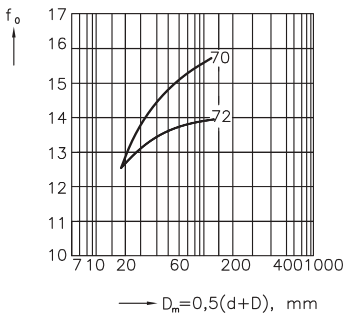
For bearings in DB and DF arrangement, the following equations are available:

$P_r = F_r + Y_1\ F_a$, kN, for $F_a/F_r < e$
$P_r = 0{,}72\ F_r + Y_2\ F_a$, kN, for $F_a/F_r > e$

Values for Y_1 and Y_2 are given in table 6.

Values of factors e, Y, Y_1 and Y_2 Table 6

$\frac{f_0\ i\ F_a}{C_{0r}}$		Single and DT	Arrangement DB or DF	
	e	Y	Y_1	Y_2
0,2	0,38	1,46	1,64	2,37
0,4	0,41	1,36	1,52	2,21
0,8	0,44	1,28	1,44	2,11
1,6	0,48	1,16	1,31	1,90
3	0,52	1,08	1,21	1,78
6	0,56	1	1,12	1,66



Equivalent static load

For single row angular contact ball bearings series 72B and 73B with a contact angle a = 40°, single and in DT arrangement, the following equation is available:

$P_{0r} = 0{,}6\ F_r + 0{,}26\ F_a$, kN
If $P_{0r} < F$ then we consider $P_0 = F_r$

For bearings in DB and DT arrangement, the following equation is available:

$P_{0r} = F_r + 0{,}52\ F_a$, kN

For single row angular contact ball bearings series 70C and 72C, with a contact angle a = 15°, single and in DT arrangement, the following equation is available:

$P_{0r} = 0{,}5\ F_r + 0{,}46\ F_a$, kN

For bearings in DB and DF arrangement, the following equation is available:

$P_{0r} = 0{,}5\ F_r + 0{,}92\ F_a$, kN

For single row angular contact ball bearings series 70A and 72A with a contact angle a = 25°, single and in DT arrangement, the following equation is available:

$P_{0r} = 0{,}5\ F_r + 0{,}38\ F_a$, kN

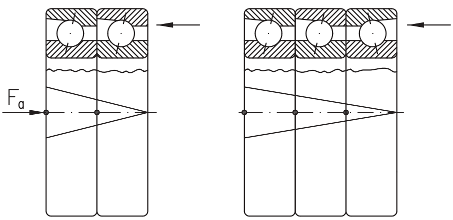
For bearings in DB and DF arrangement, the following equation in available:

$P_{0r} = F_r + 0{,}76\ F_a$, kN

Two "V" scratches are marked on the outside surface where the runout is maximum, i.e. where the outer ring thickness is maximum, so that the bearings of a set can be mounted in the manufacturing order. The place of maximum runout is marked on the chamfer between the inner ring bore and side face. Thus, the possible fit ovalnesses on the shaft can be compensated.

Every set is delivered as an unit, separately packed. In each unit, bearings are singly packed.

If distance rings are necessary to be mounted between bearings, they have not to be adjusted when being mounted. There is only one condition to be observed: the inner distance ring width should be equal to that of the outer ring, the side faces being parallel to each other. This can be easily done if both distance rings are simultaneously ground on a grinding and lapping machine. If bearings are mounted with distance rings, the mounting is also done observing the "V" marked as mentioned above. The cone vertex should be on the ring side oposite to that one on which the load acts (see next figure).



Basic dynamic load of paired bearings

Basic dynamic load given in bearings tables is valid for each single bearing. Basic dynamic load of a paired bearings set can be determined according to the specifications on page 20-21.

Basic static load of paired bearings

Basic static load of paired bearings can be similarly determined, multiplying the values of C0r in the tables by 2, 3 and 4 respectively.

Bearing speed limit

Single row angular contact ball bearings are used at high speeds.

The values of speeds for bearings series 72B and 73B, normal tolerance class, without preload are given in this catalogue.

In case of preloaded bearings, for single mounted bearing and bearings in DB, DF or DT arrangements, speed should be multiplied by the coefficients in table 7.

For bearings series 70C, 72C, 70A and 72A, speeds are given for the tolerance class P4 and light preload.

In case of bearings with other values of preloads or arrangements of 3 or 4 bearing sets, the speeds of the bearing of basic design should be multiplied by the values of the coefficients in table 7.

Speed limit reduction factor Table7

Arrangement	**Bearing preload**			
	UA,UO	L	M	S
Single	1,0	1,0	0,90	0,80
Tandem, DT	0,90	0,90	0,80	0,65
Back-to-back, DB	0,80	0,80	0,70	0,55
Face-to-face, DF	0,80	0,75	0,60	0,40
Three bearings set	0,75	0,70	0,55	0,35
Four bearings set	0,70	0,65	0,45	0,25

Abutment dimensions

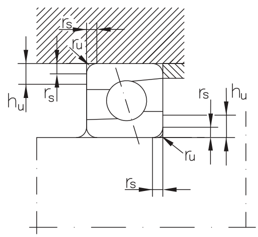
For a proper location of bearing rings on the shaft and housing shoulder respectively, shaft (housing) maximum connection radius $r_{u\,max}$ should be less than bearing minimum mounting chamfer r_{1min}, $r_{2\,min}$.

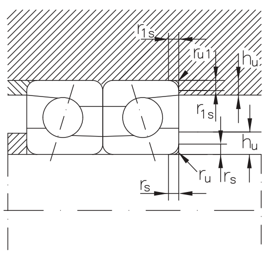
Shoulder height should also be properly sized in case of bearing maximum mounting chamfer.

The values of the connection radii and support shoulder height are given in table 8.

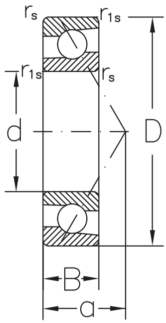
Abutment dimensions Table8

r_s, r_{1s} min	r_s, r_{1s} max	h_u, h_{u1} min	
		Bearing series	
		718, 728, 719, 729, 70	72 73
mm			
0,3	0,3	1	1,2
0,6	0,6	1,6	2,1
1	1	2,3	2,6
1,1	1	3	3,5
1,5	1,5	3,5	4,5
2	2	4,4	5,5
2,1	2,1	5,1	6
3	2,5	6,2	7
4	3	7,3	8,5





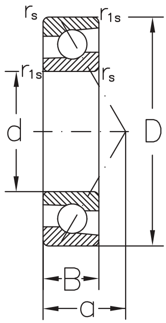
Angular contact ball bearing, single row



Dimensions						Basic radial load		Speed limit		Designation	Mass
d	D	B	r_s min.	r_{1s} min.	a	dyn. C_r	stat. C_{0r}	grease	oil		
mm						kN		min^{-1}		-	Kg
10	30	9	0,6	0,3	13	4,95	2,5	19000	28000	**7200B**	0,031
12	32	10	0,6	0,3	14	7,4	3,75	17000	24000	**7201B**	0,045
15	35	11	0,6	0,3	16	7,45	3,9	16000	22000	**7202B**	0,048
	35	11	0,6	0,3	16	7,45	3,9	16000	22000	**7202BP6**	0,048
	35	11	0,6	0,3	16	7,45	3,9	16000	22000	**7202BP5**	0,048
	42	13	1	0,6	19	12,9	6,5	14000	19000	**7302B**	0,090
17	40	12	0,6	0,6	18	11	6,1	14000	19000	**7203B**	0,070
	40	12	0,6	0,6	18	11	6,1	14000	19000	**7203BP6**	0,070
	40	12	0,6	0,6	18	11	6,1	14000	19000	**7203BP5**	0,070
	40	12	0,6	0,6	18	11	6,1	14000	19000	**7203 BTN**	0,064
	47	14	1	0,6	21	14,8	8,1	12000	17000	**7303B**	0,120
20	47	14	1	0,6	21	14,1	8,4	11000	16000	**7204B**	0,110
	47	14	1	0,6	21	14,1	8,4	11000	16000	**7204BP6**	0,110
	47	14	1	0,6	21	14,1	8,4	11000	16000	**7204BP5**	0,110
	52	15	1,1	0,6	23	17,3	9,7	10000	15000	**7304B**	0,150
	52	15	1,1	0,6	23	17,3	9,7	10000	15000	**7304BP6**	0,150
	52	15	1,1	0,6	23	17,3	9,7	10000	15000	**7304 BEP**	0,15
25	52	15	1	0,6	24	15,5	10,1	9500	14000	**7205B**	0,130
	52	15	1	0,6	24	15,5	10,1	9500	14000	**7205BP6**	0,130
	52	15	1	0,6	24	15,5	10,1	9500	14000	**7205BP5**	0,130
	62	17	1,1	0,6	27	24,4	14,6	8500	12000	**7305B**	0,250
	62	17	1,1	0,6	27	24,4	14,6	8500	12000	**7305BP6**	0,250
	62	17	1,1	0,6	27	24,4	14,6	8500	12000	**7305AMA**	0,250
	62	17	1,1	0,6	27	24,4	14,6	8500	12000	**7305 BEP**	0,25
30	62	16	1	0,6	27	20,5	13,6	8500	12000	**7206B**	0,210
	62	16	1	0,6	27	20,5	13,6	8500	12000	**7206BP6**	0,210
	62	16	1	0,6	27	20,5	13,6	8500	12000	**7206BP5**	0,210
	62	16	1	0,6	27	20,5	13,6	8500	12000	**7206ATAP2**	0,210
	72	19	1,1	0,6	31	29,3	19	7500	10000	**7306B**	0,370
	72	19	1,1	0,6	31	29,3	19	7500	10000	**7306BP6**	0,370
	72	19	1,1	0,6	31	29,3	19	7500	10000	**7306BP5**	0,370
	72	19	1,1	0,6	31	29,3	19	7500	10000	**7306AMA**	0,370
	72	19	1,1	0,6	31	29,3	19	7500	10000	**7306 BEP**	0,37
	72	19	1,1	0,6	31	29,3	19	7500	10000	**7306 BTN**	0,341
35	72	17	1,1	0,6	31	28,5	19,8	7500	10000	**7207B**	0,300
	72	17	1,1	0,6	31	28,5	19,8	7500	10000	**7207BP5**	0,300
	72	17	1,1	0,6	31	28,5	19,8	7500	10000	**7207 BTN**	0,282
	80	21	1,5	1	35	36,7	24,3	7000	9500	**7307B**	0,510
	80	21	1,5	1	35	36,7	24,3	7000	9500	**7307BP5**	0,510
40	80	18	1,1	0,6	34	32,1	23	6700	9000	**7208B**	0,390
	80	18	1,1	0,6	34	32,1	23	6700	9000	**7208BP6**	0,390
	80	18	1,1	0,6	34	32,1	23	6700	9000	**7208BP5**	0,390

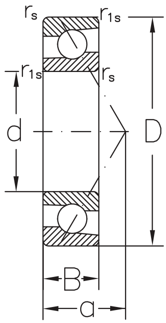
ART BEARINGS

Angular contact ball bearing, single row



Dimensions						Basic radial load		Speed limit		Designation	Mass
d	D	B	r_s min.	r_{1s} min.	a	dyn. C_r	stat. C_{0r}	grease	oil		
mm						kN		min^{-1}		-	Kg
40	90	23	1,5	1	39	44,8	30,3	6300	8500	**7308B**	0,670
	90	23	1,5	1	39	44,8	30,3	6300	8500	**7308 BEP**	0,67
	90	23	1,5	1	39	44,8	30,3	6300	8500	**7308BP6**	0,670
	90	23	1,5	1	39	44,8	30,3	6300	8500	**7308BP5**	0,670
45	85	19	1,1	0,6	37	36,1	26,2	6300	8500	**7209B**	0,440
	85	19	1,1	0,6	37	36,1	26,2	6300	8500	**7209BP5**	0,440
	100	25	1,1	0,6	37	36,1	26,2	6300	8500	**7309 BTN**	0,813
	100	25	1,5	1	43	58,3	40,1	5600	7500	**7309B**	0,900
	100	25	1,1	0,6	37	36,1	26,2	6300	8500	**7309 BEP**	0,900
	100	25	1,5	1	43	58,3	40,1	5600	7500	**7309BP6**	0,900
	100	25	1,5	1	43	58,3	40,1	5600	7500	**7309BP5**	0,900
50	90	20	1,1	0,6	39	37,4	28,6	5600	7500	**7210B**	0,490
	90	20	1,1	0,6	39	37,4	28,6	5600	7500	**7210BP6**	0,490
	90	20	1,1	0,6	39	37,4	28,6	5600	7500	**7210BP5**	0,490
	110	27	1,1	0,6	39	37,4	28,6	5600	7500	**7310 BTN**	1,05
	110	27	1,1	0,6	39	37,4	28,6	5600	7500	**7310 BEP**	1,15
	110	27	2	1	47	68,2	47,9	5000	6700	**7310B**	1,15
	110	27	2	1	47	68,2	47,9	5000	6700	**7310BP6**	1,15
	110	27	2	1	47	68,2	47,9	5000	6700	**7310BP5**	1,15
55	100	21	1,5	1	43	46,2	36,2	5300	7000	**7211B**	0,650
	100	21	1,5	1	43	46,2	36,2	5300	7000	**7211 AA**	0,64
	120	29	2	1	52	78,8	56,4	4500	6000	**7311B**	1,45
	120	29	2	1	52	78,8	56,4	4500	6000	**7311 BTN**	1,38
	120	29	2	1	52	78,8	56,4	4500	6000	**7311 BCBY**	1,441
60	110	22	1,5	1	47	56,3	44,7	4800	6300	**7212B**	0,840
	110	22	1,5	1	47	56,3	44,7	4800	6300	**7212BP5**	0,840
	110	22	1,5	1	47	56,3	44,7	4800	6300	**7212 BTN**	0,777
	130	31	2,1	1,1	56	90	65,5	4300	5600	**7312B**	1,85
	130	31	2,1	1,1	56	90	65,5	4300	5600	**7312BP5**	1,85
	130	31	2,1	1,1	56	90	65,5	4300	5600	**7312 BECBP**	1,85
	130	31	2,1	1,1	56	90	65,5	4300	5600	**7312 BTN**	1,71
65	120	23	1,5	1	50	63,6	52,5	4300	5600	**7213B**	1,05
	120	23	1,5	1	50	63,6	52,5	4300	5600	**7213BP6**	1,05
	120	23	1,5	1	50	63,6	52,5	4300	5600	**7213BP5**	1,05
	140	33	1,5	1	50	63,6	52,5	4300	5600	**7313 BTN**	2,12
	140	33	2,1	1,1	60	101	75,3	4000	5300	**7313B**	2,25
70	125	24	1,5	1	53	69,1	57,8	4300	5600	**7214B**	1,15
	125	24	1,5	1	53	69,1	57,8	4300	5600	**7214 BTN**	1,08
	150	35	2,1	1,1	64	114	86	3800	5000	**7314B**	2,75
	150	35	2,1	1,1	64	114	86	3800	5000	**7314 BEP**	2,75
	150	35	2,1	1,1	64	114	86	3800	5000	**7314BP6**	2,75
	150	35	2,1	1,1	64	114	86	3800	5000	**7314BP5**	2,75

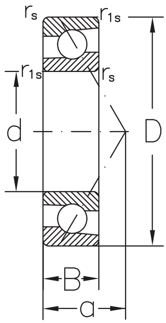
Angular contact ball bearing, single row



Dimensions						Basic radial load		Speed limit		Designation	Mass
d	D	B	r_s min.	r_{1s} min.	a	dyn. C_r	stat. C_{0r}	grease	oil		
mm						kN		min^{-1}		-	Kg
70	150	35	2,1	1,1	64	114	86	3800	5000	**7314BTN**	2,75
75	130	25	1,5	1	56	74,8	63,2	4000	5300	**7215B**	1,30
	130	25	1,5	1	56	74,8	63,2	4000	5300	**7215BP6**	1,30
	130	25	1,5	1	56	74,8	63,2	4000	5300	**7215BP5**	1,30
	130	25	1,5	1	56	74,8	63,2	4000	5300	**7215 BTN**	1,16
	160	37	2,1	1,1	68	125	97,5	3400	4500	**7315B**	3,30
	160	37	2,1	1,1	68	125	97,3	3400	4500	**7315BMAP6**	3,30
	160	37	2,1	1,1	68	125	97,5	3400	4500	**7315AMA**	3,30
	160	37	2,1	1,1	68	125	97,5	3400	4500	**7315 BEGAM**	3,30
	160	37	2,1	1,1	68	125	97,5	3400	4500	**7315 BTN**	3,1
80	140	26	2	1	59	80,5	69,3	3800	5000	**7216B**	1,55
	140	26	2	1	59	80,5	69,3	3800	5000	**7216 BTN**	1,42
	170	39	2,1	1,1	72	135	109	3200	4300	**7316B**	3,90
	170	39	2,1	1,1	72	135	109	3200	4300	**7316 BTN**	3,66
	170	39	2,1	1,1	72	135	109	3200	4300	**7316BP6**	3.903
	170	39	2,1	1,1	72	135	109	3200	4300	**7316BMAP6**	3.903
85	150	28	2	1	64	93,1	81,1	3400	4500	**7217B**	1.953
	180	41	3	1,1	76	145	122	3000	4000	**7317B**	4.603
	180	41	3	1,1	76	145	122	3000	4000	**7317BP6**	4.603
	180	41	3	1,1	76	145	122	3000	4000	**7317BMP6**	4.603
90	160	30	2	1	67	107	93,8	3200	4300	**7218B**	2.403
	160	30	2	1	67	107	93,8	3200	4300	**7218BMB**	2.403
	160	30	2	1	67	107	93,8	3200	4300	**7218 BTN**	2,21
	190	43	3	1,1	80	156	135	2800	3800	**7318B**	5.403
	190	43	3	1,1	80	156	135	2800	3800	**7318 BTN**	5
95	170	32	2,1	1,1	71	116	101	3000	4000	**7219B**	2.903
	170	32	2,1	1,1	71	116	101	3000	4000	**7219 BTN**	2,64
	200	45	3	1,1	84	168	150	2600	3600	**7319B**	6.253
100	180	34	2,1	1,1	76	129	116	2800	3800	**7220B**	3.453
	180	34	2,1	1,1	76	129	116	2800	3800	**7220BP6**	3.453
	180	34	2,1	1,1	76	129	116	2800	3800	**7220BMA**	3.453
	180	34	2,1	1,1	76	129	116	2800	3800	**7220BMAP6**	3.453
	180	34	2,1	1,1	76	129	116	2800	3800	**7220BMAP4**	3.453
	180	34	2,1	1,1	76	129	116	2800	3800	**7220BMB**	3.453
	180	34	2,1	1,1	76	129	116	2800	3800	**7220 BM**	3,6
	215	47	3	1,1	90	190	178	2400	3400	**7320B**	7.753
	215	47	3	1,1	90	190	178	2400	3400	**7320BP6**	7.753
	215	47	3	1,1	90	190	178	2400	3400	**7320 M**	7,75
	215	47	3	1,1	90	190	178	2400	3400	**7320BM**	7.753
110	200	38	2,1	1,1	84	153	145	2400	3400	**7222B**	4.803
	200	38	2,1	1,1	84	153	145	2400	3400	**7222BMB**	4.803
	240	50	3	1,1	99	248	229	2000	3000	**7322B**	10,53

ART BEARINGS

Angular contact ball bearing, single row



Dimensions						Basic radial load		Speed limit		Designation	Mass
d	D	B	r_s min.	r_{1s} min.	a	dyn. C_r	stat. C_{0r}	grease	oil		
mm						kN		min^{-1}		-	Kg
110	240	50	3	1,1	99	248	229	2000	3000	**7322BP5**	10,53
	240	50	3	1,1	99	248	229	2000	3000	**7322BM**	10,53
140	250	42	3	1,1	103	191	210	1700	2400	**7228B**	8.803
	300	62	4	1,5	123	290	334	1700	2400	**7328B**	21,63
	300	62	4	1,5	123	290	334	1700	2400	**7328BMBP5**	21,63
150	190	24	1,1	0,6	35	60,5	79,2	2200	3000	**72830CMA**	3.363
	270	45	3	1,1	111	195	222	2000	2800	**7230BM**	11,63
	320	65	4	1,5	131	317	380	1600	2000	**7330BM**	26,53
	320	65	4	1,5	131	317	380	1600	2000	**7330 M**	26,53
	320	65	4	1,5	131	317	380	1600	2000	**7330BMP5**	26,53
160	220	28	2	1	58	110	134	2200	3000	**71932AMAP5**	3.263
180	250	33	2	2	33	131	162	2000	2800	**71936AM**	5,36
200	250	30	1,5	0,6	45	102	141	3000	5600	**72840CMAP4**	3,43

ART BEARINGS

Cylindrical roller bearings

Cylindrical roller bearings are manufactured in a various range of constructive types and sizes, particularly single row cylindrical roller bearings but also two or more row cylindrical roller bearings, with cages or roller by roller, as shown in the designs below.

In case of cylindrical roller bearings, the rollers are laterally guided by the fixed ribs of one ring.

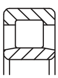
In case of bearings with cages, the ring with ribs and the rollers retained in the cage can be drawn out from the other ring, which means that these bearings are dismountable.

Therefore, bearings from joints can be much easier mounted and dismounted, especially were interference fits are needed for both rings due to the loading conditions.

Bearings are provided with unloaded rollers at both generatrix ends. Therefore, the linear contact between rollers and rings alters advantageously, i.e. peripheral stresses are avoided.

- single row
- double row
- without cage (full complement)

- single row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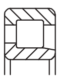
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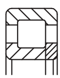
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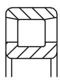
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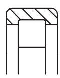
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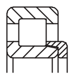
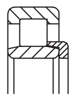
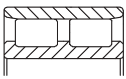

NJ+HJ


NU+HJ

- double row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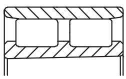
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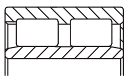
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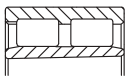
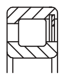
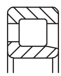

NNU49K

- without cage (full complement)


NCF V


NJ VH

Suffixes

AR - Grinding addition on the inner ring raceway
B - Cylindrical roller bearings with extended inner ring
C2 - Radial clearance smaller than normal, bearings with interchangeable elements
C2NA - Radial clearance smaller than normal, bearings with non-interchangeable elements
C3 - Radial clearance larger than normal, bearings with interchangeable elements
C3NA - Radial clearance larger than normal, bearings with non-interchangeable elements
D - Two-pieces inner ring
E - Cylindrical roller bearings, E-design (increased basic static and dynamic loads)
F - Machined steel or special cast iron cage
F2 - Constructive modification
K - Tapered bore bearing
M - Machined brass cage guided on the rolling elements
M6 - Machined brass cage with integral rivets
MA - Machined brass cage guided in the outer ring
MA6 - Machined brass cage with internal rivets guided on the outer ring
MB - Machined brass cage guided in the inner ring

MPA - Machined brass cage (one-piece)
N - Circular groove in the outer ring for snap ring
NA - Radial clearance, non-interchangeable elements
NR - Circular groove in the outer ring and snap ring
P - Two-pieces outer ring
P5 - Tolerance class more accurate than normal (P6)
P51 - Tolerance class P5 and radial clearance C1
P53 - Tolerance class P5 and radial clearance C3
P4 - Tolerance class more accurate than P5
P41 -Tolerance class P4 and radial clearance C1
R... - Non-standardized radial clearance (e.g. R45...85)
TN - Polyamide cage
V - Roller bearing without cage (full complement)
VH - Self-retaining roller bearing without cage
W20 - Lubrication holes in the outer ring
W518- Lubrication holes in the outer and inner ring
W5 - Lubrication groove and holes in both rings
W513- Lubrication groove and holes in the outer ring and lubrication holes in the inner ring W513 = W33 +W26
W7 - Locating holes
W8 - Lubrication groove on the outer ring side surfaces
W9 - Lubrication groove on the inner ring side surfaces
W20 - Lubrication holes in the outer ring
W33 - Lubrication groove and holes on the outer ring
W44 - Lubrication groove and holes on the Inner ring
W339- W9 + W33
ZS - NA radial clearance; changing the bearing elements, the clearance can be obtained from the interchangeable elements.

Single or more rows cylindrical roller bearings

Single or more rows cylindrical roller bearings are manufactured by ART in various constructive versions, depending on the position of the ribs on rings. The four basic designs (NU, NJ, N and NUP) are given in the bearing tables.

Bearings of NU design have two fixed ribs on the outer ring and one smooth inner ring. Bearings of N design have two fixed ribs on the inner ring and one smooth outer ring. These designs allow an axial displacement in certain limits, of the shaft in relation to the housing. Therefore, these rolling bearings are used in non-locating bearing units.

Bearings of NJ design have two fixed ribs on the outer ring and a fixed rib on the inner ring which can guide the shaft in a single direction (axially).

Bearings of NUP design have also two fixed ribs on the outer ring and, on the inner ring, a fixed rib and a support washer. This way they can be used as locating bearings, guiding the shaft axially in both directions.

For a shaft guiding in a single direction, it also can be used a bearing of NU design which is combined with a support washer. Thus, the constructive version NUJ is obtained.

Support washers on both sides of a bearing of NU design are not allowed as they lead to an axial blocking of the rollers.

Cylindrical roller bearings can carry heavy radial loads and can operate at high speeds.

Double or more rows cylindrical roller bearings have small sections, high load carrying capacity and stiffness.

These bearings provide high stiffness and maximum load carrying capacity and are particularly used for tool holders of the machine- tools and rolling mills.

Double row cylindrical roller bearings series NNU49 and NN30 are generally manufactured to tolerance classes P5 and SP, used for machine tools.

Large-sized bearings series NNU49 are also manufactured to the normal tolerance class.

Cylindrical roller bearings with snap ring groove

Single row cylindrical roller bearings are also manufactured with snap ring grooves on the outer rings. This design simplifies the bearing joint as the bearings are located into the housing by means of the snap rings. The snap ring groove and snap rings are in accordance with ISO 464, and tables 7 and 8 on page 90 and 92.

Cylindrical roller bearings without cage (full complement)

These bearings incorporate the maximum number of rollers and have a small section in relation to their width.

This provides a high load carrying capacity and allows space-saving designs to be achieved.

Cylindrical roller bearings without cage cannot be used at speeds as high as those with cages. These bearings are manufactured with single or more row rollers and suffix V is added to the bearing designation. The most utilized bearings are those of series NCF29 V, NCF30 V and NJ23 VH and they are given in this catalogue on page 210.

Dimensions

The main dimensions of standardized bearings given in tables are in accordance with IS015.

Misalignment

The modified contact between rollers and raceway allows not only peripheral stresses to be avoided but also, in case of single row roller bearings, permits an angular misalignment of the outer ring with respect to the inner ring, depending on the bearing series and load according to the table 1.

Permisible misalignment Table 1

Bearings series	Permisible misalignment	
	$P \le 0{,}1\ C_r$	$P > 0{,}1\ C_r$
NU10, NU2, NU3, NU4, NU2E, NU3E	max. 3’	max. 7’
NU22, NU23, NU22E, NU23E	max. 2’	max. 4’
N,NJ,NUP design, all series	max. 2’	max. 4’

Radial clearance for single and double row cylindrical roller bearings

With interchangeable elements
With cylindrical bore[1)]

Table 2

Bore diameter d		Clearance group symbol									
		C2		Normal		C3		C4		C5	
over	up to	min.	max.	min.	ma x.	min.	max.	min.	ma x.	min.	max.
mm		µm									
	24	0	25	20	45	35	60	50	75	65	90
24	**30**	0	25	20	45	35	60	50	75	70	95
30	**40**	5	30	25	50	45	70	60	85	80	105
40	**50**	5	35	30	60	50	80	70	100	95	125
50	**65**	10	40	40	70	60	90	80	10	110	140
65	**80**	10	45	40	75	65	100	90	125	130	165
80	**100**	15	50	50	85	75	110	105	140	155	190
100	**120**	15	55	50	90	85	125	125	165	180	220
120	**140**	15	60	60	105	100	145	145	190	200	245
140	**160**	20	70	70	120	115	165	165	215	225	275
160	**180**	25	75	75	125	120	170	170	220	250	300
180	**200**	35	90	90	145	140	195	195	250	275	330
200	**225**	45	105	105	165	160	220	220	280	305	365
225	**250**	45	110	110	175	170	235	235	300	330	395
250	**280**	55	125	125	195	190	260	260	330	370	440
280	**315**	55	130	130	205	200	275	275	350	410	485
315	**355**	65	145	145	225	225	305	305	385	455	535
355	**400**	100	190	190	280	280	370	370	460	510	600
400	**450**	110	210	210	310	310	410	410	510	565	665
450	**500**	110	220	220	330	330	440	440	550	625	735
500	**560**	120	240	240	360	360	480	480	600	660	780
560	**630**	140	260	260	380	380	500	500	620	675	795
630	**710**	145	285	285	425	425	565	565	705	705	845
710	**800**	150	310	310	470	470	630	630	790	790	950
800	**900**	180	350	350	520	520	690	690	860	860	1030
900	**1000**	200	390	390	580	580	770	770	960	960	1150
1000	**1120**	220	430	430	640	640	850	850	1060	1060	1270
1120	**1250**	230	470	470	710	710	950	950	1190	1190	1430
1250	**1400**	270	530	530	790	790	1050	1050	1310	1310	1570
1400	**1 600**	330	610	610	890	890	1170	1170	1450	1450	1730

1) Radial clearance for bearings with tapered bore is staggered with one group to the right, for example radial clearance C3 for cylindrical bore bearing match Normal radial clearance for tapered bore bearings.

Tolerances and radial clearance

Single row cylindrical roller bearings are usually manufactured to normal tolerance class with normal radial clearance. They can also be manufactured to more accurate tolerance classes and with larger (C3NA and C4NA) or smaller (C1NA and C2NA) radial clearances.

Tolerances of cylindrical roller bearings are given on pages 28.

Radial clearances according to international standard ISO 5753 are given in tales 2 and 3 for cylindrical bore bearings both with interchangeable rings and with non-interchangeable rings (NA).

Cages

Small and medium-sized single row cylindrical roller bearings are generally fitted with pressed sheet cages. Large-sized bearings are fitted with machined brass cages of normal design, i.e. cages of separable design guided on rolling elements M, on the outside surface MA or inner surface MB. In case of heavy loads and high speeds, cages are made in one piece.

Glass fiber reinforced polyamide 6.6 cages, are successfully used for small and medium-sized bearings, if the operating temperature doesn't exceed + 120ºC. These cages have low mass, low coefficient of friction and are noiseless while running.

Cage design and some technical data are given in table 4.

Radial clearance for single and double row cylindrical roller bearings

With non-interchangeable elements
With cylindrical bore[1)]

Table 3

Bore diameter		Clearance group symbol											
d		C1NA		C2NA		NA		C3NA		C4NA		C5NA	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
mm		µm											
2,5	**6**	0	7	8	15	15	15	30	40	40	50		
6	**10**	0	7	10	20	20	30	35	45	45	55		
10	**14**	0	10	10	20	20	30	35	45	45	55		
14	**24**	5	15	10	20	20	30	35	45	45	55	65	75
24	**20**	5	15	10	25	25	35	40	50	50	60	70	80
30	**40**	5	15	12	25	25	40	45	55	55	70	80	95
40	**50**	5	18	15	30	30	45	50	65	65	80	95	110
50	**65**	5	20	15	35	35	50	55	75	75	90	110	130
65	**80**	10	25	20	40	40	60	70	90	90	110	130	150
80	**100**	10	30	25	45	45	70	80	105	105	125	155	180
100	**120**	10	30	25	50	50	80	95	120	120	145	180	205
120	**140**	10	35	30	60	60	90	105	135	135	160	200	230
140	**160**	10	35	35	65	65	100	115	150	150	180	225	260
160	**180**	10	40	35	75	75	110	125	165	165	200	250	285
180	**200**	15	45	40	80	80	120	140	180	180	220	275	315
200	**225**	15	50	45	90	90	135	155	200	200	240	305	350
225	**250**	15	50	50	100	100	150	170	215	215	265	330	380
250	**280**	20	55	55	110	110	165	185	240	240	295	370	420
280	**315**	20	60	60	120	120	180	205	265	265	325	410	470
315	**355**	20	65	65	135	135	200	225	295	295	360	455	520
355	**400**	25	75	75	150	150	225	255	330	330	405	510	585
400	**450**	25	85	85	170	170	255	285	370	370	455	565	650
450	**500**	25	95	95	190	190	285	315	410	410	505	625	720
500	**560**	25	100	105	210	210	315	350	455	455	560	720	815
560	**630**	30	110	115	230	230	345	390	505	505	620	800	910
630	**710**	30	130	130	260	260	390	435	565	565	695	900	1030
710	**800**	35	140	145	290	290	435	485	630	630	775	1000	1140
800	**900**	35	160	160	320	320	480	540	700	700	860	1130	1290
900	**1000**	35	180	180	360	360	540	600	780	780	960	1270	1440
1000	**1120**	50	200	200	400	400	600	660	860	860	1060	1380	1560
1120	**1250**	60	220	220	440	440	660	730	950	950	1170	1520	1720
1250	**1400**	60	240	240	480	480	720	810	1050	1050	1290	1680	1900
1400	**1600**	70	270	270	540	540	810	910	1190	1190	1460	1900	2150

1) Radial clearance for bearings with tapered bore is staggered with one group to the right, for example radial clearance C3NA for cylindrical bore bearings match radial clearance NA for tapered bore bearings.

Minimum load

Cylindrical roller bearings must be subjected to a given minimum load, so that a proper operation of these bearings can be guaranteed.

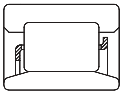
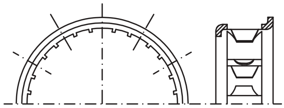
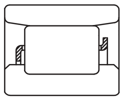
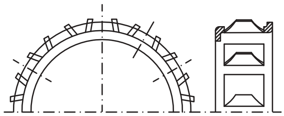
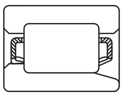
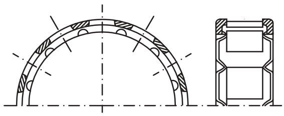
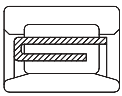
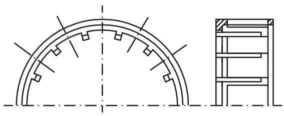
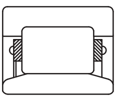
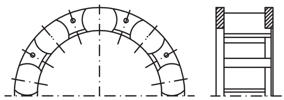
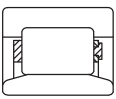
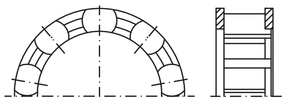
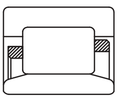
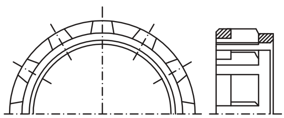
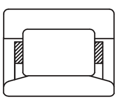
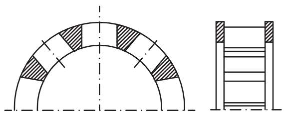
This is necessary especially as the bearings are operated at high speeds and the centrifugal forces produce additional friction in bearing due to the sliding between rollers and raceway.

The values of the minimum load can be enough accurately calculated using the equation:

$$F_{rm} = 0,02\ C_1,\ \text{kN}$$

Cage design and some technical data

Table 4

Cage	Design		Application	Max. value $D_m n$	
	bearing	cage		oil	grease
Pressed sheet cage with fins			- General application - Low inertia - Provides proper bearing lubrication - Moderate speeds - Bearings NU, NJ, NUP	$550x10^3$	$400x10^3$
Pressed sheet cage with fins			- General application - Low inertia - Provides proper bearing lubrication - Moderate speeds - Bearings N	$550x10^3$	$400x10^3$
Pressed sheet cage			- General application - Low inertia - Provides proper bearing lubrication - Moderate speeds - Bearings construction E type NU, NJ, NUP	$550x10^3$	$400x10^3$
Pressed sheet cage with fins			- General application - Low inertia - Provides propsr bearing lubrication - Moderate speeds - Bearings NU, NJ, NUP	$550x10^3$	$400x10^3$
Machined brass cage M, MA, MB			- General application - Heavy toads - Moderate and high speeds - Bearings with d > 100 mm	$1200x10^3$	$900x10^3$
Machined brass cage M6.MA6			- General application - Heavy toads - Moderate and high speeds	$1200x10^3$	$900x10^3$
Polyamide cage TN			- General application - Low frictional moment - High speeds - Low noise T < 120º C	$1400x10^3$	$1100x10^3$
One piece machined brass cage MPA			- General application - Heavy toads - Provides proper lubrication - High speeds	$1400x10^3$	$1100x10^3$

ART BEARINGS

Equivalent dynamic radial load

For cylindrical roller bearings purely radially loaded which don't locate shafts axially, equivalent dynamic load is:

$P_r = F_r$, kN

If cylindrical roller bearings have ribs on the outer and inner rings and locate shafts axially in one or both directions, equivalent dynamic load can be calculated using the equations:

$P_r = F_r$, kN, when $F_a/F_r \le e$
$P_r = 0{,}92\ F_r + Y\ F_a$, kN, when $F_a/F_r > e$

Where:
e - calculation factor with values:
- 0,2 for series 10,2,3 and 4
- 0,3 for series 22,23

Y - factor for axial load
- 0,6 for series 10,2,3 and 4
- 0,4 for series 22,23

Cylindrical roller bearings axially loaded run satisfactorily only if they are simultaneously radially loaded. Ratio F_a/F_r should not exceed 0,5 for bearings of E design and 0,4 for the other bearings.

Equivalent static radial load

For cylindrical roller bearings purely radially loaded, equivalent static load is:

$P_{0r} = F_r$, kN

Dynamic axial load

Bearings with ribs on the outer ring can accommodate axial loads in addition to radial loads. The axial load carrying capacity of cylindrical roller bearings do not depend essentially on the steel fatigue strength, but on the resistance of the sliding surfaces at the roller end and rib contact and therefore on lubrication, operating temperature and bearing thermal conductivity.

Considering the above mentioned, axial load carrying capacity of a cylindrical roller bearing can be enough accurately calculated using the following equation:

$$F_{a\,max} = \frac{k_1 C_{0r} 10^4}{n(d+D)} - k_2 F_r ,$$

where:
$F_{a\,max}$ - maximum permissible axial load, kN
C_{0r} - radial static load, kN
F_r - radial load component, kN
n - operating speed, r/min
d - bearing bore diameter, mm
D - bearing outside diameter, mm
k_1 - auxiliary factor, see table 5
k_2 - auxiliary factor, see table 5

The above equation is based on conditions which are considered typical for normal bearing operation:
- a difference of 60ºC between the bearing operating temperature and the ambient temperature
- a specific heat loss from the bearing of 0,5 mW/mm² ºC
- a viscosity ratio k=2.

The viscosity ratio k is the ratio of the actual viscosity at the operating temperature to the requisite viscosity for a proper lubrication at that temperature. Further details can be found in subchapter "Adjusted rating life", life adjustment factor a_{23} - on page 21.

In case of grease lubrication, the base oil viscosity of the grease should be used. These effects can be reduced at low speeds by using oils with EP additives.

Factors k_1 and k_2 Table 5

Factor	Lubrication	
	oil	grease
Bearings construction E		
k_1	1,5	1
k_2	0,15	0,1
Other bearings		
k_1	0,5	0,3
k_2	0,05	0,03

The values of permissible axial load $F_{a\,max}$ obtained from the equation above mentioned are valid for a continuously acting constant axial load. If axial loads act only for short periods, the values may be multiplied by 2 or for shock loads by 3.

The constantly acting axial load $F_{a\,max}$ (N) should never exceed the numerical value of 1,2 D^2 (D = bearing outside diameter, mm) and occasional shock loads should never be greater than the numerical value of $3D^2$.

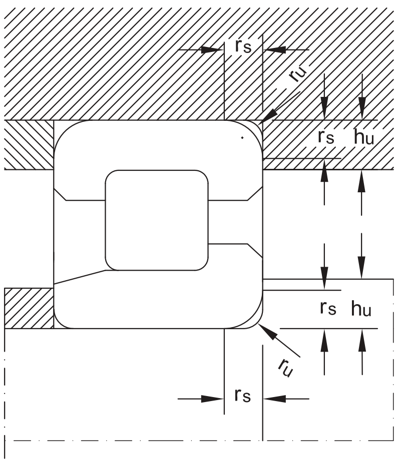
In case of heavy axial loads ($F_a > D^2$), the ribs of the outer and inner ring respectively are recommended to be supported by the bearing ad joint parts. Bearings of NUP and NJ+HJ designs which take axial loads in both directions are to be placed so that main axial loads should be taken by fixed ribs, if bearing design allows.

Heat treatment

Cylindrical roller bearings with outside diameter D > 240 mm of all series given in the catalogue are to be subject to a heat treatment of stress relieving which allows bearings to be operated up to a temperature of +150ºC.

The hardness of rigs should not be less 59 HRC.

Small-sized bearings operate normally up to +120ºC.



Abutment dimensions

For a proper location of bearing rings on the shaft and housing shoulder respectively, shaft (housing) maximum radius $r_{u\,max}$ should be less than bearing minimum mounting chamfer $r_{s\,min}$.

Shoulder height should also be properly sized in case of bearing maximum mounting chamfer.

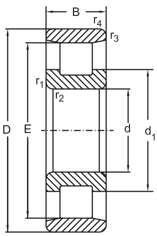
The values of the connection radius and support shoulder height are given in table 6.

Abutment dimensions for single row cylindrical roller bearings are given in table 7. The values for double row cylindrical roller bearings are given in table 8.

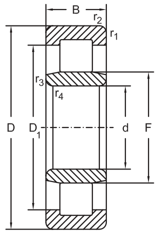
Abutment dimensions Table 6

r_s, r_{1s} min.	**r_u max.**	**h_u min.**		
		Bearing series		
		10, 18, 19, 28, 29, 30, 48, 49, 60	2, 2E, 3, 3E, 22, 22E, 23, 23E	4
mm				
0,3	0,3	1	1,2	
0,6	0,6	1,6	2,1	
1	1	2,3	2,8	
1,1	1	3	3,5	4,5
1,5	1,5	3,5	4,5	5,5
2	2	4,4	5,5	6,5
2,1	2,1	5,1	6	7
3	2,5	6,2	7	8
4	3	7,3	8,5	10
5	4	9	10	12
6	5	10	11	

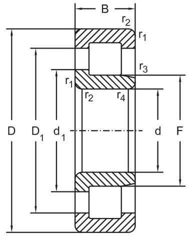
Single row cylindrical roller bearings



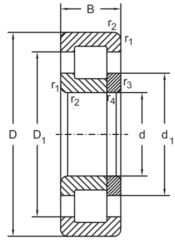
N



NU



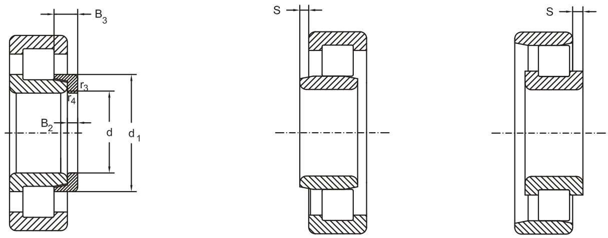
NJ



NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
15	35	11	0,6	0,3	1	12,7	10,4	18000	22000	**NU202 E**
	35	11	0,6	0,3	-	12,7	10,4	18000	22000	**NJ202 E**
17	40	12	0,6	0,3	1,2	17,6	14,6	15000	18000	**N203**
	40	12	0,6	0,3	1,2	17,6	14,6	15000	18000	**NU203 E**
	40	12	0,6	0,3	-	17,6	14,6	15000	18000	**NJ203 E**
	40	12	0,6	0,3	-	17,6	14,6	15000	18000	**NUP203 E**
	40	16	0,6	0,3	1	24	22	15000	18000	**NU2203 E**
	40	16	0,6	0,3	-	24	22	15000	18000	**NJ2203 E**
	40	16	0,6	0,3	-	24	22	15000	18000	**NUP2203 E**
	47	14	1,1	0,6	1,2	16,2	13	13000	16000	**NU303 M**
	47	14	1,1	0,6	-	16,2	13	13000	16000	**NJ303 M**
	47	14	1,1	0,6	-	16,2	13	13000	16000	**NUP303 M**
20	47	14	1	0,6	1	27,5	24,5	13000	16000	**N204**
	47	14	1	0,6	1	27,5	24,5	13000	16000	**NU204 E**
	47	14	1	0,6	1	27,5	24,5	13000	16000	**NU204 EM6**
	47	14	1	0,6	1	27,5	24,5	13000	16000	**NU204 ETN**
	47	14	1	0,6	-	27,5	24,5	13000	16000	**NJ204 E**
	47	14	1	0,6	-	27,5	24,5	13000	16000	**NJ204 EMA6**
	47	14	1	0,6	-	27,5	24,7	13000	16000	**NJ204 ETN**
	47	14	1	0,6	-	27,5	24,5	13000	16000	**NUP204 E**
	47	14	1	0,6	-	27,5	24,5	13000	16000	**NUP204 EMA6**
	47	18	1	0,6	1,8	32,5	31	13000	16000	**NU2204 E**
	47	18	1	0,6	1,8	32,5	31	13000	16000	**NU2204 EMA6**
	47	18	1	0,6	-	32,5	31	13000	16000	**NJ2204 E**
	47	18	1	0,6	-	32,5	31	13000	16000	**NJ2204 EMA6**
	47	18	1	0,6	-	32,5	31	13000	16000	**NUP2204 E**
	52	15	1	0,6	1,1	31,5	27	11000	14000	**NU304 E**
	52	15	1	0,5	1,1	31,5	27	11000	14000	**NU304 EMA6**
	52	15	1	0,6	-	31,5	27	11000	14000	**NJ304 E**
	52	15	1	0,5	-	31,5	27	11000	14000	**NJ304 EM**
	52	15	1	0,5	-	31,5	27	11000	14000	**NJ304 EMA6**
	52	15	1,1	0,6	-	31,5	27	11000	14000	**NUP304 E**
	52	15	1,1	0,5	-	31,5	27	11000	14000	**NUP304 EM**

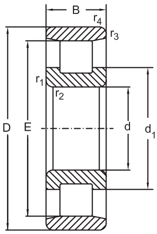
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
15	-	19,3	-	27,8	-	-	-	0,05	-
	-	19,3	21,8	27,8	2,5	5	**HJ202 E**	0,05	0,007
17	33,9	-	24,7	-	-	-	-	0,07	-
	-	22,1	-	32	-	-	-	0,07	-
	-	22,1	24,7	32	3	5,5	**HJ203 E**	0,07	0,009
	-	22,1	24,7	32	-	-	-	0,07	-
	-	22,1	-	32	-	-	-	0,09	-
	-	22,1	24,7	32	3	6	**HJ2203 E**	0,09	0,01
	-	22,1	24,7	32	-	-	-	0,09	-
	-	25,1	-	36,8	-	-	-	0,12	-
	-	25,1	27,6	36,8	4	6,5	**HJ303 E**	0,12	0,012
	-	25,1	27,6	36,8	-	-	-	0,12	-
20	40	-	29,9	-	-	-	-	0,13	-
	-	26,5	-	38,8	-	-	-	0,13	-
	-	26,5	-	38,3	-	-	-	0,12	-
	-	26,5	-	38,7	-	-	-	0,11	-
	-	26,5	29,9	38,8	3	5,5	**HJ204 E**	0,13	0,011
	-	26,5	29,9	38,7	3	5	**HJ204 E**	0,13	0,011
	-	26,5	29,9	38,7	3	5	**HJ204 E**	0,12	0,011
	-	26,5	29,9	38,8	-	-	-	0,13	-
	-	26,5	29,9	38,7	-	-	-	0,15	-
	-	26,5	-	38,4	-	-	-	0,14	-
	-	26,5	-	38,7	-	-	-	0,16	-
	-	26,5	29,9	38,4	3	6,5	**HJ2204 E**	0,14	0,012
	-	26,5	29,7	38,7	3	6,5	**HJ2204 E**	0,17	-
	-	26,5	29,9	38,4	-	-	-	0,14	-
	-	27,5	-	41,8	-	-	-	0,15	-
	-	27,5	-	42,4	-	-	-	0,18	-
	-	27,5	31,4	41,8	4	6,5	**HJ304 E**	0,15	0,017
	-	28,5	32	42	4	6,5	**HJ304 E**	0,17	0,017
	-	27,5	31	42,4	4	6,5	**HJ304 E**	0,18	0,017
	-	27,5	31,4	41,8	-	-	-	0,15	-
	-	27,5	31	42	-	-	-	0,17	-

Single row cylindrical roller bearings



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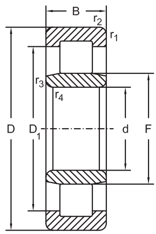

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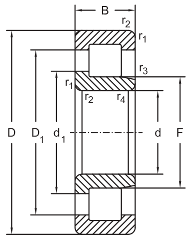

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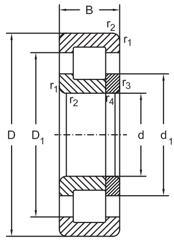
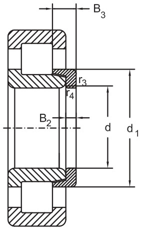


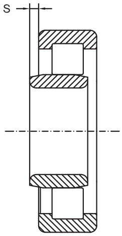
NUP

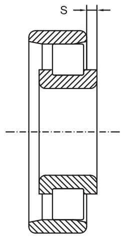
Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
20	52	15	1,1	0,5	-	31,5	27	11000	14000	**NUP304 EMA6**
	52	21	1,1	0,6	2	41,5	39	11000	14000	**NU2304 E**
	52	21	1,1	0,6	2	41,5	39	11000	14000	**NU2304 EM**
	52	21	1,1	0,6	-	41,5	39	11000	14000	**NJ2304 E**
	52	21	1,1	0,6	-	41,5	39	11000	14000	**NJ2304 EM**
	52	21	1,1	0,6	-	41,5	39	11000	14000	**NUP2304 E**
	52	21	1,1	0,6	-	41,5	39	11000	14000	**NUP2304 EM**
25	52	15	1	0,6	1,3	29	27,5	12000	15000	**N205**
	52	15	1	0,6	1,3	29	27,5	12000	15000	**NU205 E**
	52	15	1	0,6	1,3	29	27,5	12000	15000	**NU205 EM6**
	52	15	1	0,6	1,3	31	29,7	12000	15000	**NU205 ETN**
	52	15	1	0,6	-	29	27,5	12000	15000	**NJ205 E**
	52	15	1	0,6	-	29	27,5	12000	15000	**NJ205 EM6**
	52	15	1	0,6	-	29	27,5	12000	15000	**NUP205 E**
	52	15	1	0,6	-	29	27,5	12000	15000	**NUP205 EM6**
	52	18	1	0,6	1,7	34,5	35	12000	15000	**NU2205 E**
	52	18	1	0,6	1,7	34,5	35	12000	15000	**NU2205 EM6**
	52	18	1	0,6	-	34,5	35	12000	15000	**NJ2205 E**
	52	18	1	0,6	-	34,5	35	12000	15000	**NJ2205 EM6**
	52	18	1	0,6		34,9	34,6	12000	15000	**NJ2205 ETN**
	52	18	1	0,6	-	34,5	35	12000	15000	**NUP2205 E**
	52	18	1	0,6	-	34,5	35	12000	15000	**NUP2205 EM6**
	62	17	1,1	1,1	1,3	41,5	37,5	9500	12000	**N305**
	62	17	1,1	1,1	1,3	41,5	37,5	9500	12000	**NU305 E**
	62	17	1,1	1,1	1,3	41,5	37,5	9500	12000	**NU305 EM**
	62	17	1,1	1,1	-	41,5	37,5	9500	12000	**NJ305 E**
	62	17	1,1	1,1	-	41,5	37,5	9500	12000	**NJ305 EM**
	62	17	1,1	1,1	-	41,6	37,4	9500	12000	**NJ305 ETN**
	62	17	1,1	1,1	-	41,5	37,5	9500	12000	**NUP305 E**
	62	17	1,1	1,1	-	41,5	37,5	9500	12000	**NUP305 EM**
	62	24	1,1	1,1	1,9	57	56	9500	12000	**NU2305 E**
	62	24	1,1	1,1	-	57	56	9500	12000	**NJ2305 E**
	62	24	1,1	1,1	-	57	56	9500	12000	**NJ2305 EM**

Single row cylindrical roller bearings



NJ+HJ

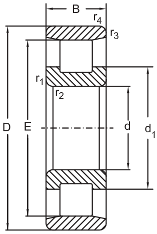




Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
20	-	27,5	31	42,4	-	-	**-**	0,18	-
	-	27,5	-	41,8	-	-	**-**	0,21	-
	-	27,5	-	42	-	-	**-**	0,25	-
	-	27,5	31,4	41,8	4	7,5	**HJ2304 E**	0,21	0,019
	-	27,5	31,5	42	4	7,5	**HJ2304 E**	0,25	0,019
	-	27,5	31,4	41,8	-	-	**-**	0,21	-
	-	27,5	31,5	42	-	-	**-**	0,33	-
25	45	-	35	-	-	-	**-**	0,13	-
	-	31,5	-	43,3	-	-	**-**	0,14	-
	-	31,5	-	43,6	-	-	**-**	0,15	-
	-	31,5	-	44	-	-	**-**	0,13	-
	-	31,5	34,9	43,3	3	6	**HJ205 E**	0,14	0,015
	-	31,5	34,9	42	3	6	**HJ205 E**	0,16	0,015
	-	31,5	34,9	43,3	-	-	**-**	0,14	-
	-	31,5	34,9	42	-	-	**-**	0,16	-
	-	31,5	-	43,3	-	-	**-**	0,16	-
	-	31,5	-	43,6	-	-	**-**	0,19	-
	-	31,5	34,9	43,3	3	6,5	**HJ2205 E**	0,16	0,015
	-	31,5	34,1	43,6	3	6,5	**HJ2205 E**	0,19	0,015
	-	31,5	34,1	43,6	3	6,5	**HJ2205 E**	0,17	0,015
	-	31,5	34,9	43,3	-	-	**-**	0,16	-
	-	31,5	34,1	43,6	-	-	**-**	0,20	-
	53	-	39	-	-	-	**-**	0,25	-
	-	34	-	50,1	-	-	**-**	0,25	-
	-	34	-	50,5	-	-	**-**	0,29	-
	-	34	38,3	50,1	4	7	**HJ305 E**	0,25	0,025
	-	34	37,5	50,5	4	7	**HJ305 E**	0,29	0,025
	-	34	37,5	50,5	4	7	**HJ305 E**	0,24	0,025
	-	34	38,3	50,1	-	-	**-**	0,25	-
	-	34	37,5	50,5	-	-	**-**	0,30	-
	-	34	-	50,1	-	-	**-**	0,35	-
	-	34	38,3	50,1	4	8	**HJ2305 E**	0,35	0,027
	-	34	38,2	50,5	4	8	**HJ2305 E**	0,41	0,027

ART BEARINGS

Single row cylindrical roller bearings



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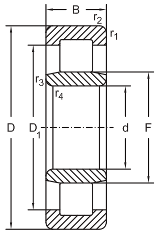

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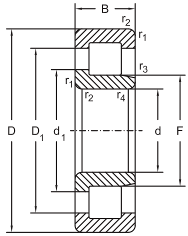

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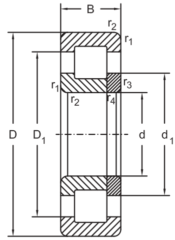
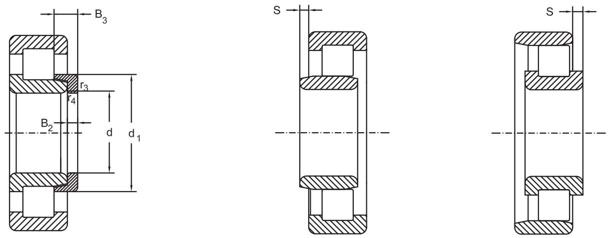


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
25	62	24	1,1	1,1	-	57	56	9500	12000	**NUP2305 E**
	80	21	1,5	1,5	2,2	50,6	44.4	8500	10000	**NU405 M**
	80	21	1,5	1,5	-	50,6	44.4	8500	10000	**NJ405 M**
	80	21	1,5	1,5	-	50,6	44.4	8500	10000	**NUP405 M**
30	62	16	1	0,6	1,4	39,7	37,9	9500	12000	**N206 EM6**
	62	16	1	0,6	1,4	39,7	37,9	9500	12000	**NU206 E**
	62	16	1	0,6	1,4	39,7	37,9	9500	12000	**NU206 EM6**
	62	16	1	0,6	1,4	41,3	40,2	9500	12000	**NU206 ETN**
	62	16	1	0,6	-	39,7	37,9	9500	12000	**NJ206 E**
	62	16	1	1	-	39,7	37,9	9500	12000	**NJ206 EM6**
	62	16	1	1	-	39,7	37,9	9500	12000	**NJ206 ETN**
	62	16	1	0,6	-	39,7	37,9	9500	12000	**NUP206 E**
	62	16	1	1	-	39,7	37,9	9500	12000	**NUP206 EM6**
	62	20	1	0,6	1,6	49	50	9500	12000	**NU2206 E**
	62	20	1,5	1	1,6	49	50	9500	12000	**NU2206 EMA6**
	62	20	1	0,6	1,6	52	54	9500	12000	**NU2206 ETN**
	62	20	1	0,6	-	49	50	9500	12000	**NJ2206 E**
	62	20	1	0,6	-	49	50	9500	12000	**NJ2206 EMA6**
	62	20	1	0,6	-	52	54	9500	12000	**NJ2206 ETN**
	62	20	1	0,6	-	49	50	9500	12000	**NUP2206 E**
	72	19	1,1	1,1	1,9	51	48	8500	10000	**N306**
	72	19	1,1	1,1	1,9	51,2	48	8500	10000	**NU306 E**
	72	19	1,1	1,1	1,9	51,2	48	8500	10000	**NU306 EM**
	72	19	1,1	1,1	1,9	51,2	48	8500	10000	**NU306 ETN**
	72	19	1 ,1	1,1	-	51,2	48	8500	10000	**NJ306 E**
	72	19	1,1	1,1	-	51,2	48	8500	10000	**NJ306 EM**
	72	19	1,1	1,1	-	51,2	48	8500	10000	**NJ306 ETN**
	72	19	1 ,1	1,1	-	51,2	48	8500	10000	**NUP306 E**
	72	19	1,1	1,1	-	51,2	48	8500	10000	**NUP306 EM**
	72	27	1 ,1	1,1	2,5	73,5	75	8500	10000	**NU2306 E**
	72	27	1 ,1	1,1	-	73,5	75	8500	10000	**NJ2306 E**
	72	27	1,1	1,1	-	73,5	75	8500	10000	**NJ2306 EM**
	72	27	1 ,1	1,1	-	73,5	75	8500	10000	**NUP2306 E**

Single row cylindrical roller bearings

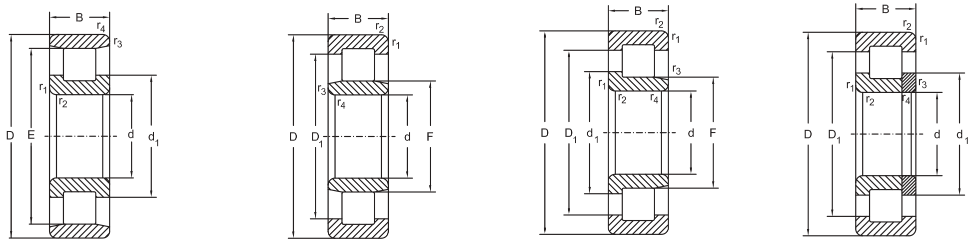


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
25	-	34	38,3	50,1	-	-	-	0,35	-
	-	38,8	-	58,4	-	-	-	0,63	-
	-	38,8	43,6	58,4	6	10,5	**HJ405**	0,63	0,057
	-	38,8	43,4	57,5	-	-	-	0,65	-
30	55,5	-	41,4	-	-	-	-	0,21	-
	-	37,5	-	52	-	-	-	0,21	-
	-	37,5	-	52,5	-	-	-	0,24	-
	-	37,5	-	52,5	-	-	-	0,20	-
	-	37,5	41,4	52	4	7	**HJ206 E**	0,21	0,025
	-	37,5	40,7	50	4	7	**HJ206 E**	0,24	0,025
	-	37,5	40,7	52,5	4	7	**HJ206 E**	0,20	0,025
	-	37,5	41,4	52	-	-	-	0,21	-
	-	37,5	40,7	52,5	-	-	-	0,25	-
	-	37,5	-	52	-	-	-	0,26	-
	-	37,5	-	52,25	-	-	-	0,31	-
	-	37,5	-	52,25	-	-	-	0,26	-
	-	37,5	41,4	52	4	7,5	**HJ2206 E**	0,26	0,025
	-	37,5	40,7	52,25	4	7,5	**HJ2206 E**	0,31	0,025
	-	37,5	40,7	52,25	4	7,5	**HJ2206 E**	0,26	0,025
	-	37,5	41,4	52	-	-	-	0,26	-
	62	-	46,4	-	-	-	-	0,36	-
	-	40,5	-	58,3	-	-	-	0,37	-
	-	40,5	-	58,5	-	-	-	0,43	-
	-	40,5	-	58,5	-	-	-	0,38	-
	-	40,5	45,1	58,3	5	8,5	**HJ306 E**	0,37	0,043
	-	40,5	44,2	57,6	5	8,5	**HJ306 E**	0,45	0,043
	-	40,5	44,2	57,6	5	8,5	**HJ306 E**	0,39	0,043
	-	40,5	45,1	58,3	-	-	-	0,37	-
	-	42	46,3	58,2	-	-	-	0,45	-
	-	40,5	-	58,3	-	-	-	0,53	-
	-	40,5	45,1	58,3	5	9,5	**HJ2306 E**	0,53	0,045
	-	40,5	44,2	58,6	5	9,5	**HJ2306 E**	0,63	0,045
	-	40,5	45,1	58,3	-	-	-	0,53	-

ART BEARINGS

Single row cylindrical roller bearings

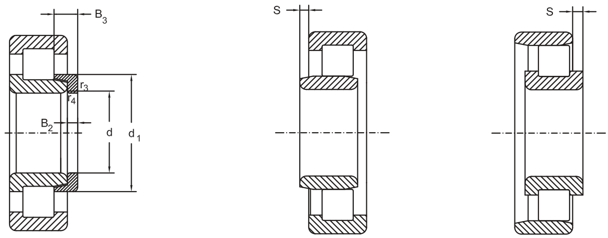


N NU NJ NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
30	90	23	1,5	1,5	2,3	65	57,8	7000	8500	**N406 M**
	90	23	1,5	1,5	2,3	65	57,8	7000	8500	**NU406 M**
	90	23	1,5	1,5	-	65	57,8	7000	8500	**NJ406 M**
	90	23	1,5	1,5	-	65	57,8	7000	8500	**NUP406 M**
35	62	14	1	0,6	1	23,6	24,5	10000	13000	**NU1007 M**
	72	17	1 ,1	0,6	1,7	50	50	8500	10000	**N207**
	72	17	1 ,1	0,6	1,7	50	50	8500	10000	**NU207 E**
	72	17	1,1	0,6	1,7	50	50	8500	10000	**NU207 EM**
	72	17	1,1	0,6	1,7	53	54	8500	10000	**NU207 ETN**
	72	17	1 ,1	0,6	-	50	50	8500	10000	**NJ207 E**
	72	17	1,1	0,6	-	53	54	8500	10000	**NJ207 ETN**
	72	17	1 ,1	0,6	-	50	50	8500	10000	**NUP207 E**
	72	17	1,1	0,6	-	50	50	8500	10000	**NUP207 EM**
	72	17	1,1	0,6	-	53	54	8500	10000	**NUP207 ETN**
	72	23	1,1	0,6	2,9	65	70	8500	10000	**N2207**
	72	23	1 ,1	0,6	2,9	65	70	8500	10000	**NU2207 E**
	72	23	1	0,6	-	65	70	8500	10000	**NJ2207 E**
	72	23	1	0,6	-	65	70	8500	10000	**NUP2207 E**
	80	21	1,1	1,5	0,6	66,7	65,4	7500	9000	**N307**
	80	21	1,1	1,5	0,6	66,7	65,4	7500	9000	**NU307 E**
	80	21	1,5	1,1	0,6	66,7	65,4	7500	9000	**NU307 EM**
	80	21	1,1	1,5	-	66,7	65,4	7500	9000	**NJ307 E**
	80	21	1,5	1,1	-	66,7	65,4	7500	9000	**NJ307 M**
	80	21	1,1	1,5	-	66,7	65,4	7500	9000	**NUP307 E**
	80	21	1,5	1,1	-	66,7	65,4	7500	9000	**NUP307 EM**
	80	31	1,1	1,5	3	91,5	98	7500	9000	**NU2307 E**
	80	31	1,1	1,5	-	91,5	98	7500	9000	**NJ2307 E**
	80	31	1,5	1,1	-	91,5	98	7500	9000	**NJ2307 EM**
	80	31	1,1	1,5	-	91,5	98	7500	9000	**NUP2307 E**
	100	25	1,5	1,5	2,6	75	69,5	6300	7500	**N407 M**
	100	25	1,5	1,5	2,6	75	69,5	6300	7500	**NU407 M**
	100	25	1,5	1,5	-	75	69,5	6300	7500	**NJ407 M**
	100	25	1,5	1,5	-	75	69,5	6300	7500	**NUP407 M**

ART BEARINGS

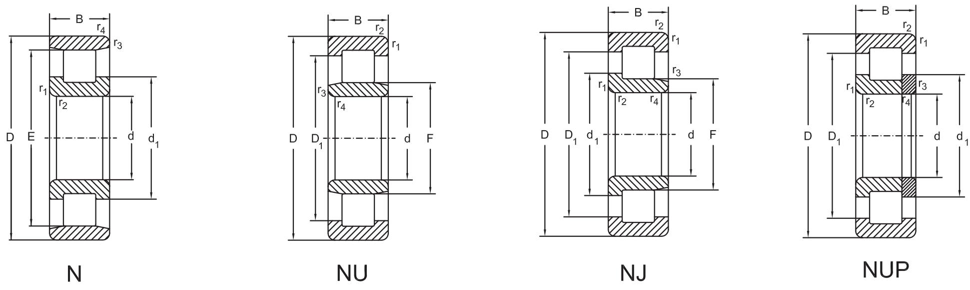
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
30	73	-	50,5	-	-	-	-	0,87	-
	-	45	-	67,8	-	-	-	0,87	-
	-	45	50,5	67,8	7	11,5	**HJ406**	0,87	0,09
	-	45	50,5	67,8	-	-	-	0,87	-
35	-	42	44,5	51,9	4	7,75	**HJ1007**	0,18	0,02
	61,8	-	47,6	-	-	-	-	0,31	-
	-	44	-	60,1	-	-	-	0,31	-
	-	44	-	60,4	-	-	-	0,33	-
	-	44	-	60,4	-	-	-	0,31	-
	-	44	48	60,1	4	7	**HJ207 E**	0,31	0,033
	-	44	47,5	60,4	4	7	**HJ207 E**	0,32	0,033
	-	44	48	60,1	-	-	-	0,31	-
	-	44	47,5	60,4	-	-	-	0,34	-
	-	44	47,5	60,4	-	-	-	0,32	-
	61,8	-	47,6	-	-	-	-	0,38	-
	-	44	-	60,1	-	-	-	0,40	-
	-	44	48	60,1	4	8,5	**HJ2207 E**	0,40	0,035
	-	44	48	60,1	-	-	-	0,40	-
	68,2	-	51	-	-	-	-	0,47	-
	-	46,2	-	65,7	-	-	-	0,49	-
	-	46,2	-	66,2	-	-	-	0,56	-
	-	46,2	51,2	65,7	6	9,5	**HJ307 E**	0,49	0,062
	-	46,2	50,5	63,4	6	9,5	**HJ307 E**	0,54	0,065
	-	46,2	51,2	65,7	-	-	-	0,49	-
	-	46,2	50,5	66,2	-	-	-	0,55	-
	-	46,2	-	65,7	-	-	-	0,72	-
	-	46,2	51,2	65,7	6	11	**HJ2307 E**	0,72	0,065
	-	46,2	50,3	66,3	6	11	**HJ2307 E**	0,84	0,065
	-	46,2	51,2	65,7	-	-	-	0,72	-
	83	-	59	-	-	-	-	1,05	-
	-	53	-	77,6	-	-	-	1,05	-
	-	53	59	77,6	8	13	**HJ407**	1,05	0,13
	-	53	59	77,6	-	-	-	1,05	-

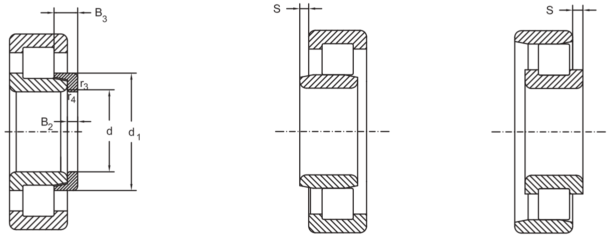
Single row cylindrical roller bearings



Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
40	68	15	1	0,6	-	26,1	27,3	9500	12000	**NJ1008 M**
	68	15	1,1	0,6	2,4	26,1	27,3	9500	12000	**NU1008 M**
	80	18	1,1	1,1	1,9	53	53	7500	9000	**N208**
	80	18	1,1	1,1	1,9	53,9	53	7500	9000	**NU208 E**
	80	18	1,1	1,1	1,9	53,9	53	7500	9000	**NU208 EM**
	80	18	1,1	1,1	1,9	53,9	53	7500	9000	**NU208 ETN**
	80	18	1,1	1,1	-	53,9	53	7500	9000	**NJ208 E**
	80	18	1,1	1,1	-	53,9	53	7500	9000	**NJ208 EM**
	80	18	1,1	1,1	-	53,9	53	7500	9000	**NJ208 ETN**
	80	18	1,1	1,1	-	53,9	53	7500	9000	**NUP208 E**
	80	18	1,1	1,1	-	53,9	53	7500	9000	**NUP208 EM**
	80	18	1,1	1,1	-	53,9	53	7500	9000	**NUP208 ETN**
	80	23	1,1	1,1	2,3	71	75	7500	9000	**NU2208 E**
	80	23	1,1	1,1	-	71	75	7500	9000	**NJ2208 E**
	80	23	1,1	1,1	-	73,6	79,6	7500	9000	**NJ2208 ETN**
	80	23	1,1	1,1	-	71	75	7500	9000	**NUP2208 E**
	90	23	1,5	1,5	1,5	81,5	78	6300	7500	**N308**
	90	23	1,5	1,5	1,5	81,5	78	6300	7500	**NU308 E**
	90	23	1,5	1,5	1,5	81,5	78	6300	7500	**NU308 EM**
	90	23	1,5	1,5	1,5	85,3	84,5	6300	7500	**NU308 ETN**
	90	23	1,5	1,5	-	81,5	78	6300	7500	**NJ308 E**
	90	23	1,5	1,5	-	81,5	78	6300	7500	**NJ308 EM**
	90	23	1,5	1,5	-	85,3	84,5	6300	7500	**NJ308 ETN**
	90	23	1,5	1,5	-	81,5	78	6300	7500	**NUP308 E**
	90	23	1,5	1,5	-	81,5	78	6300	7500	**NUP308 EM**
	90	33	1,5	1,5	3	112	120	6300	7500	**NU2308 E**
	90	33	1,5	1,5	3	112	120	6300	7500	**NU2308 EM**
	90	33	1,5	1,5	-	112	120	6300	7500	**NJ2308 E**
	90	33	1,5	1,5	-	112	120	6300	7500	**NJ2308 EM**
	90	33	1,5	1,5	-	112	120	6300	7500	**NUP2308 E**
	90	33	1,5	1,5	-	112	120	6300	7500	**NUP2308 EM**
	110	27	2	2	2,6	93	86,5	5500	6800	**N408 M**
	110	27	2	2	2,6	93	86,5	5500	6800	**NU408 M**

ART BEARINGS

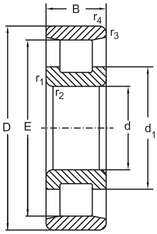
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
40	-	47	50	57,6	4	8	**HJ1008**	0,23	0,03
	-	47	-	57,7	-	-	**-**	0,23	-
	70	-	54,4	-	-	-	**-**	0,40	-
	-	49,5	-	67,3	-	-	**-**	0,38	-
	-	49,5	-	67,5	-	-	**-**	0,44	-
	-	49,5	-	67,5	-	-	**-**	0,39	-
	-	49,5	54,1	67,3	5	8,5	**HJ208 E**	0,38	0,05
	-	50	54,4	67,5	5	8,5	**HJ208 E**	0,45	0,05
	-	49,5	53,2	67,5	5	8,5	**HJ208 E**	0,40	0,05
	-	49,5	54,1	67,3	-	-	**-**	0,38	-
	-	50	54,4	65,5	-	-	**-**	0,46	-
	-	50	54,4	67,5	-	-	**-**	0,41	-
	-	49,5	-	67,3	-	-	**-**	0,49	-
	-	49,5	54,1	67,3	5	9	**HJ2208 E**	0,49	0,05
	-	49.5	53,2	67,5	5	9	**HJ2208 E**	0,51	0,05
	-	49,5	54,1	67,3	-	-	**-**	0,49	-
	77,5	-	58,8	-	-	-	**-**	0,66	-
	-	52	-	74,9	-	-	**-**	0,65	-
	-	52	-	75	-	-	**-**	0,73	-
	-	52	-	75	-	-	**-**	0,66	-
	-	52	57,7	74,9	7	-	**HJ308 E**	0,66	0,088
	-	52	56,9	75	7	11	**HJ308 E**	0,75	0,088
	-	52	56,9	75	7	11	**HJ308 E**	0,67	0,088
	-	52	57,7	74,9	-	-	**-**	0,66	-
	-	52	56,9	75	-	-	**-**	0,70	-
	-	52	-	74,9	-	-	**-**	0,95	-
	-	52	-	75,4	-	-	**-**	1,24	-
	-	52	57,7	74,9	7	12,5	**HJ2308 E**	0,95	0,92
	-	52	56,9	75,4	7	12,5	**HJ2308 E**	1,02	0,92
	-	52	57,7	74,9	-	-	**-**	0,95	-
	-	52	56,9	75,4	-	-	**-**	1,27	-
	92	-	64,8	-	-	-	**-**	1,30	-
	-	58	-	85,8	-	-	**-**	1,30	-

Single row cylindrical roller bearings



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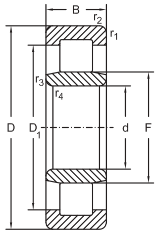

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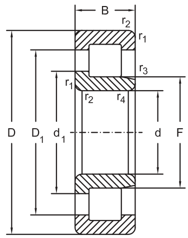

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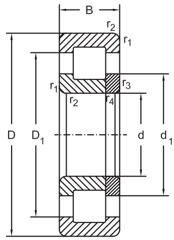
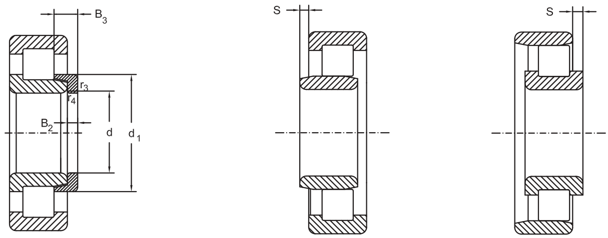


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
40	110	27	2	2	-	93	86,5	5500	6800	**NJ408 M**
	110	27	2	2	-	93	86,5	5500	6800	**NUP408 M**
45	75	16	1	0,6	2,5	32,5	35,5	8500	10000	**NU1009 M**
	85	19	1,1	1,1	1,9	61	63	7000	8500	**N209 E**
	85	19	1,1	1,1	1,9	61	63	7000	8500	**NU209 E**
	85	19	1,1	1,1	1,9	61	63	7000	8500	**NU209 EM**
	85	19	1,1	1,1	1,9	63,2	67	7000	8500	**NU209 ETN**
	85	19	1,1	1,1	-	61	63	7000	8500	**NJ209 E**
	85	19	1,1	1,1	-	61	63	7000	8500	**NJ209 EM**
	85	19	1,1	1,1	-	61	63	7000	8500	**NUP209 E**
	85	19	1,1	1,1	-	61	63	7000	8500	**NUP209 EM**
	85	23	1,1	1,1	2,3	76	81,6	7000	8500	**NU2209 E**
	85	23	1,1	1,1	2,3	76	81,6	7000	8500	**NU2209 EM**
	85	23	1,1	1,1	-	76	81,6	7000	8500	**NJ2209 E**
	85	23	1,1	1,1	-	76	81,6	7000	8500	**NJ2209 EM**
	85	23	1,1	1,1	-	76	81,6	7000	8500	**NUP2209 E**
	100	25	1,5	1,5	2,9	98	100	5600	6700	**N309 E**
	100	25	1,5	1,5	2,9	98	100	5600	6700	**NU309 E**
	100	25	1,5	1,5	2,9	98	100	5600	6700	**NU309 EM**
	100	25	1,5	1,5	-	98	100	5600	6700	**NJ309 E**
	100	25	1,5	1,5	-	98	100	5600	6700	**NJ309 EM**
	100	25	1,5	1,5	-	98	100	5600	6700	**NUP309 E**
	100	25	1,5	1,5	-	98	100	5600	6700	**NUP309 EM**
	100	36	1,5	1,5	3,5	137	153	5600	6700	**NU2309 E**
	100	36	1,5	1,5	3,5	137	153	5600	6700	**NU2309 EM**
	100	36	1,5	1,5	-	137	153	5600	6700	**NJ2309 E**
	100	36	1,5	1,5	-	137	153	5600	6700	**NJ2309 EM**
	100	36	1,5	1,5	-	137	153	5600	6700	**NUP2309 E**
	100	36	1,5	1,5	-	137	153	5600	6700	**NUP2309 EM**
	120	29	2	2	2,9	113	109	5000	6000	**N409 M**
	120	29	2	2	2,9	113	109	5000	6000	**NU409 M**
	120	29	2	2	-	113	109	5000	6000	**NJ409 M**
	120	29	2	2	-	113	109	5000	6000	**NUP409 M**

Single row cylindrical roller bearings

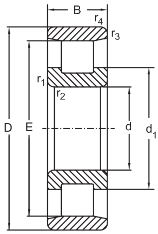


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
40	-	58	64,8	85,8	8	13	**HJ408**	1,30	0,15
	-	58	64,8	85,8	-	-	**-**	1,30	-
45	-	52,5	55,5	63,9	-	-	**-**	0,29	-
	76,5	-	59,1	-	-	-	**-**	0,50	-
	-	54,5	-	72,4	-	-	**-**	0,50	-
	-	54,5	-	72,5	-	-	**-**	0,50	-
	-	54,5	-	72,5	-	-	**-**	0,44	-
	-	54,5	59,1	72,4	5	8,5	**HJ209 E**	0,50	0,05
	-	54,5	58,4	72,5	5	8,5	**HJ209 E**	0,50	0,05
	-	54,5	59,1	72,4	-	-	**-**	0,50	-
	-	54,5	58,4	72,5	-	-	**-**	0,51	-
	-	54,5	-	72,4	-	-	**-**	0,60	-
	-	54,5	-	72,6	-	-	**-**	0,59	-
	-	54,5	59,1	72,4	5	9	**HJ2209 E**	0,60	0,057
	-	54,5	58,4	72,6	5	9	**HJ2209 E**	0,58	0,057
	-	54,5	59,1	72,4	-	-	**-**	0,60	-
	88,5	-	64,6	-	-	-	**-**	1	-
	-	58,5	-	83,1	-	-	**-**	1	-
	-	58,5	-	83,2	-	-	**-**	1	-
	-	58,5	64,6	83,1	7	11,5	**HJ309 E**	1	0,11
	-	58,5	63,8	83,2	7	13	**HJ309 E**	1,02	0,11
	-	58,5	64,6	83,1	-	-	**-**	1	-
	-	58,5	63,8	83,2	-	-	**-**	1,03	-
	-	58,5	-	83,1	-	-	**-**	1,30	-
	-	58,5	-	83,5	-	-	**-**	1,44	-
	-	58,5	64,6	83,1	7	13	**HJ2309 E**	1,30	0,12
	-	58,5	63,8	83,5	7	13	**HJ2309 E**	1,43	0,12
	-	58,5	64,6	83,1	-	-	**-**	1,30	-
	-	58,5	63,8	83,5	-	-	**-**	1,49	-
	100,5	-	71,8	-	-	-	**-**	1,70	-
	-	64,5	-	93,9	-	-	**-**	1,70	-
	-	64,5	71,8	93,9	8	13,5	**HJ409**	1,70	0,19
	-	64,5	71,8	93,9	-	-	**-**	1,70	-

ART BEARINGS

Single row cylindrical roller bearings



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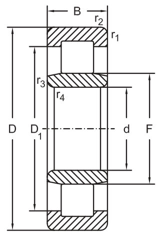

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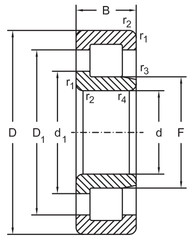
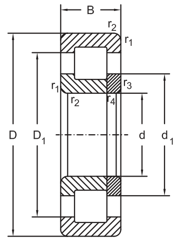


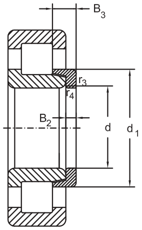
NJ



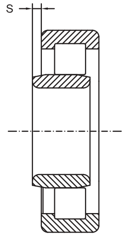
NUP

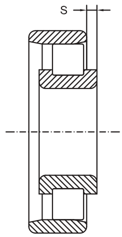
Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
50	80	16	1	0,6	2,5	36	41,5	8000	9500	**NU1010 M**
	90	20	1,1	1,1	2,2	64,4	68	6700	8000	**N210 E**
	90	20	1,1	1,1	2,2	64,4	68	6700	8000	**NU210 E**
	90	20	1,1	1,1	2,2	64,4	68	6700	8000	**NU210 EM**
	90	20	1,1	1,1	-	64,4	72,2	6700	8000	**NJ210 ETN**
	90	20	1,1	1,1	-	64,4	68	6700	8000	**NJ210 EM**
	90	20	1,1	1,1	-	64,4	68	6700	8000	**NJ210 E**
	90	20	1,1	1,1	-	64,4	68	6700	8000	**NUP210 E**
	90	20	1,1	1,1	-	64,4	68	6700	8000	**NUP210 EM**
	90	23	1,1	1,1	2,2	78	88	6700	8000	**NU2210 E**
	90	23	1,1	1,1	2,2	78	88	6700	8000	**NU2210 EM**
	90	23	1,1	1,1	-	78	88	6700	8000	**NJ2210 E**
	90	23	1,1	1,1	-	78	88	6700	8000	**NJ2210 EM**
	90	23	1,1	1,1	-	78	88	6700	8000	**NUP2210 E**
	110	27	2	2	3	110	114	5300	6300	**N310 E**
	110	27	2	2	3	110	114	5300	6300	**NU310 E**
	110	27	2	2	3	110	114	5300	6300	**NU310 EM**
	110	27	2	2	3	110	114	5300	6300	**NU310 ETN**
	110	27	2	2	-	110	114	5300	6300	**NJ310 E**
	110	27	2	2	-	110	114	5300	6300	**NJ310 EM**
	110	27	2	2	-	110	114	5300	6300	**NJ310 ETN**
	110	27	2	2	-	110	114	5300	6300	**NUP310 E**
	110	27	2	2	-	110	114	5300	6300	**NUP310 EM**
	110	40	2	2	3,7	163	186	5300	6300	**NU2310 E**
	110	40	2	2	3,7	163	186	5300	6300	**NU2310 EM**
	110	40	2	2	-	163	186	5300	6300	**NJ2310 E**
	110	40	2	2	-	163	186	5300	6300	**NJ2310 EM**
	110	40	2	2	-	163	186	5300	6300	**NUP2310 E**
	110	40	2	2	-	163	186	5300	6300	**NUP2310 EM**
	130	31	2,1	2,1	3	139	136	4500	5300	**N410 M**
	130	31	2,1	2,1	3	139	136	4500	5300	**NU410 M**
	130	31	2,1	2,1	-	139	136	4500	5300	**NJ410 M**
	130	31	2,1	2,1	-	139	136	4500	5300	**NUP410 M**

Single row cylindrical roller bearings



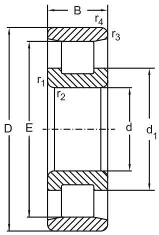
NJ+HJ





Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
50	-	57,5	60,5	68,9	-	-	**-**	0,32	-
	81,5	-	64,1	-	-	-	**-**	0,60	-
	-	59,5	-	77,4	-	-	**-**	0,60	-
	-	59,5	-	77,5	-	-	**-**	0,52	-
	-	59,5	63,2	77,5	5	9	**HJ210 E**	0,51	0,06
	-	59,5	63,2	77,5	5	9	**HJ210 E**	0,53	0,06
	-	59,5	64,1	77,4	5	9	**HJ210 E**	0,60	0,06
	-	59,5	64,1	77,4	-	-	**-**	0,60	-
	-	59,5	63,2	77,5	-	-	**-**	0,59	-
	-	59,5	-	77,4	-	-	**-**	0,65	-
	-	59,5	-	77,6	-	-	**-**	0,66	-
	-	59,5	64,1	77,4	5	9	**HJ2210 E**	0,65	0,06
	-	59,5	63,2	77,6	5	9	**HJ2210 E**	0,67	0,06
	-	59,5	64,1	77,4	-	-	**-**	0,65	-
	97	-	71,4	-	-	-	**-**	1,20	-
	-	65	-	91,4	-	-	**-**	1,20	-
	-	65	-	91,5	-	-	**-**	1,28	-
	-	65	-	91,5	-	-	**-**	1,14	-
	-	65	71,4	91,4	8	13	**HJ310 E**	1,20	0,15
	-	65	71,2	91,5	8	13	**HJ310 E**	1,27	0,15
	-	65	71,2	91,5	8	13	**HJ310 E**	1,16	0,15
	-	65	71,4	91,4	-	-	**-**	1,20	-
	-	65	71,2	91,5	-	-	**-**	1,31	-
	-	65	-	91,4	-	-	**-**	1,90	-
	-	65	-	91,5	-	-	**-**	1,94	-
	-	65	71,4	91,4	8	14,5	**HJ2310 E**	1,90	0,16
	-	65	70,5	91,5	8	14,5	**HJ2310 E**	1,97	0,16
	-	65	71,4	91,4	-	-	**-**	1,90	-
	-	65	70,5	91,5	-	-	**-**	1,85	-
	110,8	-	78,8	-	-	-	**-**	2,10	-
	-	70,8	-	103,6	-	-	**-**	2,10	-
	-	70,8	78,8	103,6	9	14,5	**HJ410**	2,10	0,24
	-	70,8	78,8	103,6	-	-	**-**	2,20	-

Single row cylindrical roller bearings



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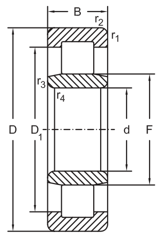

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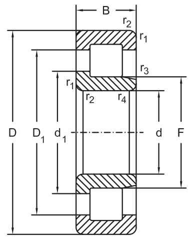

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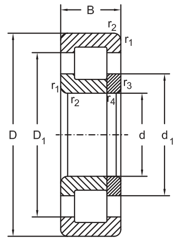
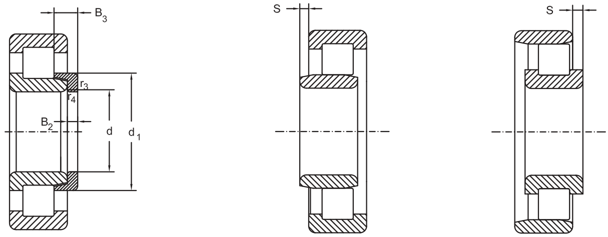


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
55	90	18	1,1	1	2,6	41,5	50	7800	9200	**NU1011 M**
	90	18	1,1	1	-	37,7	43,8	8000	9500	**NJ1011 M**
	100	21	1,5	1,1	1,7	83	95	6300	7500	**N211**
	100	21	1,5	1,1	1,7	83	95	6300	7500	**NU211 E**
	100	21	1,5	1,1	1,7	83	95	6300	7500	**NU211 EM**
	100	21	1,5	1,1	1,7	83	95	6300	7500	**NU211 ETN**
	100	21	1,5	1,1	-	83	95	6300	7500	**NJ211 E**
	100	21	1,5	1,5	-	83	95	6300	7500	**NJ211 EM**
	100	21	1,5	1,5	-	83	95	6300	7500	**NJ211 ETN**
	100	21	1,5	1,1	-	83	95	6300	7500	**NUP211 E**
	100	21	1,5	1,5	-	83	95	6300	7500	**NUP211 EM**
	100	25	1,5	1,1	2,2	98	118	6300	7500	**NU2211 E**
	100	25	1,5	1,5	2,2	98	118	6300	7500	**NU2211 EM**
	100	25	1,5	1,1	-	98	118	6300	7500	**NJ2211 E**
	100	25	1,5	1,5	-	98	118	6300	7500	**NJ2211 EM**
	100	25	1,5	1,1	-	98	118	6300	7500	**NUP2211 E**
	100	25	1,5	1,5	2,2	98	118	6300	7500	**NUP2211 EM**
	120	29	2	2	3	134	140	5000	6000	**N311**
	120	29	2	2	3	134	140	5000	6000	**NU311 E**
	120	29	2	2	3	134	140	5000	6000	**NU311 EM**
	120	29	2	2	3	143	150	5000	6000	**NU311 ETN**
	120	29	2	2	-	134	140	5000	6000	**NJ311 E**
	120	29	2	2	-	134	140	5000	6000	**NJ311 EM**
	120	29	2	2	-	134	140	5000	6000	**NJ311 ETN**
	120	29	2	2	-	134	140	5000	6000	**NUP311 E**
	120	29	2	2	-	134	140	5000	6000	**NUP311 EM**
	120	43	2	2	3,8	187,3	212	5000	6000	**NU2311 EM**
	120	43	2	2	-	187,3	212	5000	6000	**NJ2311 EM**
	120	43	2	2	-	187,3	212	5000	6000	**NUP2311 EM**
	140	33	2,1	2,1	3,3	140	137	4300	5000	**N411 M**
	140	33	2,1	2,1	3,3	140	137	4300	5000	**NU411 M**
	140	33	2,1	2,1	-	140	137	4300	5000	**NJ411 M**
	140	33	2,1	2,1	-	140	137	4300	5000	**NUP411 M**

Single row cylindrical roller bearings

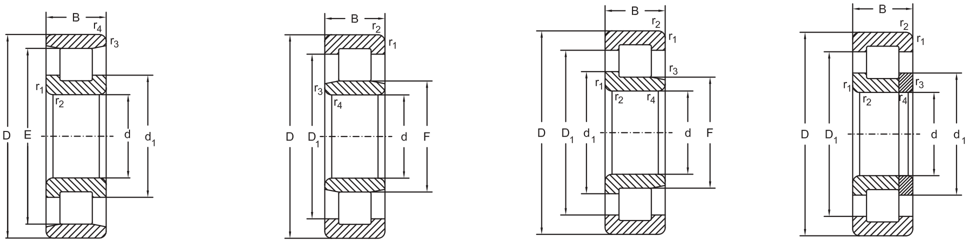


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
	-	64,5	67,5	76,7	-	-	**-**	0,47	-
	-	64,5	-	76,7	5	10	**HJ1011**	0,47	0,05
	88,5	-	71,3	-	-	-	**-**	0,66	-
	-	66	-	85,6	-	-	**-**	0,75	-
	-	66	-	85,7	-	-	**-**	0,71	-
	-	66	-	85,7	-	-	**-**	0,64	-
	-	66	71	85,6	6	9,5	**HJ211 E**	0,75	0,09
	-	66	70,8	85,7	6	9,5	**HJ211 E**	0,69	0,09
	-	66	70,8	85,7	6	9,5	**HJ211 E**	0,66	0,09
	-	66	71	85,6	-	-	**-**	0,75	-
	-	66	70,8	85,7	-	-	**-**	0,72	-
	-	66	-	85,6	-	-	**-**	0,90	-
	-	66	-	85,9	-	-	**-**	0,88	-
	-	66	71	85,6	6	10	**HJ2211 E**	0,90	0,09
	-	66	70,9	85,9	6	10	**HJ2211 E**	0,90	0,09
	-	66	71	85,6	-	-	**-**	0,90	-
55	-	66	70,9	85,9	-	-	**-**	0,92	-
	104,5	-	77,2	-	-	-	**-**	1,54	-
	-	70,5	-	100,3	-	-	**-**	1,60	-
	-	70,5	-	100,5	-	-	**-**	1,80	-
	-	70,5	-	100,5	-	-	**-**	1,50	-
	-	70,5	77,7	100,3	9	14	**HJ311 E**	1,60	0,2
	-	70,5	76,5	100,5	9	14	**HJ311 E**	1,85	0,2
	-	70,5	76,5	100,5	9	14	**HJ311 E**	1,52	0,2
	-	70,5	77,7	100,3	-	-	**-**	1,60	-
	-	70,5	76,5	100,5	-	-	**-**	1,86	-
	-	70,5	-	100,3	-	-	**-**	2,30	-
	-	70,5	77,7	100,3	9	15,5	**HJ2311 E**	2,30	0,2
	-	70,5	77,7	100,3	-	-	**-**	2,30	-
	117,2	-	85,2	-	-	-	**-**	2,50	-
	-	77,2	-	109,9	-	-	**-**	2,50	-
	-	77,2	85,2	109,9	10	16,5	**HJ411**	2,50	0,31
	-	77,2	85,2	109,9	-	-	**-**	2,50	-

ART BEARINGS

Single row cylindrical roller bearings

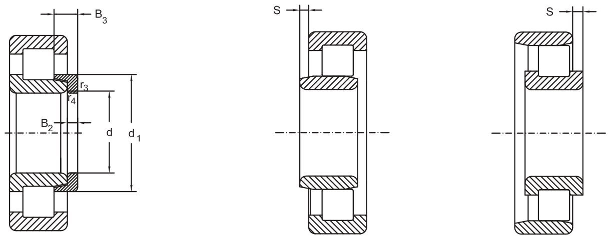


N NU NJ NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
60	95	18	1,1	1	2,8	47,8	56	6700	8000	**NU1012 EM**
	110	22	1,5	1,5	1,6	95	104	5600	6700	**N212 EM**
	110	22	1,5	1,5	1,6	95	104	5600	6700	**NU212 E**
	110	22	1,5	1,5	1,6	95	104	5600	6700	**NU212 EM**
	110	22	1,5	1,5	-	95	104	5600	6700	**NJ212 E**
	110	22	1,5	1,5	-	95	104	5600	6700	**NJ212 EM**
	110	22	1,5	1,5	-	98,4	108,7	5600	6700	**NJ212 ETN**
	110	22	1,5	1,5	-	95	104	5600	6700	**NUP212 E**
	110	22	1,5	1,5	-	95	104	5600	6700	**NUP212 EM**
	110	28	1,5	1,5	2,4	129	153	5300	6300	**NU2212 E**
	110	28	1,5	1,5	2,4	129	153	5600	6700	**NU2212 EM**
	110	28	1,5	1,5	-	129	153	5300	6300	**NJ2212 E**
	110	28	1,5	1,5	-	129	153	5600	6700	**NJ2212 EM**
	110	28	1,5	1,5	-	129	153	5300	6300	**NUP2212 E**
	110	28	1,5	1,5	-	129	153	5600	6700	**NUP2212 EM**
	130	31	2,1	2,1	3	150	156	4500	5300	**N312**
	130	31	2,1	2,1	3	150	156	4300	5000	**NU312 E**
	130	31	3,5	3,5	3	150	156	4500	5300	**NU312 EM**
	130	31	2,1	2,1	-	150	156	4300	5000	**NJ312 E**
	130	31	3,5	3,5	-	150	156	4500	5300	**NJ312 EM**
	130	31	2,1	2,1	-	150	156	4300	5000	**NUP312 E**
	130	31	2,1	2,1	-	150	156	4500	5300	**NUP312 EM**
	130	46	2,1	2,1	4	224	260	4300	5000	**NU2312 E**
	130	46	2,1	2,1	4	224	260	4300	5000	**NU2312 EM**
	130	46	2,1	2,1	-	224	260	4300	5000	**NJ2312 E**
	130	46	2,1	2,1	-	224	260	4300	5000	**NUP2312 E**
	150	35	2,1	2,1	3,4	179	184	4000	4800	**N412 M**
	150	35	2,1	2,1	3,4	179	184	4000	4800	**NU412 M**
	150	35	2,1	2,1	-	179	184	4000	4800	**NJ412 M**
	150	35	2,1	2,1	-	179	184	4000	4800	**NUP412 M**
65	100	18	1,1	1	3,3	45	58,5	6600	7800	**NU1013 M**
	100	18	1,1	1	3,3	45	58,5	6600	7800	**N1013 M**
	120	23	1,5	1,5	1,4	108	120	5300	6300	**N213**

![ART BEARINGS]

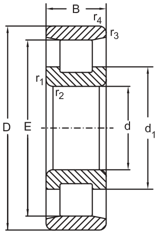
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
60	-	68,5	-	82,6	-	-	**-**	0,47	-
	100	-	77,7	-	-	-	**-**	0,89	-
	-	72	-	95,1	-	-	**-**	1	-
	-	72	-	95,2	-	-	**-**	0,90	-
	-	72	77,7	95,1	6	10	**HJ212 E**	1	0,11
	-	72	76,9	95,2	6	10	**HJ212 E**	0,91	0,11
	-	72	76,9	95,2	6	10	**HJ212 E**	0,82	0,11
	-	72	77,7	95,1	-	-	**-**	1	-
	-	72	76,9	95,2	-	-	**-**	1	-
	-	72	-	95,1	-	-	**-**	1,20	-
	-	72	-	95,2	-	-	**-**	1,27	-
	-	72	77,7	95,1	6	10	**HJ2212 E**	1,20	0,11
	-	72	76,9	92,2	6	10	**HJ2212 E**	1,29	0,11
	-	72	77,7	95,1	-	-	**-**	1,20	-
	-	73,5	78,8	99,6	-	-	**-**	1,31	-
	113	-	85	-	-	-	**-**	1,80	-
	-	77	-	108,5	-	-	**-**	1,90	-
	-	77	-	109,5	-	-	**-**	1,97	-
	-	77	84,5	108,5	9	14,5	**HJ312 E**	1,90	0,24
	-	77	83	109,5	9	14,5	**HJ312 E**	2,16	0,24
	-	77	84,5	108,5	-	-	**-**	1,90	-
	-	77	83	109,5	-	-	**-**	2,04	-
	-	77	-	108,5	-	-	**-**	2,90	-
	-	77	-	109	-	-	**-**	2,97	-
	-	77	84,5	108,5	9	16	**HJ2312 E**	2,90	0,24
	-	77	84,5	108,5	-	-	**-**	2,90	-
	127	-	91,8	-	-	-	**-**	3,10	-
	-	83	-	118,8	-	-	**-**	3,10	-
	-	83	91,8	118,8	10	16,5	**HJ412**	3,10	0,35
	-	83	91,8	118,8	-	-	**-**	3,10	-
65	-	74,5	77,5	86,7	-	-	**-**	0,52	-
	90,5	-	77,9	-	5	10	**HJ1013**	0,49	0,07
	105,6	-	85,4	-	-	-	**-**	1,06	-

Single row cylindrical roller bearings



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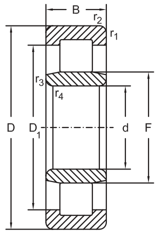

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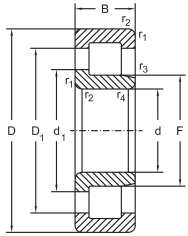
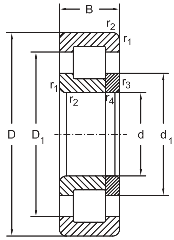


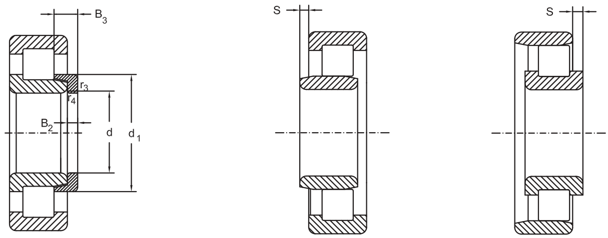
NJ



NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
65	120	23	1,5	1,5	1,4	108	120	5300	6300	**NU213 E**
	120	23	1,5	1,5	1,4	108	120	5300	6300	**NU213 EM**
	120	23	1,5	1,5	1,4	108	120	5300	6300	**NU213 EM6**
	120	23	1,5	1,5	-	108	120	5300	6300	**NJ213 E**
	120	23	1,5	1,5	-	108	120	5300	6300	**NJ213 EM**
	120	23	1,5	1,5	-	108	120	5300	6300	**NUP213 E**
	120	23	1,5	1,5	-	108	120	5300	6300	**NUP213 EM**
	120	31	1,5	1,5	2,5	147	178	4800	5600	**NU2213 EM**
	120	31	1,5	1,5	-	147	178	4800	5600	**NJ2213 EM**
	120	31	1,5	1,5	-	147	178	4800	5600	**NUP2213 EM**
	140	33	2,1	2,1	1,4	180	190	4300	5000	**N313 EM**
	140	33	2,1	2,1	1,4	180	190	4300	5000	**NU313 E**
	140	33	3,5	3,5	1,4	180	190	4300	5000	**NU313 EM**
	140	33	2,1	2,1	-	180	190	4300	5000	**NJ313 E**
	140	33	2,1	2,1	-	180	190	4300	5000	**NJ313 EM**
	140	33	2,1	2,1	-	180	190	4300	5000	**NUP313 E**
	140	33	3,5	3,5	-	180	190	4300	5000	**NUP313 EM**
	140	48	2,1	2,1	4,2	245	285	4000	4800	**NU2313 EM**
	140	48	2,1	2,1	-	245	285	4000	4800	**NJ2313 EM**
	140	48	2,1	2,1	-	245	285	4000	4800	**NUP2313 EM**
	160	37	2,1	2,1	3,5	195	203	3800	4500	**N413 M**
	160	37	2,1	2,1	3,5	195	203	3800	4500	**NU413 M**
	160	37	2,1	2,1	-	195	203	3800	4500	**NJ413 M**
	160	37	2,1	2,1	-	195	203	3800	4500	**NUP413 M**
70	110	20	1,1	1	3,4	65	81,5	6000	7000	**NU1014 M**
	110	20	1,1	1,1	-	65	81,5	6000	7000	**NJ1014 M**
	125	24	1,5	1,5	1,1	120	137	5000	6000	**N214 EM**
	125	24	1,5	1,5	1,1	120	137	5000	6000	**NU214 E**
	125	24	1,5	1,5	-	120	137	5000	6000	**NJ214 E**
	125	24	1,5	1,5	-	120	137	5000	6000	**NJ214 EM**
	125	24	1,5	1,5	-	120	137	5000	6000	**NUP214 E**
	125	24	1,5	1,5	-	120	137	5000	6000	**NUP214 EM**
	125	31	1,5	1,5	2,6	156	196	4800	5600	**NU2214 E**

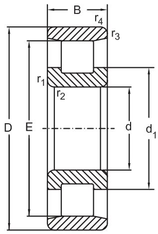
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
65	-	78,5	-	103,2	-	-	**-**	1,20	-
	-	78,5	-	103,5	-	-	**-**	1,19	-
	-	78,5	-	103,5	-	-	**-**	1,19	-
	-	78,5	84,6	103,2	6	10	**HJ213 E**	1,20	0,13
	-	78,5	83,8	103,5	6	10	**HJ213 E**	1,22	0,13
	-	78,5	84,6	103,2	-	-	**-**	1,20	-
	-	78,5	83,8	103,5	-	-	**-**	1,14	-
	-	78,5	-	103,2	-	-	**-**	1,60	-
	-	78,5	84,6	103,2	6	10,5	**HJ2213 E**	1,60	0,13
	-	78,5	84,6	103,2	-	-	**-**	1,60	-
	124,5	-	89	-	-	-	**-**	2,30	-
	-	82,5	-	117,4	-	-	**-**	2,30	-
	-	82,5	-	118	-	-	**-**	2,45	-
	-	82,5	90,7	177,4	10	15,5	**HJ313 E**	2,30	0,29
	-	82,5	89	118	10	15,5	**HJ313 E**	2,49	0,29
	-	82,5	90,7	117,4	-	-	**-**	2,30	-
	-	82,5	89	118	-	-	**-**	2,55	-
	-	82,5	-	117,4	-	-	**-**	3,70	-
	-	82,5	89	118	10	18	**HJ2313 E**	3,70	0,3
	-	82,5	89	118	-	-	**-**	3,70	-
	135,3	-	98,5	-	-	-	**-**	3,80	-
	-	89,3	-	126,9	-	-	**-**	3,80	-
	-	89,3	98,5	126,9	11	18	**HJ413**	3,80	0,43
	-	89,3	98,5	126,9	-	-	**-**	3,80	-
70	-	80	84	95,3	-	-	**-**	0,75	-
	-	80	84	95,3	5	10	**HJ1014**	0,74	0,08
	113,5	-	88,8	-	-	-	**-**	1,30	-
	-	83,5	-	108,2	-	-	**-**	1,30	-
	-	83,5	89,6	108,2	7	11	**HJ214 E**	1,30	0,16
	-	83,5	88,8	108	7	11	**HJ214 E**	1,32	0,16
	-	83,5	89,6	108,2	-	-	**-**	1,30	-
	-	83,5	89	108	-	-	**-**	1,34	-
	-	83,5	-	108,2	-	-	**-**	1,70	-

Single row cylindrical roller bearings



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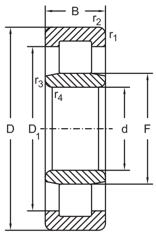

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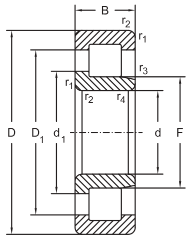

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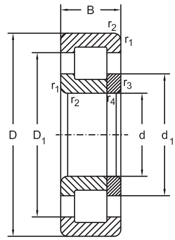
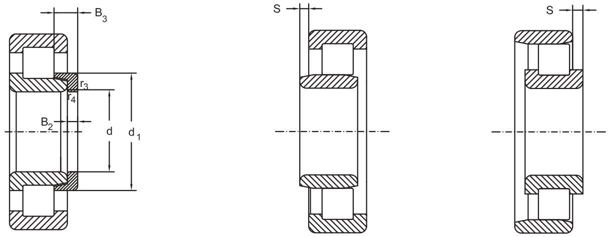


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
70	125	31	1,5	1,5	2,6	156	196	4800	5600	**NU2214 EM**
	125	31	1,5	1,5	-	156	196	4800	5600	**NJ2214 E**
	125	31	1,5	1,5	-	156	196	4800	5600	**NJ2214 EM**
	125	31	1,5	1,5	-	156	196	4800	5600	**NUP2214 E**
	125	31	1,5	1,5	-	156	196	4800	5600	**NUP2214 EM**
	150	35	2,1	2,1	1,6	205	222	4000	4800	**N314**
	150	35	2,1	2,1	1,6	205	222	4000	4800	**NU314 E**
	150	35	2,1	2,1	1,6	205	222	4000	4800	**NU314 EM6**
	150	35	2,1	2,1	-	205	222	4000	4800	**NJ314 E**
	150	35	2,1	2,1	-	205	222	4000	4800	**NUP314 E**
	150	35	2,1	2,1	-	205	222	4000	4800	**NUP314 EM**
	150	51	2,1	2,1	4,4	275	325	3800	4500	**NU2314 E**
	150	51	2,1	2,1	4,4	275	325	3800	4500	**NU2314 EM6**
	150	51	2,1	2,1	-	275	325	3800	4500	**NJ2314 E**
	150	50	2,1	2,1	-	275	325	3800	4500	**NJ2314 EM6**
	150	51	2,1	2,1	-	275	325	3800	4500	**NUP2314 E**
	150	51	2,1	2,1	-	275	325	3800	4500	**NUP2314 EM6**
	180	42	3	3	4	240	253	3400	4000	**N414 M**
	180	42	3	3	4	240	253	3400	4000	**NU414 M**
	180	42	3	3	-	240	253	3400	4000	**NJ414 M**
	180	42	3	3	-	240	253	3400	4000	**NUP414 M**
75	115	20	1,1	1	3,4	65,5	85	5600	6600	**NU1015 M**
	130	25	1,5	1,5	1,2	132	156	4800	5600	**N215 E**
	130	25	1,5	1,5	1,2	132	156	4800	5600	**NU215 E**
	130	25	1,5	1,5	1,2	132	156	4800	5600	**NU215 EM**
	130	25	1,5	1,5	-	132	156	4800	5600	**NJ215 E**
	130	25	1,5	1,5	-	132	156	4800	5600	**NUP215 E**
	130	25	1,5	1,5	-	132	156	4800	5600	**NUP215 EM**
	130	31	1,5	1,5	2,6	151	190	4000	4800	**NU2215 EM**
	130	31	1,5	1,5	-	151	190	4000	4800	**NJ2215 EM**
	130	31	1,5	1,5	-	151	190	4000	4800	**NUP2215 EM**
	160	37	2,1	2,1	1,8	240	265	4000	4800	**N315 E**
	160	37	2,1	2,1	1,8	240	265	4000	4800	**NU315 E**

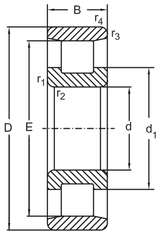
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
70	-	83,5	-	108,2	-	-	**-**	1,97	-
	-	83,5	89,6	108,2	7	11,5	**HJ2214 E**	1,70	0,15
	-	83,5	88,8	108,2	7	11,5	**HJ2214 E**	1,74	0,15
	-	83,5	89,6	108,2	-	-	**-**	1,70	-
	-	83,5	88,8	108,2	-	-	**-**	1,62	-
	130	-	98,9	-	-	-	**-**	2,68	-
	-	89	-	125,6	-	-	**-**	2,80	-
	-	89	-	125,9	-	-	**-**	3,21	-
	-	89	97,5	125,6	10	15,5	**HJ314 E**	2,80	0,34
	-	89	97,5	125,6	-	-	**-**	2,80	-
	-	89	98,5	125,9	-	-	**-**	3,27	-
	-	89	-	125,6	-	-	**-**	4	-
	-	89	-	125,9	-	-	**-**	4,51	-
	-	89	97,5	125,6	10	18,5	**HJ2314 E**	4	0,35
	-	89	95,5	125,9	10	18,5	**HJ2314 E**	4,53	0,35
	-	89	97,5	125,6	-	-	**-**	4	-
	-	89	95,9	125,9	-	-	**-**	4,27	-
	152	-	110,3	-	-	-	**-**	5,50	-
	-	100	-	142	-	-	**-**	5,50	-
	-	100	110,3	142	12	20	**HJ414**	5,50	0,61
	-	100	110,3	142	-	-	**-**	5,50	-
75	-	85	89	100,9	-	-	**-**	0,75	-
	118,5	-	94,5	-	-	-	**-**	1,25	-
	-	88,5	-	113,2	-	-	**-**	1,25	-
	-	88,5	-	113	-	-	**-**	1,38	-
	-	88,5	94,5	113,2	7	11	**HJ215 E**	1,25	0,17
	-	88,5	94,5	113,2	-	-	**-**	1,25	-
	-	88,5	94	113	-	-	**-**	1,42	-
	-	88,5	-	113,2	-	-	**-**	1,60	-
	-	88,5	94,5	113,2	7	11,5	**HJ2215 E**	1,60	0,17
	-	88,5	94,5	113,2	-	-	**-**	1,60	-
	143	-	104,3	-	-	-	**-**	3,93	-
	-	95	-	135	-	-	**-**	3,40	-

Single row cylindrical roller bearings



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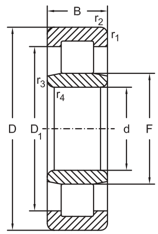

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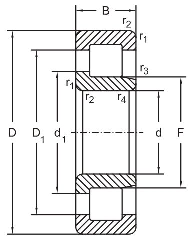

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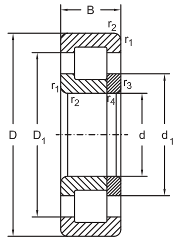
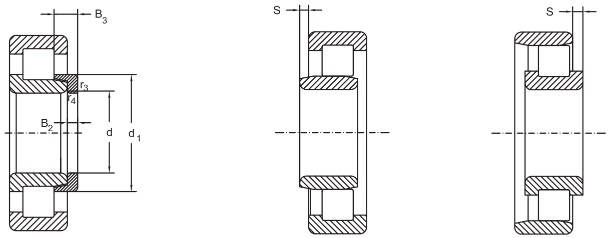


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
75	160	37	3,5	3,5	1,8	240	265	4000	4800	**NU315 EM**
	160	37	2,1	2,1	-	240	265	4000	4800	**NJ315 E**
	160	37	2,1	2,1	-	240	265	4000	4800	**NJ315 EM**
	160	37	2,1	2,1	-	240	265	4000	4800	**NUP315 E**
	160	37	2,1	2,1	-	240	265	4000	4800	**NUP315 EM**
	160	55	2,1	2,1	4,5	329	395	4000	4800	**NU2315 E**
	160	55	2,1	2,1	4,5	329	395	4000	4800	**NU2315 EM**
	160	55	2,1	2,1	-	329	395	4000	4800	**NJ2315 E**
	160	55	2,1	2,1	-	329	395	4000	4800	**NJ2315 EM**
	160	55	2,1	2,1	-	329	395	4000	4800	**NUP2315 E**
	160	55	2,1	2,1	-	329	395	4000	4800	**NUP2315 EM**
	190	45	3	3	4,2	277	294	4000	4800	**N415 M**
	190	45	3	3	4,2	277	294	4000	4800	**NU415 M**
	190	45	3	3	-	277	294	4000	4800	**NJ415 M**
	190	45	3	3	-	277	294	4000	4800	**NUP415 M**
80	125	22	1,1	1	3,6	76,5	98	5200	6200	**NU1016 M**
	125	16,5	2	2	3,6	68,2	85,2	5200	6200	**NP1016 MB**
	140	26	2	2	1,2	140	170	4300	5000	**N216 E**
	140	26	2	2	1,2	140	170	4300	5000	**NU216 E**
	140	26	2	2	1,2	140	170	4300	5000	**NU216 EM**
	140	26	2	2	-	140	170	4300	5000	**NJ216 E**
	140	26	2	2	-	140	170	4300	5000	**NUP216 E**
	140	26	2	2	-	140	170	4300	5000	**NUP216 EM**
	140	33	2	2	2,7	186	245	4300	5000	**NU2216 EM**
	140	33	2	2		186	245	4300	5000	**NJ2216 EM**
	140	33	2	2		186	245	4300	5000	**NUP2216 EM**
	170	39	2,1	2,1	2,1	255	275	3600	4300	**N316**
	170	39	2,1	2,1	2,1	255	275	3600	4300	**NU316 E**
	170	39	2,1	2,1	2,1	255	275	3600	4300	**NU316 EM**
	170	39	2,1	2,1	2,1	255	275	3600	4300	**NU316 ETN**
	170	39	2,1	2,1	-	255	275	3600	4300	**NJ316 E**
	170	39	2,1	2,1	-	255	275	3600	4300	**NJ316 EM**
	170	39	2,1	2,1	-	255	275	3600	4300	**NUP316 E**

Single row cylindrical roller bearings

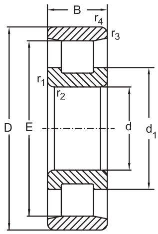


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
75	-	95	-	135,5	-	-	**-**	3,83	-
	-	95	104,3	135	11	16,5	**HJ315 E**	3,40	0,42
	-	95	102,5	135,5	11	16,5	**HJ315 E**	3,87	0,42
	-	95	104,3	135	-	-	**-**	3,40	-
	-	95	102,5	135,5	-	-	**-**	3,83	-
	-	95	-	135	-	-	**-**	5	-
	-	95	-	135,5	-	-	**-**	5,54	-
	-	95	104,3	135	11	19,5	**HJ2315 E**	5	0,43
	-	95	102,5	135,5	11	19,5	**HJ2315 E**	5,62	0,43
	-	95	104,3	135	-	-	**-**	5	-
	-	95	102,5	135,5	-	-	**-**	5,30	-
	160,5	-	116	-	-	-	**-**	6,45	-
	-	104,5	-	149,8	-	-	**-**	6,45	-
	-	104,5	116	149,8	13	21,5	**HJ415**	6,45	0,71
	-	104,5	116	149,8	-	-	**-**	6,45	-
80	-	91,5	96	109,1	-	-	**-**	1,03	-
	113,5	-	96,2	110	-	-	**-**	1,05	-
	127,3	-	101,7	-	-	-	**-**	1,54	-
	-	95,3	-	121,6	-	-	**-**	1,54	-
	-	95,3	-	121,8	-	-	**-**	1,69	-
	-	95,3	101,7	121,6	8	12,5	**HJ216 E**	1,54	0,22
	-	95,3	101,7	121,6	-	-	**-**	1,54	-
	-	95,3	100,8	121,8	-	-	**-**	1,76	-
	-	95,3	-	121,6	-	-	**-**	2,34	-
	-	95,3	101,7	121,6	8	12,5	**HJ2216 E**	2,40	0,22
	-	95,3	101,7	121,6	-	-	**-**	2,52	-
	147	-	112,6	-	-	-	**-**	4,25	-
	-	101	-	142,7	-	-	**-**	3,95	-
	-	101	-	143,2	-	-	**-**	4,28	-
	-	101	-	143,2	-	-	**-**	3,93	-
	-	101	110,6	142,7	11	17	**HJ316 E**	3,95	0,47
	-	101	108,7	143,2	11	17	**HJ316 E**	4,19	0,47
	-	101	110,6	142,7	-	-	**-**	3,95	-

ART BEARINGS

Single row cylindrical roller bearings



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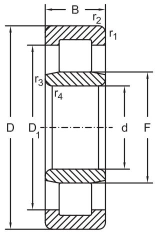

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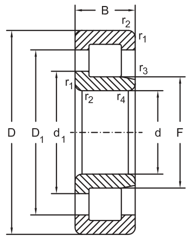

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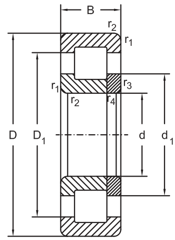
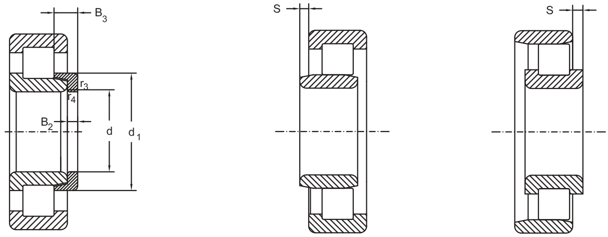


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
80	170	39	2,1	2,1	-	255	275	3600	4300	**NUP316 EM**
	170	58	2,1	2,1	5	352	424	3600	4300	**NU2316 EM**
	170	58	2,1	2,1	-	352	424	3600	4300	**NJ2316 EM**
	170	58	2,1	2,1	-	352	424	3600	4300	**NUP2316 EM**
	200	48	3	3	4,6	316	339	3000	3600	**N416 M**
	200	48	3	3	4,6	316	339	3000	3600	**NU416 M**
	200	48	3	3	-	316	339	3000	3600	**NJ416 M**
	200	48	3	3	-	316	339	3000	3600	**NUP416 M**
85	130	22	1,1	1	3,8	78	104	4800	5600	**NU1017 M**
	150	28	2	2	1,5	165	194	4300	5000	**N217**
	150	28	2	2	1,5	165	194	4300	5000	**NU217 E**
	150	28	2	2	1,5	165	194	4300	5000	**NU217 EM**
	150	28	2	2	-	165	194	4300	5000	**NJ217 E**
	150	28	2	2	-	165	194	4300	5000	**NUP217 E**
	150	28	2	2	-	165	114	4300	5000	**NUP217 EM**
	150	36	2	2	2,7	216	275	3800	4500	**NU2217 E**
	150	36	2	2	2,7	216	275	3800	4500	**NU2217 EM**
	150	36	2	2	-	216	275	3800	4500	**NJ2217 E**
	150	36	2	2	-	216	275	3800	4500	**NJ2217 EM**
	150	36	2	2	-	216	275	3800	4500	**NUP2217 E**
	150	36	2	2	-	216	275	3800	4500	**NUP2217 EM**
	180	41	3	3	2,3	288	325	3400	4000	**N317 EMB**
	180	41	3	3	2,3	288	325	3400	4000	**NU317 E**
	180	41	3	3	2,3	288	325	3400	4000	**NU317 EM**
	180	41	3	3	-	288	325	3400	4000	**NJ317 E**
	180	41	3	3	-	288	325	3400	4000	**NJ317 EM**
	180	41	3	3	-	288	325	3400	4000	**NUP317 E**
	180	60	3	3	5	367	444	3400	4000	**NU2317 EM**
	180	60	3	3	-	367	444	3400	4000	**NJ2317 EM**
	180	60	3	3	-	367	444	3400	4000	**NUP2317 EM**
	210	52	4	4	5	357	384	2800	3400	**N417 M**
	210	52	4	4	5	357	384	2800	3400	**NU417 M**
	210	52	4	4	-	357	384	2800	3400	**NJ417 M**

Single row cylindrical roller bearings

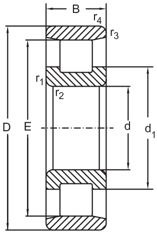


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
80	-	101	108,8	143,2	-	-	**-**	4,59	-
	-	101	-	142,7	-	-	**-**	6,60	-
	-	101	110,6	142,7	11	20	**HJ2316 E**	6,70	0,5
	-	101	110,6	142,7	-	-	**-**	6,68	-
	170	-	122	-	-	-	**-**	8,30	-
	-	110	-	158,8	-	-	**-**	8,30	-
	-	110	122	158,8	13	22	**HJ416**	8,30	0,79
	-	110	122	158,8	-	-	**-**	8,30	-
85	-	96,5	101	114,1	-	-	**-**	1,1	-
	133,8	-	108,8	-	-	-	**-**	1,9	-
	-	100,5	-	130,3	-	-	**-**	1,9	-
	-	100,5	-	130,5	-	-	**-**	2,12	-
	-	100,5	107,6	130,3	8	12,5	**HJ217 E**	1,9	0,25
	-	100,5	107,6	130,3	-	-	**-**	1,9	-
	-	100,5	107,5	130,5	-	-	**-**	2,23	-
	-	100,5	-	130,3	-	-	**-**	2,60	-
	-	100,5	-	130,5	-	-	**-**	2,76	-
	-	100,5	107,6	130,3	8	13	**HJ2217 E**	2,60	0,25
	-	100,5	106,5	130,5	8	13	**HJ2217 E**	2,87	0,25
	-	100,5	107,6	130,3	-	-	**-**	2,60	-
	-	100,5	106,5	130,5	-	-	**-**	2,80	-
	160	-	118	-	-	-	**-**	5,04	-
	-	108	-	151 ,3	-	-	**-**	5,30	-
	-	108	-	151,9	-	-	**-**	5,45	-
	-	108	118	151 ,3	12	18,5	**HJ317 E**	5,30	0,58
	-	108	116,5	151,9	12	18,5	**HJ317 E**	5	0,58
	-	108	118	151 ,3	-	-	**-**	5,30	-
	-	108	-	151 ,3	-	-	**-**	7,49	-
	-	108	118	151 ,3	12	22	**HJ2317 E**	7,61	0,6
	-	108	118	151 ,3	-	-	**-**	7,77	-
	177	-	126	-	-	-	**-**	9,80	-
	-	113	-	164,8	-	-	**-**	9,80	-
	-	113	126	164,8	14	24	**HJ417**	9,80	0,92

ART BEARINGS

Single row cylindrical roller bearings



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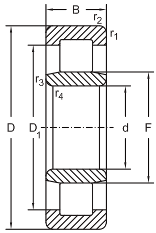

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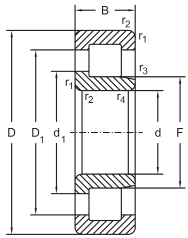

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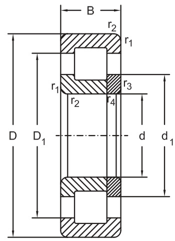
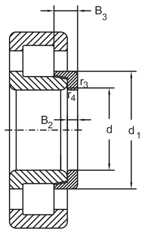


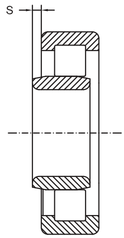
NUP

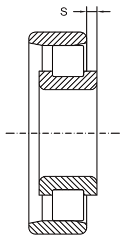
Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
85	210	52	4	4	-	357	384	2800	3400	**NUP417 M**
90	140	24	1,5	1,1	4	93	125	4500	5300	**NU1018 M**
	160	30	2	2	1,8	183	216	3800	4500	**N218 M**
	160	30	2	2	1,8	183	216	3800	4500	**NU218 E**
	160	30	2	2	1,8	183	216	3800	4500	**NU218 EM**
	160	30	2	2	-	183	216	3800	4500	**NJ218 E**
	160	30	2	2	-	183	216	3800	4500	**NJ218 EM**
	160	30	2	2	-	183	216	3800	4500	**NUP218 E**
	160	30	2	2	-	183	216	3800	4500	**NUP218 EM**
	160	40	2	2	2,9	240	315	3200	3800	**NU2218 E**
	160	40	2	2	-	240	315	3200	3800	**NJ2218 E**
	160	40	2	2	-	240	315	3200	3800	**NUP2218 E**
	190	43	3	3	2,5	315	345	3200	3800	**N318 EMB**
	190	43	3	3	2,5	315	345	3200	3800	**NU318 E**
	190	43	3	3	2,5	315	345	3200	3800	**NU318 EM**
	190	43	3	3	2,5	329	374	3200	3800	**NU318 ETN**
	190	43	3	3	-	315	345	3200	3800	**NJ318 E**
	190	43	3	3	-	315	345	3200	3800	**NJ318 EM**
	190	43	3	3	-	315	345	3200	3800	**NUP318 E**
	190	43	3	3	-	315	345	3200	3800	**NUP318 EM**
	190	64	3	3	6	430	530	3000	3600	**NU2318 E**
	190	64	3	3	6	430	530	3000	3600	**NU2318 EM**
	190	64	3	3	-	430	530	3000	3600	**NJ2318 E**
	190	64	3	3	-	430	530	3200	3800	**NJ2318 EM**
	190	64	3	3	-	430	530	3000	3600	**NUP2318 E**
	225	54	4	4	5	393	427	2800	3400	**N418 M**
	225	54	4	4	5	393	427	2800	3400	**NU418 M**
	225	54	4	4	-	393	427	2800	3400	**NJ418 M**
	225	54	4	4	-	393	427	2800	3400	**NUP418 M**
95	145	24	1,5	1,1	4,1	96,5	129	4400	5200	**NU1019 M**
	170	32	2,1	2,1	1,7	210	249	3800	4500	**N219**
	170	32	2,1	2,1	1,7	210	249	3800	4500	**NU219 EM**
	170	32	2,1	2,1	-	210	249	3800	4500	**NJ219 EM**

Single row cylindrical roller bearings



NJ+HJ

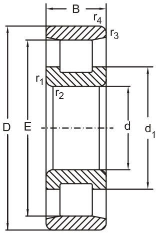




Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
85	-	113	126	164,8	-	-	**-**	9,80	-
90	-	103	108	122,1	-	-	**-**	1,4	-
	143	-	114,2	-	-	-	**-**	2,59	-
	-	107	-	138,5	-	-	**-**	2,40	-
	-	107	-	139	-	-	**-**	2,73	-
	-	107	114,5	138,5	9	14	**HJ218 E**	2,70	0,33
	-	107	113	139	9	14	**HJ218 E**	2,79	0,33
	-	107	114,5	138,5	-	-	**-**	2,40	-
	-	107	113	139	-	-	**-**	2,84	-
	-	107	-	138,5	-	-	**-**	3,20	-
	-	107	114,5	138,5	9	15	**HJ2218 E**	3,20	0,32
	-	107	114,5	138,5	-	-	**-**	3,20	-
	169,5	-	124	-	-	-	**-**	5,93	-
	-	113,5	-	160,2	-	-	**-**	5,40	-
	-	113,5	-	160,8	-	-	**-**	6,35	-
	-	115,5	-	160,8	-	-	**-**	5,50	-
	-	113,5	124	160,2	12	18,5	**HJ318 E**	5,40	0,63
	-	113,5	122,2	160,8	12	18,5	**HJ318 E**	6,14	0,63
	-	113,5	124	160,2	-	-	**-**	5,40	-
	-	113,5	122,2	160,8	-	-	**-**	6,22	-
	-	113,5	-	160,2	-	-	**-**	8,10	-
	-	113,5	-	154,3	-	-	**-**	8,82	-
	-	113,5	124	160,2	12	22	**HJ2318 E**	8,10	0,68
	-	113,5	122,2	154,3	12	22	**HJ2318 E**	9,02	0,68
	-	113,5	124	160,2	-	-	**-**	8,10	-
	191,5	-	137	-	-	-	**-**	11,50	-
	-	123,5	-	178,8	-	-	**-**	11,50	-
	-	123,5	137	178,8	14	24	**HJ418**	11,50	1,1
	-	123,5	137	178,8	-	-	**-**	11,50	-
95	-	108	113	127,1	-	-	**-**	1,45	-
	151,5	-	122	-	-	-	**-**	2,88	-
	-	112,5	-	147,4	-	-	**-**	3,24	-
	-	112,5	120,7	147,4	9	14	**HJ219 E**	3,25	0,35

ART BEARINGS

Single row cylindrical roller bearings



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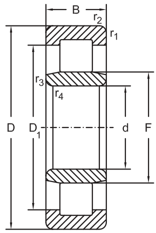

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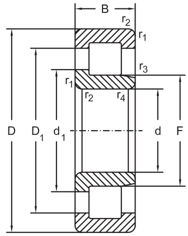

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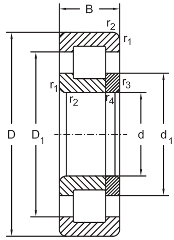
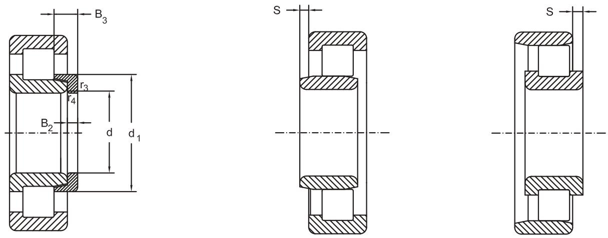


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
95	170	32	2,1	2,1	-	210	249	3800	4500	**NUP219 EM**
	170	43	2,1	2,1	3,5	273	349	3200	3800	**NU2219 EM**
	170	43	2,1	2,1	-	273	349	3200	3800	**NJ2219 EM**
	170	43	2,1	2,1	-	273	349	3200	3800	**NUP2219 EM**
	200	45	3	3	2,9	311	351	3000	3600	**N319**
	200	45	3	3	2,9	311	351	3000	3600	**NU319 EM**
	200	45	3	3	-	311	351	3000	3600	**NJ319 EM**
	200	45	3	3	-	311	351	3000	3600	**NUP319 EM**
	200	67	3	3	6,2	388	488	2800	3400	**N2319 M**
	200	67	3	3	6,2	388	488	2800	3400	**NU2319 M**
	200	67	3	3	-	388	488	2800	3400	**NJ2319 M**
	200	67	3	3	-	388	488	2800	3400	**NUP2319 M**
	240	55	4	4	5,2	415	465	2400	3000	**N419 M**
	240	55	4	4	5,2	415	465	2400	3000	**NU419 M**
	240	55	4	4	-	415	465	2400	3000	**NJ419 M**
	240	55	4	4	-	415	465	2400	3000	**NUP419 M**
100	150	24	1,5	1,1	4,2	98	134	4300	5000	**NU1020 M**
	180	34	2,1	2,1	1,7	251	305	3200	3800	**N220 E**
	180	34	2,1	2,1	1,7	251	305	3200	3800	**NU220 E**
	180	34	2,1	2,1	1,7	251	305	3200	3800	**NU220 EM**
	180	34	2,1	2,1	-	251	305	3200	3800	**NJ220 E**
	180	34	2,1	2,1	-	251	305	3200	3800	**NJ220 EM**
	180	34	2,1	2,1	-	251	305	3200	3800	**NUP220 E**
	180	34	2,1	2,1	-	251	305	3200	3800	**NUP220 EM**
	180	46	2,1	2,1	3,5	335	440	3000	3800	**NU2220 E**
	180	46	2,1	2,1	3,5	335	440	3000	3800	**NU2220 EM**
	180	46	2,1	2,1	-	335	440	3000	3600	**NJ2220 E**
	180	46	2,1	2,1	-	335	440	3000	3600	**NJ2220 EM**
	180	46	2,1	2,1	-	335	440	3000	3600	**NUP2220 E**
	215	47	3	3	3	380	425	3000	3600	**N320 E**
	215	47	3	3	3	380	425	3000	3600	**N320 EM**
	215	47	3	3	3	380	425	3000	3600	**NU320 E**
	215	47	3	3	3	380	425	3000	3600	**NU320 EM**

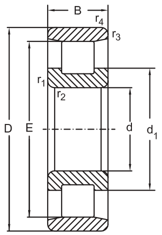
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
95	-	112,5	120,7	147,4	-	-	-	3,33	-
	-	112,5	-	147,4	-	-	-	4,29	-
	-	112,5	120,7	147,4	9	15,5	**HJ2219 E**	4,38	0,37
	-	112,5	120,7	147,4	-	-	-	4,42	-
	173,5	-	133	-	-	-	-	6,47	-
	-	121,5	-	168,2	-	-	-	7	-
	-	121,5	132,2	168,2	13	20,5	**HJ319 E**	7,20	0,8
	-	121,5	132,2	168,2	-	-	-	7,26	-
	173,5	-	132	-	-	-	-	10,30	-
	-	121,5	-	168,2	-	-	-	10,50	-
	-	121,5	132,2	168,2	13	24,5	**HJ2319 E**	10,50	0,93
	-	121,5	132,2	168,2	-	-	-	10,90	-
	201,5	-	147	-	-	-	-	13,80	-
	-	133,5	-	188,8	-	-	-	13,80	-
	-	133,5	147	188,8	15	25,5	**HJ419**	13,80	1,3
	-	133,5	147	188,8	-	-	-	13,80	-
100	-	113	118	132,1	-	-	-	1,50	-
	163	-	127,3	-	-	-	-	3,44	-
	-	119	-	155,5	-	-	-	3,44	-
	-	119	-	157	-	-	-	3,77	-
	-	119	127,3	155,5	10	15	**HJ220 E**	3,44	0,44
	-	119	127	157	10	15	**HJ220 E**	3,49	0,44
	-	119	127,3	155,5	-	-	-	3,44	-
	-	119	127	164,5	-	-	-	3,89	-
	-	119	-	155,5	-	-	-	5,50	-
	-	120	-	159	-	-	-	5,23	-
	-	119	127,3	155,5	10	16	**HJ2220 E**	5,50	0,45
	-	128	120	159	10	16	**HJ2220 E**	5,23	0,45
	-	119	127,3	155,5	-	-	-	5,50	-
	191,5	-	139,6	-	-	-	-	7,70	-
	185,5	-	138,5	-	-	-	-	8,59	-
	-	127,5	-	181	-	-	-	7,70	-
	-	127,5	-	173.5	-	-	-	8,73	-

Single row cylindrical roller bearings



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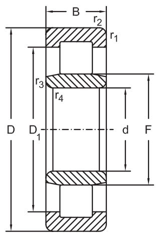

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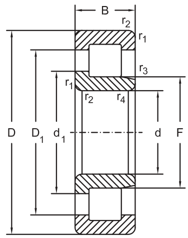

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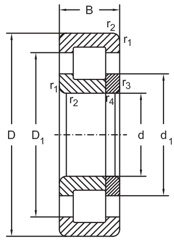
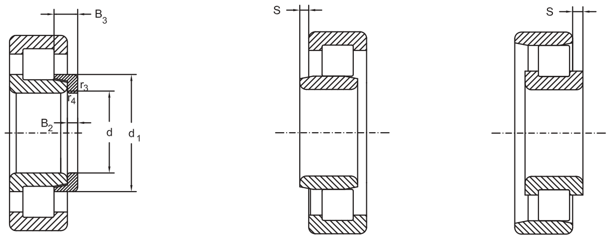


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
100	215	47	3	3	-	380	425	3000	3600	**NJ320 E**
	215	47	3	3	-	380	425	3000	3600	**NJ320 EM**
	215	47	3	3	-	380	425	3000	3600	**NUP320 E**
	215	73	3	3	6,3	570	720	2600	3200	**NU2320 E**
	215	73	3	3	-	570	720	2600	3200	**NJ2320 E**
	215	73	4	4	-	570	720	2600	3200	**NJ2320 EM**
	215	73	3	3	-	570	720	2600	3200	**NUP2320 E**
	250	58	4	4	5,7	440	490	2400	3000	**N420 M**
	250	58	4	4	5,7	440	490	2400	3000	**NU420 M**
	250	58	4	4	-	440	490	2400	3000	**NJ420 M**
	250	58	4	4	-	440	490	2400	3000	**NUP420 M**
105	160	26	2	1,1	4,4	112	153	3800	4500	**NU1021 M**
	160	26	2	2	-	112	153	3800	4500	**NJ1021 M**
	190	36	2,1	2,1	2	260	320	3000	3600	**N221 E**
	190	36	2,1	2,1	2	260	320	3000	3600	**NU221 E**
	190	36	2,1	2,1	-	260	320	3000	3600	**NJ221 E**
	190	36	2,1	2,1	-	260	320	3000	3600	**NJ221 EM**
	190	36	2,1	2,1	-	260	320	3000	3600	**NUP221 E**
	225	49	3	3	3	335	380	2600	3200	**N321 E**
	225	49	3	3	3	335	380	2600	3200	**NU321 E**
	225	49	3	3	3	335	380	2600	3200	**NU321 EM**
	225	49	3	3	-	335	380	2600	3200	**NJ321 E**
	225	49	3	3	-	335	380	2600	3200	**NJ321 EM**
	225	49	3	3	-	335	380	2600	3200	**NUP321 E**
	260	60	4	4	5,7	490	540	2200	2800	**NU421 M**
	260	60	4	4	-	490	540	2200	2800	**NJ421 M**
	260	60	4	4	-	490	540	2200	2800	**NUP421 M**
110	170	28	2	1,1	4,5	140	190	3600	4500	**NU1022 M**
	200	38	2,1	2,1	2,1	292	365	3000	3600	**N222 E**
	200	38	2,1	2,1	2,1	292	365	3000	3600	**NU222 E**
	200	38	2,1	2,1	2,1	292	365	3000	3600	**NU222 EM**
	200	38	2,1	2,1	-	292	365	3000	3600	**NJ222 E**
	200	38	2,1	2,1	-	292	365	3000	3600	**NJ222 EM**

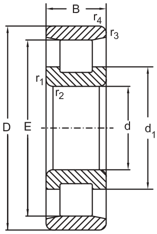
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
100	-	127,5	139,6	181	13	20,5	**HJ320 E**	7,70	0,9
	-	127,5	139	173,5	13	20,5	**HJ320 E**	8,61	0,9
	-	127,5	139,6	181	-	-	**-**	7,70	-
	-	127,5	-	181	-	-	**-**	12	-
	-	127,5	139,6	181	13	23,5	**HJ2320 E**	12	0,95
	-	127,5	139	181,5	13	23,5	**HJ2320 E**	13,26	0,95
	-	127,5	139,6	181	-	-	**-**	12	-
	211	-	153,5	-	-	-	**-**	15,80	-
	-	139	-	197	-	-	**-**	15,80	-
	-	139	153,5	197	16	27	**HJ420**	15,80	1,6
	-	139	153,5	197	-	-	**-**	15,80	-
105	-	119,5	124,5	140,3	-	-	**-**	1,90	-
	-	119,5	-	140,3	7	13,5	**HJ1021**	1,91	0,24
	171,5	-	134,7	-	-	-	**-**	4,10	-
	-	125,5	-	163	-	-	**-**	4,10	-
	-	125,5	134,7	163	10	16	**HJ221 E**	4,10	0,52
	-	125,5	134,5	164,5	10	16	**HJ221 E**	4,56	0,52
	-	125,5	134,7	163	-	-	**-**	4,10	-
	195	-	147	-	-	-	**-**	9,10	-
	-	135	-	183,8	-	-	**-**	9,10	-
	-	133	-	191	-	-	**-**	9,91	-
	-	135	147	183,8	13	20,5	**HJ321 E**	9,10	1
	-	133	143	191	13	20,5	**HJ321 E**	10,03	1
	-	135	147	183,8	-	-	**-**	9,10	-
	-	144,5	-	206	-	-	**-**	17,50	-
	-	144,5	159,5	206	16	27	**HJ421**	17,50	1,7
	-	144,5	159,5	206	-	-	**-**	17,50	-
110	-	125	131	149	-	-	**-**	2,40	-
	180,5	-	141,6	-	-	-	**-**	4,90	-
	-	132,5	-	172,4	-	-	**-**	4,90	-
	-	132,5	-	174	-	-	**-**	5,30	-
	-	132,5	141,6	172,4	11	17	**HJ222 E**	4,90	0,62
	-	132,5	141	174	11	17	**HJ222 E**	5,40	0,62

Single row cylindrical roller bearings



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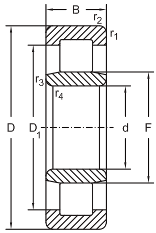

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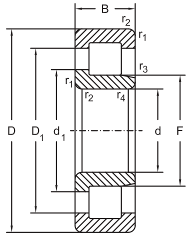

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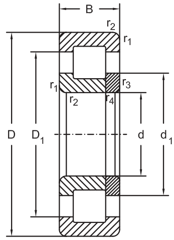
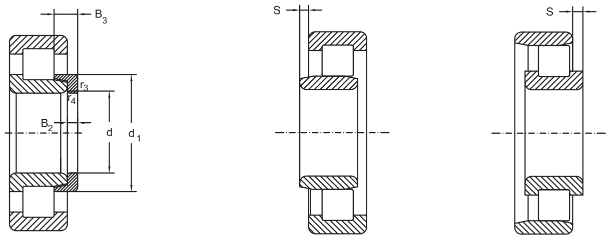


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
110	200	38	2,1	2,1	-	292	365	3000	3600	**NUP222 E**
	200	38	2,1	2,1	-	292	365	3000	3600	**NUP222 EM**
	200	53	2,1	2,1	4	380	520	2800	3400	**NU2222 E**
	200	53	2,1	2,1	4	380	520	2800	3400	**NU2222 EM**
	200	53	2,1	2,1	-	380	520	2800	3400	**NJ2222 E**
	200	53	2,1	2,1	-	380	520	2800	3400	**NJ2222 EM**
	200	53	2,1	2,1	-	380	520	2800	3400	**NUP2222 E**
	240	50	3	3	3,2	443	513	2400	3000	**N322 E**
	240	50	3	3	3,2	443	513	2400	3000	**NU322 E**
	240	50	3	3	3,2	443	513	2400	3000	**NU322 EM**
	240	50	3	3	-	443	513	2400	3000	**NJ322 E**
	240	50	3	3	-	443	513	2400	3000	**NUP322 E**
	240	50	3	3	-	443	513	2400	3000	**NUP322 EM**
	240	80	3	3	7,2	630	800	2200	2800	**NU2322 E**
	240	80	3	3	7,2	630	800	2200	2800	**NU2322 EM**
	240	80	3	3	-	630	800	2200	2800	**NJ2322 E**
	240	80	3	3	-	630	800	2200	2800	**NJ2322 EM**
	240	80	3	3	-	630	800	2200	2800	**NUP2322 E**
	280	65	4	4	6,2	583	672	2200	2800	**NU422 M**
	280	65	4	4	-	583	672	2200	2800	**NJ422 M**
	280	65	4	4	-	583	672	2200	2800	**NUP422 M**
120	180	28	2	1	4,5	150	208	3400	4000	**NU1024 M**
	215	40	2,1	2,1	2,5	335	415	2600	3200	**N224 E**
	215	40	2,1	2,1	2,5	335	415	2600	3200	**NU224 E**
	215	40	2,1	2,1	2,5	335	415	2600	3200	**NU224 EM**
	215	40	2,1	2,1	2,5	335	415	2600	3200	**NU224 EM6**
	215	40	2,1	2,1	-	335	415	2600	3200	**NJ224 E**
	215	40	2,1	2,1	-	335	415	2600	3200	**NJ224 EM**
	215	40	2,1	2,1	-	335	415	2600	3200	**NUP224 E**
	215	58	2,1	2,1	4,1	450	610	2600	3200	**NU2224 E**
	215	58	2,1	2,1	-	450	610	2600	3200	**NJ2224 E**
	215	58	2,1	2,1	-	450	610	2600	3200	**NJ2224 EM**
	215	58	2,1	2,1	-	450	610	2600	3200	**NUP2224 E**

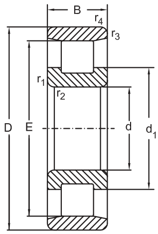
Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
110	-	132,5	141,6	172,4	-	-	**-**	4,90	-
	-	132,5	141	174	-	-	**-**	5,50	-
	-	132,5	-	172,4	-	-	**-**	6,70	-
	-	132,5	-	174	-	-	**-**	7,40	-
	-	132,5	141,6	172,4	11	19,5	**HJ2222 E**	6,70	0,65
	-	132,5	142	174	11	19,5	**HJ2222 E**	7,30	0,65
	-	132,5	141,6	172,4	-	-	**-**	6,70	-
	211	-	155,9	-	-	-	**-**	10,50	-
	-	143	-	199,9	-	-	**-**	10,50	-
	-	143	-	201	-	-	**-**	11,50	-
	-	143	155,9	199,9	14	22	**HJ322 E**	10,50	1,2
	-	143	155,9	199,9	-	-	**-**	10,50	-
	-	143	155	201	-	-	**-**	11,90	-
	-	143	-	199,9	-	-	**-**	17	-
	-	143	-	201	-	-	**-**	19,10	-
	-	143	155,9	199,9	14	26,5	**HJ2322 E**	17	1,3
	-	143	155	201	14	26,5	**HJ2322 E**	19,40	1,3
	-	143	155,9	199,9	-	-	**-**	17	-
	-	155	-	219,5	-	-	**-**	20,80	-
	-	155	171	219,5	17	29,5	**HJ422**	20,80	2,1
	-	155	171	219,5	-	-	**-**	20,80	-
120	-	135	141	158,8	-	-	**-**	2,60	-
	195,5	-	153,5	-	-	-	**-**	5,70	-
	-	143,5	-	186,9	-	-	**-**	5,70	-
	-	143,5	-	187,4	-	-	**-**	6,40	-
	-	143,5	-	187,4	-	-	**-**	6,40	-
	-	143,5	153,5	186,9	11	17	**HJ224 E**	5,70	0,72
	-	143,5	152	187,4	11	17	**HJ224 E**	6,50	0,72
	-	143,5	153,5	186,9	-	-	**-**	5,70	-
	-	143,5	-	186,9	-	-	**-**	8,30	-
	-	143,5	153,5	186,9	11	20	**HJ2224 E**	8,30	0,75
	-	143,5	152	181	11	20	**HJ2224 E**	9,30	0,75
	-	143,5	153,5	186,9	-	-	**-**	8,30	-

Single row cylindrical roller bearings



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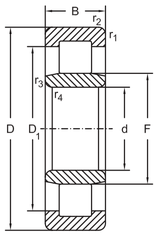

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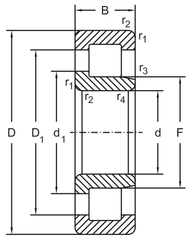

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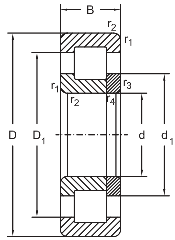
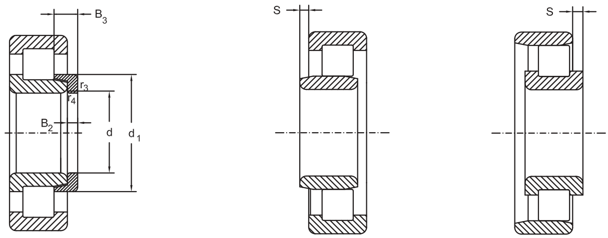


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
120	260	55	3	3	3,7	520	600	2200	2800	**N324 E**
	260	55	3	3	3,7	520	600	2200	2800	**NU324 E**
	260	55	3	3	3,7	520	600	2200	2800	**NU324 EM**
	260	55	3	3	-	520	600	2200	2800	**NJ324 E**
	260	55	3	3	-	520	600	2200	2800	**NJ324 EM**
	260	55	3	3	-	520	600	2200	2800	**NUP324 E**
	260	55	3	3	-	520	600	2200	2800	**NUP324 EM**
	260	86	3	3	7,2	780	1020	2000	2600	**NU2324 EM**
	260	86	3	3	-	780	1020	2000	2600	**NJ2324 EM**
	260	86	3	3	-	780	1020	2000	2600	**NUP2324 EM**
	310	72	5	5	6,3	670	780	1800	2200	**N424 M**
	310	72	5	5	6,3	670	780	1800	2200	**NU424 M**
	310	72	5	5	-	670	780	1800	2200	**NJ424 M**
	310	72	5	5	-	673	770	1800	2200	**NUP424 M**
130	200	33	2	1	4,7	180	250	3000	3600	**NU1026 M**
	200	33	2	2	-	180	250	3000	3600	**NJ1026 M**
	230	40	3	3	2,6	360	450	2400	3000	**N226 E**
	230	40	3	3	2,6	360	450	2400	3000	**NU226 E**
	230	40	3	3	2,6	360	450	2400	3000	**NU226 EM**
	230	40	3	3	-	360	450	2400	3000	**NJ226 E**
	230	40	3	3	-	360	450	2400	3000	**NJ226 EM**
	230	40	3	3	-	360	450	2400	3000	**NUP226 E**
	230	64	3	3	4,3	530	735	2400	3000	**NU2226 E**
	230	64	3	3	4,3	530	735	2400	3000	**NU2226 EM**
	230	64	3	3	-	530	735	2400	3000	**NJ2226 E**
	230	64	3	3	-	530	735	2400	3000	**NUP2226 E**
	280	58	4	4	3,7	570	670	2000	2600	**N326 E**
	280	58	4	4	3,7	570	670	2000	2600	**NU326 E**
	280	58	4	4	3,7	570	670	2000	2600	**NU326 EM6**
	280	58	4	4	-	570	670	2000	2600	**NJ326 E**
	280	58	4	4	-	570	670	2000	2600	**NJ326 EM6**
	280	58	4	4	-	570	670	2000	2600	**NUP326 E**
	280	58	4	4	-	570	670	2000	2600	**NUP326 EM6**

Single row cylindrical roller bearings

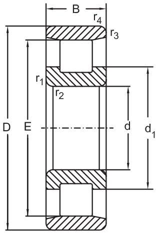


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
120	230	-	168,7	-	-	-	-	15,20	-
	-	154	-	217,3	-	-	-	13,40	-
	-	154	-	218,3	-	-	-	14,80	-
	-	154	168,7	217,3	14	22,5	**HJ324 E**	13,40	1,4
	-	154	168,3	218,3	14	22,5	**HJ324 E**	14,90	1,4
	-	154	168,7	217,3	-	-	-	13,40	-
	-	154	170	218,3	-	-	-	15,37	-
	-	154	-	217,3	-	-	-	23,50	-
	-	154	168,7	217,3	14	26	**HJ2324 E**	23,50	1,5
	-	154	168,7	217,3	-	-	-	23,50	-
	260	-	188	-	-	-	-	29,60	-
	-	170	-	242,5	-	-	-	30,50	-
	-	170	188	242,5	17	30,5	**HJ424**	30,50	2,7
	-	170	188	240	-	-	-	31,30	-
130	-	148	155	175	-	-	-	3,90	-
	-	148	154,8	175,2	8	16	**HJ1026**	4,20	0,45
	209,5	-	164,2	-	-	-	-	6,50	-
	-	153,5	-	200,2	-	-	-	6,50	-
	-	153,5	-	201,3	-	-	-	7,10	-
	-	153,5	164,2	200,2	11	17	**HJ226 E**	6,50	0,8
	-	153,5	164	201,3	11	17	**HJ226 E**	7,29	0,8
	-	153,5	164,2	200,2	-	-	-	6,50	-
	-	153,5	182,3	200,2	-	-	-	10,50	-
	-	153,5	-	193,7	-	-	-	11,48	-
	-	153,5	-	200,2	11	21	**HJ2226 E**	10,50	0,85
	-	153,5	182,3	200,2	-	-	-	10,50	-
	247	-	182,3	-	-	-	-	16,50	-
	-	167	-	233,8	-	-	-	16,50	-
	-	167	-	235	-	-	-	18,50	-
	-	167	182,3	233,8	14	23	**HJ326 E**	16,50	1,7
	-	167	182,6	235	14	23	**HJ326 E**	18,65	1,7
	-	167	182,3	233,8	-	-	-	16,50	-
	-	167	182,7	235	-	-	-	20,15	-

ART BEARINGS

Single row cylindrical roller bearings



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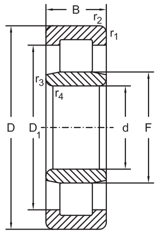

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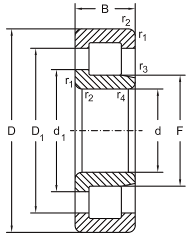

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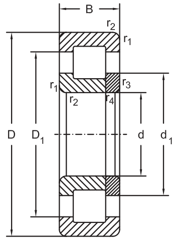
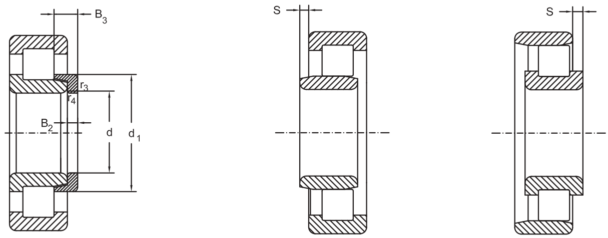


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
130	280	93	4	4	8,1	915	1220	1900	2400	**NU2326 EM**
	280	93	4	4	-	915	1220	1900	2400	**NJ2326 EM**
	280	93	4	4	-	915	1220	1900	2400	**NUP2326 EM**
	340	78	6	5	6,5	790	960	1800	2200	**NU426 M**
	340	78	6	5	-	790	960	1800	2200	**NJ426 M**
140	210	33	2	1,1	4,8	183	265	2800	3400	**NU1028 M**
	250	42	3	3	3,7	390	510	2400	3000	**N228 EM**
	250	42	3	3	3,7	390	510	2400	3000	**NU228 EM**
	250	42	3	3	-	390	510	2400	3000	**NJ228 EM**
	250	42	3	3	-	390	510	2400	3000	**NUP228 EM**
	250	68	3	3	4,4	570	830	2200	2800	**NU2228 EM**
	250	68	3	3	-	570	830	2200	2800	**NJ2228 EM**
	250	68	3	3	-	570	830	2200	2800	**NUP2228 EM**
	300	62	4	4	3,7	670	800	1900	2400	**N328 E**
	300	62	4	4	3,7	670	800	1900	2400	**NU328 E**
	300	62	4	4	3,7	670	800	1900	2400	**NU328 EM**
	300	62	4	4	-	670	800	1900	2400	**NJ328 E**
	300	62	4	4	-	670	800	1900	2400	**NJ328 M**
	300	62	4	4	-	670	800	1900	2400	**NUP328 E**
	300	62	4	4	-	670	800	1900	2400	**NUP328 EM**
	300	102	4	4	9,2	1130	1589	1800	2200	**NU2328 EM**
	300	102	4	4	-	1130	1589	1800	2200	**NJ2328 EM**
	300	102	4	4	-	1130	1589	1800	2200	**NUP2328 EM**
	360	82	6	5	7	850	1020	1600	1900	**NU428 M**
	360	82	6	5	-	850	1020	1600	1900	**NJ428 M**
150	225	35	2,1	1,5	4,9	208	310	2600	3200	**NU1030 M**
	270	45	3	3	4	440	585	2200	2800	**N230 EM**
	270	45	3	3	4	440	585	2200	2800	**NU230 EM**
	270	45	3	3	-	440	585	2200	2800	**NJ230 EM**
	270	45	3	3	-	440	585	2200	2800	**NUP230 EM**
	270	73	3	3	4,3	655	980	2000	2600	**NU2230 EM**
	270	73	3	3	-	655	980	2000	2600	**NJ2230 EM**
	270	73	3	3	-	655	980	2000	2600	**NUP2230 EM**

Single row cylindrical roller bearings

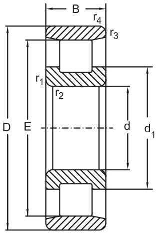


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
130	-	167	-	233,8	-	-	**-**	29,60	-
	-	167	182,3	233,8	14	28	**HJ2326 E**	29,60	1,8
	-	167	182,3	233,8	-	-	**-**	29,60	-
	-	185	-	265	-	-	**-**	42,60	-
	-	185	205	265	18	32	**HJ426**	42,60	3,4
140	-	158	165	185	-	-	**-**	4,10	-
	225	-	180	-	-	-	**-**	9,50	-
	-	169	-	215,3	-	-	**-**	9,50	-
	-	169	180	215,3	11	18	**HJ228 E**	9,50	1
	-	169	180	215,3	-	-	**-**	9,50	-
	-	169	-	215,3	-	-	**-**	15,50	-
	-	169	180	215,3	11	23	**HJ2228 E**	15,50	1,1
	-	169	180	215,3	-	-	**-**	15,50	-
	264	-	195,5	-	-	-	**-**	22,50	-
	-	180	-	250,3	-	-	**-**	22,50	-
	-	180	-	251	-	-	**-**	21,36	-
	-	180	195,5	250,3	15	25	**HJ328 E**	22,50	2
	-	180	196	251	15	25	**HJ328 E**	22,21	2
	-	180	195,5	250,3	-	-	**-**	22,50	-
	-	180	196	251	-	-	**-**	23,04	-
	-	180	-	250,3	-	-	**-**	37,20	-
	-	180	195,5	250,3	15	31	**HJ2328 E**	37,20	2,2
	-	180	195,5	250,3	-	-	**-**	37,20	-
	-	198	-	281	-	-	**-**	49,50	-
	-	198	219	281	18	33	**HJ428**	49,50	3,9
150	-	169,5	176,5	198,1	-	-	**-**	5	-
	242	-	193,7	-	-	-	**-**	11,80	-
	-	182	-	231,8	-	-	**-**	11,80	-
	-	182	193,7	231,8	12	19,5	**HJ230 E**	11,80	1,3
	-	182	193,7	231,8	-	-	**-**	11,80	-
	-	182	-	231,8	-	-	**-**	19,50	-
	-	182	193,7	231,8	12	24,5	**HJ2230 E**	19,50	1,4
	-	182	193,7	231,8	-	-	**-**	19,50	-

ART BEARINGS

Single row cylindrical roller bearings



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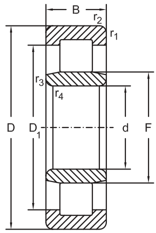

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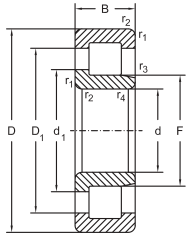

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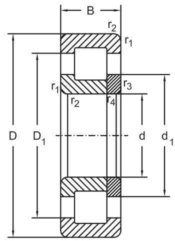
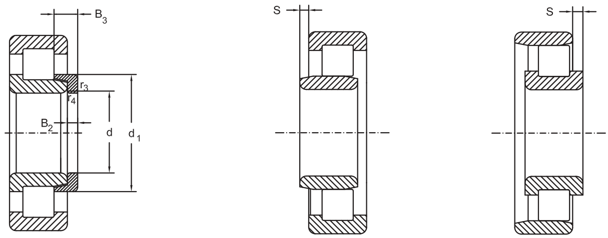


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
150	320	65	4	4	4	800	1000	1800	2200	**N330 EM**
	320	65	4	4	4	800	1000	1800	2200	**NU330 EM**
	320	65	4	4	-	800	1000	1800	2200	**NJ330 EM**
	320	65	4	4	-	800	1000	1800	2200	**NUP330 EM**
	320	108	4	4	9,8	1160	1600	1700	2000	**NU2330 EM**
	320	108	4	4	-	1160	1600	1700	2000	**NJ2330 EM**
	320	108	4	4	-	1160	1600	1700	2000	**NUP2330 EM**
	380	85	6	5	7,5	898	1145	1500	1800	**NU430 M**
	380	85	6	5	-	898	1145	1500	1800	**NJ430 M**
160	240	38	2,1	1,5	5,2	245	355	2400	3000	**NU1032 M**
	240	38	2,1	2,1	-	245	355	2400	3000	**NJ1032 M**
	290	48	3	3	4,1	500	670	2000	2600	**N232 EM**
	290	48	3	3	4,1	500	670	2000	2600	**NU232 EM**
	290	48	3	3	-	500	670	2000	2600	**NJ232 EM**
	290	48	3	3	-	500	670	2000	2600	**NUP232 EM**
	290	80	3	3	4,5	800	1180	1900	2400	**NU2232 EM**
	290	80	3	3	-	800	1180	1900	2400	**NJ2232 EM**
	290	80	3	3	-	800	1180	1900	2400	**NUP2232 EM**
	340	68	4	4	4	865	1060	1600	1900	**N332 EM**
	340	68	4	4	4	865	1060	1600	1900	**NU332 EM**
	340	68	4	4	-	865	1060	1600	1900	**NJ332 EM**
	340	68	4	4	-	865	1060	1600	1900	**NUP332 EM**
	340	114	4	4	10	1320	1830	1600	1900	**NU2332 EM**
	340	114	4	4	-	1320	1830	1600	1900	**NJ2332 EM**
	340	114	4	4	-	1320	1830	1600	1900	**NUP2332 EM**
170	260	42	2,1	2,1	5,8	300	430	2200	2800	**NU1034 M**
	260	42	2,1	2,1	-	300	430	2200	2800	**NJ1034 M**
	310	52	4	4	4,2	618	828	1800	2200	**NU234 EM6**
	310	52	4	4	-	618	828	1800	2200	**NJ234 EM6**
	310	52	4	4	-	618	828	1800	2200	**NUP234 EM6**
	310	86	4	4	4,2	950	1400	1700	2000	**NU2234 EM**
	310	86	4	4	-	950	1400	1700	2000	**NJ2234 EM**
	310	86	4	4	-	950	1400	1700	2000	**NUP2234 EM**

Single row cylindrical roller bearings

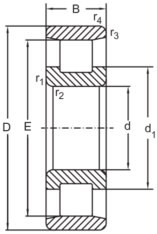


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
150	283	-	210,1	-	-	-	**-**	27,50	-
	-	193	-	268,4	-	-	**-**	27,50	-
	-	193	210,1	268,4	15	25	**HJ330 E**	27,50	2,4
	-	193	210,1	268,4	-	-	**-**	27,50	-
	-	193	-	268,4	-	-	**-**	44,80	-
	-	193	210,1	268,4	15	31,5	**HJ2330 E**	44,80	2,5
	-	193	210,1	268,4	-	-	**-**	44,80	-
	-	213	-	296	-	-	**-**	48	-
	-	213	234	296	20	36,5	**HJ430**	48	4,9
160	-	180	188	211,7	-	-	**-**	6,20	-
	-	180	188	210,3	10	19	**HJ1032**	6	0,75
	259	-	207,4	-	-	-	**-**	14,60	-
	-	195	-	248,2	-	-	**-**	14,60	-
	-	195	207,4	248,2	12	20	**HJ232 E**	14,60	1,5
	-	195	207,4	248,2	-	-	**-**	14,60	-
	-	193	-	249,7	-	-	**-**	24,50	-
	-	193	206,1	249,7	12	24,5	**HJ2232 E**	24,50	1,6
	-	193	206,1	249,7	-	-	**-**	24,50	-
	300	-	222,2	-	-	-	**-**	32,30	-
	-	204	-	284,6	-	-	**-**	32,30	-
	-	204	222,2	284,6	15	25	**HJ332 E**	32,10	2,7
	-	204	222,2	284,6	-	-	**-**	32,10	-
	-	204	-	284,6	-	-	**-**	53,50	-
	-	204	222,2	284,6	15	32	**HJ2332 E**	53,50	2,9
	-	204	222,2	284,6	-	-	**-**	53,50	-
170	-	193	200,9	227,7	-	-	**-**	8,40	-
	-	193	201,8	227,3	11	21	**HJ1034**	8,74	1
	-	207	-	267,1	-	-	**-**	18,20	-
	-	207	220,8	267,1	12	20	**HJ234 E**	18,20	1,7
	-	207	220,8	267,1	-	-	**-**	18,20	-
	-	205	-	268,5	-	-	**-**	29,80	-
	-	205	219,6	268,5	12	24	**HJ2234 E**	29,80	1,8
	-	205	219,6	268,5	-	-	**-**	29,80	-

ART BEARINGS

Single row cylindrical roller bearings



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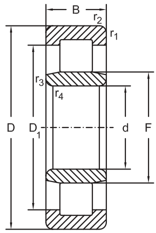

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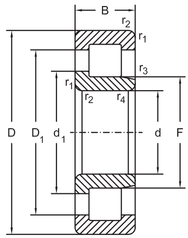

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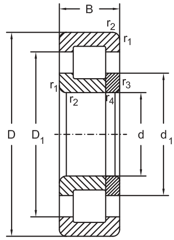
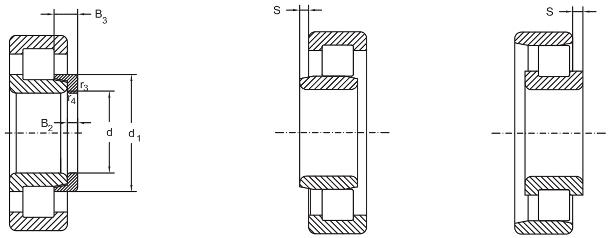


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
170	360	72	4	4	4,3	800	1020	1600	1900	**N334 EM**
	360	72	4	4	4,3	928	1150	1600	1900	**NU334 EM**
	360	72	4	4	-	928	1150	1600	1900	**NJ334 EM**
	360	72	4	4	-	928	1150	1600	1900	**NUP334 EM**
	360	120	4	4	10	1220	1760	1500	1800	**NU2334 M**
	360	120	4	4	-	1220	1760	1500	1800	**NJ2334 M**
	360	120	4	4	-	1220	1760	1500	1800	**NUP2334 M**
180	280	46	2,1	2,1	6,1	360	520	2200	2800	**N1036 M**
	280	46	2,1	2,1	6,1	360	520	2200	2800	**NU1036 M**
	280	46	2,1	2,1	-	360	520	2200	2800	**NJ1036 M**
	320	52	4	4	4,5	610	830	1800	2200	**N236 EM**
	320	52	4	4	4,5	610	830	1800	2200	**NU236 EM**
	320	52	4	4	-	610	830	1800	2200	**NJ236 EM**
	320	52	4	4	-	610	830	1800	2200	**NUP236 EM**
	320	86	4	4	4,2	1000	1500	1700	2000	**NU2236 EM**
	320	86	4	4	-	1000	1500	1700	2000	**NJ2236 EM**
	320	86	4	4	-	1000	1500	1700	2000	**NUP2236 EM**
	380	75	4	4	4,4	900	1160	1500	1800	**N336 M**
	380	75	4	4	4,4	900	1160	1500	1800	**NU336 M**
	380	75	4	4	-	900	1160	1500	1800	**NJ336 M**
	380	75	4	4	-	900	1160	1500	1800	**NUP336 M**
	380	126	4	4	10,5	1370	2000	1400	1700	**NU2336 M**
	380	126	4	4	-	1370	2000	1400	1700	**NJ2336 M**
	380	126	4	4	-	1370	2000	1400	1700	**NUP2336 M**
190	290	46	2,1	2,1	6,2	365	550	2000	2600	**NU1038 M**
	340	55	4	4	4,7	680	930	1700	2000	**N238 EM**
	340	55	4	4	4,7	680	930	1700	2000	**NU238 EM**
	340	55	4	4	-	680	930	1700	2000	**NJ238 EM**
	340	55	4	4	-	680	930	1700	2000	**NUP238 EM**
	340	92	4	4	5	854	1338	1600	1900	**NU2238 EM**
	340	92	4	4	-	854	1338	1600	1900	**NJ2238 M**
	400	78	5	5	4,5	1236	1635	1400	1700	**NU338 EM**
	400	78	5	5	-	1236	1635	1400	1700	**NJ338 EM**

Single row cylindrical roller bearings

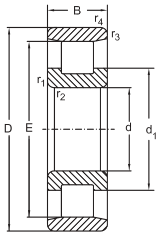


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
170	310	-	238	-	-	-	-	38	-
	-	220	-	292,5	-	-	-	38	-
	-	220	238	292,5	16	29,5	**HJ334 E**	38	3,3
	-	220	238	292,5	-	-	-	38	-
	-	220	-	292,5	-	-	-	63,50	-
	-	220	238	292,5	16	38,5	**HJ2334 E**	63,50	3,7
	-	220	238	292,5	-	-	-	63,50	-
180	255	-	215	-	-	-	-	10,28	-
	-	205	214,1	244,7	-	-	-	10,90	-
	-	205	215	244	12	22,5	**HJ1036**	10,50	1,3
	289	-	230,2	-	-	-	-	18,90	-
	-	217	-	277,2	-	-	-	18,90	-
	-	217	230,2	277,2	12	20	**HJ236 E**	19	1,8
	-	217	230,2	277,2	-	-	-	19	-
	-	215	-	278,6	-	-	-	31,20	-
	-	215	229,6	278,6	12	24	**HJ2236 E**	31,20	1,9
	-	215	229,6	278,6	-	-	-	31,20	-
	328	-	252	-	-	-	-	44	-
	-	232	-	308,5	-	-	-	44	-
	-	232	252	308,5	17	30,5	**HJ336 E**	44	3,9
	-	232	252	308,5	-	-	-	44	-
	-	232	-	308,5	-	-	-	74	-
	-	232	252	308,5	17	40	**HJ2336 E**	74	4,9
	-	232	252	308,5	-	-	-	74	-
190	-	215	225	254,5	-	-	-	11,40	-
	306	-	244,6	-	-	-	-	22,80	-
	-	230	-	293,6	-	-	-	22,80	-
	-	230	244,6	293,6	13	21,5	**HJ238 E**	22,80	2,2
	-	230	244,6	293,6	-	-	-	22,80	-
	-	231	-	285,2	-	-	-	36,70	-
	-	231	246	285,2	13	26,5	**HJ2238 E**	37,60	2,4
	-	245	-	334,5	-	-	-	50,50	-
	-	245	263,5	334,5	18	31	**HJ338 E**	50,50	4,5

ART BEARINGS

Single row cylindrical roller bearings



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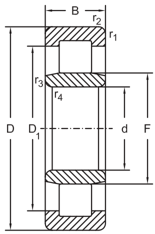

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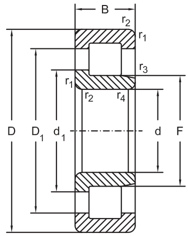

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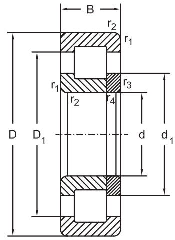
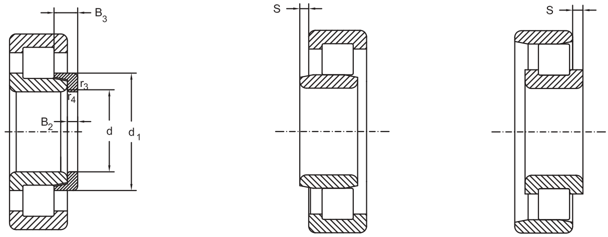


NUP

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
190	400	132	5	5	11	1789	1635	1400	1700	**NU2338 EM6**
	400	132	5	5	-	1789	2628	1400	1700	**NJ2338 EM6**
	400	132	5	5	-	1789	2628	1400	1700	**NUP2338 EM6**
200	310	51	2,1	2,1	7	400	600	2000	2600	**NU1040 M**
	310	51	2,1	2,1	-	400	600	2200	2800	**NUP1040 M**
	360	58	4	4	5	750	1040	1600	1900	**N240 EM**
	360	58	4	4	5	750	1040	1600	1900	**NU240 EM**
	360	58	4	4	-	750	1040	1600	1900	**NJ240 EM**
	360	58	4	4	-	750	1040	1600	1900	**NUP240 EM**
	360	98	4	4	5,1	1220	1860	1500	1800	**NU2240 EM**
	360	98	4	4	-	1220	1860	1500	1800	**NJ2240 EM**
	420	80	5	5	5	1300	1695	1400	1700	**NU340 EM**
	420	80	5	5	-	1300	1695	1400	1700	**NJ340 M**
	420	138	5	5	11,5	1740	2685	1300	1600	**NU2340 M**
	420	138	5	5	-	1740	2685	1300	1600	**NJ2340 M**
220	340	56	3	3	7,5	650	1047	1700	2000	**NU1044 M**
	340	56	5	5	-	650	1047	1700	2000	**NJ1044 M**
	400	65	4	4	6	778	1113	1500	1800	**NU244 M**
	400	65	4	4	-	778	1113	1500	1800	**NJ244 M**
	400	65	4	4	-	778	1113	1500	1800	**NUP244 M**
	400	108	4	4	6	1370	2310	1400	1700	**NU2244 M**
	400	108	4	4	-	1370	2310	1400	1700	**NJ2244 M**
	460	88	5	5	5,2	1230	1650	1300	1600	**NU344 M**
	460	88	5	5	-	1230	1650	1300	1600	**NUP344 M**
	460	145	5	5	12	2015	3095	1200	1500	**NU2344 E**
240	360	56	3	3	7,6	695	1168	1600	1900	**NU1048 M**
	440	72	4	4	6	936	1339	1400	1700	**NU248 M**
	440	72	4	4	-	936	1339	1400	1700	**NJ248 M**
	440	72	4	4	-	936	1339	1400	1700	**NUP248 M**
	440	120	4	4	7	1430	2320	1300	1600	**NU2248 M**
	500	95	5	5	5,5	1400	1930	1200	1500	**NU348 M**
	500	155	5	5	8,5	2080	3150	1600	1900	**NU2348 EM**
260	400	65	4	4	8	660	1039	1500	1800	**NU1052 M**

Single row cylindrical roller bearings

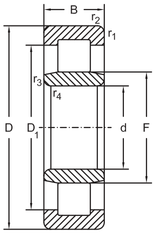


NJ+HJ

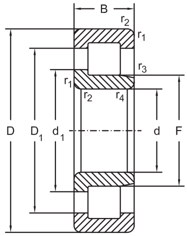
Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	**Designation**	Bearing	Thrust collar
mm								kg	
190	-	245	-	334,5	-	-	**-**	83,50	-
	-	245	263,5	334,5	18	36,5	**HJ2338 E**	83,50	5
	-	245	263,5	334,5	-	-	**-**	85,80	-
200	-	229	239,5	270,1	-	-	**-**	14,80	-
	-	229	239	270,8	-	-	**-**	14,90	-
	323	-	258,2	-	-	-	**-**	26,90	-
	-	243	-	310,1	-	-	**-**	26,90	-
	-	243	258,2	310,1	14	23	**HJ240 E**	26,90	2,6
	-	243	258,2	310,1	-	-	**-**	26,90	-
	-	241	-	311,5	-	-	**-**	45,70	-
	-	241	256,9	311,5	14	28	**HJ2240 E**	45,70	3
	-	260	-	348	-	-	**-**	60,80	-
	-	260	280	339,3	18	33	**HJ340 E**	57,50	5,2
	-	260	-	339,3	-	-	**-**	99	-
	-	260	280	339,3	18	44,5	**HJ2340 E**	99	5,5
220	-	250	262	297,3	-	-	**-**	19,30	-
	-	250	262	298	14	27	**HJ1044**	19,22	2,2
	-	270	-	334,3	-	-	**-**	38,10	-
	-	270	285,5	334,3	15	27,5	**HJ244 E**	38,10	3,6
	-	270	285,5	334,3	-	-	**-**	38,10	-
	-	270	-	334,3	-	-	**-**	63,50	-
	-	270	285,5	334,3	15	36,5	**HJ2244 E**	63,50	3,6
	-	284	-	373,3	-	-	**-**	75,50	-
	-	284	307	373,6	-	-	**-**	77,17	-
	-	284	-	373,3	-	-	**-**	124	-
240	-	270	282	317,3	-	-	**-**	20,70	2,4
	-	295	-	367,3	-	-	**-**	51,50	-
	-	295	313	367,3	16	29,5	**HJ248 E**	51,50	4,65
	-	295	313	366,4	-	-	**-**	52,13	-
	-	295	-	367,3	-	-	**-**	85,90	-
	-	310	-	405,3	-	-	**-**	96,20	-
	-	299	-	419	-	-	**-**	148,40	-
260	-	296	309,6	349,7	-	-	**-**	30,80	-

ART BEARINGS

Single row cylindrical roller bearings



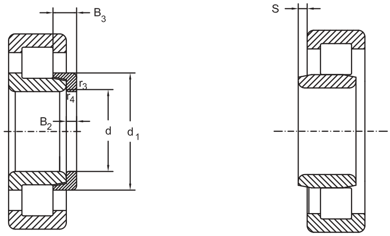
NU



NJ

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min^{-1}		
260	480	80	5	5	6,2	1140	1630	1200	1500	**NU252 M**
	480	80	5	5	-	1140	1630	1200	1500	**NJ252 M**
	480	130	5	5	7,2	1760	2900	1100	1400	**NU2252 M**
	540	102	6	6	6	1600	2200	1100	1400	**NU352 M**
	540	165	6	6	9	2320	3550	1000	1300	**NU2352 M**
280	420	65	4	4	8,2	680	1100	1400	1700	**NU1056 M**
	500	80	5	5	6,2	1120	1660	1200	1500	**NU256 M**
	500	80	5	5	-	1120	1660	1200	1500	**NJ256 M**
	500	130	5	5	7,2	1760	2900	1100	1400	**NU2256 M**
	580	108	6	6	7	1800	2500	1000	1300	**NU356 M**
300	460	74	4	4	9,5	900	1430	1300	1600	**NU1060 M**
	460	74	4	4	-	900	1430	1300	1600	**NJ1060 M**
	540	85	5	5	7,2	1400	2040	1100	1400	**NU260 M**
	540	85	5	5	-	1400	2040	1100	1400	**NJ260 M**
	540	140	5	5	14	2080	3400	1000	1300	**NU2260 M**
	620	109	7,5	7,5	7,2	2080	3000	900	1100	**NU360 M**
320	480	74	4	4	9,7	915	1500	1200	1500	**NU1064 M**
	580	92	5	5	8,3	1600	2360	1000	1300	**NU264 M**
	580	92	5	5	-	1600	2360	1000	1300	**NJ264 M**
	440	56	3	3	-	655	1122	1000	1300	**NJ1964 M**
340	520	82	5	5	10	1120	1830	1200	1400	**NU1068 M**
360	540	82	5	5	10,2	1145	1900	1200	1400	**NU1072 M**
380	560	82	5	5	10,6	1180	2000	1000	1300	**NU1076 M**
400	600	90	5	5	12	1380	2368	950	1200	**NU1080 M**
	600	90	5	5	-	1400	2368	950	1200	**NUP1080 M**
	540	65	4	4	13,5	1161	2232	950	1200	**NU1980 EM**
420	620	90	5	5	14	1420	2450	900	1100	**NU1084 M**
440	650	94	6	6	14,7	1560	2750	850	1000	**NU1088 M**
460	680	100	6	6	15,9	1660	3000	850	1000	**NU1092 M**
480	650	78	5	5	16	1140	2240	900	1100	**NU1996 M**
	700	100	5	5	15,9	1680	3080	900	1100	**NU1096 M**
500	670	78	5	5	10	1140	2240	850	1000	**NU19/500 M**
	720	100	6	6	10,5	1760	3200	800	950	**NU10/500 M**

Single row cylindrical roller bearings

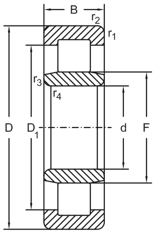


NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
260	-	320	-	399,3	-	-	**-**	68,30	-
	-	320	340	399,3	18	33	**HJ252 E**	68,30	6,2
	-	320	-	399,3	-	-	**-**	112	-
	-	336	-	437,3	-	-	**-**	120	-
	-	336	-	437,3	-	-		195	-
280	-	316	329,6	369,7	-	-	**-**	32,80	-
	-	340	-	419,3	-	-	**-**	71,80	-
	-	340	360	419,3	18	33	**HJ256 E**	71,80	6,5
	-	340	-	419,3	-	-	**-**	117	-
	-	362	-	469,3	-	-	**-**	147	-
300	-	340	356	403,6	-	-	**-**	46,30	-
	-	340	356	403,6	19	36	**HJ1060**	45,90	5,4
	-	364	-	453,3	-	-	**-**	89,90	-
	-	364	387	453,3	20	34,5	**HJ260 E**	89,90	8,4
	-	364	-	453,3	-	-	**-**	148	-
	-	388	-	506,7	-	-	**-**	168	-
320	-	360	376	423,1	-	-	**-**	48,70	-
	-	390	-	485,3	-	-	**-**	113	-
	-	390	415	485,3	21	37	**HJ264 E**	113	10,2
	-	348	360	400	19	36	**HJ1964**	26,10	5,5
340	-	385	403	456	-	-	**-**	65	-
360	-	405	423	476,4	-	-	**-**	68,20	-
380	-	425	-	496,7	-	-	**-**	71,20	-
400	-	450	-	529,5	-	-	**-**	92,50	-
	-	450	470	530	-	-	**-**	105,20	-
	-	435	-	495,8	-	-	**-**	44,02	-
420	-	470	-	549,5	-	-	**-**	96,20	-
440	-	493	-	575,7	-	-	**-**	110	-
460	-	516	-	601,5	-	-	**-**	129	-
480	-	525	-	587	-	-	**-**	77,50	-
	-	525	-	587	-	-	**-**	128	-
500	-	545	-	606,8	-	-	**-**	80,40	-
	-	556	-	641,7	-	-	**-**	139	-

ART BEARINGS

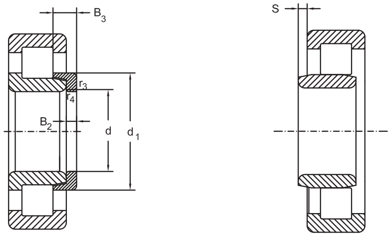
Single row cylindrical roller bearings



NU

Dimensions						Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	r_3, r_4 min.	s ≈	dyn. C_r	stat. C_{0r}	grease	oil	
mm						kN		min $^{-1}$		
560	750	85	5	5	7,5	1600	3200	750	900	**NU19/560 M**
	820	115	6	6	12,3	2300	4200	630	750	**NU10/560 M**
600	870	118	6	6	13,9	2750	5050	580	480	**NU10/600 M**
630	850	100	6	6	8,5	1900	3750	670	800	**NU19/630 M**
710	950	106	6	6	9,3	2080	4400	600	700	**NU19/710 M**

Single row cylindrical roller bearings



NJ+HJ

Dimensions							Thrust collar	Mass	
d	E	F	d_1 ≈	D_1 ≈	B_2	B_3	Designation	Bearing	Thrust collar
mm								kg	
560	-	610	-	679,8	-	-	**-**	110	-
	-	626	-	713	-	-	**-**	215	-
600	-	667	-	779	-	-	**-**	240	-
630	-	688	-	768,5	-	-	**-**	169	-
710	-	774	-	860,6	-	-	**-**	219	-

ART BEARINGS

ART BEARINGS

Double Row Cylindrical Roller Bearings

Standards, Boundary dimensions

Standard plans DIN 616
Double row cylindrical roller bearings, DIN 5412 / part 4

General

Double Row Cylindrical Roller Bearings of series NN30 and NNU 49 are separable radial bearings.

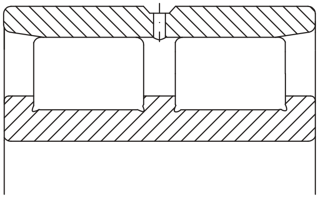
They are frequently used as non – locating bearings arrangements of working spindles for machine tools. Therefore, these bearings are often used in high precision tolerance class, frequently in combination with reduced internal clearance. These bearings also feature high radial load capacity and are satisfactory for high speed applications, providing a very stiff and rigid bearing arrangement. They are also commonly used with tapered bores, namely suffix K, (i.e. taper 1:12).

Design variants of Double Row Cylindrical Roller Bearings

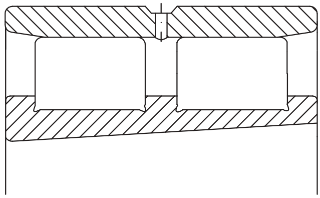
Double Row Cylindrical Roller Bearings of series NN 30.. and NNU 49.. are produced and available either with or without tapered bores, as standard (see also figure below).

Bearings of series NN 30.. comprise of a plain outer ring and an inner ring with three integral shoulders to guide the two separate rows of rollers around the raceway. These bearings series are produced with lubrication facilities in their outer ring, such as a circumferential lubrication groove and holes as standard, name suffix W33.

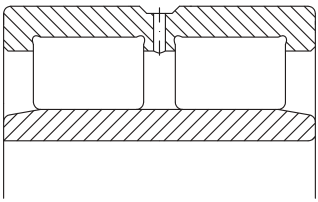
Unlike the NN30.. series the double row cylindrical roller bearings of the NNU 49.. series feature opposite internal design characteristics, (i.e. outer ring with 3 integral shoulders around the raceway and a plain inner ring). These bearing series also feature lubrication facilities in their outer ring as standard, also namely, suffix W33.



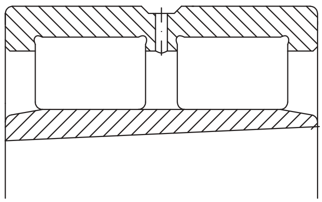
NN30..W33



NN30..K..W33



NNU49..W33



NNU49..K..W33

Cylindrical roller bearings of series NN30.. and NNU49.. allow for compensation of length changes within the bearings itself. In this way they are ideal non-locating bearings.

Both bearing rings may be mounted with heavy interference fit to shaft and housing.

Misalignment

Double Row Cylindrical Roller bearings are not able to accomodate misalignments.

Tolerances

Double Row Cilindrical Roller Bearings of series NN 30.. and NNU 49.. are frequently used as spindle bearings.

Consequently, they are also available with closer tolerance classes, such as P4 or SP, as standard.

On request these bearings are also be produced to other tolerance classes.

Detailed tolerance values, for ART double row cylindrical roller bearings and ART double row cylindrical roller bearings in spindle bearing design, tolerance class SP, are listed in the table shown in the chapter "Bearing tolerances" page 25.

Cages

ART Double Row Cylindrical Roller Bearings of the series NN 30.. and NNU 49.. are produced with roller riding solid brass cages as standard.

Internal clearance

ART Double Row Cylindrical Roller Bearings are produced with normal internal clearance (clearance group CN, historically designated C0) as standard. Other internal radial clearances are produced upon order request.

NOTE:
ART Double Row Cylindrical Roller Bearings of series NN 30.. and NNU 49.. produced to high precision design are frequently used with reduced internal radial clearance (clearance group C1).

As these bearings are produced to very closed tolerances, under no circumstances should components be mixed or exchanged with other bearing parts.

The value of internal clearance groups of ART Cylindrical Roller Bearings are listed in the tables on pages 155-156.

These Values conform, as far as they are standardised, and conform to DIN 620/part 4 and ISO 5753-1, respectively.

Minimum load

The minimum load applied to fast rotating double row cylindrical roller bearings should be higher than 4 % of it's dynamic load rating C_r.

Equivalent Dynamic bearing load

Since double Row Cylindrical Roller Bearings of series NN 30.. and NNU 49.. are non – locating bearings, they are not able to accomodate any thrust loads.

$$P = F_r$$

Equivalent static bearing load

For Single and Double row cylindrical roller bearings:

$$P_0 = F_r$$

Mounting

When handling High Precision double row cylindrical roller bearings particular attention must be paid to the relevant instructions of fitting and mounting of these bearings.

When double row cylindrical roller bearings, with tapered inner bores, are mounted the effect on the running clearance can be adjusted to obtain a specific clearance or preload.

As these bearing types are separable under no circumstances should either components or assembled bearings be mixed or exchanged with other bearing parts.

Abutment and fillet dimensions for Double row cylindrical roller bearings

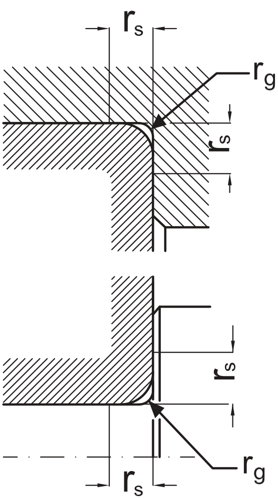
The bearing rings must only contact adjacent parts with their side faces. The bearing corners must not touch the corner fillet radii or either the shaft or housing corners.

Therefore, the largest fillet radius (rg) must be smaller than the minimum fillet dimension of the bearings rings (rs) as listed in the bearing tables, also see next page.

Recommendations for the dimensions of adjacent parts are listed in **DIN 5418**.

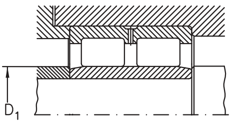
Abutment and fillet dimensions for Double Row Cylindrical Roller Bearings

Dimensions are in [mm]

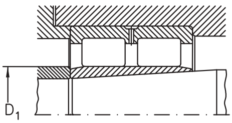


Abutment dimension for Double row Cylindrical Roller Bearings

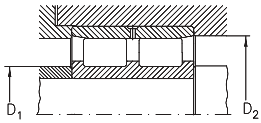
All dimensions are in [mm]



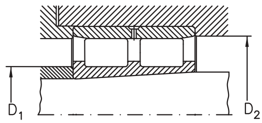
NNU49..W33



NNU49..K..W33



NN30..W33

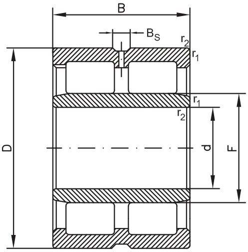


NN30..K..W33

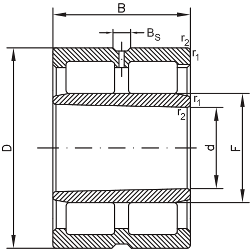
Shaft diameter	for Bearings series					
	NNU49, NNU49 K		NN30, NN30 K			
d	Type	D1	Type	D1	D2	
		max		min	min	max
mm						
30	**-**	-	**NN3006**	35	49	50
35	**-**	-	**NN3007**	40	56	57
40	**-**	-	**NN3008**	45	62	63
45	**-**	-	**NN3009**	50	69	70
50	**-**	-	**NN3010**	55	74	75
55	**-**	-	**NN3011**	61	82	84
60	**-**	-	**NN3012**	66	87	89
65	**-**	-	**NN3013**	71	92	94
70	**-**	-	**NN3014**	76	102	104
75	**-**	-	**NN3015**	81	107	109
80	**-**	-	**NN3016**	86	115	119
85	**-**	-	**NN3017**	91	120	124
90	**-**	-	**NN3018**	98	129	133
95	**-**	-	**NN3019**	103	134	137
100	**NNU4920**	112	**NN3020**	108	139	142
105	**NNU4921**	117	**NN3021**	114	148	151
110	**NNU4922**	122	**NN3022**	119	157	161
120	**NNU4924**	133	**NN3024**	129	167	171
130	**NNU4926**	145	**NN3026**	139	184	191
140	**NNU4928**	155	**NN3028**	149	194	201
150	**NNU4930**	167	**NN3030**	160	208	215
160	**NNU4932**	177	**NN3032**	170	222	230
170	**NNU4934**	187	**NN3034**	180	239	250
180	**NNU4936**	200	**NN3036**	190	258	270
190	**NNU4938**	210	**NN3038**	200	268	280
200	**NNU4940**	223	**NN3040**	210	285	300
220	**NNU4944**	243	**NN3044**	232	313	328
240	**NNU4948**	263	**NN3048**	252	334	348
260	**NNU4952**	289	**NN3052**	275	368	385
280	**NNU4956**	309	**NN3056**	295	388	405
300	**NNU4960**	335	**NN3060**	315	422	445
320	**NNU4964**	335	**NN3064**	335	442	465

ART BEARINGS

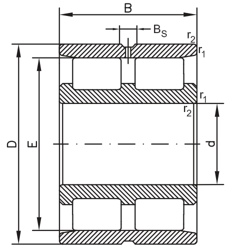
Double Row Cylindrical Roller Bearings



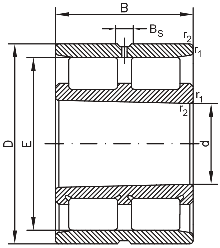
NNU49..W33



NNU49..K..W33



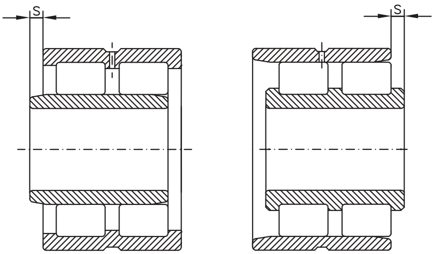
NN30..W33



NN30..K..W33

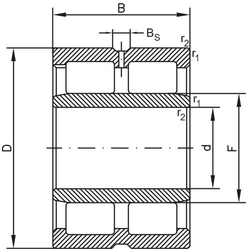
Dimensions				Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	dyn. C_r	stat. C_{0r}	grease	oil	
mm				kN		min^{-1}		
30	55	19	1	29	34	16000	19000	**NN3006 MW33**
	55	19	1	29	34	16000	19000	**NN3006 KMW33**
35	62	20	1	39,3	50	14000	17000	**NN3007 MW33**
	62	20	1	39,3	50	14000	17000	**NN3007 KMW33**
40	68	21	1	45	58,5	12000	15000	**NN3008 MW33**
	68	21	1	45	58,5	12000	15000	**NN3008 KMW33**
45	75	23	1	54	72	11000	14000	**NN3009 MW33**
	75	23	1	54	72	11000	14000	**NN3009 KMW33**
50	80	23	1	57	80	10000	13000	**NN3010 MW33**
	80	23	1	57	80	10000	13000	**NN3010 KMW33**
55	90	26	1,1	72	100	9000	11000	**NN3011 MW33**
	90	26	1,1	72	100	9000	11000	**NN3011 KMW33**
60	95	26	1,1	75	110	8500	10000	**NN3012 MW33**
	95	26	1,1	75	110	8500	10000	**NN3012 KMW33**
65	100	26	1,1	76,5	118	8000	9500	**NN3013 MW33**
	100	26	1,1	76,5	118	8000	9500	**NN3013 KMW33**
70	110	30	1,1	98	151	7000	8500	**NN3014 MW33**
	110	30	1,1	98	151	7000	8500	**NN3014 KMW33**
75	115	30	1,1	100	156	6700	8000	**NN3015 MW33**
	115	30	1,1	100	156	6700	8000	**NN3015 KMW33**
80	125	34	1,1	120	186	6300	7500	**NN3016 MW33**
	125	34	1,1	120	186	6300	7500	**NN3016 KMW33**
85	130	34	1,1	125	200	6000	7000	**NN3017 MW33**
	130	34	1,1	125	200	6000	7000	**NN3017 KMW33**
90	140	37	1,5	141	224	5600	6700	**NN3018 MW33**
	140	37	1,5	141	224	5600	6700	**NN3018 KMW33**
95	145	37	1,5	146	236	5300	6300	**NN3019 MW33**
	145	37	1,5	146	236	5300	6300	**NN3019 KMW33**

Double Row Cylindrical Roller Bearings

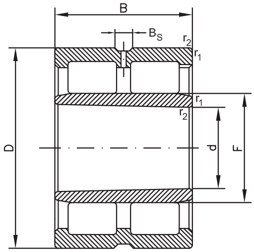


Bearing dimensions					Mass
d	E	F	B_s	s	
mm					[kg]
30	48,5	-	4,8	1,4	0,12
	48,5	-	4,8	1,4	0,12
35	55	-	4,8	1,4	0,25
	55	-	4,8	1,4	0,25
40	61	-	4,8	1,4	0,33
	61	-	4,8	1,4	0,32
45	67,5	-	4,8	1,7	0,39
	67,5	-	4,8	1,7	0,38
50	72,5	-	4,8	1,7	0,42
	72,5	-	4,8	1,7	0,41
55	81	-	4,8	1,9	0,62
	81	-	4,8	1,9	0,60
60	86,1	-	4,8	1,9	0,67
	86,1	-	4,8	1,9	0,65
65	91	-	4,8	1,9	0,73
	91	-	4,8	1,9	0,71
70	100	-	6,5	2,3	1,03
	100	-	6,5	2,3	0,99
75	105	-	6,5	2,3	1,08
	105	-	6,5	2,3	1,05
80	113	-	6,5	2,5	1,51
	113	-	6,5	2,5	1,46
85	118	-	6,5	2,5	1,55
	118	-	6,5	2,5	1,50
90	127	-	6,5	2,5	2,15
	127	-	6,5	2,5	2,09
95	132	-	6,5	2,5	2,10
	132	-	6,5	2,5	2,03

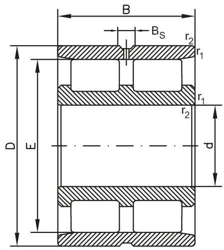
Double Row Cylindrical Roller Bearings



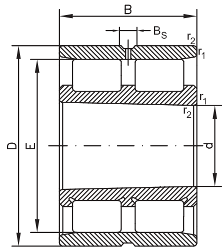
NNU49..W33



NNU49..K..W33



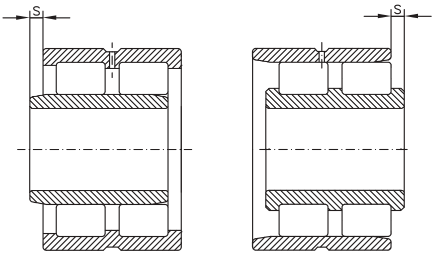
NN30..W33



NN30..K..W33

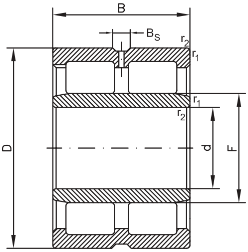
Dimensions				Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	dyn. C_r	stat. C_{0r}	grease	oil	
mm				kN		min^{-1}		
100	140	40	1,1	129	255	5300	6300	**NNU4920 MW33**
	140	40	1,1	129	255	5300	6300	**NNU4920 KMW33**
	150	37	1,5	152	264	5300	6300	**NN3020 MW33**
	150	37	1,5	152	264	5300	6300	**NN3020 KMW33**
105	145	40	1,1	129	260	5300	6300	**NNU4921 MW33**
	145	40	1,1	129	260	5300	6300	**NNU4921 KMW33**
	160	41	2	192	310	4800	5600	**NN3021 MW33**
	160	41	2	192	310	4800	5600	**NN3021 KMW33**
110	150	40	1,1	132	270	5000	6000	**NNU4922 MW33**
	150	40	1,1	132	270	5000	6000	**NNU4922 KMW33**
	170	45	2	226	365	4500	5300	**NN3022 MW33**
	170	45	2	226	365	4500	5300	**NN3022 KMW33**
120	165	45	1,1	176	340	4500	5300	**NNU4924 MW33**
	165	45	1,1	176	340	4500	5300	**NNU4924 KMW33**
	180	46	2	235	405	4300	5000	**NN3024 MW33**
	180	46	2	235	405	4300	5000	**NN3024 KMW33**
130	180	50	1,5	193	390	4000	4800	**NNU4926 MW33**
	180	50	1,5	193	390	4000	4800	**NNU4926 KMW33**
	200	52	2	294	510	3800	4500	**NN3026 MW33**
	200	52	2	294	510	3800	4500	**NN3026 KMW33**
140	190	50	1,5	190	400	3800	4500	**NNU4928 MW33**
	190	50	1,5	190	400	3800	4500	**NNU4928 KMW33**
	210	53	2	305	520	3600	4300	**NN3028 MW33**
	210	53	2	305	520	3600	4300	**NN3028 KMW33**
150	210	60	2	326	655	3600	4300	**NNU4930 MW33**
	210	60	2	326	655	3600	4300	**NNU4930 KMW33**
	225	56	2	339	600	3400	4000	**NN3030 MW33**
	225	56	2	339	600	3400	4000	**NN3030 KMW33**

Double Row Cylindrical Roller Bearings

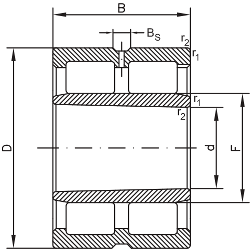


Bearing dimensions					Mass
d	E	F	B_s	s	
mm					[kg]
100	-	113	6,5	2	1,80
	-	113	6,5	2	1,72
	137	-	6,5	2,5	2,20
	137	-	6,5	2,5	2,13
105	-	118	6,5	1,5	2,07
	-	118	6,5	1,5	1,98
	146	-	6,5	2,6	2,84
	146	-	6,5	2,6	2,75
110	-	123	6,5	1,5	2,13
	-	123	6,5	1,5	2,04
	155	-	6,5	2,8	3,68
	155	-	6,5	2,8	3,56
120	-	134,5	6,5	1,5	2,76
	-	134,5	6,5	1,5	2,64
	165	-	6,5	3,1	3,96
	165	-	6,5	3,1	3,83
130	-	146	6,5	2	3,54
	-	146	6,5	2	3,37
	182	-	9,5	3,35	5,75
	182	-	9,5	3,35	5,57
140	-	156	6,5	2	4,24
	-	156	6,5	2	4,06
	192	-	9,5	3,35	6,38
	192	-	9,5	3,35	6,18
150	-	168,5	6,5	2,3	6,49
	-	168,5	6,5	2,3	6,21
	206	-	9,5	3,7	7,50
	206	-	9,5	3,7	7,26

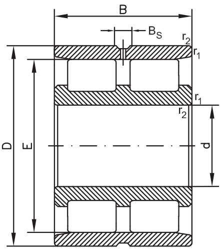
Double Row Cylindrical Roller Bearings



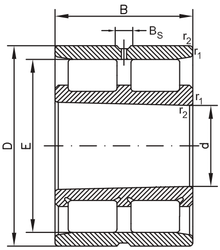
NNU49..W33



NNU49..K..W33



NN30..W33

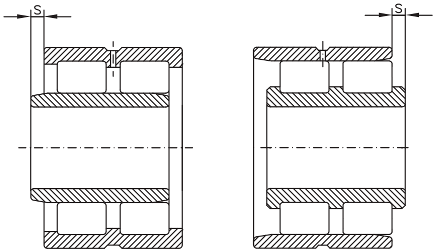


NN30..K..W33

Dimensions				Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	dyn. C_r	stat. C_{0r}	grease	oil	
mm				kN		min^{-1}		
160	220	60	2	335	680	3400	4000	**NNU4932 MW33**
	220	60	2	335	680	3400	4000	**NNU4932 KMW33**
	240	60	2,1	388	670	3200	3800	**NN3032 MW33**
	240	60	2,1	388	670	3200	3800	**NN3032 KMW33**
170	230	60	2	340	720	3200	3800	**NNU4934 MW33**
	230	60	2	340	720	3200	3800	**NNU4934 KMW33**
	260	67	2,1	458	810	3000	3600	**NN3034 MW33**
	260	67	2,1	458	810	3000	3600	**NN3034 KMW33**
180	250	69	2	405	877	3000	3600	**NNU4936 MW33**
	250	69	2	405	877	3000	3600	**NNU4936 KMW33**
	280	74	2,1	576	1080	2800	3400	**NN3036 MW33**
	280	74	2,1	576	1080	2800	3400	**NN3036 KMW33**
190	260	69	2	412	910	2800	3400	**NNU4938 MW33**
	260	69	2	412	910	2800	3400	**NNU4938 KMW33**
	290	75	2,1	614	1088	2600	3200	**NN3038 MW33**
	290	75	2,1	614	1088	2600	3200	**NN3038 KMW33**
200	280	80	2,1	490	1040	2600	3200	**NNU4940 MW33**
	280	80	2,1	490	1040	2600	3200	**NNU4940 KMW33**
	310	82	2,1	715	1271	2400	3000	**NN3040 MW33**
	310	82	2,1	715	1271	2400	3000	**NN3040 KMW33**
220	300	80	2,1	535	1321	2400	3000	**NNU4944 MW33**
	300	80	2,1	535	1321	2400	3000	**NNU4944 KMW33**
	340	90	3	890	1591	2200	2800	**NN3044 MW33**
	340	90	3	890	1591	2200	2800	**NN3044 KMW33**
240	320	80	2,1	556	1300	2200	2800	**NNU4948 MW33**
	320	80	2,1	556	1300	2200	2800	**NNU4948 KMW33**
	360	92	3	850	1560	2000	2600	**NN3048 MW33**
	360	92	3	850	1560	2000	2600	**NN3048 KMW33**

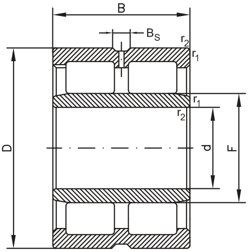
ART BEARINGS

Double Row Cylindrical Roller Bearings

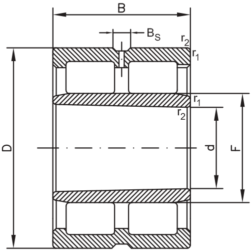


Bearing dimensions					Mass
d	E	F	B_s	s	
mm					[kg]
160	-	178,5	6,5	2,3	6,67
	-	178,5	6,5	2,3	6,37
	219	-	9,5	4,2	9,42
	219	-	9,5	4,2	9,12
170	-	188,5	6,5	2,3	7,16
	-	188,5	6,5	2,3	6,85
	236	-	9,5	4,5	12,8
	236	-	9,5	4,5	12,4
180	-	202	9,5	2,6	10,6
	-	202	9,5	2,6	10,1
	255	-	12,2	4,8	16,9
	255	-	12,2	4,8	16,3
190	-	212	9,5	2,6	10,6
	-	212	9,5	2,6	10,1
	265	-	12,2	4,8	17,6
	265	-	12,2	4,8	17,1
200	-	225	12,2	3,4	16,5
	-	225	12,2	3,4	15,9
	282	-	12,2	5,3	23,1
	282	-	12,2	5,3	22,4
220	-	245	12,2	3,4	16,8
	-	245	12,2	3,4	16,1
	310	-	15	4,5	29,2
	310	-	15	4,5	28,2
240	-	265	12	3,4	18,0
	-	265	12	3,4	17,2
	330	-	15	6	31,9
	330	-	15	6	30,8

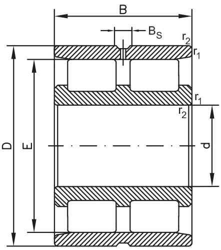
Double Row Cylindrical Roller Bearings



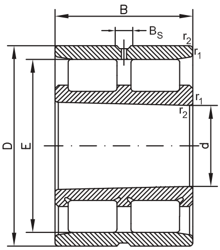
NNU49..W33



NNU49..K..W33



NN30..W33

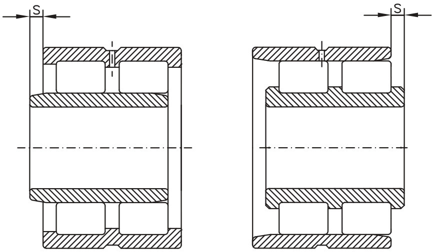


NN30..K..W33

Dimensions				Basical radial load		Speed limit		Designation
d	D	B	r_1, r_2 min.	dyn. C_r	stat. C_{0r}	grease	oil	
mm				kN		min^{-1}		
260	360	100	2,1	750	1700	2000	2600	**NNU4952 MW33**
	360	100	2,1	750	1700	2000	2600	**NNU4952 KMW33**
	400	104	4	1060	2000	1900	2400	**NN3052 MW33**
	400	104	4	1060	2000	1900	2400	**NN3052 KMW33**
280	380	100	2,1	765	1800	1900	2400	**NNU4956 MW33**
	380	100	2,1	765	1800	1900	2400	**NNU4956 KMW33**
	420	106	4	1080	2080	1800	2200	**NN3056 MW33**
	420	106	4	1080	2080	1800	2200	**NN3056 KMW33**
300	420	118	3	1188	2943	1700	2000	**NNU4960 MW33**
	420	118	3	1188	2943	1700	2000	**NNU4960 KMW33**
	460	118	4	1270	2400	1600	1900	**NN3060 MW33**
	460	118	4	1270	2400	1600	1900	**NN3060 KMW33**
320	440	118	3	1060	2550	1600	1900	**NNU4964 KMW33**
	480	121	4	1320	2600	1600	1900	**NN3064 MW33**
380	520	140	4	1705	4620	1100	1300	**NNU4976 MW33**
	520	140	4	1705	4620	1100	1300	**NNU4976 KMW33**
420	560	140	4	1786	5067	1000	1200	**NNU4984 MW33**
	560	140	4	1786	5067	1000	1200	**NNU4984 KMW33**

ART BEARINGS

Double Row Cylindrical Roller Bearings



Bearing dimensions					Mass
d	E	F	B_s	s	
mm					[kg]
260	-	292	15	4	31,3
	-	292	15	4	29,9
	364	-	15	6,5	47,4
	364	-	15	6,5	45,9
280	-	312	15	4	32,7
	-	312	15	4	31,2
	384	-	15	6,75	51,2
	384	-	15	6,75	49,5
300	-	339	17,7	5	52,3
	-	339	17,7	5	50,1
	418	-	17,7	7,45	71,2
	418	-	17,7	7,45	69,1
320	-	359	17,7	5	52,6
	438	-	17,7	7,95	76,8
380	-	426	19,7	5,5	91,9
	-	426	19,7	5,5	88,1
420	-	466	19,7	5,5	96,3
	-	466	19,7	5,5	92,1

Tapered roller bearings

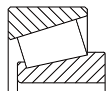
Tapered roller bearings have the rolling elements under the form of a frustum of a cone.

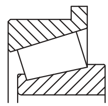
They roll on tapered surfaces which, if it's extended, converge towards a single point on the bearing axis.

The rollers are guided tangentially by the cage and axially by the big rib of the outer ring, on which they have point contact. As between roller and raceways there is linear contact, tapered roller bearings can take heavy radial loads. They can also take heavy axial or combined loads, depending on the contact angle caused by the tapered rolling elements. The contact angle is the angle of the outer raceway generatrix.

Constructive versions for single row tapered roller bearings:

- single row





R

Suffixes

A - increased basic load
B - enlarged contact angle
F - machined cage of hardened steel or special cast iron
F2 - constructive modifications
J - pressed cage of not hardened steel sheet
K - tapered bore 1:12
M - machined brass cage
P6X- tolerance class with smaller values than normal
P5 - tolerance class with smaller values than P6X
P4 - tolerance class with smaller values than P5
P2 - tolerance class with smaller values than P4
R - rib on the outer ring
S0 - operating temperature up to +150ºC
S1 - operating temperature up to +200ºC
TN - polyamide cage
X - modified main dimensions according to ISO

Single row tapered roller bearings

Single row tapered roller bearings are of separable design, i.e. the outer ring and the inner ring with rollers and cage assembly can be separately mounted. These two assemblies are interchangeable.

Tapered roller bearings can be manufactured both in standardized constructive versions with dimensions series 320, 302, 322, 303, 323, 313 and with non-standardized dimensions, mm or inch.

Tapered roller bearings can carry only single direction axial loads. Under pure radial loads, an axial force occurs which is supossed to distance the bearing ring in axial direction.

Therefore, tapered roller bearings are generally pair mounted on both ends of the shaft, in "X" or "O" arrangements, so that the shaft will be axially located in both directions (table 3). Thus, the optimum clearance in these two bearings can be adjusted.

Single row tapered roller bearings can also be manufactured with rib on the outer ring. This design is to be used when the housing cannot be manufactured with shoulder, but only with a passed through bore. In this case, axial location can be provided by the bearing ring.

Permissible values of misalignment between shaft and housing are given in table 1, depending on bearing size and load magnitude.

Tolerances

Tapered roller bearings are generally manufactured

Permisible misalignment Table 1		
Bearings series	**Load magnitude**	**Permisible misalignment**
329, 320, 330, 331, 302, 322, 332, 313, 303	$F_r/C_{0r} < 0,1$ $Fr/C_{0r} > 0,1$	2' 4'
323	$F_r/C_{0r} < 0,1$ $F_r/C_{0r} > 0,1$	1'30" 3'

to the normal tolerance class ISO and AFBMA, respectively (for bearings with inch dimensions).

For certain applications (e.g. bearings for machine-tools), they can be also manufactured to tolerance classes P5 and P6X or 3 AFBMA.

At request, they can be manufactured to tolerance class P4.

Single row tapered roller bearings have the outer rings interchangeable with the inner ring - rollers - cage assembly (if they have the same mark) and also with bearings produced by other companies, according to ISO and AFBMA respectively.

The tolerances for bearings overall dimensions are given in tables on the pages 34-38 for tapered roller bearings, both with metric and inch dimensions. Tolerances for mounting chamfer are given in tables on page 42.

Cages

Small and medium-sized tapered roller bearings are generally fitted with pressed sheet cages. Large sized bearings are generally fitted with machined steel or brass cages, with welded pins. In some cases, median or large sized bearings can also be fitted with machined steel or brass cages. In all cases, the cage is guided on rollers.

For small and medium sized bearings, glass fibre reinforced polyamide 6.6 cages can be successfully used if the operating temperature doesn't exceed +120°C. They have low mass, are noiseless in operation an have low coefficient of friction.

Design and some technical data are given in table 2.

Equivalent dynamic radial load

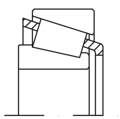
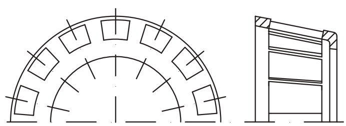
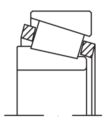
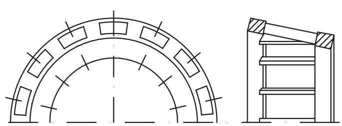
Equivalent dynamic radial load can be calculated using the following equations:

$P_r = F_r$, kN, when $F_a/F_r \leq e$
$P_r = 0,4\ F_r + YF_a$, kN, when $F_a/F_r > e$

Fa values can be calculated using the equations in table 3.

These equations are available when bearings are mounted so that axial clearance is in fact zero without preloading. F_{rA} and F_{rB} should always be considered as being positive, even if they act in the opposite direction to that in the figure.

The values of e, Y are given in bearing tables.

Cage design and some technical data Table 2					
Cage	**Design**		**Application**	**Max. value $D_m n$**	
	bearing	cage		oil	grease
Pressed sheet cage			- General application - Small and medium sized bearings d ≤ 250 mm	$350x10^3$	$245x10^3$
Machined brass cage M			- General application - Median and large sized bearings d > 150 mm	$450x10^3$	$315x10^3$

Equivalent static radial load

Equivalent static radial load can be calculated using the equations:

$P_{0r} = F_r$, kN, when $F_a/F_r \le 1/2\, Y_0$
$P_{0r} = 0{,}5\, F_r + Y_0\, F_a$, kN, when $F_a/F_r > 1/2\, Y_0$

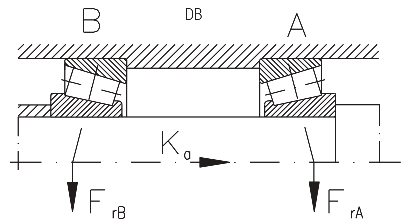
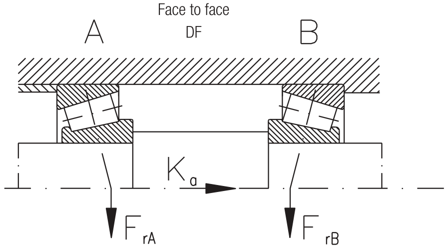
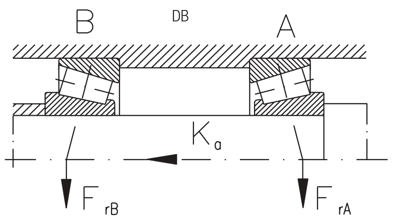
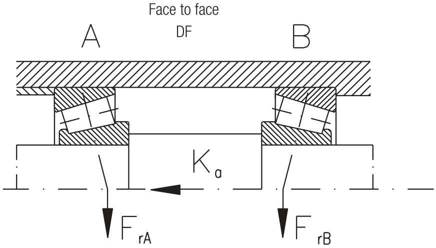
F_a is calculated as in case of equivalent dynamic radial load. The values of Y_0 are given in bearing tables.

Abutment dimensions

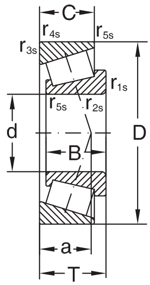
The mounting dimensions of tapered roller bearings are given in the bearings tables, for single row tapered roller bearings. These dimensions are also available for bearings with ribs.

Calculating relations for axial loadings F_a

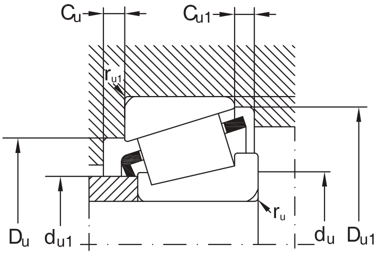
Table 3

	Loading versions	Axial load
Back to back DB  Face to face DF 	1a) $\frac{F_{rA}}{Y_A} \ge \frac{F_{rB}}{Y_B}$ $K_a \ge 0$	$F_{aA} = \frac{0{,}5F_{rA}}{Y_A}$ $F_{aB} = F_{aA} + K_a$
	1b) $\frac{F_{rA}}{Y_A} < \frac{F_{rB}}{Y_B}$ $K_a \ge 0{,}5\left(\frac{F_{rB}}{Y_B} - \frac{F_{rA}}{Y_A}\right)$	$F_{aA} = \frac{0{,}5F_{rA}}{Y_A}$ $F_{aB} = F_{aA} + K_a$
	1c) $\frac{F_{rA}}{Y_A} < \frac{F_{rB}}{Y_B}$ $K_a < 0{,}5\left(\frac{F_{rB}}{Y_B} - \frac{F_{rA}}{Y_A}\right)$	$F_{aA} = F_{aB} - K_a$ $F_{aB} = \frac{0{,}5F_{rB}}{Y_B}$
Back to back DB  Face to face DF 	2a) $\frac{F_{rA}}{Y_A} \le \frac{F_{rB}}{Y_B}$ $K_a \ge 0$	$F_{aA} = F_{aB} + K_a$ $F_{aB} = \frac{0{,}5F_{rB}}{Y_B}$
	2b) $\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$ $K_a \ge 0{,}5\left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	$F_{aA} = F_{aB} + K_a$ $F_{aB} = \frac{0{,}5F_{rB}}{Y_B}$
	2c) $\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$ $K_a < 0{,}5\left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B}\right)$	$F_{aA} = \frac{0{,}5F_{rA}}{Y_A}$ $F_{aB} = F_{aA} - K_a$

Tapered roller bearings, single row

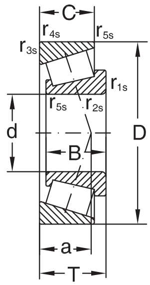


Dimensions									Designation	ISO series	Basic radial load. Factors				
d	D	B	C	T	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	r_5 min.	a			dyn. C_r	e	Y	stat C_{0r}	Y_0
mm											kN	-	-	kN	-
15	35	11	10	11,75	0,6	0,6	0,3	8,2	**30202 A**	-	14,8	0,32	1,9	13,2	1
	42	13	11	14,25	1	1	0,3	9	**30302 A**	2FB	21,5	0,28	2,1	19,8	1,1
17	40	12	11	13,25	1	1	0,3	10	**30203 A**	2DB	18,3	0,35	1,7	19	0,9
	40	16	14	17,25	1	1	0,3	11,2	**32203 A**	2DD	27	0,31	1,9	28	1,1
	47	14	12	15,25	1	1	0,3	10	**30303 A**	2FB	26	0,28	2,1	24,5	1,1
	47	19	16	20,25	1	1	0,3	12	**32303 A**	2FD	34	0,28	2,1	35,5	1,1
20	42	15	12	15	0,6	0,6	0,3	10	**32004 XA**	3CC	26	0,37	1,6	28,5	0,9
	47	14	12	15,25	1	1	0,3	11	**30204 A**	2DB	25,8	0,35	1,7	26,4	0,9
	47	18	15	19,25	1	1	0,3	12,5	**32204 A**	2DD	30	0,33	1,8	35	1
	52	15	13	16,25	1,5	1,5	0,6	11	**30304 A**	2FB	32	0,3	2	32	1,1
	52	21	18	22,25	1,5	1,5	0,6	14	**32304 A**	2FD	42,5	0,3	2	47	1,1
25	47	15	11,5	15	0,6	0,6	0,3	11	**32005 XA**	4CC	26	0,43	1,4	33,5	0,8
	47	17	14	17	0,6	0,6	0,3	11	**33005**	2CE	31	0,29	2,1	38	1,1
	52	15	13	16,25	1	1	0,3	12	**30205 A**	3CC	30,1	0,37	1,6	32,9	0,9
	52	18	15	19,25	1	1	0,3	16	**32205 A**	2CD	31	0,33	1,8	37	1
	52	22	18	22	1	1	0,3	14	**33205**	2DE	48,5	0,35	1,71	58	0,94
	62	17	15	18,25	1,5	1,5	0,6	13	**30305 A**	2FB	43	0,3	2	43	1,1
	62	17	13	18,25	1,5	1,5	0,6	20	**31305 A**	7FB	39	0,83	0,7	41	0,4
	62	24	20	25,25	1,5	1,5	0,6	15	**32305 A**	2FD	58,3	0,3	2	60,3	1,1
30	55	17	13	17	1	1	0,3	13	**32006 XA**	4CC	34	0,43	1,4	45,5	0,8
	55	20	16	20	1	1	0,3	13,1	**33006**	2CE	42	0,29	2,1	54	1,1
	62	16	14	17,25	1	1	0,3	14	**30206 A**	3DB	40,5	0,37	1,6	45,1	0,9
	62	20	17	21,25	1	1	0,3	15	**32206 A**	3DC	49	0,37	1,6	61	0,9
	62	25	19,5	25	1	1	0,3	16	**33206**	2DE	65	0,34	1,76	77	0,97
	72	19	16	20,75	1,5	1,5	0,6	15	**30306 A**	2FB	52,9	0,37	1,9	51,8	1,1
	72	19	14	20,75	1,5	1,5	0,6	22	**31306 A**	7FB	46,5	0,31	0,7	49,5	0,4
	72	27	23	28,75	1,5	1,5	0,6	18	**32306 A**	2FD	75,8	0,83	1,9	82,7	1,1
35	62	18	14	18	1	1	0,3	15	**32007 XA**	4CC	35,9	0,31	1,3	52,4	0,7
	62	21	17	21	1	1	0,3	14,1	**33007**	2CE	49	0,31	2	65	1,1
	72	17	15	18,25	1,5	1,5	0,6	15	**30207 A**	3DB	50,5	0,46	1,6	54,7	0,9
	72	23	19	24,25	1,5	1,5	0,6	17	**32207 A**	3DC	66,2	0,37	1,6	77,5	0,9
	72	28	22	28	1,5	1,5	0,6	18	**33207**	2DE	86	0,35	1,7	105	0,93
	80	21	18	22,75	2	1,5	0,6	16	**30307 A**	2FB	71,2	0,37	1,9	72,5	1,1
	80	21	15	22,75	2	1,5	0,6	25	**31307 A**	7FB	58,1	0,31	0,7	64	0,4
	80	31	25	32,75	2	1,5	0,6	20	**32307 A**	2FE	95,3	0,83	1,9	106	1,1
40	68	19	14,5	19	1	1	0,3	15	**32008 XA**	3CD	48,8	0,31	1,6	65,6	0,9
	68	22	18	22	1	1	0,3	14,6	**33008**	2BE	59	0,28	2,1	81,5	1,2
	75	26	20,5	26	1,5	1,5	0,3	18	**33108**	2CE	79	0,36	1,69	103	0,93
	80	18	16	19,75	1,5	1,5	0,6	16	**30208 A**	3DB	57,9	0,37	1,6	62,4	0,9
	80	23	19	24,75	1,5	1,5	0,6	19	**32208 A**	3DC	66,2	0,37	1,6	79,5	0,9

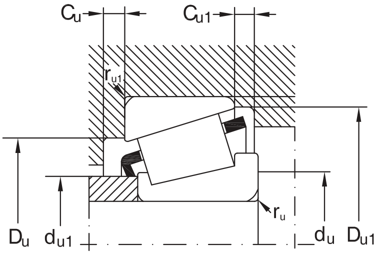


Speed limit		Mass	Mounting dimensions								
grease	oil		d_{u1} max.	d_u min.	D_u min.	D_u max.	D_{u1} min.	C_u min.	C_{u1} min.	r_u max.	r_{u1} max.
min^{-1}		Kg									
11000	15000	0,05	19	23	30	30	33	2	1,5	0,6	0,6
9000	13000	0,09	22	21	36	36	38	2	3	1	1
9000	13000	0,074	23	23	34	34	37	2	2	1	1
9000	13000	0,11	22	26	34	34	37	2	3	1	1
8500	12000	0,13	25	23	40	41	42	2	3	1	1
8000	11000	0,17	24	23	39	41	43	3	4	1	1
8500	12000	0,097	25	25	36	37	39	3	3	0,6	0,6
8000	11000	0,12	27	26	40	41	43	2	3	1	1
8500	11000	0,16	25	29	38	41	44,5	3	4	1	1
8000	11000	0,17	28	27	44	45	47	2	3	1,5	1,5
7500	10000	0,221	27	27	43	45	47	3	4	1,5	1,5
8000	11000	0,113	30	30	40	42	44	3	3,5	0,6	0,6
8000	11000	0,13	29	33	41	42	44	3	3	0,6	0,6
7500	10000	0,15	31	31	44	46	48	2	3	1	1
7500	10000	0,182	31	31	44	46	48	3	4	1	1
7500	10000	0,214	30	31	43	46	49	4	4	1	1
6700	9000	0,25	34	32	54	55	57	2	3	1,5	1,5
5600	7500	0,255	34	32	47	55	59	3	5	1,5	1,5
6000	8000	0,36	33	32	53	55	57	3	5	1,5	1,5
6700	9000	0,017	35	36	48	49	52	3	4	1	1
6700	9000	0,21	35	39	48	49	52	3	4	1	1
6300	8500	0,22	35	36	53	56	57	2	3	1	1
6300	8500	0,28	37	36	52	56	59	3	4	1	1
6300	8500	0,39	36	36	53	56	59	5	5,5	1	1
5600	7500	0,38	37	37	62	65	66	3	4,5	1,5	1,5
5000	6700	0,39	40	37	55	65	68	3	6,5	1,5	1,5
5300	7000	0,55	40	37	59	65	66	4	5,5	1,5	1,5
6000	8000	0,22	39	41	54	56	59	4	4	1	1
6000	8000	0,27	40	44	55	56	59	4	4	1	1
5300	7000	0,32	40	42	62	65	67	3	3	1,5	1,5
5300	7000	0,42	44	42	61	65	67	3	5,5	1,5	1,5
5300	7000	0,58	42	42	61	65	68	5	6	1,5	1,5
5000	6700	0,52	43	44	70	71	74	3	4,5	2	1,5
4500	6000	0,52	45	44	62	71	76	4	7,5	2	1,5
4800	6300	0,73	44	44	66	71	74	4	7,5	2	1,5
5300	7000	0,27	44	46	60	62	65	4	4,5	1	1
5300	7000	0,32	45	49	61	62	65	4	4	1	1
5300	7000	0,54	47	47	65	68	71	4	5,5	1,5	1,5
4800	6300	0,42	46	47	69	73	74	3	3,5	1,5	1,5
4800	6300	0,51	49	47	68	73	75	3	5,5	1,5	1,5

Tapered roller bearings, single row

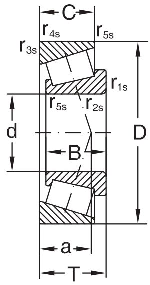


Dimensions									Designation	ISO series	Basic radial load. Factors				
d	D	B	C	T	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	r_5 min.	a			dyn. C_r	e	Y	stat C_{0r}	Y_0
mm											kN	-	-	kN	-
40	80	32	25	32	1,5	1,5	0,6	21	**33208**	2DE	105	0,36	1,68	134	0,92
	90	23	20	25,25	2	1,5	0,6	19	**30308 A**	2FB	83,9	0,37	1,7	91,3	0,9
	90	23	17	25,25	2	1,5	0,6	28	**31308 A**	7FB	74,6	0,83	0,7	60,8	0,4
	90	33	27	35,25	2	1,5	0,6	23	**32308 A**	2FD	105	0,35	1,7	122	0,9
45	75	20	15,5	20	1	1	0,3	16	**32009 XA**	3CC	57	0,4	1,5	82,2	0,8
	75	24	19	24	1	1	0,3	16,3	**33009**	2CE	69	0,29	2	99	1,1
	80	26	20,5	26	1,5	1,5	0,3	19	**33109**	3CE	84	0,38	1,57	115	0,86
	85	19	16	20,75	1,5	1,5	0,6	18	**30209 A**	3DB	60,1	0,4	1,5	67,1	0,8
	85	23	19	24,75	1,5	1,5	0,6	20	**32209 A**	3DC	76,5	0,4	1,5	91,6	0,8
	85	32	25	32	1,5	1,5	0,6	22	**33209**	3DE	107	0,39	1,56	146	0,86
	100	25	22	27,25	2	1,5	0,6	21	**30309 A**	2FB	106	0,35	1,7	118	0,9
	100	25	18	27,25	2	1,5	0,6	31	**31309 A**	7FB	88,9	0,83	0,7	97,1	0,4
	100	36	30	38,25	2	1,5	0,6	25	**32309 A**	2FD	133	0,35	1,7	159	0,9
50	80	20	15,5	20	1	1	0,3	18	**32010 XA**	3CC	58,5	0,43	1,4	88,5	0,8
	80	24	19	24	1	1	0,3	17	**33010**	2CE	75	0,32	1,9	113	1,04
	85	26	20	26	1,5	1,5	0,3	20	**33110**	3CE	86	0,41	1,46	122	0,8
	90	20	17	21,75	1,5	1,5	0,6	19	**30210 A**	3DB	69,7	0,43	1,4	81,3	0,8
	90	23	19	24,75	1,5	1,5	0,6	21	**32210 A**	3DC	79,1	0,43	1,4	95,8	0,8
	90	32	24,5	32	1,5	1,5		23	**33210**	3DE	115	0,41	1,45	163	0,8
	110	27	23	29,25	2,5	2	0,6	23	**30310 A**	2FB	120	0,35	1,7	133	0,9
	110	27	19	29,25	2,5	2	0,6	34	**31310 A**	7FB	102	0,83	0,7	112	0,4
	110	40	33	42,25	2,5	2	0,6	27	**32310 A**	2FD	160	0,35	1,7	194	0,9
55	90	23	17,5	23	1,5	1,5	0,6	20	**32011 XA**	3CC	77	0,4	1,5	117	0,8
	90	27	21	27	1,5	1,5	0,6	19	**33011**	2CE	94	0,31	1,92	142	1,06
	95	30	23	30	1,5	1,5	0,6	22	**33111**	3CE	113	0,37	1,6	163	0,88
	100	21	18	22,75	2	1,5	0,6	20	**30211 A**	3DB	83	0,4	1,5	95,2	0,8
	100	25	21	26,75	2	1,5	0,6	22	**32211 A**	3DC	96,2	0,4	1,5	115	0,8
	100	35	27	35	2	1,5	0,6	26	**33211**	3DE	138	0,4	1,5	194	0,83
	120	29	25	31,5	2,5	2	0,6	24	**30311 A**	2FB	146	0,35	1,7	166	0,9
	120	29	21	31,5	2,5	2	0,6	37	**31311 A**	7FB	118	0,83	0,7	133	0,4
	120	43	35	45,5	2,5	2	0,6	29	**32311 A**	2FD	191	0,35	1,7	235	0,9
60	95	23	17,5	23	1,5	1,5	0,6	21	**32012 XA**	4CC	78,5	0,43	1,4	119	0,8
	95	27	21	27	1,5	1,5	0,6	20	**33012**	2CE	95	0,33	1,83	148	1,01
	100	30	23	30	1,5	1,5	0,6	23	**33112**	3CE	116	0,4	1,51	171	0,83
	110	22	19	23,75	2	1,5	0,6	22	**30212 A**	3EB	91,6	0,4	1,5	105	0,8
	110	28	24	29,75	2	1,5	0,6	24	**32212 A**	3EC	122	0,4	1,5	152	0,8
	110	38	29	38	2	1,5	0,6	28	**33212**	3EE	169	0,4	1,48	237	0,82
	130	31	26	33,5	3	2,5	1	26	**30312 A**	2FB	164	0,35	1,7	187	0,9
	130	31	22	33,5	3	2,5	1	39	**31312 A**	7FB	140	0,83	0,7	158	0,4
	130	46	37	48,5	3	2,5	1	31	**32312 A**	2FD	229	0,35	1,7	288	0,9

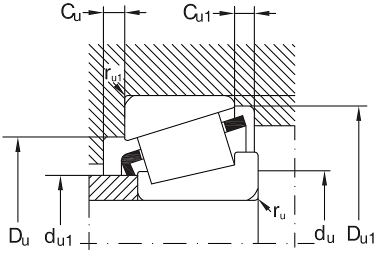


Speed limit		Mass	Mounting dimensions								
grease	oil		d_{u1} max.	d_u min.	D_u min.	D_u max.	D_{u1} min.	C_u min.	C_{u1} min.	r_u max.	r_{u1} max.
min^{-1}		Kg									
4800	6300	0,74	47	47	67	73	76	5	7	1,5	1,5
4500	6000	0,7	48	49	77	81	82	3	5	2	1,5
4000	5300	0,685	52	49	71	81	86	4	8	2	1,5
4000	5300	0,993	51	49	73	81	82	4	8	2	1,5
4800	6300	0,33	50	51	67	69	72	4	4,5	1	1
4800	6300	0,41	51	54	67	69	71	4	5	1	1
4800	6300	0,597	52	52	69	73	77	4	5,5	1,5	1,5
4500	6000	0,47	51	52	74	78	80	3	4,5	1,5	1,5
4500	6000	0,56	54	52	73	78	80	3	5,5	1,5	1,5
4500	6000	0,89	52	52	72	78	81	5	7	1,5	1,5
4000	5300	0,92	53	54	86	91	92	3	5	2	1,5
3400	4500	0,915	59	54	79	91	95	4	9	2	1,5
3600	4800	1,25	56	54	82	91	93	4	8	2	1,5
4500	6000	0,36	56	56	72	74	77	4	4,5	1	1
4500	6000	0,47	56	56	72	74	76	4	5	1	1
4300	5600	0,6	56	57	74	78	82	4	6	1,5	1,5
4300	5600	0,53	58	57	79	83	85	3	4,5	1,5	1,5
4300	5600	0,6	58	57	78	83	85	3	5,5	1,5	1,5
4300	5600	0,97	57	57	77	83	87	5	7,5	1,5	1,5
3600	4800	1,19	65	60	95	100	102	4	6	2,5	2
3200	4300	1,16	62	60	87	100	104	4	10	2,5	2
3200	4300	1,83	62	60	90	100	102	5	9	2,5	2
4000	5300	0,54	63	62	81	83	86	4	5,5	1,5	1,5
4000	5300	0,67	63	62	81	83	86	5	6	1,5	1,5
3800	5000	0,89	62	62	83	88	91	5	7	1,5	1,5
3800	5000	0,69	64	64	88	91	94	4	4,5	1,5	1,5
3800	5000	0,82	63	64	87	91	95	4	5,5	1,5	1,5
3800	5000	1,17	62	64	85	91	96	6	8	2	1,5
3200	4300	1,53	71	65	104	110	111	4	6,5	2	2
2800	3800	1,49	68	65	94	110	113	4	10,5	2	2
3000	4000	2,21	68	65	99	110	111	5	10,5	2	2
3800	5000	0,58	67	67	85	88	91	4	5,5	1,5	1,5
3800	5000	0,71	67	67	85	88	90	5	6	1,5	1,5
3400	4500	1,01	67	67	88	93	96	5	7	1,5	1,5
3400	4500	0,86	70	69	96	101	103	4	4,5	2	1,5
3400	4500	1,1	69	69	95	101	104	4	5,5	2	1,5
3400	4500	1,55	69	69	93	101	105	6	9	2	1,5
3000	4000	1,9	77	72	112	118	120	5	7,5	3	2,5
2600	3600	1,83	73	72	103	118	123	5	11,5	3	2,5
2600	3600	2,8	74	72	107	118	120	6	11,5	3	2,5

Tapered roller bearings, single row



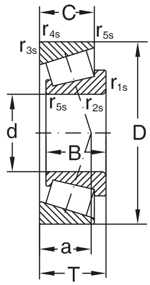
Dimensions									Designation	ISO series	Basic radial load. Factors				
d	D	B	C	T	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	r_5 min.	a			dyn. C_r	e	Y	stat C_{0r}	Y_0
mm											kN	-	-	kN	-
65	100	23	17,5	23	1,5	1,5	0,6	22	**32013 XA**	4CC	80,6	0,46	1,3	123	0,7
	100	27	21	27	1,5	1,5	0,6	21	**33013**	2CE	100	0,35	1,72	161	0,95
	110	34	26,5	34	1,5	1,5	0,6	26	**33113**	3DE	149	0,39	1,55	225	0,85
	120	23	20	24,75	2	1,5	0,6	23	**30213 A**	3EB	111	0,4	1,5	129	0,8
	120	31	27	32,75	2	1,5	0,6	27	**32213 A**	3EC	149	0,4	1,5	189	0,8
	120	41	32	41	2	1,5	0,6	30	**33213**	3EE	203	0,39	1,54	285	0,85
	140	33	28	36	3	2,5	1	28	**30313 A**	2GB	191	0,35	1,7	220	0,9
	140	33	23	36	3	2,5	1	42	**31313 A**	7GB	164	0,83	0,7	189	0,4
	140	48	39	51	3	2,5	1	33	**32313 A**	2GO	256	0,35	1,7	322	0,9
70	110	25	19	25	1,5	1,5	0,6	23	**32014 XA**	4CC	95,6	0,43	1,4	143	0,8
	110	31	25,5	31	1,5	1,5	0,6	22	**33014**	2CE	136	0,28	2,11	223	1,16
	120	37	29	37	2	1,5	0,6	28	**33114**	3DE	174	0,38	1,58	260	0,87
	125	24	21	26,25	2	1,5	0,6	25	**30214 A**	3EB	119	0,43	1,4	143	0,8
	125	31	27	33,25	2	1,5	0,6	28	**32214 A**	3EC	157	0,43	1,4	204	0,8
	125	41	32	41	2	1,5	0,6	31	**33214**	3EE	210	0,41	1,47	300	0,81
	150	35	30	38	3	2,5	1	29	**30314 A**	2GB	224	0,35	1,7	264	0,9
	150	35	25	38	3	2,5	1	45	**31314 A**	7GB	185	0,83	0,7	215	0,4
	150	51	42	54	3	2,5	1	36	**32314 A**	2GD	297	0,35	1,7	381	0,9
75	115	25	19	25	1,5	1,5	0,6	25	**32015 XA**	4CC	97,3	0,46	1,3	149	0,7
	115	31	25,5	31	1,5	1,5	0,6	23	**33015**	2CE	139	0,3	2,01	232	1,11
	125	37	29	37	2	1,5	0,6	30	**33115**	3DE	178	0,4	1,51	275	0,83
	130	25	22	27,25	2	1,5	0,6	27	**30215 A**	4DB	134	0,43	1,4	166	0,8
	130	31	27	33,25	2	1,5	0,6	29	**32215 A**	4DC	157	0,43	1,4	205	0,8
	130	41	31	41	2	1,5	0,6	32	**33215**	3EE	206	0,43	1,4	310	0,77
	160	37	31	40	3	2,5	1	31	**30315 A**	2GB	246	0,35	1,7	289	0,9
	160	37	26	40	3	2,5	1	48	**31315 A**	7GB	213	0,83	0,7	251	0,4
	160	55	45	58	3	2,5	1	38	**32315 A**	2GD	350	0,35	1,7	460	0,9
80	125	29	22	29	1,5	1,5	0,6	27	**32016 XA**	3CC	130	0,43	1,4	198	0,8
	125	36	29,5	36	1,5	1,5	0,6	26	**33016**	2CE	175	0,28	2,16	290	1,19
	130	37	29	37	2	1,5	0,6	31	**33116**	3DE	188	0,42	1,44	300	0,79
	140	26	22	28,25	2,5	2	0,6	28	**30216 A**	3EB	145	0,43	1,4	177	0,8
	140	33	28	35,25	2,5	2	0,6	30	**32216 A**	3EC	180	0,43	1,4	232	0,8
	140	46	35	46	2,5	2	0,6	35	**33216**	3EE	250	0,43	1,41	380	0,78
	170	39	33	42,5	3	2,5	1	33	**30316 A**	2GB	277	0,35	1,7	329	0,9
	170	39	27	42,5	3	2,5	1	52	**31316 A**	7GB	222	0,83	0,7	275	0,4
	170	58	48	61,5	3	2,5	1	41	**32316 A**	2GD	383	0,35	1,7	503	0,9
85	130	29	22	29	1,5	1,5	0,6	28	**32017 XA**	4CC	136	0,44	1,4	213	0,8
	130	36	29,5	36	1,5	1,5	0,6	26	**33017**	2CE	184	0,29	2,06	315	1,13
	140	41	32	41	2,5	2	0,6	33	**33117**	3DE	221	0,41	1,48	350	0,81
	150	28	24	30,5	2,5	2	0,6	30	**30217 A**	3EB	167	0,43	1,4	206	0,8



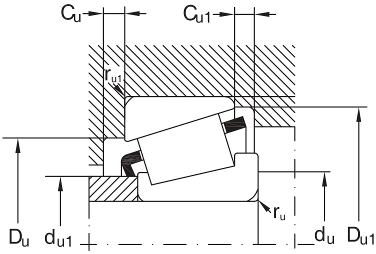
Speed limit		Mass	Mounting dimensions								
grease	oil		d_{u1} max.	d_u min.	D_u min.	D_u max.	D_{u1} min.	C_u min.	C_{u1} min.	r_u max.	r_{u1} max.
min^{-1}		Kg									
3400	4500	0,62	72	72	90	93	97	4	5,5	1,5	1,5
3400	4500	0,76	72	72	89	93	96	5	6	1,5	1,5
3000	4000	1,31	73	72	96	103	106	6	7,5	1,5	1,5
3000	4000	1,1	77	74	106	111	113	4	4,5	2	1,5
3000	4000	1,48	76	74	104	111	115	4	5,5	2	1,5
3000	4000	2,02	74	74	102	111	115	6	9	2	1,5
2600	3600	2,3	83	77	122	128	130	5	8	3	2,5
2200	3200	2,25	79	77	111	128	132	5	13	3	2,5
2400	3400	3,49	80	77	117	128	130	6	12	3	2,5
3200	4300	0,83	78	77	98	103	105	5	6	1,5	1,5
3200	4300	1,14	78	77	99	103	105	5	5,5	1,5	1,5
3000	4000	1,71	79	79	104	111	115	6	8	2	1,5
3000	4000	1,22	81	79	110	116	118	4	5	2	1,5
2800	3800	1,56	80	79	108	116	119	4	6	2	1,5
2800	3800	2,06	79	79	107	116	120	7	9	2	1,5
2400	3400	3	89	82	130	138	140	5	8	3	2,5
2000	3000	2,82	84	82	118	138	141	5	13	3	2,5
2200	3200	4,1	86	82	125	138	140	6	12	3	2,5
3000	4000	0,88	83	82	103	108	110	5	6	1,5	1,5
3000	4000	1,16	83	82	104	108	110	6	5,5	1,5	1,5
2800	3800	1,79	84	84	109	116	120	6	8	2	1,5
2800	3800	1,33	86	84	115	121	124	4	5	2	1,5
2600	3600	2,62	85	84	115	121	124	4	6	2	1,5
2600	3600	2,47	83	84	111	121	125	7	10	2	1,5
2600	3600	3,4	95	87	139	148	149	5	9	3	2,5
1900	2800	3,5	91	87	127	148	151	6	14	3	2,5
2000	3000	5	91	87	133	148	149	7	13	3	2,5
2600	3600	1,24	89	87	112	117	120	6	7	1,5	1,5
2600	3600	1,67	90	87	112	117	119	6	6,5	1,5	1,5
2400	3400	1,9	89	89	114	121	126	6	8	2	1,5
2400	3400	1,59	91	90	124	130	132	4	6	2,5	2
2400	3400	2	90	90	122	130	134	5	7	2,5	2
2400	3400	2,93	89	90	119	130	135	7	11	2,5	2
2000	3000	4	102	92	148	158	159	5	9,5	3	2,5
1900	2800	4,07	97	92	134	158	159	6	15,5	3	2,5
1900	2800	5,9	98	92	142	158	159	7	13,5	3	2,5
2400	3400	1,3	94	92	117	122	125	6	7	1,5	1,5
2400	3400	1,75	94	92	118	122	125	6	6,5	1,5	1,5
2200	3200	2,38	95	95	122	130	135	7	9	2,5	2
2200	3200	2	97	95	132	140	141	5	6,5	2,5	2

ART BEARINGS

Tapered roller bearings, single row

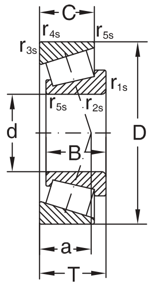


Dimensions									Designation	ISO series	Basic radial load. Factors				
d	D	B	C	T	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	r_5 min.	a			dyn. C_r	e	Y	stat C_{0r}	Y_0
mm											kN	-	-	kN	-
85	150	36	30	38,5	2,5	2	0,6	33	**32217 A**	3EC	213	0,43	1,4	283	0,8
	150	49	37	49	2,5	2	0,6	37	**33217**	3EE	295	0,42	1,43	435	0,79
	180	41	34	44,5	4	3	1	35	**30317 A**	2GB	298	0,35	1,7	354	0,9
	180	41	28	44,5	4	3	1	55	**31317 A**	7GB	245	0,83	0,7	298	0,4
	180	60	49	63,5	4	3	1	42	**32317 A**	2GD	400	0,35	1,7	555	0,9
90	140	32	24	32	2	1,5	0,6	30	**32018 XA**	3CC	159	0,43	1,4	246	0,8
	140	39	32,5	39	2	1,5	0,6	28	**33018**	2CE	216	0,27	2,23	365	1,23
	150	45	35	45	2,5	2	0,6	36	**33118**	3DE	265	0,4	1,51	420	0,83
	160	30	26	32,5	2,5	2	0,6	31	**30218 A**	3FB	190	0,43	1,4	238	0,8
	160	40	34	42,5	2,5	2	0,6	36	**32218 A**	3FC	251	0,43	1,4	340	0,8
	190	43	36	46,5	4	3	1	36	**30318 A**	2GB	328	0,35	1,7	394	0,9
	190	43	30	46,5	4	3	1	57	**31318 A**	7GB	270	0,83	0,7	330	0,4
	190	64	53	67,5	4	3	1	44	**32318 A**	2GD	461	0,35	1,7	612	0,9
95	145	32	24	32	2	1,5	0,6	31	**32019 XA**	4CC	163	0,44	1,4	257	0,8
	145	39	32,5	39	2	1,5	0,6	29	**33019**	2CE	221	0,28	2,16	380	1,19
	170	32	27	34,5	3	2,5	1	33	**30219 A**	2FB	210	0,43	1,4	264	0,8
	170	43	37	45,5	3	2,5	1	39	**32219 A**	3FC	281	0,43	1,4	390	0,8
	200	45	38	49,5	4	3	1	39	**30319 A**	2GB	350	0,35	1,7	449	0,9
	200	45	32	49,5	4	3	1	60	**31319 A**	7GB	300	0,83	0,7	365	0,4
	200	67	55	71,5	4	3	1	47	**32319 A**	2GD	500	0,35	1,7	670	0,9
100	150	32	24	32	2	1,5	0,6	32	**32020 XA**	4CC	171	0,46	1,3	277	0,7
	150	39	32,5	39	2	1,5	0,6	29	**33020**	2CE	225	0,29	2,09	395	1,15
	180	34	29	37	3	2,5	1	35	**30220 A**	3FB	238	0,43	1,4	303	0,8
	180	46	39	49	3	2,5	1	41	**32220 A**	3FC	320	0,43	1,4	444	0,8
	180	63	48	63	3	2,5	1	46	**33220**	3FE	430	0,4	1,48	660	0,82
	215	47	39	51,5	4	2	1	40	**30320 A**	2GB	404	0,35	1,7	492	0,9
	215	73	60	77,5	4	3	1	53	**32320 A**	2GD	578	0,35	1,7	780	0,9
105	160	35	26	35	2,5	2	0,6	34	**32021 XA**	4DC	204	0,44	1,4	334	0,8
	160	43	34	43	2,5	2	0,6	31	**33021**	2DE	265	0,28	2,12	450	1,17
	190	36	30	39	3	2,5	1	37	**30221 A**	3FB	270	0,43	1,4	350	0,8
	190	50	43	53	3	2,5	1	44	**32221 A**	3FC	358	0,43	1,4	510	0,8
	225	77	63	81,5	4	3	1	53	**32321 A**	2GD	405	0,35	1,7	815	0,9
110	170	38	29	38	2,5	2	0,6	36	**32022 XA**	4DC	235	0,43	1,4	382	0,8
	170	47	37	47	2,5	2	0,6	33	**33022**	2DE	295	0,29	2,09	520	1,15
	180	56	43	56	2,5	2	0,6	44	**33122**	3EE	370	0,42	1,43	630	0,79
	200	38	32	41	3	2,5	1	39	**30222 A**	3FB	304	0,43	1,4	396	0,8
	200	53	46	56	3	2,5	1	46	**32222 A**	3FC	406	0,43	1,4	580	0,8
	240	50	42	54,5	4	3	1	43	**30322 A**	2GB	479	0,35	1,7	588	0,9
	240	80	65	84,5	4	3	1	55	**32322 A**	2GD	699	0,35	1,7	956	0,9
120	180	38	29	38	2,5	2	0,6	39	**32024 XA**	4DC	238	0,46	1,3	397	0,7

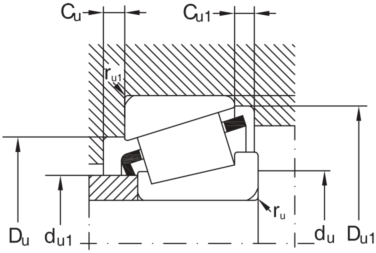


Speed limit		Mass	Mounting dimensions								
grease	oil		d_{u1} max.	d_u min.	D_u min.	D_u max.	D_{u1} min.	C_u min.	C_{u1} min.	r_u max.	r_{u1} max.
min^{-1}		Kg									
2200	3200	2,5	96	95	130	140	142	5	8,5	2,5	2
2200	3200	3,58	95	95	128	140	144	7	12	2,5	2
1900	2800	4,7	107	99	156	166	167	6	10,5	4	3
1800	2600	5,08	103	99	143	166	169	6	16,5	4	3
1800	2600	6,85	103	99	150	166	167	8	14,5	4	3
2200	3200	1,7	100	99	125	131	134	6	8	2	1,5
2200	3200	2,48	100	99	127	131	135	7	6,5	2	1,5
2200	3000	3,19	100	100	130	140	144	7	10	2,5	2
2200	3000	2,49	103	100	140	150	150	5	6,5	2,5	2
2000	3000	3,3	102	100	138	150	152	5	8,5	2,5	2
1700	2400	5,5	113	104	165	176	176	6	10,5	4	3
1700	2400	5,92	109	104	151	176	179	6	16,5	4	3
1700	2400	8,21	108	104	157	176	177	8	14,5	4	3
2200	3200	1,8	105	104	130	136	140	6	8	2	1,5
2200	3200	2,33	104	104	131	136	139	7	6,5	2	1,5
1900	2800	2,96	110	107	149	158	159	5	7,5	3	2,5
1900	2800	4	108	107	145	158	161	5	8,5	3	2,5
1800	2600	6,7	118	109	172	186	184	6	11,5	4	3
1700	2400	6,95	114	109	157	186	187	6	17,5	4	3
1700	2400	11	115	109	166	186	186	8	16,5	4	3
2000	3000	1,85	109	109	134	141	144	6	8	2	1,5
2000	3000	2,42	108	109	135	141	143	7	6,5	2	1,5
1900	2800	3,54	116	112	157	168	168	5	8	3	2,5
1800	2600	4,76	114	112	154	168	171	5	10	3	2,5
1800	2600	6,77	112	112	151	168	172	10	15	3	2,5
1700	2400	7,9	127	114	184	201	197	6	12,5	4	3
1600	2200	14	123	114	177	201	200	8	17,5	4	3
1900	2800	2,42	116	115	143	150	154	6	9	2,5	2
1900	2800	3,34	116	115	145	150	153	7	9	2,5	2
1800	2600	4,26	122	117	165	178	177	6	9	3	2,5
1800	2600	5,9	120	117	161	178	180	5	10	3	2,5
1500	2000	14,5	128	119	185	211	209	9	18,5	4	3
1800	2600	3,06	122	120	152	160	163	7	9	2,5	2
1800	2600	4,16	123	120	152	160	161	7	10	2,5	2
1700	2400	5,54	121	120	155	170	174	9	13	2,5	2
1700	2400	5	129	122	174	188	187	6	9	3	2,5
1700	2400	6,9	126	122	170	188	190	6	10	3	2,5
1600	2200	12,5	141	124	206	226	220	8	12,5	4	3
1400	1900	16,4	137	124	198	226	222	9	19,5	4	3
1700	2400	3,25	131	130	161	170	173	7	9	2,5	2

Tapered roller bearings, single row



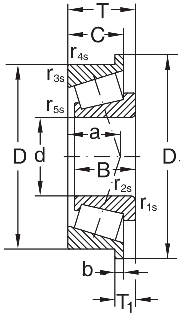
Dimensions									Designation	ISO series	Basic radial load. Factors				
d	D	B	C	T	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	r_5 min.	a			dyn. C_r	e	Y	stat C_{0r}	Y_0
mm											kN	-	-	kN	-
120	180	48	38	48	2,5	2	0,6	36	**33024**	2DE	310	0,31	1,97	560	1,08
	215	40	34	43,5	3	2,5	1	43	**30224 A**	4FB	340	0,43	1,4	459	0,8
	215	58	50	61,5	3	2,5	1	51	**32224 A**	4FD	446	0,43	1,4	653	0,8
	260	55	46	59,5	4	3	1	47	**30324 A**	2GB	568	0,35	1,7	712	0,9
	260	86	69	90,5	4	3	1	60	**32324 A**	2GD	799	0,35	1,7	1104	0,9
130	200	45	34	45	2,5	2	0,6	42	**32026 XA**	4EC	315	0,43	1,4	526	0,8
	230	40	34	43,75	4	3	1	45	**30226 A**	4FB	367	0,43	1,4	485	0,8
	230	64	54	67,75	4	3	1	56	**32226 A**	4FD	551	0,43	1,4	836	0,8
	280	58	49	63,75	5	4	1,5	51	**30326 A**	2GB	640	0,35	1,7	820	0,9
	280	66	44	72	5	4	1,5	87	**31326 XA**	7GB	597	0,83	0,7	761	0,4
	280	93	78	98,75	5	4	1,5	66	**32326 A**	-	947	0,35	1,7	1333	0,9
140	210	45	34	45	2,5	2	0,6	46	**32028 XA**	4DC	312	0,46	1,3	529	0,7
	250	42	36	45,75	4	3	1	47	**30228 A**	4FB	396	0,43	1,4	527	0,8
	250	68	58	71,75	4	3	1	60	**32228 A**	4FD	602	0,43	1,4	907	0,8
	300	70	47	77	5	4	1,5	90	**31328 XA**	7GB	714	0,83	0,7	935	0,4
150	225	48	36	48	3	2,5	1	49	**32030 XA**	4EC	355	0,46	1,3	620	0,7
	225	59	46	59	3	2,5	1	48	**33030**	2EE	465	0,36	1,65	880	0,9
	270	45	38	49	4	3	1	50	**30230 A**	4GB	457	0,43	1,4	618	0,8
	270	73	60	77	4	3	1	64	**32230 A**	4GD	705	0,43	1,4	1080	0,8
160	240	51	38	51	3	2,5	1	52	**32032 XA**	4EC	402	0,46	1,3	696	0,7
	290	48	40	52	4	3	1	54	**30232 A**	4GB	520	0,43	1,4	710	0,8
	290	80	67	84	4	3	1	70	**32232 A**	4GD	840	0,43	1,4	1400	0,8
170	230	38	30	38	2,5	2	0,6	42	**32934 A**	3DC	280	0,37	1,6	572	0,9
	260	57	43	57	3	2,5	1	56	**32034 XA**	4EC	480	0,44	1,4	865	0,8
	310	52	43	57	5	4	1,5	58	**30234 A**	4GB	610	0,43	1,4	844	0,8
	310	86	71	91	5	4	1,5	75	**32234 A**	4GD	889	0,43	1,4	1377	0,8
180	250	45	34	45	2,5	2	0,6	53	**32936 A**	4DC	350	0,48	1,3	727	0,7
	280	64	48	64	3	2,5	1	59	**32036 XA**	3FD	599	0,43	1,4	1037	0,8
	320	52	43	57	5	4	1,5	61	**30236 A**	4GB	584	0,46	1,3	825	0,7
	320	86	71	91	5	4	1,5	78	**32236 A**	4GD	974	0,46	1,3	1571	0,7
190	260	45	34	45	2,5	2	0,6	55	**32938 A**	4DC	358	0,48	1,3	772	0,7
	290	64	48	64	3	2,5	1	62	**32038 XA**	4FD	609	0,44	1,4	1077	0,8
	340	92	75	97	5	4	1,5	81	**32238 A**	4GD	1080	0,43	1,4	1860	8
200	280	51	39	51	3	2,5	1	53	**32940 A**	3EC	474	0,4	1,5	950	0,8
	310	70	53	70	3	2,5	1	66	**32040 XA**	4FD	716	0,43	1,4	1356	0,8
	310	70	53	70	3	2,5	1	66	**T32040 X**	4FD	716	0,43	1,4	1356	0,8
	310	70	53	70	3	2,5	1	66	**T32040 XP5**	4FD	716	0,43	1,4	1356	0,8
	360	98	82	104	5	4	1,5	83	**32240 A**	3GD	1220	0,4	1,5	2020	0,8
220	300	51	39	51	3	2,5	1	58	**32944 M**	3EC	407	0,43	1,4	827	0,8
	340	76	57	76	4	3	1	72	**32044 XA**	4FD	850	0,43	1,4	1537	0,8



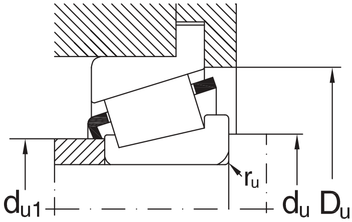
Speed limit		Mass	Mounting dimensions								
grease	oil		d_{u1} max.	d_u min.	D_u min.	D_u max.	D_{u1} min.	C_u min.	C_{u1} min.	r_u max.	r_{u1} max.
min^{-1}		Kg									
1700	2400	4,55	132	130	160	170	171	6	10	2,5	2
1600	2200	6,01	140	132	187	203	201	6	9,5	3	2,5
1600	2200	8,59	136	132	181	203	204	7	11,5	3	2,5
1500	2000	13,6	152	134	221	246	237	10	13,5	4	3
1300	1800	24,5	148	134	213	246	239	9	21,5	4	3
1600	2200	4,93	144	140	178	190	192	8	11	2,5	2
1500	2000	7,6	152	144	203	216	217	7	9,5	4	3
1500	2000	10,7	146	144	193	216	219	7	13,5	4	3
1300	1800	19,5	164	148	239	262	255	8	14,5	5	4
1200	1700	18,6	157	148	218	262	261	9	28	5	4
1100	1600	27,6	160	148	230	262	260	10	20,5	5	4
1600	2200	5,23	153	150	187	200	202	8	11	2,5	2
1400	1900	8,5	163	154	219	236	234	9	9,5	4	3
1400	1900	13,9	159	154	210	236	238	8	13,5	4	3
1200	1700	23,9	169	158	235	282	280	9	30	5	4
1500	2000	6,35	164	162	200	213	216	8	12	3	2,5
1500	2000	8,23	164	162	200	213	217	8	13	3	2,5
1300	1800	10,7	175	164	234	256	250	9	11	4	3
1200	1700	17,9	171	164	226	256	254	8	17	4	3
1300	1800	7,75	175	172	213	228	231	8	13	3	2,5
1100	1600	13,6	189	174	252	276	269	9	12	4	3
1100	1600	25,5	183	174	242	276	274	10	17	4	3
1400	1900	4,5	183	180	213	220	222	7	8	2,5	2
1200	1700	10,5	187	182	230	248	249	10	14	3	2,5
1000	1500	19	203	188	269	292	288	8	14	5	4
1000	1500	29,3	196	188	259	292	294	10	20	5	4
1200	1700	6,65	193	190	225	240	241	8	11	2,5	2
1100	1600	14,5	199	192	247	268	267	10	16	3	2,5
1000	1500	20	211	198	278	302	297	9	14	5	4
950	1400	27,4	204	198	267	302	303	10	20	5	4
1100	1600	7	204	200	235	249	251	8	11	2,5	2
1000	1500	15	209	202	257	278	279	10	16	3	2,5
900	1300	39,5	216	207	286	322	323	10	22	5	4
1000	1500	9,5	216	212	257	268	271	9	12	3	2,5
950	1400	19,5	221	212	273	298	297	11	17	3	2,5
950	1400	19,5	221	212	273	298	297	11	17	3	2,5
950	1400	19,5	221	212	273	298	297	11	17	3	2,5
900	1300	33	226	217	302	342	340	11	22	5	4
950	1400	11,2	234	232	275	288	290	9	12	3	2,5
900	1300	25,5	243	234	300	326	326	12	19	4	3

ART BEARINGS

Tapered roller bearings with flanged outer ring



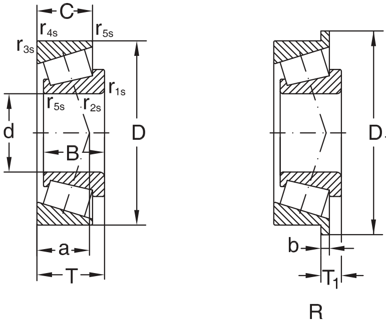
Dimensions												Designation
d	D	B	C	T	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	r_5 min.	T_1	D_1	C_1	a	
mm												
20	47	14	12	15,25	1	1	0,3	6,25	51	3	11	**30204 AR**
25	52	15	13	16,25	1	1	0,3	6,75	57	3,5	12	**30205 AR**
30	62	16	14	17,25	1	1	0,3	6,75	67	3,5	14	**30206 AR**
	62	20	17	21,25	1	1	0,3	8,25	67	4	15	**32206 AR**
	72	19	16	20,75	1,5	1,5	0,6	8,75	77	4	15	**30306 AR**
	72	27	23	28,75	1,5	1,5	0,6	11,75	77	6	18	**32306 AR**
35	72	17	15	18,25	1,5	1,5	0,6	7,25	77	4	15	**30207 AR**
	72	23	19	24,75	1,5	1,5	0,6	10,25	77	4,5	17	**32207 AR**
	80	21	18	22,75	2	1,5	0,6	8,25	85	4,5	16	**30307 AR**
	80	31	25	32,75	2	1,5	0,6	13,75	85	6	20	**32307 AR**
40	80	18	16	19,75	1,5	1,5	0,6	7,75	85	4	16	**30208 AR**
	80	23	19	24,75	1,5	1,5	0,6	10,25	85	4,5	19	**32208 AR**
	90	23	20	25,25	2	1,5	0,6	9,75	95	4,5	19	**30308 AR**
	90	33	27	35,25	2	1,5	0,6	14,25	95	6	23	**32308 AR**
45	85	19	16	20,75	1,5	1,5	0,6	8,75	90	4	18	**30209 AR**
	85	23	19	24,75	1,5	1,5	0,6	10,25	90	4,5	20	**32209 AR**
	100	25	22	27,25	2	1,5	0,6	10,25	106	5	21	**30309 AR**
	100	36	30	38,25	2	1,5	0,6	15,25	106	7	25	**32309 AR**
50	90	20	17	21,75	1,5	1,5	0,6	8,75	95	4	19	**30210 AR**
	90	23	19	24,75	1,5	1,5	0,6	10,25	95	4,5	21	**32210 AR**
	110	27	23	29,25	2,5	2	0,6	11,25	116	5	23	**30310 AR**
	110	40	33	42,25	2,5	2	0,6	17,25	116	8	28	**32310 AR**
55	100	21	18	22,75	2	1,5	0,6	9,25	106	4,5	20	**30211 AR**
	100	25	21	26,75	2	1,5	0,6	10,75	106	5	22	**32211 AR**
	120	43	35	45,5	2,5	2	0,6	18,5	127	8	29	**32311 AR**
60	110	22	19	23,75	2	1,5	0,6	9,25	116	4,5	22	**30212 AR**
	110	28	24	29,75	2	1,5	0,6	10,75	116	5	24	**32212 AR**
	130	46	37	48,5	3	2,5	1	19,5	137	8	31	**32312 AR**
65	120	23	20	24,75	2	1,5	0,6	9,25	127	4,5	23	**30213 AR**
	120	31	27	32,75	2	1,5	0,6	11,75	127	6	26	**32213 AR**
70	125	24	21	26,25	2	1,5	0,6	10,25	132	5	25	**30214 AR**
	125	31	27	33,25	2	1,5	0,6	12,25	132	6	28	**32214 AR**



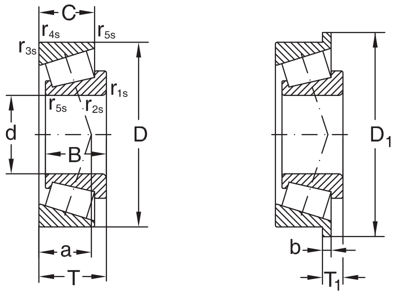
ISO series	Basic radial load. Factors					Speed limit		Mass	Mounting dimensions			
	dyn. C_r	e	Y	stat C_{0r}	Y_0	grease	oil		d_{u1} max.	d_u min.	D_u min.	r_u max.
	kN	-	-	kN	-	min^{-1}		Kg				
2DB	26	0,35	1,7	29	0,9	8000	11000	0,127	27	26	43	1
3CC	29,5	0,37	1,6	36	0,9	7500	10000	0,161	31	31	48	1
3DB	38	0,37	1,6	48	0,9	6300	8500	0,233	37	36	57	1
3DC	47,5	0,37	1,6	65	0,9	6300	8500	0,29	37	36	59	1
2FB	53	0,31	1,9	65	1,1	5600	7500	0,398	39	37	66	1,5
2FD	72,3	0,31	1,9	97	1,1	5600	7000	0,577	40	37	66	1,5
3DB	49,4	0,37	1,6	58	0,9	5300	7000	0,338	44	42	67	1,5
3DC	61,6	0,37	1,6	80	0,9	5300	7000	0,422	43	42	67	1,5
2FB	68,2	0,31	1,9	83	1,1	5000	6700	0,543	45	44	74	2
2FE	88,2	0,31	1,9	120	1,1	4800	6300	0,76	44	44	74	2
3DB	58,5	0,37	1,6	70	0,9	4800	6300	0,44	49	47	74	1,5
3DC	71	0,37	1,6	95	0,9	4800	6300	0,533	48	47	75	1,5
2FB	81	0,35	1,7	105	0,9	4500	6000	0,725	52	49	82	2
2FD	110	0,35	1,7	156	0,9	4000	5300	1,027	50	49	82	2
3DB	63	0,4	1,5	83	0,8	4500	6000	0,491	54	52	80	1,5
3DC	75	0,4	1,5	103	0,8	4500	6000	0,584	53	52	80	1,5
2FB	101	0,35	1,7	130	0,9	4000	5300	0,958	59	54	92	2
2FD	132	0,35	1,7	188	0,9	3600	4800	1,3	56	54	93	2
3DB	70,5	0,43	1,4	95	0,8	4300	5600	0,552	58	57	85	1,5
3DC	76,5	0,43	1,4	106	0,8	4300	5600	0,625	58	57	85	1,5
2FB	120	0,35	1,7	156	0,9	3600	4800	1,23	65	60	102	2,5
2FD	165	0,35	1,7	239	0,9	3200	4300	1,89	62	60	102	2,5
3DB	84,5	0,4	1,5	112	0,8	3800	5000	0,724	64	64	94	1,5
3DC	99	0,4	1,5	138	0,8	3800	5000	0,858	63	64	95	1,5
2FD	187	0,35	1,7	276	0,9	3000	4000	2,29	68	65	111	2
2EB	91,5	0,4	1,5	122	0,8	3400	4500	0,897	70	69	103	2
2EC	120	0,4	1,5	170	0,8	3400	4500	1,14	69	69	104	2
2FD	216	0,35	1,7	318	0,9	2600	3600	1,92	74	72	120	3
3EB	110	0,4	1,5	147	0,8	3000	4000	1,14	77	74	113	2
3EC	142	0,4	1,5	206	0,8	3000	4000	1,54	76	74	115	2
3EB	120	0,43	1,4	163	0,8	3000	4000	1,27	81	79	118	2
3EC	150	0,43	1,4	220	0,8	2800	3800	1,62	80	79	119	2

Tapered roller bearings, single row

inch dimensions



d	D	B	C	T / T_1	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	D_1	a	Designation
mm									
11,112	34,988	10,988	8,730	10,998	1,3	1,3		9	**A4044/A4138**
12,700	34,988	10,988	8,730	10,998	1,3	1,3		9	**A4050/A4138**
14,989	34,988	10,988	8,730	10,998	0,8	1,3		9	**A4059/A4138**
15,875	42,862	16,670	13,495	16,670	1,5	1,5			**17580/17520**
17,462	39,878	14,605	10,668	13,843	1,3	1,3		9	**LM11749/LM11710**
19,050	39,992	11,153	9,525	12,014	1	1,3			**A6075/A6157**
	45,237	16,637	12,065	15,494	1,3	1,3		10	**LM11949/LM11910**
	49,225	19,050	14,288	18,034	1,3	1,3		11	**09067/09195**
21,430	50,005	18,288	13,970	17,526	1,3	1,3		11	**M12649/M12610**
21,987	45,237	16,637	12,065	15,494	1,3	1,3		10	**LM12749/LM12710**
	45,974	16,637	12,065	15,494	1,3	1,3		10	**LM12749/LM12711**
22,225	56,896	19,837	15,875	19,368	1,3	1,3			**1755/1729**
23,812	56,896	19,837	15,875	19,368	0,8	1,3		12,5	**1779/1729**
25,000	51,994	14,260	12,700	15,011	1,5	1,3		12	**07097/07204**
25,400	51,994	14,260	12,700	15,011	1,5	1,3			**07100S/07204**
	50,005	14,260	9,525	13,495	1,5	1			**07097/07196**
	50,005	14,260	9,525	13,495	1	1		11	**07100/07196**
	50,292	14,732	10,668	14,224	1,3	1,3		11	**L44643/L44610**
	57,150	19,431	14,732	19,431	1,5	1,5		16,3	**M84548/M84510**
	61,912	20,638	14,288	19,050	0,8	2			**15101/15243**
	62,000	20,638	14,288	19,050	3,5	1,3		13,3	**15100/15245**
	62,000	20,638	14,288	19,050	0,8	1,3		13,3	**15101/15245**
26,988	50,292	14,732	10,668	14,224	3,5	1,3		11	**L44649/L44610**
28,575	68,262	22,225	17,462	22,225	0,8	1,5		17,1	**02474/02420**
29,000	50,292	14,732	10,668	14,224	3,5	1,3		11	**L45449/L45410**
30,162	64,292	21,433	16,670	21,433	1,5	1,5		18,2	**M86649/M86610**
30,226	69,012	19,583	15,875	19,845	0,8	1,3		15,9	**14116/14276**
31,750	59,131	16,764	11,811	15,875	*	1,3		13	**LM67048/LM67010**
	62,000	19,050	14,288	18,161	3,5	1,3		13	**15123/15245**
	68,262	22,225	17,462	22,225	3,5	1,5		17,1	**02475/02420**
	69,012	19,583	15,875	19,845	3,5	1,3		15,9	**14125A/14276**
	69,012	19,583	15,875	19,845	0,8	1,3			**14124/14276**
33,338	68,262	22,225	17,462	22,225	0,8	1,5		19,2	**M88048/M88010**
	76,200	28,575	23,020	29,370	0,8	3,3		23,8	**HM89443/HM89410**
34,925	65,088	18,288	13,970	18,034	*	1,3		14	**LM48548/LM48510**
	69,012	26,721	15,875	26,982	0,8	1,3		15,9	**14136A/14276**
	72,233	25,400	19,842	25,400	2,3	2,3		21	**HM88649/HM88610**
	76,200	28,575	23,020	29,370	3,5	3,3		23	**HM89446/HM894410**

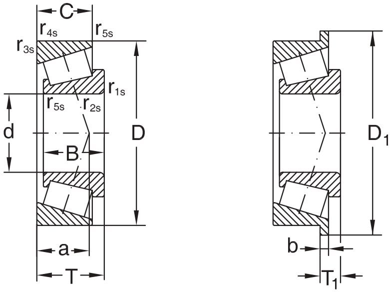


R

Basic radial load. Factors					Speed limit		Mass
dyn. C_r	e	Y	stat C_{0r}	Y_0	grease	oil	
kN	-	-	kN	-	min^{-1}		Kg
12	0,45	1,3	11,85	0,7	11000	15000	0,055
12	0,45	1,3	11,85	0,7	10000	15000	0,058
12	0,45	1,3	11,85	0,7	10000	14000	0,063
29,1	0,33	1,81	29,2	1	9800	13000	0,11
19,8	0,29	2,1	21,1	1,2	8500	12000	0,081
12,4	0,53	1,14	12,3	0,63	10000	13000	0,07
25,5	0,3	2	25,104	1,1	7500	11000	0,123
31,1	0,27	2,3	33,1	1,2	7000	10000	0,16
34,1	0,28	2,2	38	1,2	7000	10000	0,16
25,2	0,31	2	27,7	1,1	7500	10000	0,122
25,2	0,31	2	27,7	1,1	7000	10000	0,123
42	0,31	1,9	45,3	1,07	7200	9600	0,24
42	0,31	1,9	45,3	1,07	7200	9600	0,24
23,7	0,4	1,5	27,5	0,8	6300	9000	0,14
27	0,4	1,5	29,6	0,8	6300	9500	0,14
27	0,4	1,5	29,6	0,8	6300	9000	0,11
23,7	0,4	1,5	27,5	0,8	6300	9500	0,115
23,4	0,37	1,6	25,913	0,9	6300	9000	0,125
44,9	0,55	1,1	52,9	0,6	6900	9200	0,23
46,8	0,35	1,71	53,9	0,9	6100	8200	0,29
46,8	0,35	1,71	53,9	0,94	6100	8200	0,29
46,8	0,35	1,7	53,9	0,9	6100	8200	0,29
23,4	0,37	1,6	25,913	0,9	6300	9000	0,115
59,1	0,42	1,44	70,2	0,79	5800	7700	0,4
24,1	0,37	1,6	32,2	0,9	6300	9000	0,115
55,7	0,55	1,1	71,7	0,6	6100	8100	0,33
50,6	0,38	1,57	61,7	0,86	5600	7400	0,36
31,1	0,41	1,5	35,912	0,8	5300	7500	0,18
43,9	0,35	1,7	49,708	0,9	5300	7500	0,228
59,1	0,42	1,44	70,2	0,79	5800	7700	0,37
50,6	0,38	1,57	61,7	0,86	5600	7400	0,34
50,6	0,38	1,57	61,7	0,86	5600	7400	0,35
59,6	0,55	1,1	77,4	0,6	5700	7500	0,37
86,2	0,55	1,1	119	0,6	5100	6800	0,66
42,9	0,38	1,6	50,696	0,9	4800	7000	0,248
50,6	0,38	1,57	61,7	0,86	5600	7400	0,36
66,5	0,55	1,1	86,61	0,6	4500	6700	0,487
72,5	0,55	1,1	97,9	0,6	4500	6300	0,57

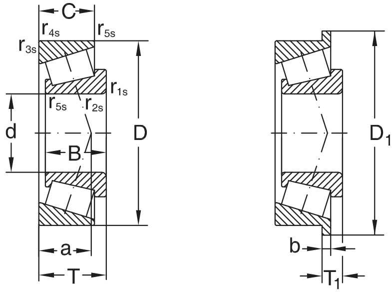
Tapered roller bearings, single row

inch dimensions



R

d	D	B	C	T / T_1	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	D_1	a	Designation
mm									
34,987	59,131	16,764	11,938	15,875	*	1,3		13	**L68149/L68110**
	59,974	16,764	11,938	15,875	*	1,3		13	**L68149/L68111**
36,512	76,200	28,575	23,020	29,370	3,5	3,3		23,8	**HM89449/HM89410**
	76,200	28,575	23,020	29,370	3,5	0,8			**HM89449/HM89411**
38,000	63,000	17,000	13,500	17,000	*	1,3		14	**JL69349/JL69310**
38,100	65,088	18,288	13,970	18,034	2,3	1,3		13	**LM29749/LM29710**
	69,012	19,050	15,083	19,050	3,5	2,3		15,9	**13685/13621**
	79,375	29,771	23,812	29,370	3,5	3,3		20	**3490/3420**
39,688	73,025	22,098	21,336	25,654	0,8	2,3		18	**M201047/M201011**
40,987	67,975	18,000	13,500	17,500	3,5	1,5		13,8	**LM300849/LM300811**
41,275	73,431	19,812	16,604	21,430	3,5	0,8		18,1	**LM501349/LM501314**
	73,431	19,812	14,732	19,559	3,5	0,8		16	**LM501349/LM501310**
	76,200	17,384	14,880	18,009	1,5	1,5		17,1	**11162/11300**
44,450	73,025	18,258	15,083	18,258	1,5	1,5		14	**L102849/L102810**
	82,931	25,400	19,050	23,812	3,5	0,8		18	**25580/25520**
	82,931	25,400	19,050	23,812	0,5	0,8		17,4	**25581/25520**
	88,900	29,370	23,020	30,162	3,5	3,3		25,5	**HM803149/HM803110**
	95,250	28,575	22,225	27,783	0,8	0,8		20	**33885/33822**
	95,250	28,575	22,225	30,958	3,5	0,8		31,4	**HM903249/HM903210**
	104,775	36,512	28,575	36,512	3,5	3,3		28,8	**HM807040/HM807010**
	107,950	29,317	22,225	27,783	3,5	0,8		20	**460/453 A**
45,242	73,431	19,812	15,748	19,558	3,5	0,8		15	**LM102949/LM102910**
	77,788	19,842	15,080	19,842	3,5	0,8		17,3	**LM603049/LM603011**
45,618	82,931	25,400	19,050	23,812	3,5	0,8		18	**25590/25520**
	82,931	25,400	22,225	26,988	3,5	2,3		19	**25590/25523**
46,037	85,000	25,608	20,638	25,400	0,8	1,3		19	**2984 A/2924**
47,625	93,264	30,302	23,812	30,162	3,5	3,3		21	**3779/3730**
49,212	104,775	36,512	28,575	36,512	3,5	3,3		28,8	**HM807044/HM807010**
	103,188	44,475	36,512	43,658	3,5	3,3		27,4	**5395/5335**
50,000	82,000	21,500	17,000	21,500	3	0,5		16,3	**JLM104948/JLM104910**
	90,000	28,000	23,000	28,000	3	2,5		20,6	**JM205149/JM205110**
	90,000	22,225	15,875	8,887	2		94,661	16	**365/362 R**
50,800	82,550	22,225	16,510	21,590	3,5	1,3		16	**LM104949/LM104911**
	92,075	25,400	19,845	24,608	3,5	0,8		20	**28580/28521**
	95,250	28,575	22,225	27,783	3,5	0,8		20	**33889/33822**
	97,630	24,608	19,446	9,124	3,5		101,549	21	**28678/28622 R**
	104,775	36,512	28,575	36,512	3,5	3,3		29,1	**HM807046/HM807010**
	111,125	26,909	20,638	30,162	3,5	3,3		37	**55200 C/55437**

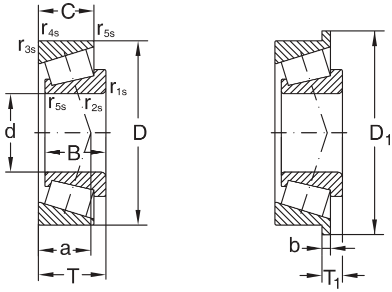


R

Basic radial load. Factors					Speed limit		Mass
dyn. C_r	e	Y	stat C_{0r}	Y_0	grease	oil	
kN	-	-	kN	-	min^{-1}		Kg
30,1	0,42	1,4	38,841	0,8	5300	7500	0,17
30,1	0,42	1,4	38,841	0,8	5300	7500	0,18
86,2	0,55	1,1	119	0,6	5100	6800	0,62
86,2	0,55	1,1	119	0,6	5100	6800	0,63
32,9	0,42	1,4	43,8	0,8	4800	7000	0,221
38,4	0,33	1,8	48,72	1	4800	6700	0,227
52,5	0,4	1,49	67,9	0,82	5300	7100	0,28
79,3	0,36	1,6	103	0,9	4300	6000	0,55
57,5	0,33	1,8	72	1	4300	6300	0,46
46,1	0,35	1,72	63,5	0,95	5300	7000	0,23
58,4	0,4	1,5	74,2	0,83	5000	6600	0,34
48,6	0,4	1,5	64,3	0,8	4300	6000	0,32
44,5	0,49	1,23	55,1	0,68	4900	6500	0,33
47	0,32	1,9	68,9	1	4300	6000	0,3
75,7	0,33	1,8	95,1	1	3800	5600	0,554
83,8	0,33	1,8	111	1	3800	5600	0,56
105	0,55	1,1	144	0,6	4300	5800	0,84
120	0,33	1,8	161	1	3600	5000	0,98
107	0,74	0,81	132	0,45	3700	4900	1
159	0,49	1,23	223	0,68	3600	4800	1,62
96,8	0,33	1,8	127	1	3600	5000	0,97
97,8	0,34	1,8	134	1	3000	4500	0,31
59,6	0,43	1,41	77,9	0,77	4600	6200	0,36
48,5	0,31	2	66,4	1,1	4000	6000	0,3
70	0,33	1,8	95,2	1	3800	5300	0,55
70	0,33	1,8	95,2	1	3800	5300	0,58
68,3	0,35	1,7	97	1	3800	5300	0,6
159	0,49	1,23	223	0,68	3600	4800	1,52
182	0,3	2,02	246	1,97	3800	5100	1,72
75,2	0,31	1,97	104	1,08	4300	5700	0,41
115	0,33	1	154	1,82	4100	5400	0,74
98	0,34	1,8	128	1	3400	5000	0,905
74,3	0,32	1,9	87,26	1	3400	5000	0,554
65,2	0,31	2	86,2	1,1	3600	5300	0,411
71	0,38	1,6	103	0,9	3400	4800	0,69
102	0,33	1,8	135	1	3400	4800	0,86
159	0,49	1,23	223	0,68	3600	4800	1,49
118	0,88	0,68	161	0,37	3200	4200	1,34

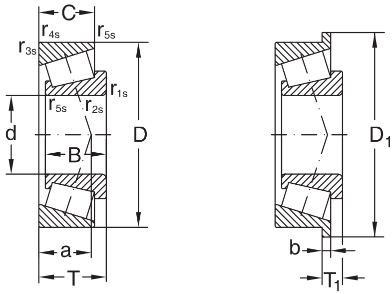
Tapered roller bearings, single row

inch dimensions



R

Dimensions									Designation
d	D	B	C	T / T_1	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	D_1	a	
mm									
53,975	104,775	36,512	28,575	36,512	3,5	3,3		28,8	**HM807049/HM807010**
	123,825	32,791	25,400	36,512	3,5	3,3			**72212 C/72487**
	123,825	32,791	25,400	17,462	3,5		130,073	37	**72212/72487 R**
55,562	123,825	32,791	25,400	36,512	3,5	3,3			**72218 C/72487**
57,150	104,775	30,958	23,812	30,162	2,3	3,3			**45290/45220**
	104,775	30,958	23,812	30,162	6,4	3,3			**45291/45220**
	104,775	29,317	24,605	30,162	2,3	3,3		23	**462A/453 X**
	107,950	29,317	22,225	27,783	3,5	0,8		20,7	**469/453A**
	110,000	29,317	27,000	27,795	3,5	2		24	**462/454**
	112,712	30,162	23,812	30,162	8	3,3		23	**39581/39520**
	123,825	36,678	30,162	38,100	3,5	3,3		28,4	**555S/552A**
60,325	122,238	38,354	29,718	38,100	8	3,3		27,2	**HM212044/HM212011**
	127,000	44,450	34,925	44,450	3,5	3,3		34,9	**65237/65500**
	127,000	36,512	26,988	36,512	3,5	3,3		32	**HM813841/HM813810**
63,485	94,976	15,499	11,999	17,000	1	1		28	**L910349/L910310**
63,500	92,075	12,700	9,525	13,495	1,5	1,5		16	**LL510749/LL510710**
	94,458	19,050	15,083	19,050	1,5	1,5			**L610549/L610510**
	112,712	30,162	23,812	30,162	3,5	3,3		23	**39585/39520**
	112,712	30,048	23,812	30,162	3,5	0,8		25	**3982/3928**
	112,712	30,048	23,812	30,162	3,5	3,3		25	**3982/3920**
	112,712	30,048	23,812	11,112	3,5		117,373	25	**3982/3920 R**
	120,000	29,007	23,444	29,002	3,5	3,3		26	**483/472 A**
	122,238	38,354	29,718	38,100	7	3,3		27,2	**HM212047/HM212011**
	122,238	38,430	29,770	38,305	3,5	2		27	**X3962/X3963**
66,675	110,000	25,400	19,050	25,400	3,5	1,3		24	**29590/29521**
	122,238	38,354	29,718	38,100	3,5	3,3		27	**HM212049/HM212011**
	112,712	30,048	23,812	30,162	3,5	3,3		25	**3984/3920**
70,000	110,000	25,000	20,500	26,000	1	2,5		20,5	**JLM813049/JLM813010**
71,438	120,000	32,545	26,195	32,545	3,5	3,3		25,8	**47490/47420**
	136,525	46,038	36,512	46,038	3,5	3,3		38	**H715345/H715311**
	127,000	36,170	28,575	36,512	3,5	3,3		28	**567 A/563**
73,025	127,000	36,170	28,575	36,512	3,5	3,3		28	**567/563**
	139,992	36,098	28,575	36,512	3,5	3,3		30,8	**576/572**
	146,050	41,275	31,750	41,275	3,5	3,3		34	**657/653**
76,200	133,350	33,338	26,195	33,338	3,5	3,3			**47679/47620**
	139,992	36,098	28,575	36,512	3,5	3,3		31	**575/572**
	149,225	54,229	44,450	53,975	9,7	3,3		38,8	**6461 A/6420**
	150,089	46,672	36,512	44,450	3,5	3,3		32,3	**748S/742**

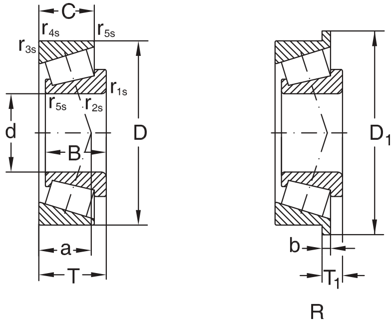


R

Basic radial load. Factors					Speed limit		Mass
dyn. C_r	e	Y	stat C_{0r}	Y_0	grease	oil	
kN	-	-	kN	-	min^{-1}		Kg
159	0,49	1,23	223	0,68	3600	4800	1,41
167	0,74	0,81	208	0,45	2900	3900	2,12
143	0,74	0,8	162	0,4	2800	4000	2,1
167	0,74	0,81	208	0,45	2900	3900	2,08
142	0,33	1,8	189	1	3000	4300	1,08
142	0,33	1,8	189	1	3000	4300	1,06
97,8	0,34	1,8	134	1	3000	4500	1,1
126	0,34	1,79	166	1	3500	4700	1,09
109	0,34	1,8	139	1	3000	4300	1,22
130	0,34	1,8	196	1	2800	4000	1,03
177	0,35	1,73	248	1	3000	4100	2,14
209	0,34	1,78	279	0,98	3100	4100	1,99
225	0,49	1,23	297	0,68	3100	4200	2,66
161	0,5	1,2	226	0,7	2600	3800	2,16
42,3	0,78	0,8	56,8	0,4	3000	4500	0,4
31,2	0,4	1,5	46	0,8	3200	4500	0,25
62	0,42	1,41	108	0,78	3600	4800	0,45
130	0,34	1,8	196	1	2800	4000	1,22
116	0,4	1,5	174	0,8	2800	4000	1,24
116	0,4	1,5	174	0,8	2800	4000	1,24
116	0,4	1,5	174	0,8	2800	4000	1,26
133	0,38	1,6	167	0,9	2600	3800	1,44
209	0,34	1,78	279	0,98	3100	4100	1,91
189	0,34	1,8	248	1	2600	3800	2,03
92	0,44	1,4	138	0,7	2800	4000	0,9
189	0,34	1,8	248	1	2600	3800	1,92
113	0,4	1,5	172	0,8	2800	4000	1,2
106	0,49	1,23	168	0,68	3200	4200	0,88
166	0,36	1,67	249	0,9	3000	4000	1,41
219	0,48	1,2	296	0,7	2400	3400	2,91
161	0,36	1,7	226	0,9	2400	3600	1,64
161	0,36	1,7	226	0,9	2400	3400	2,68
191	0,4	1,49	292	0,82	2600	3400	2,47
213	0,41	1,5	307	0,8	2200	3200	3,31
167	0,4	1,48	262	0,7	2600	3500	1,9
184	0,4	1,5	239	0,8	2200	3200	2,35
321	0,36	1,66	463	0,91	2500	3400	4,15
294	0,33	1,84	417	1,01	2400	3200	3,62

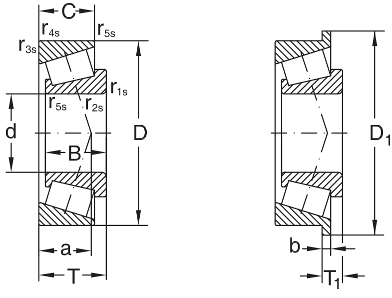
Tapered roller bearings, single row

inch dimensions



Dimensions										Designation
d	D	B	C	T / T_1	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	D_1	a		
mm										
76,200	161,925	55,100	42,862	53,975	3,5	3,3		40		**6576/6535**
77,788	120,000	23,012	16,000	23,000	3,5	2,3		24		**34306/34472 X**
80,962	150,089	46,672	36,512	44,450	5	3,3		32,3		**740/742**
82,550	133,350	33,338	26,195	33,338	3,5	3,3		29,5		**47686/47620**
	139,992	36,098	28,575	36,512	3,5	3,3		31		**580/572**
	146,050	41,275	31,750	41,275	3,5	3,3		34		**663/653**
	152,400	41,275	31,750	41,275	3,5	3,3		33,7		**663/652**
	161,925	48,260	38,100	47,625	3,5	3,3		35		**757/752**
85,025	150,089	46,672	36,512	44,450	3,5	3,3		32,3		**749/742**
85,725	133,350	29,769	25,400	33,338	3,3	3,3		31		**497/492 W**
	146,050	41,275	31,750	41,275	6,4	3,3		34		**665 A/653**
	152,400	36,322	30,162	39,688	3,5	3,3				**596/592 A**
88,900	152,400	36,322	30,162	39,688	3,5	3,3		36,8		**593/592 A**
	152,400	39,688	30,162	39,688	6,4	3,3		34		**HM518445/HM518410**
	161,925	48,260	38,100	47,625	3,5	3,3		34,9		**759/752**
	190,500	57,531	46,038	57,150	8	3,3		41		**HH221434/HH221410**
89,975	146,975	40,000	32,500	40,000	7	3,5		31		**HM218248/HM218210**
92,075	152,400	36,322	30,162	39,688	6,4	3,3		35		**598 A/592 A**
	171,450	48,260	38,100	47,625	3,5	3,3		37		**77362/77675**
95,250	148,430	28,971	21,433	28,575	3	3		33		**42375/42584**
	152,400	36,322	30,162	15,875	3,5		158,648	35		**594/592 R**
	152,400	36,322	30,162	39,688	3,5	3,3		37		**594/592 A**
	168,275	41,275	30,162	41,275	3,5	3,3		38,5		**683/672**
96,838	149,225	28,971	24,608	12,700	3,5		154,681	34		**42381/42587 R**
100,012	157,162	36,116	26,195	36,512	3,5	3,3		36		**52393/52618**
101,600	180,975	48,006	38,100	17,462	3,5		188,798	40		**780/772 R**
	212,725	66,675	53,975	66,675	7	3,3		48		**HH224335/HH224310**
114,300	177,800	41,275	30,162	41,275	3,5	3,3		43		**64450/64700**
	190,500	49,212	34,925	47,625	3,6	3,3				**71450/71750**
117,475	180,975	31,750	25,400	34,925	3,5	3,3		39,6		**68462/68712**
120,650	174,625	36,512	27,783	35,720	3,5	1,5				**M224749/M224710**
	206,375	47,625	34,925	47,625	3,5	3,5				**795/792**
127,000	215,900	47,625	34,925	47,625	3,5	3,3		49,9		**74500/74850**
130,000	234,950	63,500	49,212	63,500	6	3,3				**95512/95925**
133,350	215,900	47,625	34,925	20,638	3,5		223,733			**74525/74850 R**
136,525	215,900	47,625	34,925	20,638	3,5		223,733			**74537/74850 R**
139,700	215,900	47,625	34,925	47,625	3,5	3,3				**74550/74850**
	215,900	47,625	34,925	20,638	3,5		223,733			**74550/74850 R**

ART BEARINGS

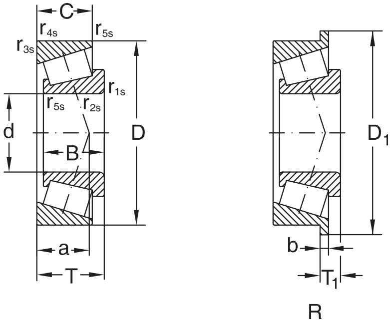


R

Basic radial load. Factors					Speed limit		Mass
dyn. C_r	e	Y	stat C_{0r}	Y_0	grease	oil	
kN	-	-	kN	-	min^{-1}		Kg
327	0,4	1,5	448	0,8	2000	3000	5,37
84,91	0,45	1,3	117	0,7	2400	3600	0,836
294	0,33	1,84	417	1,01	2400	3200	3,39
167	0,4	1,48	262	0,7	2400	3400	1,69
168	0,4	1,5	247	0,8	2200	3200	2,13
201	0,41	1,5	286	0,8	2200	3000	3,73
229	0,41	1,47	335	0,81	2500	3300	3,12
272	0,34	1,8	358	1	2000	2800	4,7
294	0,33	1,84	417	101	2400	3300	3,21
135	0,45	1,3	203	0,7	2200	3200	1,34
213	0,41	1,5	307	0,8	2200	3000	2,6
200	0,44	1,36	319	0,75	2300	3100	2,86
200	0,44	1,36	319	0,75	2300	3100	2,73
235	0,4	1,5	338	0,8	2000	3000	2,8
303	0,34	1,76	441	0,97	2300	3100	4,06
395	0,34	1,8	526	1	1800	2600	8,85
220	0,33	1,8	386	1	2000	3000	2,59
174	0,44	1,4	268	0,7	2000	2800	2,59
305	0,37	1,6	416	0,9	1900	2600	4,79
136	0,49	1,2	416	0,7	2000	2800	1,72
204	0,44	1,4	313	0,7	2000	2800	2,64
200	0,44	1,36	319	0,75	2000	2800	2,47
245	0,47	1,28	386	0,7	2100	2800	3,68
136	0,49	1,2	210	0,7	2000	2800	1,74
142	0,47	1,3	195	0,7	1900	2800	2,47
321	0,39	1,6	462	0,9	1700	2400	5,5
557	0,33	1,8	783	1	1600	2200	11,1
254	0,52	1,15	419	0,6	2600	3800	3,45
337	0,42	1,44	543	0,79	1800	2500	5,14
181	0,47	1,28	271	0,7	2100	2800	2,74
220	0,33	1,8	375	1	1700	2400	2,7
308	0,49	1,2	523	0,7	1400	2000	6,97
507	0,36	1,6	784	0,9	1300	1900	11,3
313	0,49	1,2	528	0,7	1400	2000	6,78
313	0,49	1,2	528	0,7	1400	2000	6,53
310	0,49	1,2	531	0,7	1400	2000	6,08
310	0,49	1,2	531	0,7	1400	2000	6,17

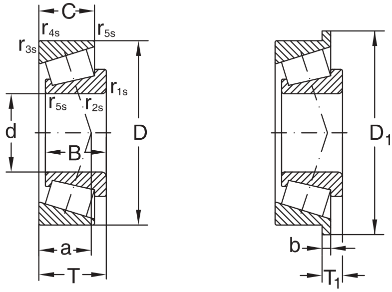
Tapered roller bearings, single row

inch dimensions



Dimensions									Designation
d	D	B	C	T / T_1	$r_{1s,2s}$ min.	$r_{3s,4s}$ min.	D_1	a	
mm									
158,750	225,425	39,688	33,338	41,275	3,5	3,3			**46780/46720**
	225,425	39,688	33,338	13,495	3,5		230,881		**46780/46720 R**
180,000	250,000	45,000	37,000	47,000	3	2,5			**JM736149/JM36110**
196,850	254,000	27,783	21,433	28,575	1,5	1,5			**L540049/L540010**
203,200	261,142	27,783	21,433	28,575	1,5	1,5			**LL641149/LL641110**
209,550	282,575	46,038	36,512	46,038	3,5	3,3			**67989/67920**
	317,500	63,500	46,038	63,500	4,3	3,3			**93825/93125**
234,950	327,025	52,388	36,512	52,388	6,4	3,3			**8575/8520**
241,300	327,025	52,388	36,512	25,400	6,4		336,448		**8578/8520 R**

***** Special mounting chamfer.



R

Basic radial load. Factors					Speed limit		Mass
dyn. C_r	e	Y	stat C_{0r}	Y_0	grease	oil	
kN	-	-	kN	-	min^{-1}		Kg
305	0,38	1,6	541	0,9	1300	1800	5,35
305	0,38	1,6	541	0,9	1300	1800	5,4
334	0,48	1,3	703	0,7	1100	1600	7,85
170	0,39	1,5	334	0,9	1100	1600	3,32
174	0,41	1,5	353	0,8	1100	1500	3,56
331	0,51	1,2	661	0,6	1000	1400	8,84
651	0,52	1,2	1098	0,6	950	1300	18,5
468	0,41	1,5	934	0,8	850	1200	12,3
468	0,41	1,5	934	0,8	850	1200	11,9

ART BEARINGS

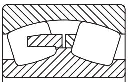
Spherical roller bearings

Spherical roller bearings operate in arduous conditions. The spherical rollers can be symmetrical or unsymmetrical and are self-aligning in the outer ring sphered raceway. Thus, the possible coaxiality deviations of the supporting bearings as well as shaft bending can be compensated.

Spherical roller bearings are manufactured in the following constructive versions, depending on the bearing size and series.

MB design

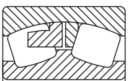
These bearings have a central fixed rib and machined cages guided on the inner ring rib.



a.

MA design

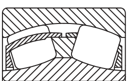
These bearings have a central fixed rib and machined cages guided on the outer ring rib.



b.

C design

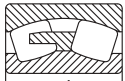
These bearings have a central guide rib floating on the inner ring, symmetrical rollers with larger dimensions so that the load carrying capacity increases. Special pressed sheet cage. Bearings of this design are of small and medium sizes.



c.

CA design

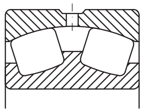
These bearings have side shoulders and an one-piece machined brass cage. They also have symmetrical rollers with larger dimensions so that the load carrying capacity increases. This design is available for medium and large-sized bearings

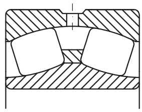


d.

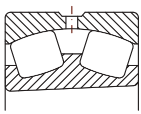
Other constructive versions are shown below:

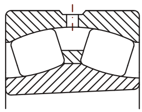
Cylindrical bore, lubrication groove and holes in the outer ring



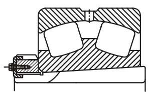


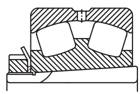
Tapered bore, lubrication groove and holes in the outer ring (taper 1:12,1:30)

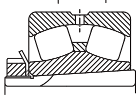




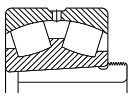
With adapter sleeves

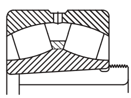






With withdrawal sleeves.





Suffixes

C - modified inner design, increased basic load, symmetrical rollers, pressed sheet cage.
CA - modified inner design, increased basic load, one-piece machined brass cage
F2, F3 - constructive modifications
K - tapered bore bearings, taper 1:12
K30 - tapered bore bearings, taper 1:30
MA - machined brass cage guided on the outer ring
MB - machined brass cage guided on the inner ring
P - two-piece outer ring
W33 - lubrication groove and holes in the outer ring

Tolerances

Spherical roller bearings with both cylindrical and tapered bore, are manufactured in normal tolerance class (see chapter Bearing tolerance, page 25).

Radial Clearance

Spherical roller bearings are generally manufactured with normal radial clearance. At request, they can be manufactured with clearances larger than normal (C3, C4 etc.) or smaller than normal (C2).

The limit values of the radial clearance measured on unloaded bearings are in accordance with SR ISO 5753 and are given in tables 1 and 2.

Dimensions

The main dimensions of spherical roller bearings are in accordance with ISO 15 and national standard SR 3918 respectively.

The dimensions of the adapter sleeves are in accordance with national standard SR ISO 2982-1.

The dimensions of the safety washers are In accordance with national standard SR ISO 2982-2.

Radial clearance of spherical roller bearings with cylindrical bore Table 1

Bore diameter d		Radial clearance									
		C2		Normal		C3		C4		C5	
over	up to	min	max	min	max	min	max	min	max	min	max
14	**18**	10	20	20	35	35	45	45	60	60	75
18	**24**	10	20	20	35	35	45	45	60	60	75
24	**30**	15	25	25	40	40	55	55	75	75	95
30	**40**	15	30	30	45	45	60	60	80	80	100
40	**50**	20	35	35	55	55	75	75	100	100	125
50	**65**	20	40	40	65	65	90	90	120	120	150
65	**80**	30	50	50	80	80	110	110	145	145	180
80	**100**	35	60	60	100	100	135	135	180	180	225
100	**120**	40	75	75	120	120	160	160	210	210	260
120	**140**	50	95	95	145	145	190	190	240	240	300
140	**160**	60	110	110	170	170	220	220	280	280	350
160	**180**	65	120	120	180	180	240	240	310	310	390
180	**200**	70	130	130	200	200	260	260	340	340	430
200	**225**	80	140	140	220	220	290	290	380	380	470
225	**250**	90	150	150	240	240	320	320	420	420	520
250	**280**	100	170	170	260	260	350	350	460	460	570
280	**315**	110	190	190	280	280	370	370	500	500	630
315	**355**	120	200	200	310	310	410	410	550	550	690
355	**400**	130	220	220	340	340	450	450	600	600	750
400	**450**	140	240	240	370	370	500	500	660	660	820
450	**500**	140	260	260	410	410	550	550	720	720	900
500	**560**	150	280	280	440	440	600	600	780	780	1000
560	**630**	170	310	310	480	480	650	650	850	850	1100
630	**710**	190	350	350	530	530	700	700	920	920	1190
710	**800**	210	390	390	580	580	770	770	1010	1010	1300
800	**900**	230	430	430	650	650	860	860	1120	1120	1440
900	**1000**	260	480	480	710	710	930	930	1220	1220	1570

Radial clearance of spherical roller bearings with tapered bore											Table 2
Bore diameter d		Radial clearance									
		C2		Normal		C3		C4		C5	
over	up to	min	max	min	max	min	max	min	max	min	max
18	**24**	15	25	75	35	35	45	45	60	60	75
24	**30**	20	30	30	40	40	55	55	75	75	95
30	**40**	25	35	35	50	50	65	65	85	85	105
40	**50**	30	45	45	60	60	80	80	100	100	130
50	**65**	40	55	55	75	75	95	95	120	120	160
65	**80**	50	70	70	95	95	120	120	150	150	200
80	**100**	55	80	80	110	110	140	140	180	180	230
100	**120**	65	100	100	135	135	170	170	220	220	280
120	**140**	80	120	120	160	160	200	200	260	260	330
140	**160**	90	130	130	180	180	230	230	300	300	380
160	**180**	100	140	140	200	200	260	260	340	340	430
180	**200**	110	160	160	220	220	290	290	370	370	470
200	**225**	120	180	180	250	250	320	320	410	410	520
225	**250**	140	200	200	270	270	350	350	450	450	570
250	**280**	150	220	220	300	300	390	390	490	490	620
280	**315**	170	240	240	330	330	430	430	540	540	680
315	**355**	190	270	270	360	360	470	470	590	590	740
355	**400**	210	300	300	400	400	520	520	650	650	820
400	**450**	230	330	330	440	440	570	570	720	720	910
450	**500**	260	370	370	490	490	630	630	790	790	1000
500	**560**	290	410	410	540	540	680	680	870	870	1100
560	**630**	320	460	460	600	600	760	760	980	980	1230
630	**710**	350	510	510	670	670	850	850	1090	1090	1360
710	**800**	390	570	570	750	750	960	960	1220	1220	1500
800	**900**	440	640	640	840	840	1070	1070	1370	1370	1690
900	**1000**	490	710	710	930	930	1190	1190	1520	1520	1860

The dimensions of the bearings nuts are in accordance with national standard SR ISO 2982-2.

The dimensions of the withdrawal sleeves are In accordance with national standard SR ISO 2982-1 and pages 416-437.

Misalignment

Spherical roller bearings allow angular misalignment between the outer ring and Inner ring without any influence on the bearing rating life. Under normal loads and operating conditions and when the Inner ring rotates, the values of the permissible misalignment depending on the bearing series are given In table 3.

Cages

Small and medium size spherical roller bearing are fitted with pressed sheet or machined brass cages (Y). Bearings of normal design are fitted with machined brass or steel cages guided on the rollers (M), inner ring (MB) or outer ring raceway (MA).

Glass fibre reinforced polyamide 6.6 cages are successfully used for small and medium size bearings if the operating temperature doesn't exceed +120°C.

Large-size bearings are fitted with machined brass cages, CA design.

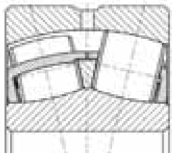
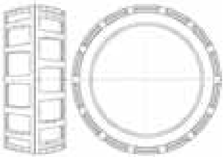
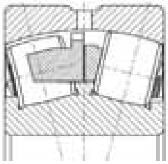
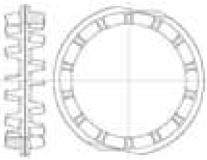
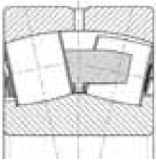
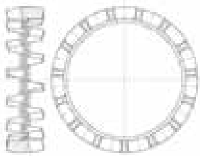
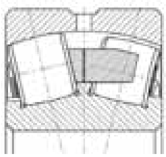
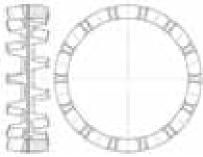
Designs and some technical data are given in table 4.

Table 3

Bearing series	Permissible angular misalignment [degrees]
213	1
222	1,5
223	2
230	1,5
231	1,5
232	2,5
239	1,5
240	2
241	2,5

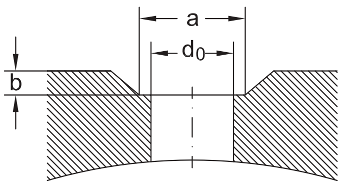
Cage design and some technical data

Table 4

Cage	Design		Application	Max. value $D_m n$	
	bearing	cage		oil	grease
C design - Floating guiding middle collar on inner ring - Special steel sheet cage - Oversize symmetrical spherical rollers to provide for increased loading capacity - Small and middle size bearings are produced in this version			- General application design - Moderate speeds - Bearings with d<200mm	300×10^3	225×10^3
MA design - Machined solid brass cage guided on outer ring - Middle standing collar on inner ring - Side flanges on inner ring			- General application - Moderate and high speeds - Bearings with d>200 mm	400×10^3	300×10^3
CA design - One-piece solid brass cage - Side flanges on inner ring - Oversize symmetrical spherical rollers to provide with increased loading capacity - Middle and large size bearings are produced in this version			- General application - Bearings with d>200 mm	350×10^3	265×10^3
MB design - Middle standing collar on inner ring - Machined solid brass cage guided on collar - Side flanges on inner ring - All bearings sizes can be produced in this version			- General application - Bearings with d>40mm	350×10^3	265×10^3

Lubrication grooves and holes

Spherical roller bearings are provided with a lubrication groove and holes in the outer ring, excepting those of series 213. Designation suffix W33 is used to identify this feature on bearings. The dimensions of the groove, bore diameter and their number depending on the dimension series are given in table 5.



Axial load for bearings mounted on adapter sleeves

If the spherical roller bearings are mounted on a smooth shaft using an adapter sleeve, without side support, the axial load carrying capacity depends on the friction between shaft and sleeve.

Considering that the mounting is correctly done, the permissible axial load can be accurately enough determined using the following equation

$$F_{a\,max} = 3 * B * d, KN$$

where:

$F_{a\,max}$ - maximum permissible axial load, KN;
B - bearing width, mm;
d - bearing bore diameter, mm.

Dimensions of lubrication grooves and holes

Table 5

Series 23900				Series 23000				Series 24000			
Outer diameter range	**Dimensions**			**Outer diameter range**	**Dimensions**			**Outer diameter range**	**Dimensions**		
	d0	**a**	**b**		**d0**	**a**	**b**		**d0**	**a**	**b**
mm				mm				mm			
250 … 380	4,5	7,2	1,5	**170 … 225**	4,5	7,2	1,5	**… 200**	4,5	7,2	1,5
380 … 440	4,5	7,2	2	**225 … 280**	6	9,6	2	**200 … 240**	6	9,6	2
440 … 520	6	9,6	3	**280 … 310**	7,5	12,1	2,5	**240 … 280**	7,5	12,1	2,5
520 … 560	7,5	12,1	3	**310 … 480**	9	14,5	3	**280 … 520**	9	14,5	3
560 … 670	9	14,5	3	**480 … 980**	12	19,7	3	**520 … 600**	9	14,5	3
670 … 1000	12	19,7	3,5					**600 … 980**	12	19,7	3

Series 23100				Series 24100				Series 22200			
Outer diameter range	**Dimensions**			**Outer diameter range**	**Dimensions**			**Outer diameter range**	**Dimensions**		
	d0	**a**	**b**		**d0**	**a**	**b**		**d0**	**a**	**b**
mm				mm				mm			
250 … 380	4,5	7,2	1,5	**170 … 225**	4,5	7,2	1,5	**… 200**	4,5	7,2	1,5
380 … 440	4,5	7,2	2	**225 … 280**	6	9,6	2	**200 … 240**	6	9,6	2
440 … 520	6	9,6	3	**280 … 310**	7,5	12,1	2,5	**240 … 280**	7,5	12,1	2,5
520 … 560	7,5	12,1	3	**310 … 480**	9	14,5	3	**280 … 520**	9	14,5	3
560 … 670	9	14,5	3	**480 … 980**	12	19,7	3	**520 … 600**	9	14,5	3
560 … 670	9	14,5	3	**480 … 980**	12	19,7	3	**520 … 600**	9	14,5	3
670 … 1000	12	19,7	3,5					**600 … 980**	12	19,7	3

Series 23200				Series 22300				Series 21300			
Outer diameter range	**Dimensions**			**Outer diameter range**	**Dimensions**			**Outer diameter range**	**Dimensions**		
	d0	**a**	**b**		**d0**	**a**	**b**		**d0**	**a**	**b**
mm				mm				mm			
250 … 380	4,5	7,2	1,5	**170 … 225**	4,5	7,2	1,5	**… 200**	4,5	7,2	1,5
380 … 440	4,5	7,2	2	**225 … 280**	6	9,6	2	**200 … 240**	6	9,6	2
440 … 520	6	9,6	3	**280 … 310**	7,5	12,1	2,5	**240 … 280**	7,5	12,1	2,5
520 … 560	7,5	12,1	3	**310 … 480**	9	14,5	3	**280 … 520**	9	14,5	3
560 … 670	9	14,5	3	**480 … 980**	12	19,7	3	**520 … 600**	9	14,5	3
560 … 670	9	14,5	3	**480 … 980**	12	19,7	3	**520 … 600**	9	14,5	3

Number of lubrication holes - all series			
Bore diameter range [mm]	50 … 260	260 … 460	460 … 950
Number of lubrication holes	3	4	6

Equivalent dynamic radial load

$P_r = F_r + Y_1 F_a$, kN, for $F_a/F < e$
$P_r = 67\ F_r + Y_2 F_a$, kN, for $F_a/F_r > e$

The values of the factors depending on the bearing type can be found in bearing tables.

Equivalent static radial load

$P_{0r} = F_r + Y_0 * F_a$, KN
The value of the factor Y0 depending on the bearing type can be found in bearing tables.

Abutment dimensions

For a proper location of bearing rings on the shaft and housing shoulder respectively, shaft (housing) maximum connection radius ru max should be less than bearing minimum mounting chamfer rs min.

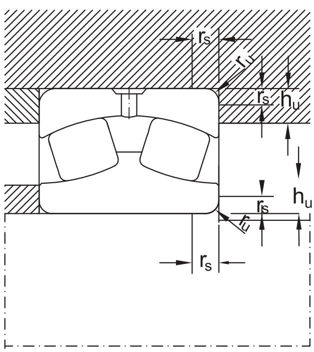
Shoulder height should also be properly sized in case of bearing maximum mounting chamfer.

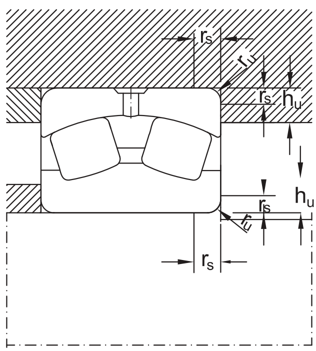
The values of the connection radii and support shoulder height are given in tableb.The mounting dimensions for bearings with withdrawal sleeves are given in table 6.

Abutment dimensions of spherical roller bearings

Table 6

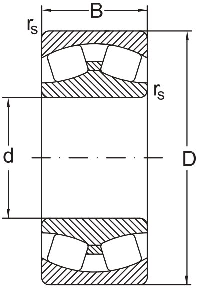
rs min	ru max	hu max	
		Bearing series	
		230 239 240	231, 213, 241, 223, 222, 233, 232
mm			
1	1	2,3	2,8
1,1	1	3	3,5
1,5	1,5	3,5	4,5
2	2	4,4	5,5
2,1	2,1	5,1	6
3	2,5	6,2	7
4	3	7,3	8,5
5	4	9	10
6	5	11,5	13
7,5	6	14	16
9,5	8	17	20





ART BEARINGS

Spherical Roller Bearings



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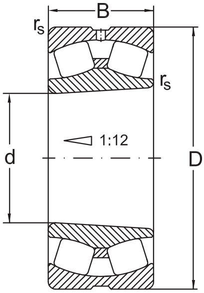
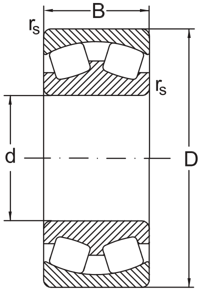
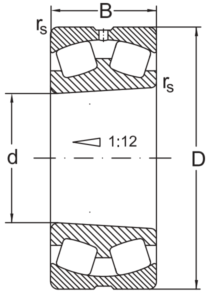


CKW33



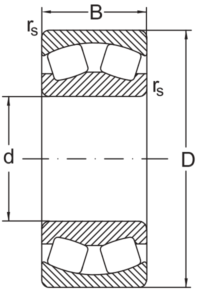
MB



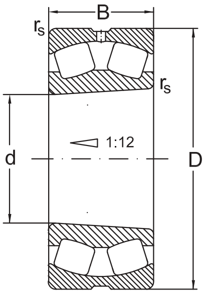
MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
25	52	18	1	43	0,35	1,8	2,9	46
	52	18	1	43	0,35	1,8	2,9	46
30	62	20	1	59	0,33	2	3,1	62
	62	20	1	59	0,33	2	3,1	62
35	72	23	1,1	81	0,32	2,1	3,1	88
	72	23	1,1	81	0,32	2,1	3,1	88
	80	21	1,5	66	0,28	2,4	3,6	65
	80	21	1,5	66	0,28	2,4	3,6	65
40	80	23	1,1	88	0,31	2,2	3,2	98
	80	23	1,1	88	0,31	2,2	3,2	98
	80	23	1,1	88	0,31	2,2	3,2	98
	80	23	1,1	78	0,31	2,2	3,2	87
	80	23	1,1	78	0,31	2,2	3,2	87
	80	23	1,1	78	0,31	2,2	3,2	87
	80	23	1,1	78	0,31	2,2	3,2	87
	80	23	1,1	78	0,31	2,2	3,2	87
	90	23	1,5	99	0,26	2,6	3,9	120
	90	23	1,5	99	0,26	2,6	3,9	120
	90	23	1,5	99	0,26	2,6	3,9	120
	90	33	1,5	140	0,4	1,6	2,5	145
	90	33	1,5	140	0,4	1,6	2,5	145
	90	33	1,5	140	0,4	2,6	2,5	145
	90	33	1,5	140	0,4	2,5	2,5	145
	90	33	1,5	140	0,4	1,6	2,5	145
	90	33	1,5	140	0,4	1,6	2,5	145

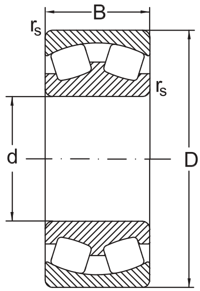
Spherical Roller Bearings



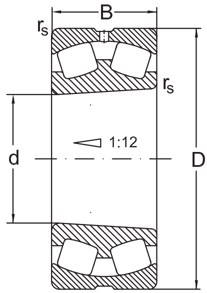
CA



CAKW33



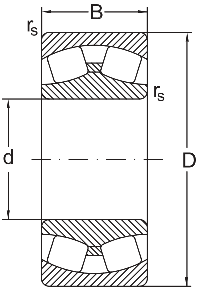
MA



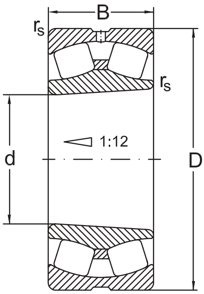
MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
25	1,9	7500	10000	**22205 CW33**	0,182
	1,9	7500	10000	**22205 CKW33**	0,177
30	2	6300	8500	**22206 CW33**	0,287
	2	6300	8500	**22206 CKW33**	0,281
35	2	5300	7000	**22207 CW33**	0,438
	2	5300	7000	**22207 CKW33**	0,428
	2,4	5000	6400	**21307 MBKW33**	0,55
	2,4	5000	6400	**21307 MBW33**	0,56
40	2,1	4800	6300	**22208 C**	0,54
	2,1	4800	6300	**22208 CK**	0,54
	2,1	4800	6300	**22208 CKW33**	0,52
	2,1	4400	5800	**22208 MAC4F80W33**	0,654
	2,1	4400	5800	**22208 MB**	0,57
	2,1	4400	5800	**22208 MBK**	0,57
	2,1	4400	5800	**22208 MBKW33**	0,56
	2,1	4400	5800	**22208 MBW33**	0,56
	2,6	4500	6000	**21308 C**	0,71
	2,6	4500	6000	**21308 CK**	0,7
	2,6	4500	6000	**21308 CKW33**	0,7
	1,6	4300	5600	**22308 C**	0,97
	1,6	4300	5600	**22308 CK**	0,95
	1,6	4300	5600	**22308 CKW33**	0,93
	1,6	4300	5600	**22308 CW33**	0,96
	1,6	4300	5600	**22308 CY**	0,98
	1,6	4300	5600	**22308 CYK**	0,95

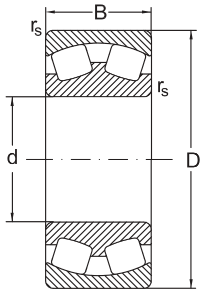
Spherical Roller Bearings



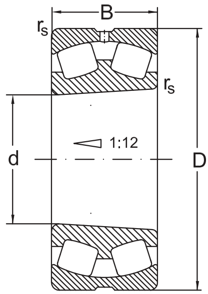
C



CKW33



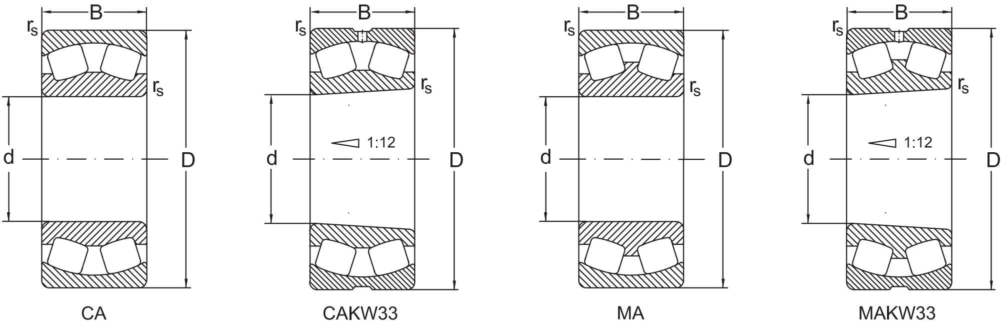
MB



MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
40	90	33	1,5	140	0,4	1,6	2,5	145
	90	33	1,5	140	0,4	1,6	2,5	145
	90	33	1,5	125	0,4	1,7	2,5	135
	90	33	1,5	125	0,4	1,7	2,5	135
	90	33	1,5	125	0,4	1,7	2,5	135
	90	33	1,5	125	0,4	1,7	2,5	135
	90	33	1,5	125	0,4	1,7	2,5	135
45	85	23	1,1	93	0,26	2,6	3,4	105
	85	23	1,1	93	0,26	2,6	3,4	105
	85	23	1,1	93	0,26	2,6	3,4	105
	85	23	1,1	93	0,26	2,6	3,4	105
	85	23	1,1	77	0,28	2,4	3,5	87,5
	85	23	1,1	77	0,28	2,4	3,5	87,5
	85	23	1,1	77	0,28	2,4	3,5	87,5
	85	23	1,1	77	0,28	2,4	3,5	87,5
	100	25	1,5	120	0,26	2,6	3,9	135
	100	25	1,5	120	0,26	2,6	3,9	135
	100	25	1,5	120	0,26	2,6	3,9	135
	100	25	1,5	105	0,28	2,4	3,6	107
	100	36	1,5	165	0,35	1,9	2,9	190
	100	36	1,5	165	0,35	1,9	2,9	190
	100	36	1,5	165	0,35	1,9	2,9	190
	100	36	1,5	165	0,35	1,9	2,9	190
	100	36	1,5	150	0,4	1,7	2,5	175
	100	36	1,5	150	0,4	1,7	2,5	175

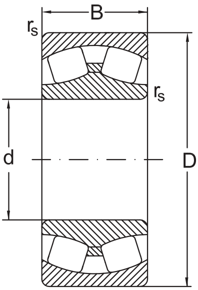
Spherical Roller Bearings



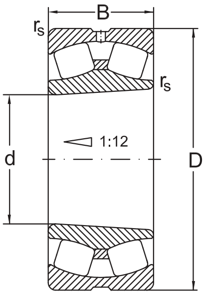
d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
40	1,6	4300	5600	**22308 CYKW33**	0,94
	1,6	4300	5600	**22308 CYW33**	0,972
	1,6	3800	5000	**22308 MAKC4F80W33**	1,42
	1,6	3800	5000	**22308 MBK**	1
	1,6	3800	5000	**22308 MBKW33**	0,99
	1,6	3800	5000	**22308 MB**	1,05
	1,6	3800	5000	**22308 MBW33**	1,01
45	2,5	4500	6000	**22209 C**	0,71
	2,5	4500	6000	**22209 CK**	0,7
	2,5	4500	6000	**22209 CKW33**	0,66
	2,5	4500	6000	**22209 CW33**	0,68
	2,3	4100	5500	**22209 MBK**	0,73
	2,3	4100	5500	**22209 MBKW33**	0,71
	2,3	4100	5500	**22209 MB**	0,77
	2,3	4100	5500	**22209 MBW33**	0,75
	2,6	4000	5300	**21309 C**	0,94
	2,6	4000	5300	**21309 CK**	0,93
	2,6	4000	5300	**21309 CKW33**	0,93
	2,3	3600	4800	**21309 MB**	0,94
	1,9	3800	5000	**22309 C**	1,33
	1,9	3800	5000	**22309 CK**	1,3
	1,9	3800	5000	**22309 CKW33**	1,3
	1,9	3800	5000	**22309 CW33**	1,33
	1,6	3400	4500	**22309 MBK**	1,37
	1,6	3400	4500	**22309 MBKW33**	1,32

ART BEARINGS

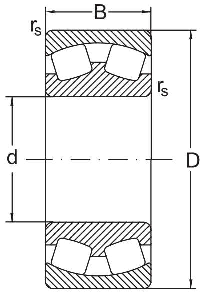
Spherical Roller Bearings



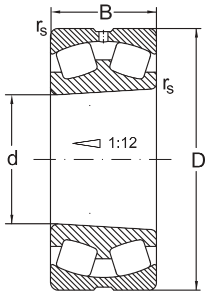
C



CKW33



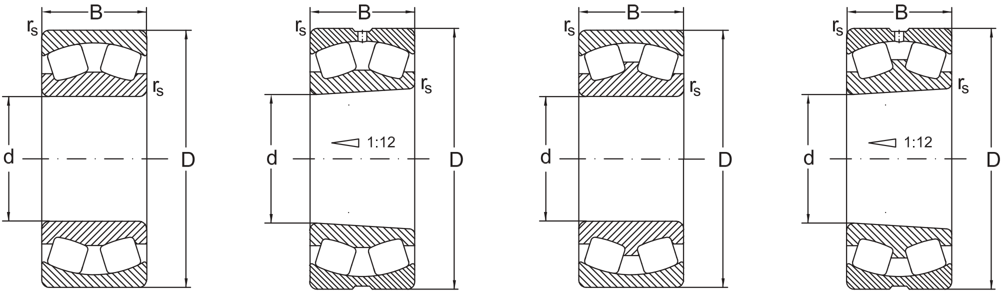
MB



MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
45	100	36	1,5	150	0,4	1,7	2,5	175
	100	36	1,5	150	0,4	1,7	2,5	175
50	90	23	1,1	100	0,24	2,9	4,2	120
	90	23	1,1	100	0,24	2,9	4,2	120
	90	23	1,1	100	0,24	2,9	4,2	120
	90	23	1,1	100	0,24	2,9	4,2	120
	90	23	1,1	78	0,26	2,6	3,8	91,3
	90	23	1,1	78	0,26	2,6	3,8	91,3
	90	23	1,1	78	0,26	2,6	3,8	91,3
	90	23	1,1	78	0,26	2,6	3,8	91,3
	110	27	2	120	0,24	2,8	4,1	130
	110	27	2	120	0,24	2,8	4,1	130
	110	27	2	120	0,24	2,8	4,1	130
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	220
	110	40	2	190	0,38	1,8	2,7	202
	110	40	2	177	0,4	1,7	2,5	202
	110	40	2	177	0,4	1,7	2,5	202
	110	40	2	177	0,4	1,7	2,5	202
	110	40	2	177	0,4	1,7	2,5	202

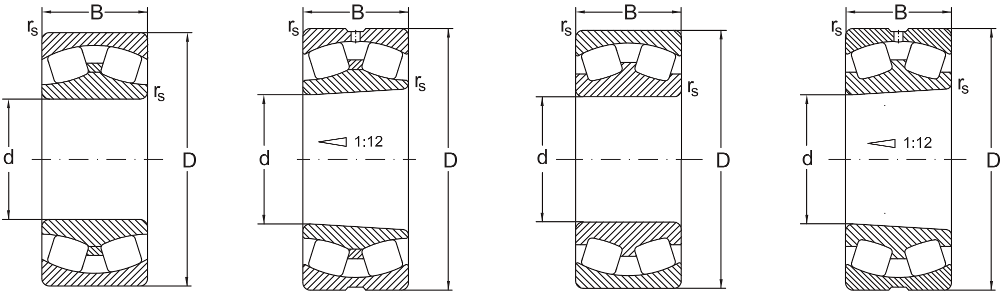
Spherical Roller Bearings



CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
45	1,6	3400	4500	**22309 MB**	1,37
	1,6	3400	4500	**22309 MBW33**	1,35
50	2,7	4000	5300	**22210 C**	0,74
	2,7	4000	5300	**22210 CK**	0,7
	2,7	4000	5300	**22210 CKW33**	0,69
	2,7	4000	5300	**22210 CW33**	0,72
	2,5	3600	4800	**22210 MBK**	0,76
	2,5	3600	4800	**22210 MBKW33**	0,75
	2,5	3600	4800	**22210 MB**	0,77
	2,5	3600	4800	**22210 MBW33**	0,76
	2,7	3600	4800	**21310 C**	1,25
	2,7	3600	4800	**21310 CK**	1,2
	2,7	3600	4800	**21310 CKW33**	1,2
	1,7	3400	4500	**22310 C**	1,81
	1,7	3400	4500	**22310 CK**	1,77
	1,7	3400	4500	**22310 CKW33**	1,76
	1,7	3400	4500	**22310 CW33**	1,8
	1,7	3400	4500	**22310 CY**	1,82
	1,7	3400	4500	**22310 CYK**	1,81
	1,7	3400	4500	**22310 CYKW33**	1,77
	1,7	3400	4500	**22310 CYW33**	1,81
	1,6	3000	4000	**22310 MBK**	1,84
	1,6	3000	4000	**22310 MBKW33**	1,83
	1,6	3000	4000	**22310 MAC4F80W33**	1,83
	1,6	3000	4000	**22310 MB**	1,85

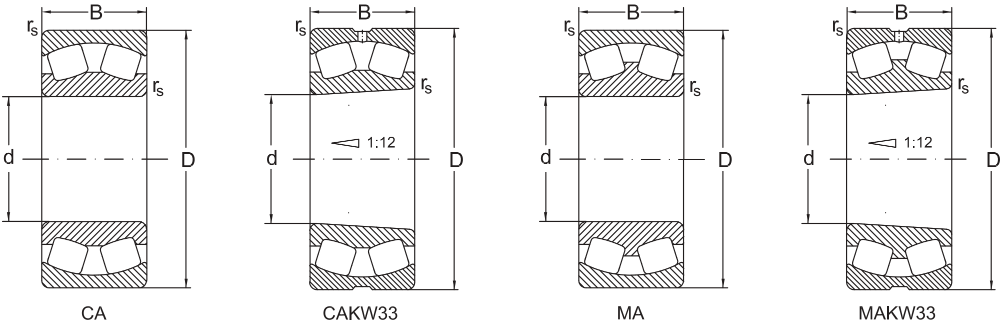
Spherical Roller Bearings



C CKW33 MB MBKW33

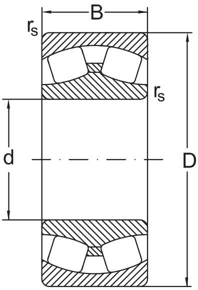
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
50	110	40	2	177	0,4	1,7	2,5	202
55	100	25	1,5	120	0,27	2,7	4,1	140
	100	25	1,5	120	0,27	2,7	4,1	140
	100	25	1,5	120	0,27	2,7	4,1	140
	100	25	1,5	120	0,27	2,7	4,1	140
	100	25	1,5	94	0,26	2,6	3,9	107
	100	25	1,5	94	0,26	2,6	3,9	107
	100	25	1,5	94	0,26	2,6	3,9	107
	100	25	1,5	94	0,26	2,6	3,9	107
	120	29	2	135	0,24	2,8	4,1	155
	120	29	2	135	0,24	2,8	4,1	155
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	230	0,4	1,7	2,5	265
	120	43	2	220	0,4	1,7	2,5	255
	120	43	2	220	0,4	1,7	2,5	255
	120	43	2	220	0,4	1,7	2,5	255
	120	43	2	220	0,4	1,7	2,5	255
	120	43	2	220	0,4	1,7	2,5	255
	120	43	2	220	0,4	1,7	2,5	255

Spherical Roller Bearings

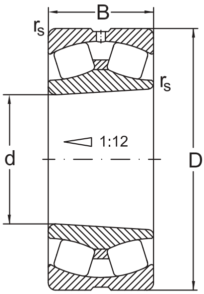


d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
50	1,6	3000	4000	**22310 MBW33**	1,84
55	2,7	3800	5000	**22211 C**	0,93
	2,7	3800	5000	**22211 CK**	0,9
	2,7	3800	5000	**22211 CKW33**	0,87
	2,7	3800	5000	**22211 CW33**	0,89
	2,5	3600	4600	**22211 MBK**	0,89
	2,5	3600	4600	**22211 MBKW33**	0,88
	2,5	3600	4600	**22211 MB**	0,91
	2,5	3600	4600	**22211 MBW33**	0,89
	2,7	3200	4300	**21311 C**	1,65
	2,7	3200	4300	**21311 CK**	1,6
	1,6	3000	4000	**22311 C**	2,32
	1,6	3000	4000	**22311 CK**	2,27
	1,6	3000	4000	**22311 CKW33**	2,25
	1,6	3000	4000	**22311 CW33**	2,32
	1,6	3000	4000	**22311 CY**	2,34
	1,6	3000	4000	**22311 CYK**	2,28
	1,6	3000	4000	**22311 CYKW33**	2,26
	1,6	3000	4000	**22311 CYW33**	2,32
	1,6	2800	3600	**22311 MBK**	2,1
	1,6	2800	3600	**22311 MAKW33**	2,44
	1,6	2800	3600	**22311 MA**	2,49
	1,6	2800	3600	**22311 MAC4F80W33**	2,42
	1,6	2800	3600	**22311 MAC4W502**	2,44
	1,6	2800	3600	**22311 MAW502**	2,44

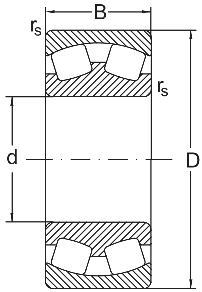
Spherical Roller Bearings



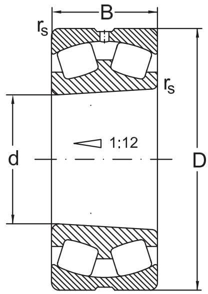
C



CKW33



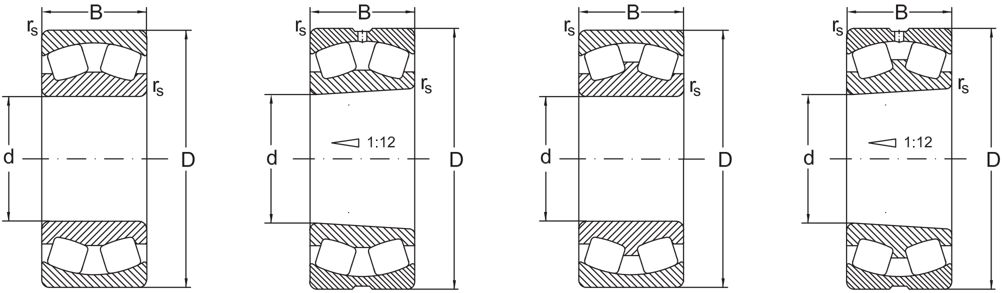
MB



MBKW33

Dimensions				**Basic radial load. Factors**				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
55	120	43	2	220	0,4	1,7	2,5	255
	120	43	2	220	0,4	1,7	2,5	255
60	110	28	1,5	145	0,27	2,7	4	175
	110	28	1,5	145	0,27	2,7	4	175
	110	28	1,5	145	0,27	2,7	4	175
	110	28	1,5	117,8	0,27	2,6	3,8	140,3
	110	28	1,5	117,8	0,27	2,6	3,8	140,3
	110	28	1,5	117,8	0,27	2,6	3,8	140,3
	110	28	1,5	117,8	0,27	2,6	3,8	140,3
	130	31	2,1	150	0,24	2,9	4,3	180
	130	31	2,1	150	0,24	2,9	4,3	180
	130	31	2,1	151	0,24	2,9	4,3	152
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	270	0,4	1,7	2,5	320
	130	46	2,1	260	0,4	1,7	2,5	310
	130	46	2,1	260	0,4	1,7	2,5	310
	130	46	2,1	260	0,4	1,7	2,5	310
	130	46	2,1	260	0,4	1,7	2,5	310
	130	46	2,1	260	0,4	1,7	2,5	310

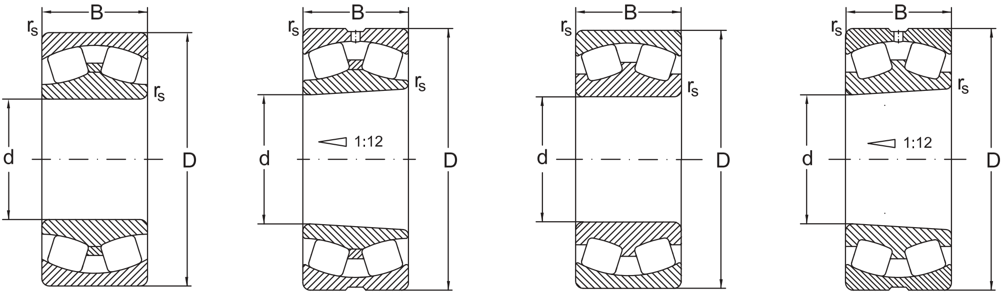
Spherical Roller Bearings



CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
55	1,6	2800	3600	**22311 MB**	2,43
	1,6	2800	3600	**22311 MBW33**	2,42
60	2,7	3400	4500	**22212 C**	1,32
	2,7	3400	4500	**22212 CK**	1,29
	2,7	3400	4500	**22212 CKW33**	1,25
	2,5	3200	4100	**22212 MBK**	1,19
	2,5	3200	4100	**22212 MBKW33**	1,17
	2,5	3200	4100	**22212 MB**	1,22
	2,5	3200	4100	**22212 MBW33**	1,2
	2,8	3000	4000	**21312 C**	1,95
	2,8	3000	4000	**21312 CK**	1,9
	2,8	2800	3800	**21312 MBK**	2,13
	1,7	2800	3800	**22312 C**	2,91
	1,7	2800	3800	**22312 CK**	2,84
	1,7	2800	3800	**22312 CKW33**	2,8
	1,7	2800	3800	**22312 CW33**	2,87
	1,7	2800	3800	**22312 CY**	2,93
	1,7	2800	3800	**22312 CYK**	2,86
	1,7	2800	3800	**22312 CYKW33**	2,82
	1,7	2800	3800	**22312 CYW33**	2,89
	1,7	2600	3400	**22312 MBK**	3,04
	1,7	2600	3400	**22312 MBKW33**	3
	1,7	2600	3400	**22312 MAC4F80W33**	3,07
	1,7	2600	3400	**22312 MB**	3,04
	1,7	2600	3400	**22312 MBW33**	3

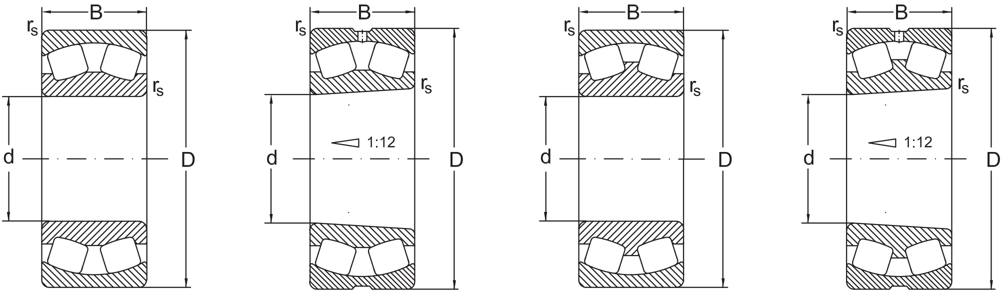
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
65	120	31	1,5	180	0,28	2,4	3,6	220
	120	31	1,5	180	0,28	2,4	3,6	220
	120	31	1,5	180	0,28	2,4	3,6	220
	120	31	1,5	180	0,28	2,4	3,6	220
	120	31	1,5	165	0,28	2,4	3,6	200
	120	31	1,5	165	0,28	2,4	3,6	200
	120	31	1,5	165	0,28	2,4	3,6	200
	120	31	1,5	165	0,28	2,4	3,6	200
	140	33	2,1	220	0,24	2,8	4,2	290
	140	33	2,1	220	0,24	2,8	4,2	290
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	305	0,39	1,7	2,6	360
	140	48	2,1	280	0,39	1,7	2,6	360
	140	48	2,1	280	0,39	1,7	2,6	330
	140	48	2,1	280	0,39	1,7	2,6	330
	140	48	2,1	280	0,39	1,7	2,6	330
	140	48	2,1	280	0,39	1,7	2,6	330
	140	48	2,1	280	0,39	1,7	2,6	330
	140	48	2,1	280	0,39	1,7	2,6	330
	140	48	2,1	280	0,39	1,7	2,6	330

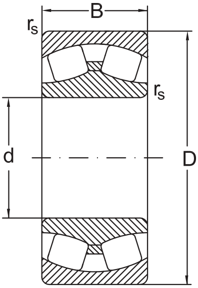
Spherical Roller Bearings



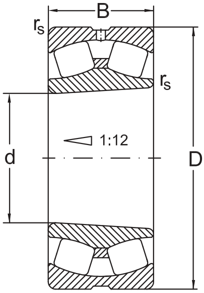
CA | CAKW33 | MA | MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
65	2,4	3000	4000	**22213 C**	1,73
	2,4	3000	4000	**22213 CK**	1,71
	2,4	3000	4000	**22213 CKW33**	1,65
	2,4	3000	4000	**22213 CW33**	1,68
	2,4	2800	3600	**22213 MBK**	1,59
	2,4	2800	3600	**22213 MBKW33**	1,57
	2,4	2800	3600	**22213 MB**	1,62
	2,4	2800	3600	**22213 MBW33**	1,6
	2,8	2800	3800	**21313 C**	2,47
	2,8	2800	3800	**21313 CK**	2,43
	1,7	2800	3600	**22313 C**	3,57
	1,7	2800	3600	**22313 CK**	3,49
	1,7	2800	3600	**22313 CKW33**	3,44
	1,7	2800	3600	**22313 CW33**	3,51
	1,7	2800	3600	**22313 CY**	3,54
	1,7	2800	3600	**22313 CYK**	3,44
	1,7	2800	3600	**22313 CYKW33**	3,43
	1,7	2800	3600	**22313 CYW33**	3,53
	1,7	2400	3200	**22313 MB**	3,81
	1,7	2400	3200	**22313 MBW33**	3,7
	1,7	2400	3200	**22313 MBK**	3,71
	1,7	2400	3200	**22313 MBKW33**	3,65
	1,7	2400	3200	**22313 MA**	3,56
	1,7	2400	3200	**22313 MAC4F80W33**	3,77
	1,7	2400	3200	**22313 MAC4W502**	3,51

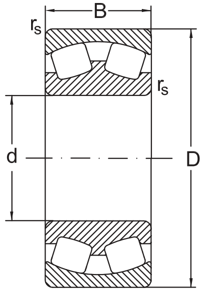
Spherical Roller Bearings



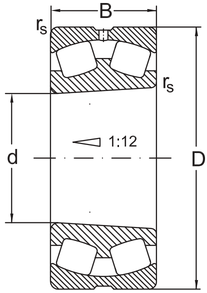
C



CKW33



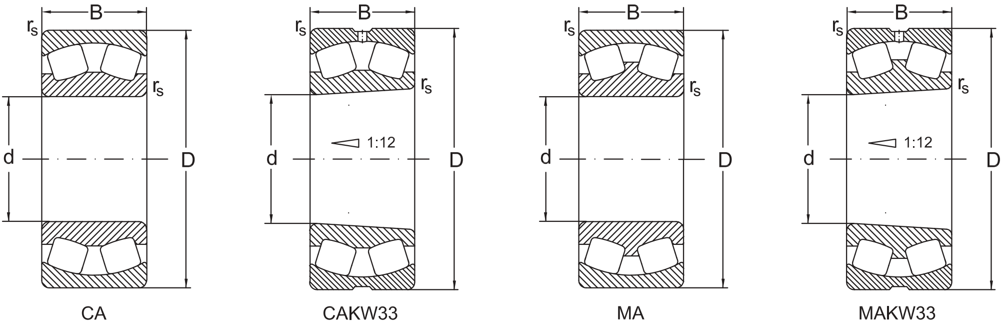
MB



MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
65	140	48	2,1	280	0,39	1,7	2,6	330
70	125	31	1,5	180	0,26	2,6	3,9	225
	125	31	1,5	180	0,26	2,6	3,9	225
	125	31	1,5	180	0,26	2,6	3,9	225
	125	31	1,5	180	0,26	2,6	3,9	225
	150	35	2,1	190	0,26	2,6	4	197
	150	35	2,1	190	0,26	2,6	4	197
	150	35	2,1	190	0,26	2,6	4	197
	150	51	2,1	375	0,38	1,9	2,9	455
	150	51	2,1	375	0,38	1,9	2,9	455
	150	51	2,1	375	0,38	1,9	2,9	455
	150	51	2,1	375	0,38	1,9	2,9	455
	150	51	2,1	340	0,37	1,8	2,7	420
	150	51	2,1	340	0,37	1,8	2,7	420
	150	51	2,1	340	0,37	1,8	2,7	420
	150	51	2,1	340	0,37	1,8	2,7	420
	150	51	2,1	340	0,37	1,8	2,7	420
	150	51	2,1	340	0,37	1,8	2,7	420
75	130	31	1,5	190	0,23	2,9	4,4	250
	130	31	1,5	190	0,23	2,9	4,4	250
	130	31	1,5	190	0,24	2,9	4,4	250
	130	31	1,5	190	0,24	2,9	4,4	250
	130	31	1,5	175	0,24	2,8	4,1	230
	130	31	1,5	175	0,24	2,8	4,1	230
	130	31	1,5	175	0,24	2,8	4,1	230

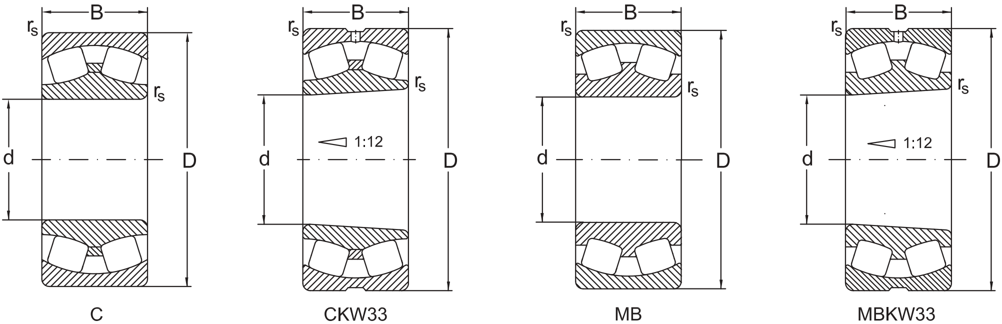
Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
65	1,7	2400	3200	**22313 MAW502**	3,51
70	2,6	2800	3800	**22214 C**	1,82
	2,6	2800	3800	**22214 CK**	1,82
	2,6	2800	3800	**22214 CKW33**	1,8
	2,6	2800	3800	**22214 CW33**	1,82
	2,6	2600	3400	**21314 MBKW33**	3,12
	2,6	2600	3400	**21314 MB**	3,2
	2,6	2600	3400	**21314 MBW33**	3,16
	1,9	2400	3200	**22314 C**	4,32
	1,9	2400	3200	**22314 CK**	4,32
	1,9	2400	3200	**22314 CKW33**	4,21
	1,9	2400	3200	**22314 CW33**	4,3
	1,7	2200	2800	**22314 MB**	4,51
	1,7	2200	2800	**22314 MBW33**	4,51
	1,7	2200	2800	**22314 MBK**	4,37
	1,7	2200	2800	**22314 MBKW33**	4,37
	1,7	2200	2800	**22314 MAC4F80W33**	4,58
	1,7	2200	2800	**22314 MBW7**	4,53
75	2,9	2800	3800	**22215 C**	1,91
	2,9	2800	3800	**22215 CK**	1,88
	2,9	2800	3800	**22215 CW33**	1,89
	2,9	2800	3800	**22215 CKW33**	1,86
	2,7	2600	3400	**22215 MBK**	1,75
	2,7	2600	3400	**22215 MBKW33**	1,73
	2,7	2600	3400	**22215 MB**	1,79

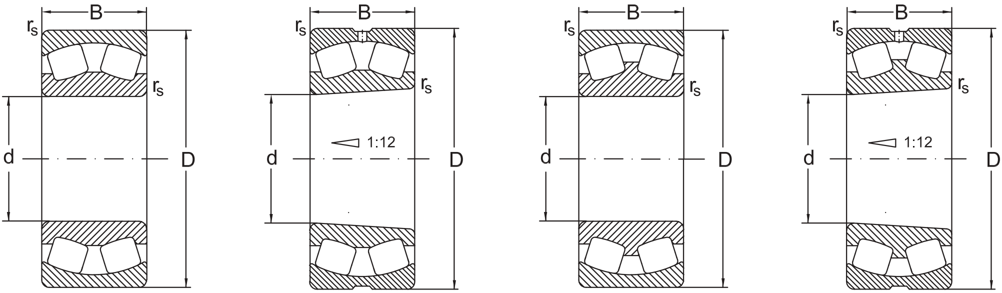
ART BEARINGS

Spherical Roller Bearings



Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
75	130	31	1,5	175	0,24	2,8	4,1	230
	160	37	2,1	280	0,23	2,9	4,4	360
	160	37	2,1	280	0,23	2,9	4,4	360
	160	55	2,1	415	0,38	1,8	2,6	520
	160	55	2,1	415	0,38	1,8	2,6	520
	160	55	2,1	415	0,38	1,8	2,6	520
	160	55	2,1	415	0,38	1,8	2,6	520
	160	55	2,1	380	0,34	1,9	2,9	475
	160	55	2,1	380	0,34	1,9	2,9	475
	160	55	2,1	380	0,34	1,9	2,9	475
	160	55	2,1	380	0,34	1,9	2,9	475
	160	55	2,1	380	0,34	1,9	2,9	475
80	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	210	0,25	2,6	4	275
	140	33	2	195	0,24	2,8	4,1	250
	140	33	2	195	0,24	2,8	4,1	250
	140	33	2	195	0,24	2,8	4,1	250
	140	33	2	195	0,24	2,8	4,1	250
	170	39	2,1	310	0,23	2,9	4,2	400

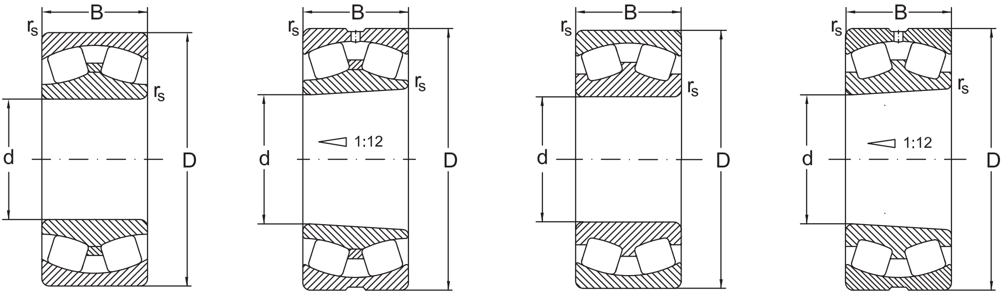
Spherical Roller Bearings



CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
75	2,7	2600	3400	**22215 MBW33**	1,77
	2,9	2400	3200	**21315 CW33**	3,78
	2,9	2400	3200	**21315 CKW33**	3,73
	1,7	2200	3000	**22315 C**	5,28
	1,7	2200	3000	**22315 CW33**	5,26
	1,7	2200	3000	**22315 CK**	5,16
	1,7	2200	3000	**22315 CKW33**	5,14
	1,9	1900	2600	**22315 MBK**	5,14
	1,9	1900	2600	**22315 MBKW33**	5,12
	1,9	1900	2600	**22315 MAC4F80W33**	5,57
	1,9	1900	2600	**22315 MB**	5,26
	1,9	1900	2600	**22315 MBW33**	5,24
80	2,6	2600	3400	**22216 C**	2,12
	2,6	2600	3400	**22216 CW33**	2,1
	2,6	2600	3400	**22216 CK**	2,07
	2,6	2600	3400	**22216 CKW33**	2,05
	2,6	2600	3400	**22216 CY**	2,13
	2,6	2600	3400	**22216 CYK**	2,13
	2,6	2600	3400	**22216 CYKW33**	2,06
	2,6	2600	3400	**22216 CYW33**	2,11
	2,7	2400	3200	**22216 MBK**	2,09
	2,7	2400	3200	**22216 MBKW33**	2,07
	2,7	2400	3200	**22216 MB**	2,14
	2,7	2200	3000	**22216 MBW33**	2,1
	2,8	2200	3000	**21316 CW33**	4,26

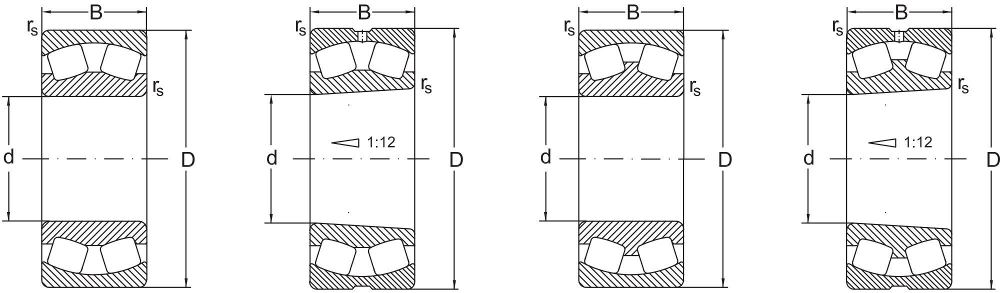
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
80	170	39	2,1	310	0,23	2,9	4,2	400
	170	58	2,1	450	0,35	1,9	2,9	550
	170	58	2,1	450	0,35	1,9	2,9	550
	170	58	2,1	450	0,35	1,9	2,9	550
	170	58	2,1	450	0,35	1,9	2,9	550
	170	58	2,1	410	0,25	2,6	4	500
	170	58	2,1	410	0,25	2,6	4	500
	170	58	2,1	410	0,25	2,6	4	500
	170	58	2,1	410	0,25	2,6	4	500
	170	58	2,1	410	0,25	2,6	4	500
85	150	36	2	250	0,26	2,6	3,9	325
	150	36	2	250	0,26	2,6	3,9	325
	150	36	2	250	0,26	2,6	3,9	325
	150	36	2	250	0,26	2,6	3,9	325
	150	36	2	230	0,25	2,7	4	295
	150	36	2	230	0,25	2,7	4	295
	150	36	2	230	0,25	2,7	4	295
	150	36	2	230	0,25	2,7	4	295
	150	36	2	230	0,25	2,7	4	295
	180	41	3	233,4	0,22	3	4,5	244
	180	41	3	350	0,22	3	4,5	450
	180	41	3	350	0,22	3	4,5	450
	180	60	3	500	0,33	2	3	620
	180	60	3	500	0,33	2	3	620
	180	60	3	500	0,33	2	3	620

Spherical Roller Bearings

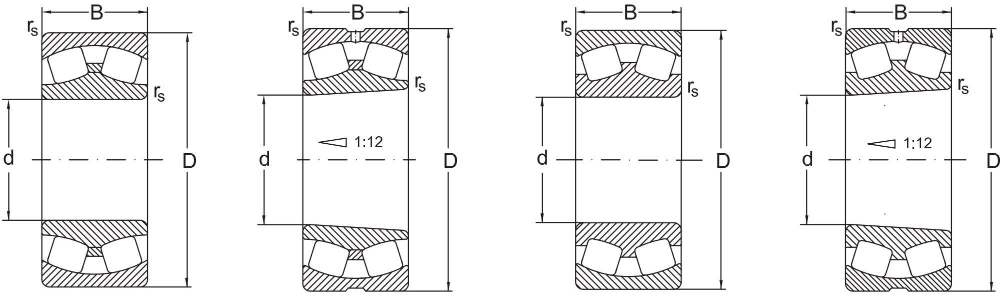


CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
80	2,8	2200	3000	**21316 CKW33**	4,2
	1,8	2000	2600	**22316 C**	6,33
	1,8	2000	2600	**22316 CK**	6,14
	1,8	2000	2600	**22316 CKW33**	6,12
	1,8	2000	2600	**22316 CW33**	6,27
	2,6	1800	2400	**22316 MAC4F80W33**	6,95
	2,6	1800	2400	**22316 MBK**	6,11
	2,6	1800	2400	**22316 MB**	6,25
	2,6	1800	2400	**22316 MBW33**	6,23
	2,6	1800	2400	**22316 MBKW33**	6,09
85	2,6	2400	3200	**22217 C**	2,57
	2,6	2400	3200	**22217 CK**	2,52
	2,6	2400	3200	**22217 CW33**	2,56
	2,6	2400	3200	**22217 CKW33**	2,5
	2,6	2200	2800	**22217 MB**	2,76
	2,6	2200	2800	**22217 MBK**	2,7
	2,6	2200	2800	**22217 MBKW33**	2,69
	2,6	2200	2800	**22217 MBW7**	2,76
	2,6	2200	2800	**22217 MBW33**	2,75
	2,9	2100	2600	**21317 MBKW33**	5,1
	2,9	2200	2800	**21317 C**	5,1
	2,9	2200	2800	**21317 CK**	5
	2	1800	2400	**22317 C**	7,68
	2	1800	2400	**22317 CK**	7,52
	2	1800	2400	**22317 CKW33**	7,47

ART BEARINGS

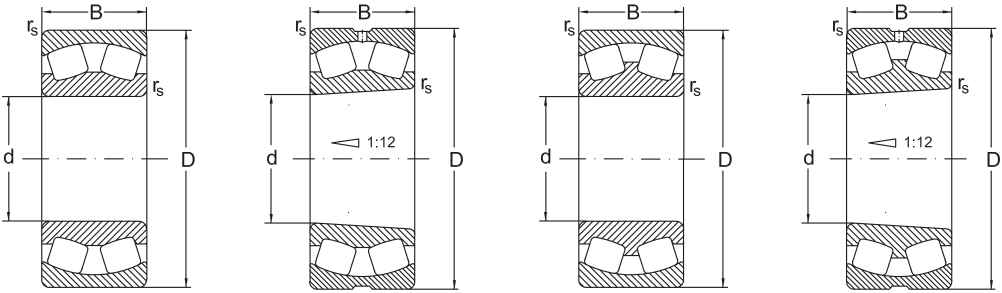
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
85	180	60	3	460	0,22	3	4,5	570
	180	60	3	406	0,37	1,8	2,7	507
	180	60	3	406	0,37	1,8	2,7	507
	180	60	3	406	0,37	1,8	2,7	507
	180	60	3	406	0,37	1,8	2,7	507
	180	60	3	406	0,37	1,8	2,7	507
	180	60	3	406	0,37	1,8	2,7	507
90	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	305	0,27	2,5	3,8	410
	160	40	2	280	0,26	2,6	3,8	375
	160	40	2	280	0,26	2,6	3,8	375
	160	40	2	280	0,26	2,6	3,8	375
	160	40	2	280	0,26	2,6	3,8	375
	160	52,4	2	340	0,34	2	3	485
	160	52,4	2	340	0,34	2	3	485
	160	52,4	2	340	0,34	2	3	485
	160	52,4	2	340	0,34	2	3	485
	190	43	3	385	0,22	3	4,5	510
	190	43	3	385	0,22	3	4,5	510

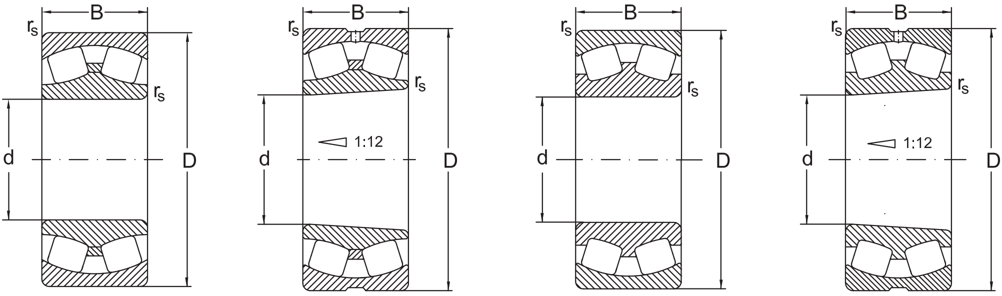
Spherical Roller Bearings



CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
85	2,9	2200	2800	**22317 CA**	7,64
	1,8	1800	2400	**22317 MBW33**	7,17
	1,8	1700	2200	**22317 MBK**	7,07
	1,8	1700	2200	**22317 MAC4F80W33**	7,88
	1,8	1700	2200	**22317 MB**	7,33
	1,8	1700	2200	**22317 MBW20**	7,23
	1,8	1700	2200	**22317 MBKW33**	7,01
90	2,5	2200	3000	**22218 C**	3,4
	2,5	2200	3000	**22218 CW33**	3,38
	2,5	2200	3000	**22218 CK**	3,33
	2,5	2200	3000	**22218 CKW33**	3,31
	2,5	2200	3000	**22218 CY**	3,41
	2,5	2200	3000	**22218 CYK**	3,34
	2,5	2200	3000	**22218 CYKW33**	3,33
	2,5	2200	3000	**22218 CYW33**	3,39
	2,5	2200	2800	**22218 MBK**	3,47
	2,5	2200	2800	**22218 MBKW33**	3,46
	2,5	2200	2800	**22218 MBW33**	3,46
	2,5	2200	2800	**22218 MB**	3,57
	2	1500	2000	**23218 MBKW33**	4,23
	2	1500	2000	**23218 MB**	4,37
	2	1500	2000	**23218 MBK**	4,25
	2	1500	2000	**23218 MBW33**	4,35
	2,9	2200	2800	**21318 C**	5,8
	2,9	2200	2800	**21318 CK**	5,7

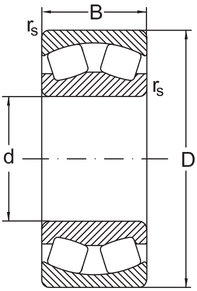
Spherical Roller Bearings



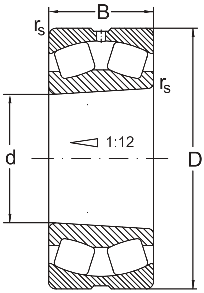
C | CKW33 | MB | MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
90	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	570	0,36	1,9	2,8	730
	190	64	3	530	0,37	1,8	2,7	670
	190	64	3	530	0,37	1,8	2,7	670
	190	64	3	530	0,37	1,8	2,7	670
	190	64	3	530	0,37	1,8	2,7	670
	190	64	3	530	0,37	1,8	2,7	670
	190	64	3	530	0,37	1,8	2,7	670
95	170	43	2,1	340	0,24	2,8	4,2	450
	170	43	2,1	340	0,24	2,8	4,2	450
	170	43	2,1	340	0,24	2,8	3,8	450
	170	43	2,1	340	0,24	2,8	4,2	450
	170	43	2,1	340	0,24	2,8	4,2	450
	170	43	2,1	310	0,26	2,6	3,8	415
	170	43	2,1	310	0,26	2,6	3,8	415
	170	43	2,1	310	0,26	2,6	3,8	415
	170	43	2,1	310	0,26	2,6	3,8	415
	200	45	3	420	0,22	3	4,5	580
	200	45	3	385	0,22	3,1	4,6	530

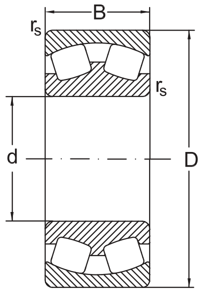
Spherical Roller Bearings



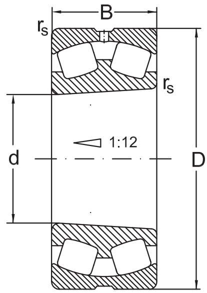
CA



CAKW33



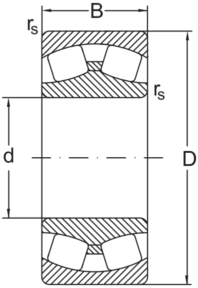
MA



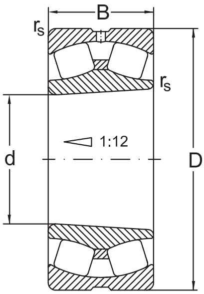
MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
90	1,8	1800	2400	**22318 C**	8,68
	1,8	1800	2400	**22318 CK**	8,5
	1,8	1800	2400	**22318 CW33**	8,6
	1,8	1800	2400	**22318 CKW33**	8,5
	1,8	1800	2400	**22318 CY**	8,73
	1,8	1800	2400	**22318 CYK**	8,55
	1,8	1800	2400	**22318 CYKW33**	8,53
	1,8	1800	2400	**22318 CYW33**	8,71
	1,8	1700	2200	**22318 MBK**	8,5
	1,8	1700	2200	**22318 MBKW33**	8,49
	1,8	1700	2200	**22318 MA**	9,21
	1,8	1700	2200	**22318 MAC4F80W33**	9,2
	1,8	1700	2200	**22318 MB**	8,69
	1,8	1700	2200	**22318 MBW33**	8,68
95	2,8	2200	2800	**22219 C**	4,26
	2,8	2200	2800	**22219 CK**	4,17
	2,8	2200	2800	**22219 CKW33**	4,15
	2,8	2200	2800	**22219 CW25**	4,24
	2,8	2200	2800	**22219 CW33**	4,24
	2,5	2000	2600	**22219 MBK**	4,3
	2,5	2000	2600	**22219 MBKW33**	4,28
	2,5	2000	2600	**22219 MB**	4,32
	2,5	2000	2600	**22219 MBW25**	4,32
	3	2000	2600	**21319 CA**	7,43
	3	2000	2600	**21319 MB**	7,38

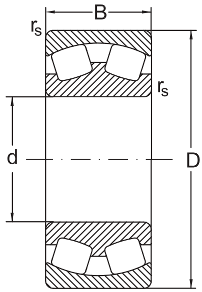
Spherical Roller Bearings



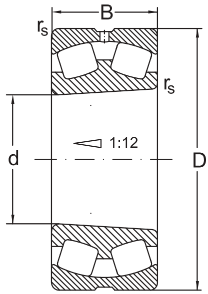
C



CKW33



MB

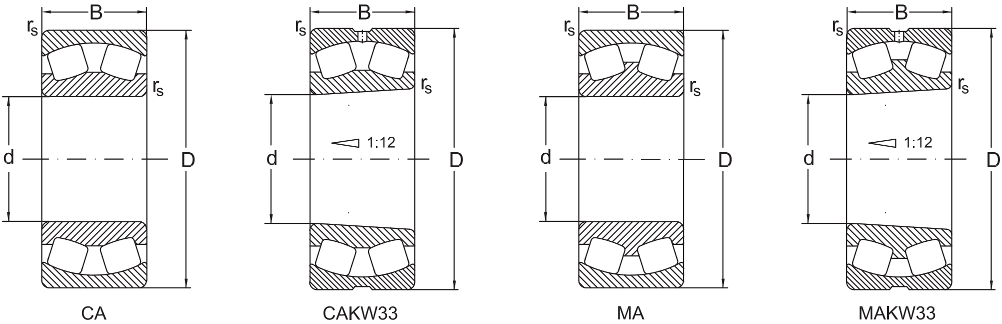


MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
95	200	45	3	385	0,22	3,1	4,6	530
	200	67	3	620	0,35	1,9	2,9	800
	200	67	3	620	0,35	1,9	2,9	800
	200	67	3	620	0,35	1,9	2,9	800
	200	67	3	620	0,35	1,9	2,9	800
	200	67	3	620	0,35	1,9	2,9	800
	200	67	3	570	0,35	1,9	2,7	740
	200	67	3	570	0,38	1,8	2,7	740
	200	67	3	570	0,38	1,8	2,7	740
	200	67	3	570	0,38	1,8	2,7	740
	200	67	3	570	0,38	1,8	2,7	740
	200	67	3	570	0,38	1,8	2,7	740
100	165	52	2	347	0,28	2,4	3,5	534
	165	52	2	355	0,31	2,2	3,2	540
	165	52	2	355	0,31	2,2	3,2	540
	165	52	2	355	0,31	2,2	3,2	540
	165	52	2	355	0,31	2,2	3,2	540
	180	46	2,1	375	0,24	2,8	4,2	500
	180	46	2,1	375	0,24	2,8	4,2	500
	180	46	2,1	375	0,24	2,8	4,2	500
	180	46	2,1	375	0,24	2,8	4,2	500
	180	46	2,1	340	0,27	2,5	3,7	455
	180	46	2,1	340	0,27	2,5	3,7	455
	180	46	2,1	340	0,27	2,5	3,7	455
	180	46	2,1	340	0,27	2,5	3,7	455

ART BEARINGS

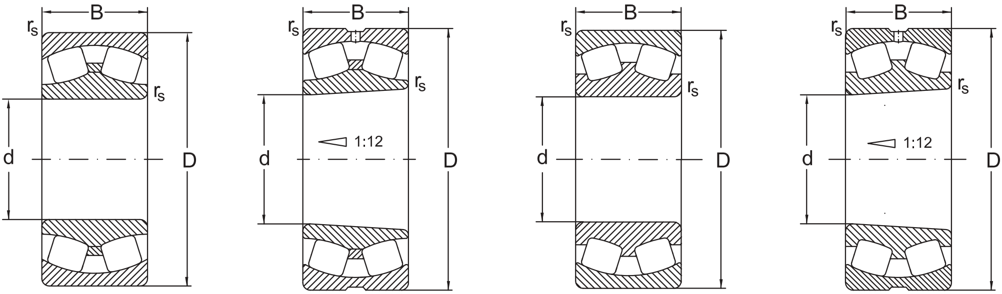
Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
95	3	2000	2600	**21319 MBK**	7,28
	1,8	1700	2200	**22319 C**	8,83
	1,8	1700	2200	**22319 CK**	8,61
	1,8	1700	2200	**22319 CKW33**	8,5
	1,8	1700	2200	**22319 CW25**	8,71
	1,8	1700	2200	**22319 CW33**	8,72
	1,7	1500	2000	**22319 MBK**	9,88
	1,7	1500	2000	**22319 MAC4F80W33**	10,7
	1,7	1500	2000	**22319 MB**	10,1
	1,7	1500	2000	**22319 MBW25**	9,97
	1,7	1500	2000	**22319 MBW33**	9,97
	1,7	1500	2000	**22319 MBKW33**	9,97
100	2,3	2200	3000	**23120 CW33**	5
	2,1	2000	2600	**23120 MBKW33**	4,53
	2,1	2000	2600	**23120 MB**	4,7
	2,1	2000	2600	**23120 MBK**	4,57
	2,1	2000	2600	**23120 MBW33**	4,66
	2,8	2200	2800	**22220 C**	5,24
	2,8	2200	2800	**22220 CK**	5,13
	2,8	2200	2800	**22220 CKW33**	5,09
	2,8	2200	2800	**22220 CW33**	5,23
	2,4	2000	2600	**22220 MBK**	5,24
	2,4	2000	2600	**22220 MB**	5,35
	2,4	2000	2600	**22220 MBW33**	5,31
	2,4	2000	2600	**22220 MBKW33**	5,2

ART BEARINGS

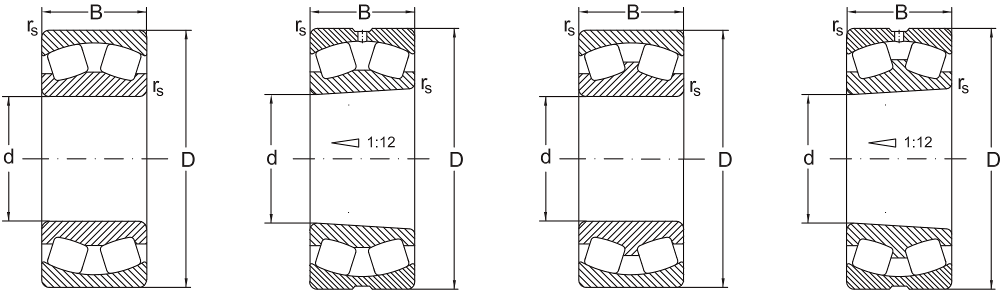
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
	180	60,3	2,1	495	0,33	2	3	720
	180	60,3	2,1	495	0,33	2	3	720
	180	60,3	2,1	495	0,33	2	3	720
	180	60,3	2,1	495	0,33	2	3	720
	180	60,3	2,1	455	0,33	2	3	660
	180	60,3	2,1	455	0,33	2	3	660
	180	60,3	2,1	455	0,33	2	3	660
	180	60,3	2,1	455	0,33	2	3	660
	180	60,3	2,1	455	0,33	2	3	660
	180	60,3	2,1	455	0,33	2	3	660
	180	60,3	2,1	455	0,33	2	3	660
	215	47	3	460	0,22	3,1	4,7	640
100	215	47	3	425	0,22	3,1	4,7	580
	215	47	3	425	0,22	3,1	4,7	580
	215	73	3	730	0,35	1,9	2,9	960
	215	73	3	730	0,35	1,9	2,9	960
	215	73	3	730	0,35	1,9	2,9	960
	215	73	3	730	0,35	1,9	2,9	960
	215	73	3	730	0,35	1,9	2,9	960
	215	73	3	670	0,37	1,8	2,9	880
	215	73	3	670	0,37	1,8	2,9	880
	215	73	3	670	0,37	1,8	2,9	880
	215	73	3	670	0,37	1,8	2,9	880
	215	73	3	670	0,37	1,8	2,7	880
	215	73	3	670	0,37	1,8	2,7	880

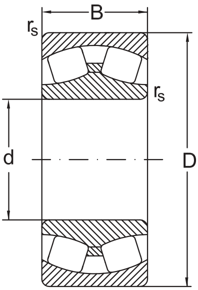
Spherical Roller Bearings



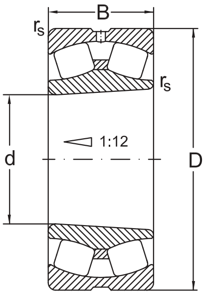
CA | CAKW33 | MA | MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
100	2	1700	2200	**23220 C**	7,34
	2	1700	2200	**23220 CK**	7,19
	2	1700	2200	**23220 CKW33**	7,13
	2	1700	2200	**23220 CW33**	7,28
	2	1500	2000	**23220 MA**	7,04
	2	1500	2000	**23220 MAK**	6,85
	2	1500	2000	**23220 MAW33**	7,03
	2	1500	2000	**23220 MAKW33**	6,84
	2	1500	2000	**23220 MBK**	6,8
	2	1500	2000	**23220 MB**	6,99
	2	1500	2000	**23220 MBW33**	6,98
	3,1	1800	2400	**21320 CA**	9,07
	3,1	1700	2200	**21320 MB**	8,96
	3,1	1700	2200	**21320 MBK**	8,84
	1,9	1500	2000	**22320 C**	12,95
	1,9	1500	2000	**22320 CK**	12,67
	1,9	1500	2000	**22320 CW33**	12,83
	1,9	1500	2000	**22320 CKW33**	12,55
	1,9	1500	2000	**22320 CYW33**	12,83
	1,7	1400	1800	**22320 MBK**	13,21
	1,7	1400	1800	**22320 MBKW33**	13,09
	1,7	1400	1800	**22320 MA**	13,89
	1,7	1400	1800	**22320 MAC4F80W33**	13,78
	1,7	1400	1800	**22320 MB**	13,49
	1,7	1400	1800	**22320 MBW33**	13,37

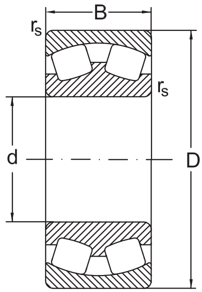
Spherical Roller Bearings



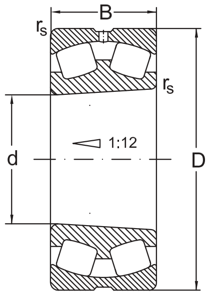
C



CKW33



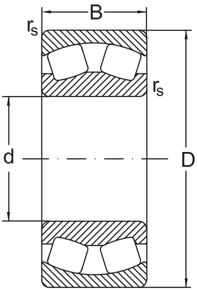
MB



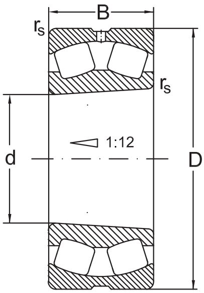
MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
110	170	45	2	295	0,24	2,8	4,2	485
	170	45	2	295	0,24	2,8	4,2	485
	170	45	2	295	0,24	2,8	4,2	485
	170	45	2	295	0,24	2,8	4,2	485
	180	56	2	450	0,3	2,3	3,4	700
	180	56	2	410	0,3	2,3	3,3	640
	180	56	2	410	0,3	2,3	3,3	640
	180	56	2	410	0,3	2,3	3,3	640
	180	56	2	410	0,3	2,3	3,3	640
	180	69	2	466	0,39	1,7	2,6	771
	180	69	2	466	0,39	1,7	2,6	771
	180	69	2	466	0,39	1,7	2,6	771
	180	69	2	466	0,39	1,7	2,6	771
	200	53	2,1	515	0,25	2,7	4	650
	200	53	2,1	515	0,25	2,7	4	650
	200	53	2,1	515	0,25	2,7	4	650
	200	53	2,1	515	0,25	2,7	4	650
	200	53	2,1	455	0,28	2,4	3,5	585
	200	53	2,1	455	0,28	2,4	3,5	585
	200	53	2,1	455	0,28	2,4	3,5	585
	200	53	2,1	455	0,28	2,4	3,5	585
	200	69,8	2,1	620	0,33	2	3	920
	200	69,8	2,1	570	0,37	1,8	2,7	840
	200	69,8	2,1	570	0,37	1,8	2,7	840
	200	69,8	2,1	570	0,37	1,8	2,7	840

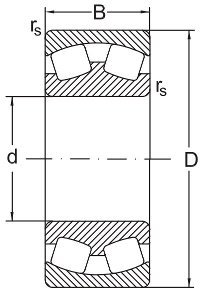
Spherical Roller Bearings



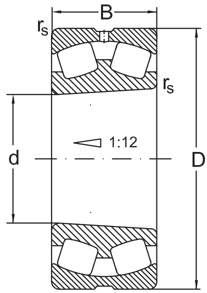
CA



CAKW33



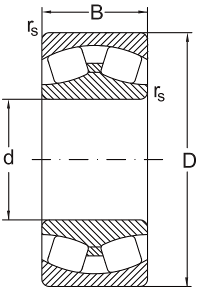
MA



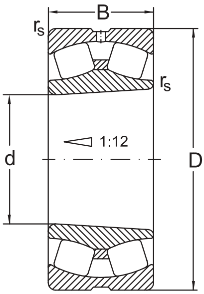
MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
110	2,7	2000	2600	**23022 MBK**	3,58
	2,7	2000	2600	**23022 MBKW33**	3,56
	2,7	2000	2600	**23022 MB**	3,8
	2,7	2000	2600	**23022 MBW33**	3,56
	2,2	2000	2600	**23122 C**	6,26
	2,2	1800	2400	**23122 MBK**	5,18
	2,2	1800	2400	**23122 MB**	5,29
	2,2	1800	2400	**23122 MBW33**	5,19
	2,2	1800	2400	**23122 MBKW33**	5,07
	1,7	1200	1600	**24122 CA**	6,9
	1,7	1200	1600	**24122 CAW33**	6,82
	1,7	1200	1600	**24122 CAK30**	6,8
	1,7	1200	1600	**24122 CAK30W33**	6,77
	2,5	1800	2400	**22222 C**	7,52
	2,5	1800	2400	**22222 CK**	7,45
	2,5	1800	2400	**22222 CKW33**	7,39
	2,5	1800	2400	**22222 CW33**	7,45
	2,3	1700	2200	**22222 MBK**	7,1
	2,3	1700	2200	**22222 MB**	7,31
	2,3	1700	2200	**22222 MBW33**	7,1
	2,3	1700	2200	**22222 MBKW33**	7
	2	1400	1800	**23222 C**	10,75
	1,8	1200	1600	**23222 MBK**	9,4
	1,8	1200	1600	**23222 MB**	9,7
	1,8	1200	1600	**23222 MBW20**	9,5

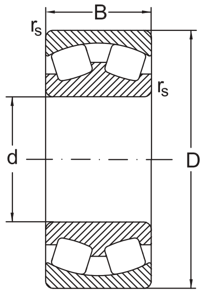
Spherical Roller Bearings



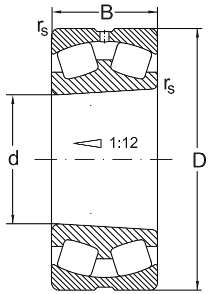
C



CKW33



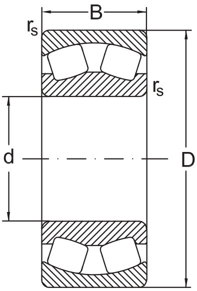
MB



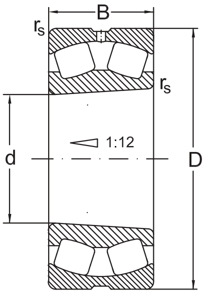
MBKW33

Dimensions				**Basic radial load. Factors**				
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}
mm				kN				kN
110	200	69,8	2,1	570	0,37	1,8	2,7	840
	200	69,8	2,1	570	0,37	1,8	2,7	840
	240	50	3	475	0,21	3,2	4,8	500
	240	50	3	475	0,21	3,2	4,8	500
	240	80	3	870	0,34	1,2	2,3	1160
	240	80	3	870	0,34	1,2	2,3	1160
	240	80	3	870	0,34	1,2	2,3	1160
	240	80	3	870	0,34	1,2	2,3	1160
	240	80	3	870	0,34	2	3	1160
	240	80	3	870	0,34	2	3	1160
	240	80	3	800	0,37	1,8	2,7	1060
	240	80	3	800	0,37	1,8	2,7	1060
	240	80	3	800	0,37	1,8	2,7	1060
	240	80	3	800	0,37	1,8	2,7	1060
	240	80	3	800	0,37	1,8	2,7	1060
	240	80	3	800	0,37	1,8	2,7	1060
	240	80	3	800	0,37	1,8	2,7	1060
120	180	46	2	365	0,22	3	4,6	610
	180	46	2	365	0,22	3	4,6	610
	180	46	2	365	0,22	3	4,6	610
	180	46	2	365	0,22	3	4,6	610
	180	46	2	335	0,24	2,8	4,2	560
	180	46	2	335	0,24	2,8	4,2	560
	180	46	2	335	0,24	2,8	4,2	560
	180	46	2	335	0,24	2,8	4,2	560

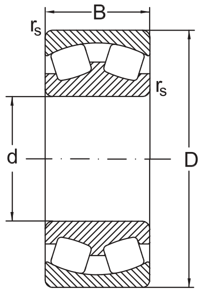
Spherical Roller Bearings



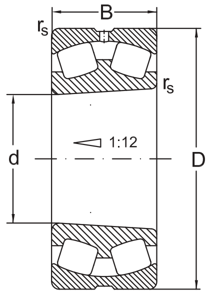
CA



CAKW33



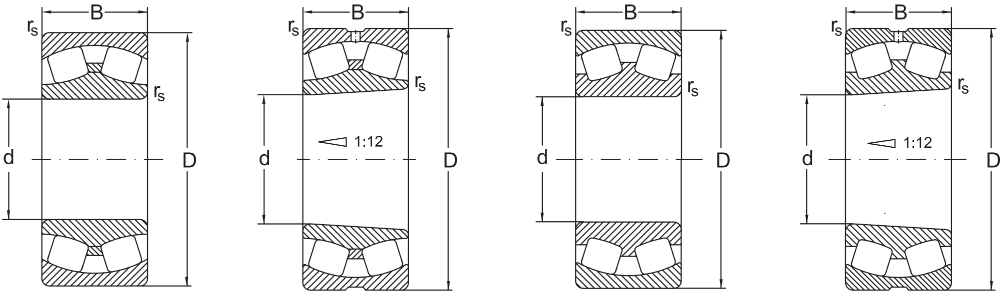
MA



MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
110	1,8	1200	1600	**23222 MBW33**	9,45
	1,8	1200	1600	**23222 MBKW33**	9,25
	3,2	1500	2000	**21322 MB**	12
	3,2	1500	2000	**21322 MBK**	11,7
	1,2	1400	1900	**22322 C**	18
	1,2	1400	1900	**22322 CW33**	17,7
	1,2	1400	1900	**22322 CK**	17,5
	1,2	1400	1900	**22322 CKW33**	17,2
	2	1400	1900	**22322 CY**	18
	2	1400	1900	**22322 CYK**	18,5
	1,8	1300	1700	**22322 MBK**	17,2
	1,8	1300	1700	**22322 MBKW33**	17,9
	1,8	1300	1700	**22322 MB**	18,7
	1,8	1300	1700	**22322 MBW33**	18,4
	1,8	1300	1700	**22322 MA**	18,7
	1,8	1300	1700	**22322 MAC4F80W33**	18,4
	1,8	1300	1700	**22322 MAW33**	18,4
120	2,8	2000	2600	**23024 C**	4,31
	2,8	2000	2600	**23024 CK**	4,11
	2,8	2000	2600	**23024 CKW33**	4,02
	2,8	2000	2600	**23024 CW33**	4,22
	2,8	1800	2400	**23024 MBK**	4
	2,8	1800	2400	**23024 MB**	4,19
	2,8	1800	2400	**23024 MBW33**	4,1
	2,8	1800	2400	**23024 MBKW33**	3,9

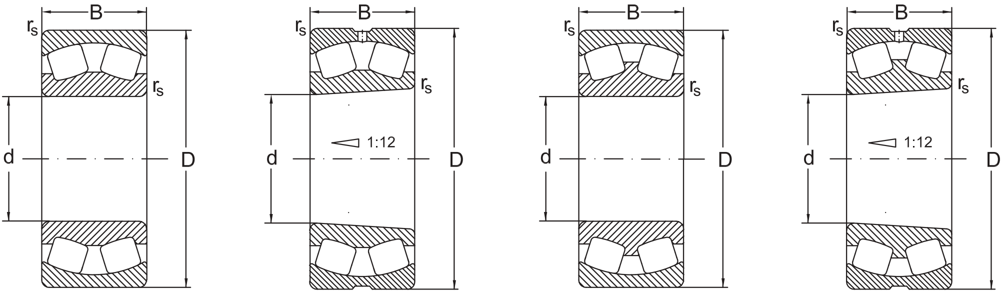
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
120	180	60	2	450	0,35	2,3	3,3	800
	180	60	2	450	0,35	2,3	3,3	800
	180	60	2	430	0,32	2,1	3,1	770
	180	60	2	430	0,32	2,1	3,1	770
	180	60	2	410	0,32	2,1	3,1	740
	180	60	2	410	0,32	2,1	3,1	740
	180	60	2	410	0,32	2,1	3,1	740
	200	62	2	510	0,35	2,3	3,5	800
	200	62	2	510	0,35	2,3	3,5	800
	200	62	2	495	0,31	2,2	3,3	770
	200	62	2	495	0,31	2,2	3,3	770
	200	62	2	495	0,31	2,2	3,3	770
	200	62	2	495	0,31	2,2	3,3	770
	200	80	2	630	0,4	1,7	2,5	1050
	200	80	2	630	0,4	1,7	2,5	1050
	200	80	2	630	0,4	1,7	2,5	1050
	215	58	2,1	590	0,27	2,6	3,8	800
	215	58	2,1	590	0,27	2,6	3,8	800
	215	58	2,1	590	0,27	2,6	3,8	800
	215	58	2,1	590	0,27	2,6	3,8	800
	215	58	2,1	540	0,29	2,3	3,5	740
	215	58	2,1	540	0,29	2,3	3,5	740
	215	58	2,1	540	0,29	2,3	3,5	740
	215	58	2,1	540	0,29	2,3	3,5	740
	215	76	2,1	730	0,35	1,9	2,9	1120

Spherical Roller Bearings

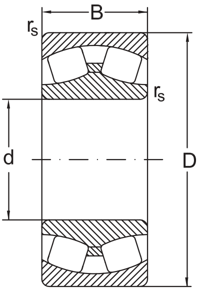


CA   CAKW33   MA   MAKW33

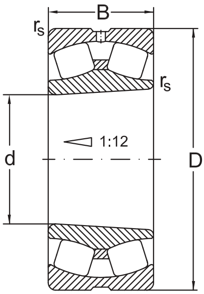
d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
	2,2	1600	2200	**24024 C**	5,2
	2,2	1600	2200	**24024 CW33**	4,9
	2	1500	2000	**24024 CAW33**	5,4
	2	1500	2000	**24024 CAK30W33**	5,3
	2	1400	1800	**24024 MBK30W33**	5,1
	2	1400	1800	**24024 MB**	5,12
	2	1400	1800	**24024 MBW33**	5,1
	2,3	1800	2400	**23124 C**	7,8
	2,3	1800	2400	**23124 CW33**	7,7
	2,2	1700	2200	**23124 MBK**	7,9
	2,2	1700	2200	**23124 MB**	8,19
	2,2	1700	2200	**23124 MBW33**	8,13
120	2,2	1700	2200	**23124 MBKW33**	7,84
	1,6	1000	1300	**24124 MB**	10,22
	1,6	1000	1300	**24124 MBW33**	10,2
	1,6	1000	1300	**24124 MBK30W33**	10,04
	2,5	1700	2200	**22224 C**	8,9
	2,5	1700	2200	**22224 CK**	8,7
	2,5	1700	2200	**22224 CW33**	8,8
	2,5	1700	2200	**22224 CKW33**	8,6
	2,3	1500	2000	**22224 MBK**	9,03
	2,3	1500	2000	**22224 MBKW33**	9,09
	2,3	1500	2000	**22224 MB**	9,73
	2,3	1500	2000	**22224 MBW33**	9,53
	1,8	1300	1700	**23224 C**	13,1

ART BEARINGS

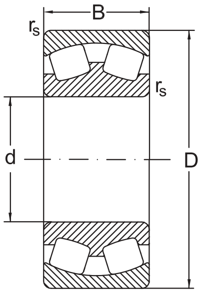
Spherical Roller Bearings



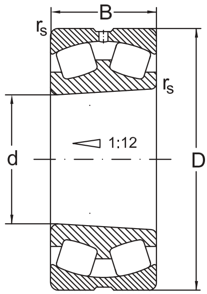
C



CKW33



MB

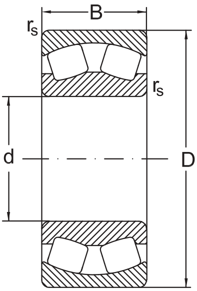


MBKW33

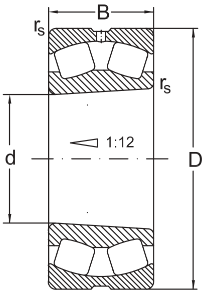
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
120	215	76	2,1	670	0,37	1,8	2,7	1020
	215	76	2,1	670	0,37	1,8	2,7	1020
	215	76	2,1	670	0,37	1,8	2,7	1020
	215	76	2,1	670	0,37	1,8	2,7	1020
	260	86	3	1010	0,35	1,9	2,9	1340
	260	86	3	1010	0,35	1,9	2,9	1340
	260	86	3	1010	0,35	1,9	2,9	1340
	260	86	3	1010	0,35	1,9	2,9	1340
	260	86	3	930	0,36	1,8	2,7	1230
	260	86	3	930	0,36	1,8	2,7	1230
	260	86	3	930	0,36	1,8	2,7	1230
	260	86	3	930	0,36	1,8	2,7	1230
	260	86	3	930	0,36	1,8	2,7	1230
	260	86	3	930	0,36	1,8	2,7	1230
130	200	52	2	450	0,27	3	4,6	730
	200	52	2	450	0,27	3	4,6	730
	200	52	2	450	0,27	3	4,6	730
	200	52	2	450	0,27	3	4,6	730
	200	52	2	410	0,23	2,9	4,4	670
	200	52	2	410	0,23	2,9	4,4	670
	200	52	2	410	0,23	2,9	4,4	670
	200	52	2	410	0,23	2,9	4,4	670
	200	69	2	530	0,34	2	3	900
	200	69	2	530	0,34	2	3	900
	200	69	2	530	0,34	2	3	900

ART BEARINGS

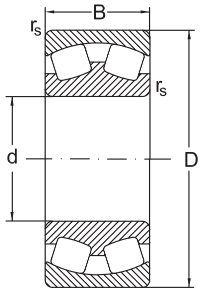
Spherical Roller Bearings



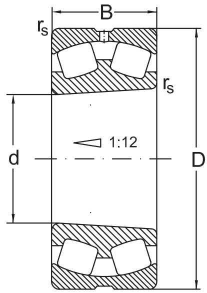
CA



CAKW33



MA

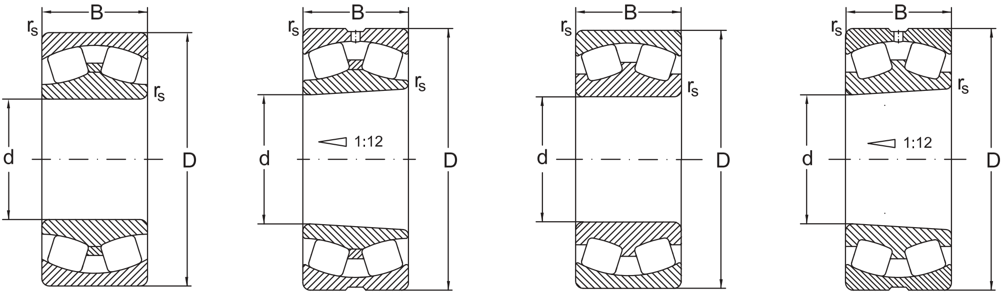


MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
120	1,8	1100	1500	**23224 MBK**	11,84
	1,8	1100	1500	**23224 MB**	12,8
	1,8	1100	1500	**23224 MBW33**	11,73
	1,8	1100	1500	**23224 MBKW33**	11
	1,8	1300	1700	**22324 C**	23,76
	1,8	1300	1700	**22324 CK**	23,29
	1,8	1300	1700	**22324 CKW33**	23,05
	1,8	1300	1700	**22324 CW33**	23,52
	1,8	1100	1500	**22324 MAKC4F80W33**	23,4
	1,8	1100	1500	**22324 MBK**	22,93
	1,8	1100	1500	**22324 MAC4F80W33**	23,93
	1,8	1100	1500	**22324 MB**	23,39
	1,8	1100	1500	**22324 MBW33**	23,18
	1,8	1100	1500	**22324 MBKW33**	22,71
130	2,9	1800	2400	**23026 C**	6,09
	2,9	1800	2400	**23026 CK**	5,7
	2,9	1800	2400	**23026 CKW33**	5,4
	2,9	1800	2400	**23026 CW33**	5,8
	2,8	1700	2200	**23026 MBK**	5,61
	2,8	1700	2200	**23026 MB**	5,78
	2,8	1700	2200	**23026 MBW33**	5,73
	2,8	1700	2200	**23026 MBKW33**	5,56
	1,9	1200	1600	**24026 C**	
	1,9	1200	1600	**24026 CW33**	
	1,9	1200	1600	**24026 MB**	7,98

ART BEARINGS

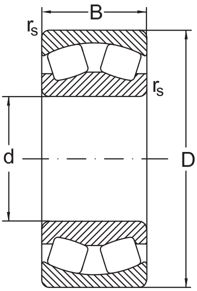
Spherical Roller Bearings



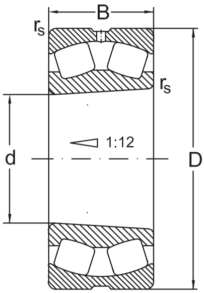
C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
	200	69	2	530	0,34	2	3	900
	200	69	2	530	0,34	2	3	900
	210	64	2	590	0,28	2,4	3,6	940
	210	64	2	540	0,3	2,3	3,3	860
	210	64	2	540	0,3	2,3	3,3	860
	210	64	2	540	0,3	2,3	3,3	860
	210	64	2	540	0,3	2,3	3,3	860
	210	80	2	650	0,37	1,8	2,7	1100
	210	80	2	650	0,37	1,8	2,7	1100
	210	80	2	650	0,37	1,8	2,7	1100
	230	64	3	660	0,29	2,3	3,5	960
	230	64	3	660	0,29	2,3	3,5	960
130	230	64	3	660	0,29	2,3	3,5	960
	230	64	3	660	0,29	2,3	3,5	960
	230	64	3	660	0,29	2,3	3,5	960
	230	64	3	660	0,29	2,3	3,5	960
	230	64	3	660	0,29	2,3	3,5	960
	230	64	3	600	0,29	2,3	3,4	880
	230	64	3	600	0,29	2,3	3,4	880
	230	64	3	600	0,29	2,3	3,4	880
	230	64	3	600	0,29	2,3	3,4	880
	230	80	3	830	0,33	2	3	1270
	230	80	3	760	0,35	1,9	2,8	1170
	230	80	3	760	0,35	1,9	2,8	1170
	230	80	3	760	0,35	1,9	2,8	1170

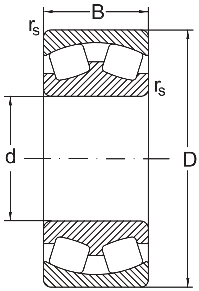
Spherical Roller Bearings



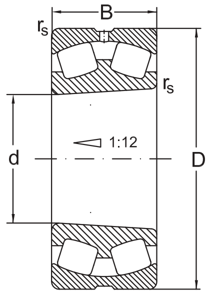
CA



CAKW33



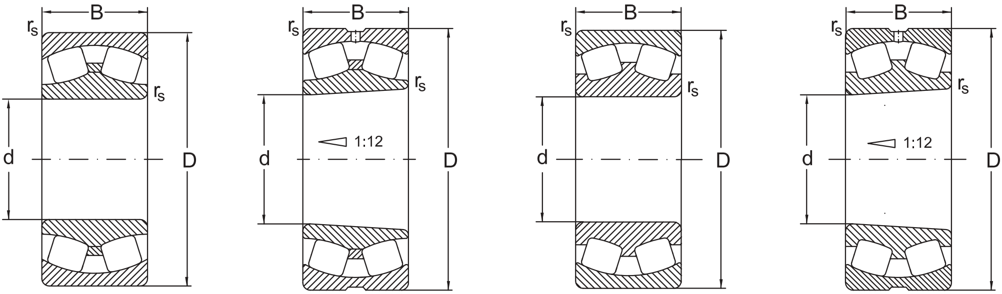
MA



MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
130	1,9	1200	1600	**24026 MBW33**	7,99
	1,9	1200	1600	**24026 MBK30W33**	7,78
	2,5	1700	2200	**23126 C**	9,7
	2,2	1500	2000	**23126 MBK**	8,36
	2,2	1500	2000	**23126 MB**	8,66
	2,2	1500	2000	**23126 MBW33**	8,4
	2,2	1500	2000	**23126 MBKW33**	8,16
	1,8	900	1200	**24126 MB**	11,4
	1,8	900	1200	**24126 MBW33**	11,07
	1,8	900	1200	**24126 MBK30W33**	10,64
	2,3	1700	2200	**22226 C**	11,14
	2,3	1700	2200	**22226 CW33**	10,9
	2,3	1700	2200	**22226 CK**	10,87
	2,3	1700	2200	**22226 CKW33**	10,6
	2,3	1700	2200	**22226 CY**	11,14
	2,3	1700	2200	**22226 CYK**	10,87
	2,3	1700	2200	**22226 CYW33**	10,9
	2,2	1500	2000	**22226 MB**	11,47
	2,2	1500	2000	**22226 MBKW33**	11,2
	2,2	1500	2000	**22226 MBW33**	11,3
	2,2	1500	2000	**22226 MBK**	11,35
	2	1300	1700	**23226 C**	15,86
	1,9	1100	1500	**23226 MBK**	14,52
	1,9	1100	1500	**23226 MB**	14,97
	1,9	1100	1500	**23226 MBW33**	14,95

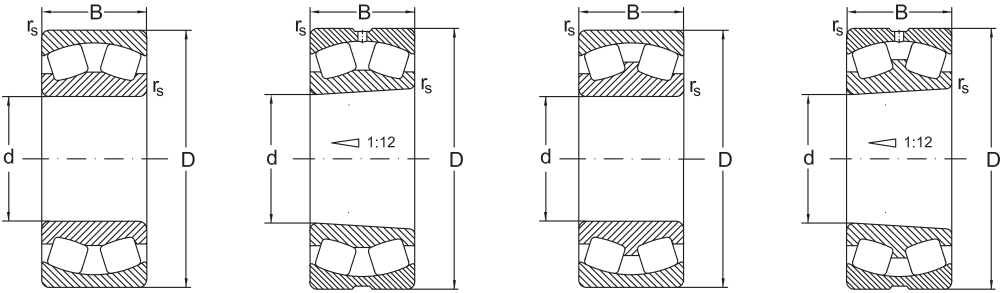
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
130	230	80	3	760	0,35	1,9	2,8	1170
	280	93	4	1170	0,35	1,9	2,9	1580
	280	93	4	1170	0,35	1,9	2,9	1580
	280	93	4	1170	0,35	1,9	2,9	1580
	280	93	4	1170	0,35	1,9	2,9	1580
	280	93	4	1170	0,35	1,9	2,9	1580
	280	93	4	1080	0,37	1,8	2,7	1450
	280	93	4	1080	0,37	1,8	2,7	1450
	280	93	4	1080	0,37	1,8	2,7	1450
	280	93	4	1080	0,37	1,8	2,7	1450
	280	93	4	1080	0,37	1,8	2,7	1450
140	210	53	2	475	0,22	3	4,6	820
	210	53	2	475	0,22	3	4,6	820
	210	53	2	475	0,22	3	4,6	820
	210	53	2	475	0,22	3	4,6	820
	210	53	2	435	0,22	3	4,6	750
	210	53	2	435	0,22	3	4,6	750
	210	53	2	435	0,22	3	4,6	750
	210	53	2	435	0,22	3	4,6	750
	210	69	2	550	0,32	2,1	3,1	990
	210	69	2	550	0,32	2,1	3,1	990
	225	68	2,1	660	0,28	2,4	3,6	1080
	225	68	2,1	600	0,3	2,3	3,3	990
	225	68	2,1	600	0,3	2,3	3,3	990
	225	68	2,1	600	0,3	2,3	3,3	990

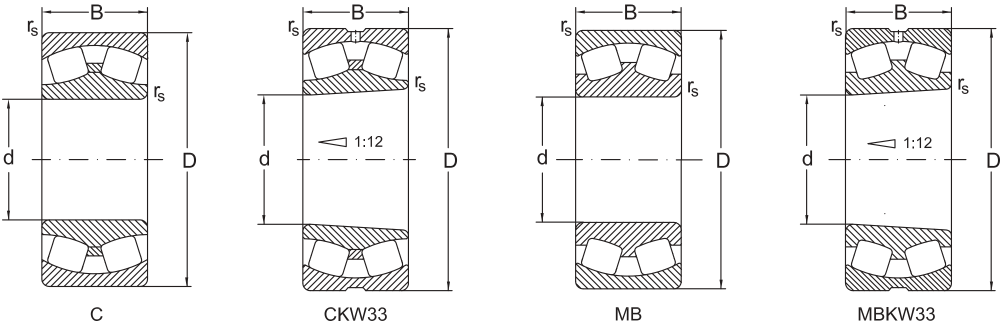
Spherical Roller Bearings



CA | CAKW33 | MA | MAKW33

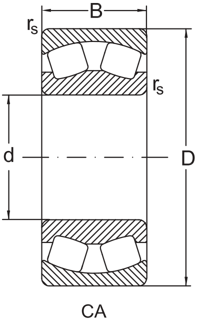
d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
130	1,9	1100	1500	**23226 MBKW33**	14,5
	1,8	1200	1600	**22326 C**	28,82
	1,8	1200	1600	**22326 CK**	28,65
	1,8	1200	1600	**22326 CKW33**	28,33
	1,8	1200	1600	**22326 CW33**	28,45
	1,8	1200	1600	**22326 CYW502**	28,45
	1,8	1100	1400	**22326 MBK**	28,77
	1,8	1100	1400	**22326 MAC4F80W33**	29,48
	1,8	1100	1400	**22326 MB**	28,9
	1,8	1100	1400	**22326 MBW33**	28,7
	1,8	1100	1400	**22326 MBKW33**	28,4
140	2,8	1700	2200	**23028 C**	7,20
	2,8	1700	2200	**23028 CK**	7,03
	2,8	1700	2200	**23028 CKW33**	6,96
	2,8	1700	2200	**23028 CW33**	7,13
	2,8	1500	2000	**23028 MBK**	6,07
	2,8	1500	2000	**23028 MB**	6,18
	2,8	1500	2000	**23028 MBW33**	6,08
	2,8	1500	2000	**23028 MBKW33**	5,98
	2,1	1100	1500	**24028 MBW33**	9,07
	2,1	1100	1500	**24028 MBK30W33**	8,66
	2,5	1500	2000	**23128 C**	11,8
	2,2	1400	1800	**23128 MBK**	10,38
	2,2	1400	1800	**23128 MB**	10,72
	2,2	1400	1800	**23128 MBW33**	10,69

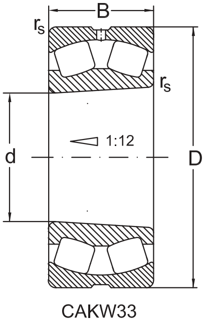
Spherical Roller Bearings

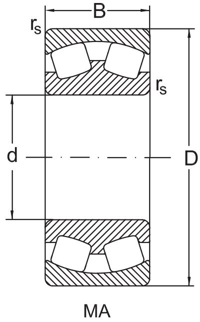


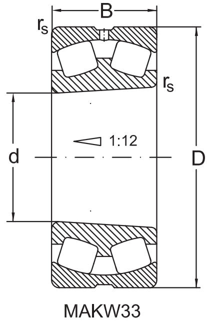
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
	225	68	2,1	600	0,3	2,3	3,3	990
	225	85	2,1	740	0,37	1,8	2,7	1280
	225	85	2,1	740	0,37	1,8	2,7	1280
	225	85	2,1	740	0,37	1,8	2,7	1280
	250	68	3	730	0,26	2,6	3,9	1080
	250	68	3	730	0,26	2,6	3,9	1080
	250	68	3	730	0,26	2,6	3,5	1080
	250	68	3	730	0,26	2,6	3,9	1080
	250	68	3	670	0,29	2,3	3,5	990
	250	68	3	670	0,29	2,3	3,5	990
	250	68	3	670	0,29	2,3	3,5	990
	250	68	3	670	0,29	2,3	3,5	990
140	250	88	3	960	0,33	2	3	1500
	250	88	3	880	0,37	1,8	2,7	1380
	250	88	3	880	0,37	1,8	2,7	1380
	250	88	3	880	0,37	1,8	2,7	1380
	250	88	3	880	0,37	1,8	2,7	1380
	300	102	4	1360	0,35	1,9	2,9	1870
	300	102	4	1360	0,35	1,9	2,9	1870
	300	102	4	1360	0,35	1,9	2,9	1870
	300	102	4	1360	0,35	1,9	2,9	1870
	300	102	4	1240	0,38	1,7	2,6	1720
	300	102	4	1240	0,38	1,7	2,6	1720
	300	102	4	1240	0,38	1,7	2,6	1720
	300	102	4	1240	0,38	1,7	2,6	1720

Spherical Roller Bearings





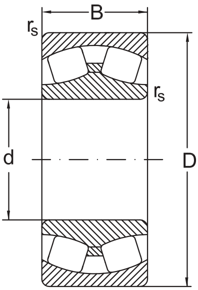




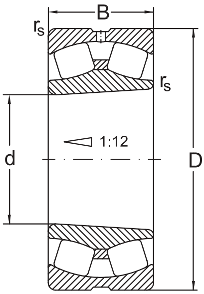
d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
140	2,2	1400	1800	**23128 MBKW33**	10,36
	1,8	850	1100	**24128 MB**	13,27
	1,8	850	1100	**24128 MBW33**	13,2
	1,8	850	1100	**24128 MBK30W33**	12,64
	2,5	1400	1900	**22228 C**	14,4
	2,5	1400	1900	**22228 CK**	14,09
	2,5	1400	1900	**22228 CKW33**	13,97
	2,5	1400	1900	**22228 CW33**	14,27
	2,3	1300	1700	**22228 MBK**	14,2
	2,3	1300	1700	**22228 MB**	14,5
	2,3	1300	1700	**22228 MBW33**	14,27
	2,3	1300	1700	**22228 MBKW33**	13,97
	2	1100	1400	**23228 C**	20,86
	1,8	1000	1300	**23228 MBK**	18,72
	1,8	1000	1300	**23228 MB**	19,32
	1,8	1000	1300	**23228 MBW33**	19,19
	1,8	1000	1300	**23228 MBKW33**	18,59
	1,8	1100	1400	**22328 C**	36,9
	1,8	1100	1400	**22328 CK**	36,34
	1,8	1100	1400	**22328 CKW33**	36,13
	1,8	1100	1400	**22328 CW33**	36,79
	1,7	1000	1300	**22328 MBK**	34,57
	1,7	1000	1300	**22328 MAC4F80W33**	37,5
	1,7	1000	1300	**22328 MB**	35,77
	1,7	1000	1300	**22328 MBW33**	35,17

BEARINGS

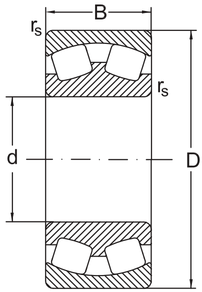
Spherical Roller Bearings



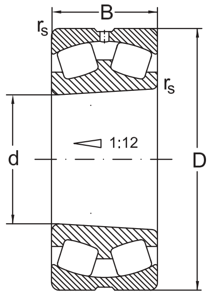
C



CKW33



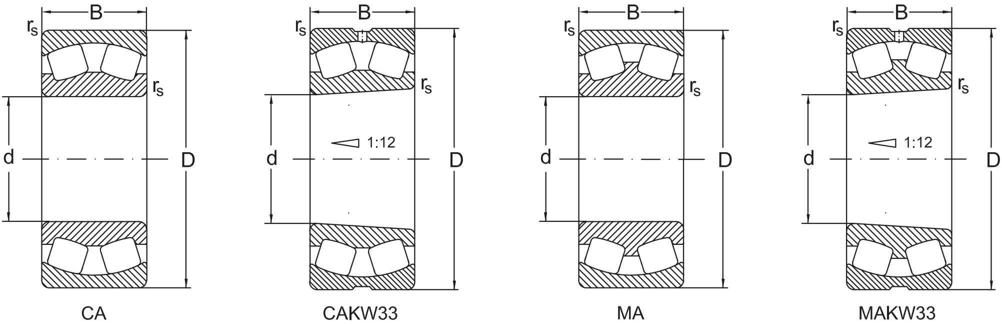
MB



MBKW33

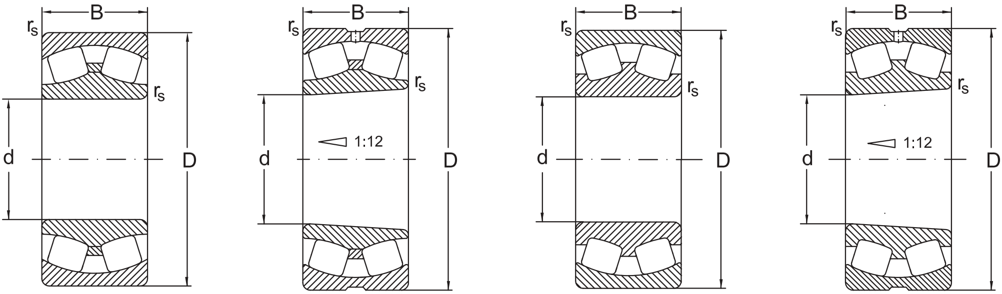
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
140	300	102	4	1240	0,38	1,7	2,6	1720
	300	118	4	1200	0,43	1,6	2,3	1700
150	225	56	2,1	520	0,22	3	4,6	900
	225	56	2,1	520	0,22	3	4,6	900
	225	56	2,1	520	0,22	3	4,6	900
	225	56	2,1	520	0,22	3	4,6	900
	225	56	2,1	480	0,22	3	4,6	830
	225	56	2,1	480	0,22	3	4,6	830
	225	56	2,1	480	0,22	3	4,6	830
	225	56	2,1	480	0,22	3	4,6	830
	225	75	2,1	620	0,37	1,8	2,7	1140
	225	75	2,1	600	0,33	2,1	3,1	1080
	225	75	2,1	600	0,33	2,1	3,1	1080
	225	75	2,1	600	0,33	2,1	3,1	1080
	225	75	2,1	600	0,33	2,1	3,1	1080
	250	100	2,1	1080	0,37	1,8	2,7	1840
	250	100	2,1	990	0,4	1,7	2,5	1600
	250	100	2,1	990	0,4	1,7	2,5	1600
	250	100	2,1	990	0,4	1,7	2,5	1600
	250	100	2,1	990	0,4	1,7	2,5	1600
	250	100	2,1	818	0,4	2,1	2,5	1357
	250	80	2,1	800	0,32	2,1	3,2	1320
	250	80	2,1	800	0,32	2,1	3,2	1320
	250	80	2,1	800	0,32	2,1	3,2	1320
	250	80	2,1	800	0,32	2,1	3,2	1320

Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
140	1,7	1000	1300	**22328 MBKW33**	34,37
	1,5	1100	1500	**23328 MAC4F80W33**	42,23
150	2,8	1500	2000	**23030 C**	8,57
	2,8	1500	2000	**23030 CK**	8,4
	2,8	1500	2000	**23030 CKW33**	8,32
	2,8	1500	2000	**23030 CW33**	8,51
	2,8	1400	1800	**23030 MBK**	8,05
	2,8	1400	1800	**23030 MB**	8,15
	2,8	1400	1800	**23030 MBW33**	8,11
	2,8	1400	1800	**23030 MBKW33**	7,9
	2,1	1200	1600	**24030 C**	10,5
	2	1100	1400	**24030 MBK30**	10,1
	2	1100	1400	**24030 MB**	10,25
	2	1100	1400	**24030 MBW33**	10,14
	2	1100	1400	**24030 MBK30W33**	9,97
	1,8	850	1100	**24130 C**	19,4
	1,6	800	1000	**24130 CA**	19,66
	1,6	800	1000	**24130 CAK30**	18,9
	1,6	800	1000	**24130 CAW33**	19,5
	1,6	800	1000	**24130 CAK30W33**	18,76
	1,6	800	1000	**24130 MBW33**	19,97
	2,1	1300	1700	**23130 MBK**	16
	2,1	1300	1700	**23130 MB**	16,37
	2,1	1300	1700	**23130 MBW33**	16,24
	2,1	1300	1700	**23130 MBKW33**	16

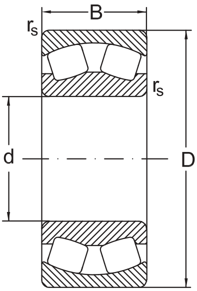
Spherical Roller Bearings



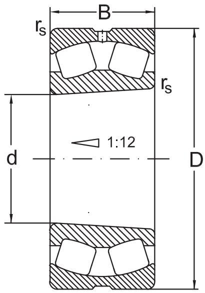
C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
150	270	73	3	880	0,26	2,6	3,9	1300
	270	73	3	880	0,26	2,6	3,9	1300
	270	73	3	880	0,26	2,6	3,9	1300
	270	73	3	880	0,26	2,6	3,9	1300
	270	73	3	810	0,29	2,3	3,5	1190
	270	73	3	810	0,29	2,3	3,5	1190
	270	73	3	810	0,29	2,3	3,5	1190
	270	73	3	810	0,29	2,3	3,5	1190
	270	96	3	1090	0,4	2,1	2,5	1750
	270	96	3	1030	0,38	1,8	2,7	1610
	270	96	3	1030	0,38	1,8	2,7	1610
	270	96	3	1030	0,38	1,8	2,7	1610
	270	96	3	1030	0,38	1,8	2,7	1610
	320	108	4	1520	0,35	1,9	2,9	2110
	320	108	4	1520	0,35	1,9	2,9	2110
	320	108	4	1520	0,35	1,9	2,9	2110
	320	108	4	1520	0,35	1,9	2,9	2110
	320	108	4	1400	0,38	1,7	2,6	1940
	320	108	4	1400	0,38	1,7	2,6	1940
	320	108	4	1400	0,38	1,7	2,6	1940
	320	108	4	1400	0,38	1,7	2,6	1940
	320	108	4	1400	0,38	1,7	2,6	1940
	320	108	4	1400	0,38	1,7	2,6	1940
160	240	60	2,1	610	0,22	3	4,6	1060
	240	60	2,1	610	0,22	3	4,6	1060

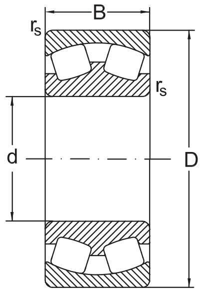
Spherical Roller Bearings



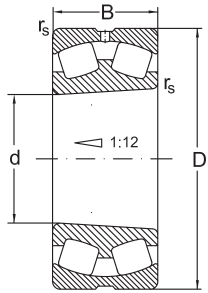
CA



CAKW33



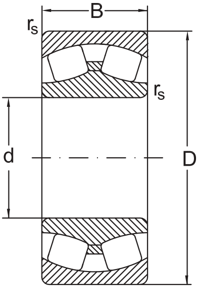
MA



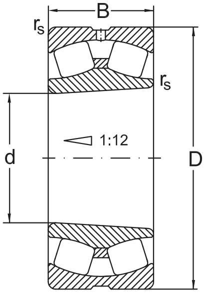
MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min^{-1}			kg
150	2,5	1400	1800	**22230 C**	18,30
	2,5	1400	1800	**22230 CK**	18,23
	2,5	1400	1800	**22230 CKW33**	16,99
	2,5	1400	1800	**22230 CW33**	18,07
	2,3	1200	1600	**22230 MBK**	17,6
	2,3	1200	1600	**22230 MB**	18,24
	2,3	1200	1600	**22230 MBW33**	18,02
	2,3	1200	1600	**22230 MBKW33**	17,62
	1,8	1100	1400	**23230 C**	24,7
	1,7	1000	1300	**23230 MBK**	24,13
	1,7	1000	1300	**23230 MB**	24,7
	1,7	1000	1300	**23230 MBW33**	24,58
	1,7	1000	1300	**23230 MBKW33**	24,0
	1,8	1100	1400	**22330 C**	44,62
	1,8	1100	1400	**22330 CK**	43,87
	1,8	1100	1400	**22330 CKW33**	43,47
	1,8	1100	1400	**22330 CW33**	44,6
	1,7	1000	1300	**22330 MAKC4F80W33**	44,3
	1,7	1000	1300	**22330 MBK**	41,35
	1,7	1000	1300	**22330 MAC4F80W33**	44,4
	1,7	1000	1300	**22330 MB**	42,25
	1,7	1000	1300	**22330 MBW33**	41,85
	1,7	1000	1300	**22330 MBKW33**	40,95
160	2,8	1400	1900	**23032 C**	9,97
	2,8	1400	1900	**23032 CK**	9,71

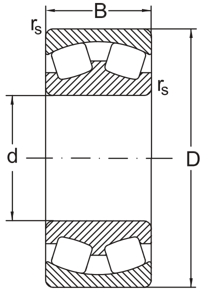
Spherical Roller Bearings



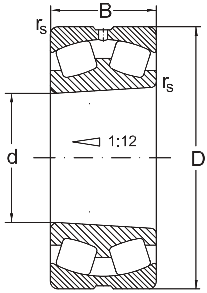
C



CKW33



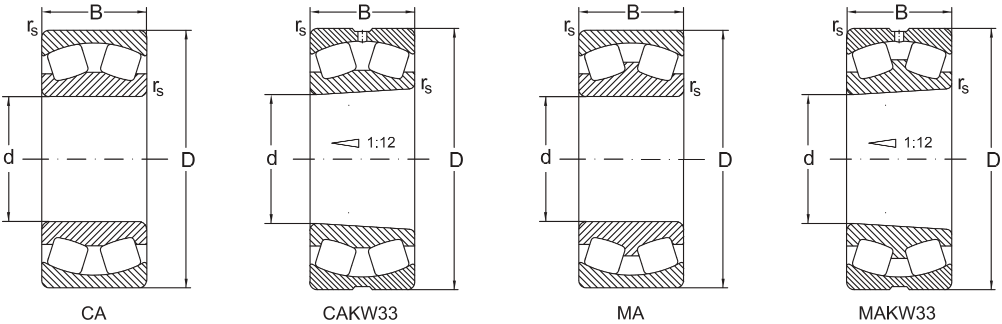
MB



MBKW33

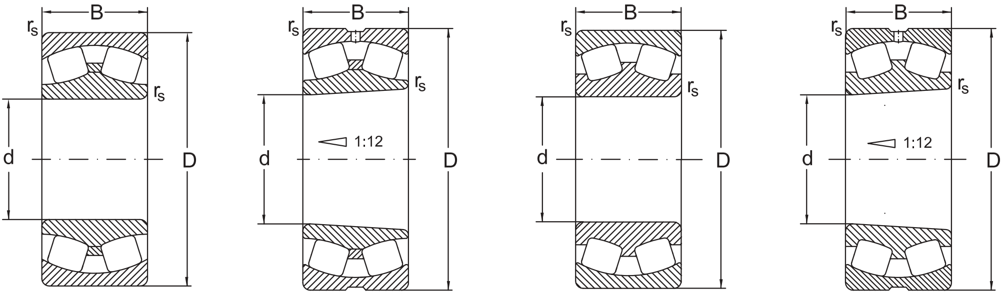
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
160	240	60	2,1	610	0,22	3	4,6	1060
	240	60	2,1	610	0,22	3	4,6	1060
	240	60	2,1	560	0,22	3	4,6	970
	240	60	2,1	560	0,22	3	4,6	970
	240	60	2,1	560	0,22	3	4,6	970
	240	60	2,1	560	0,22	3	4,6	970
	240	80	2,1	720	0,38	1,7	2,6	1320
	240	80	2,1	650	0,32	2,1	3,1	1170
	240	80	2,1	650	0,32	2,1	3,1	1170
	240	80	2,1	650	0,32	2,1	3,1	1170
	270	109	2,1	1250	0,39	1,7	2,5	2110
	270	109	2,1	1250	0,39	1,7	2,5	2110
	270	109	2,1	1250	0,39	1,7	2,5	2110
	270	109	2,1	1250	0,39	1,7	2,5	2110
	270	109	2,1	1250	0,39	1,7	2,5	2110
	270	109	2,1	1250	0,39	1,7	2,5	2110
	270	109	2,1	940	0,41	1,6	2,4	1558
	270	86	2,1	1010	0,3	2,3	3,4	1640
	270	86	2,1	930	0,32	2,1	3,2	1510
	270	86	2,1	930	0,32	2,1	3,2	1510
	270	86	2,1	930	0,32	2,1	3,2	1510
	270	86	2,1	930	0,32	2,1	3,2	1510
	290	104	3	1210	0,3	2,3	3,4	1900
	290	104	3	1180	0,38	1,8	2,7	1830
	290	104	3	1180	0,38	1,8	2,7	1830

Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
160	2,8	1400	1900	**23032 CKW33**	9,56
	2,8	1400	1900	**23032 CW33**	9,80
	2,8	1300	1700	**23032 MBK**	10,45
	2,8	1300	1700	**23032 MB**	10,61
	2,8	1300	1700	**23032 MBW33**	10,49
	2,8	1300	1700	**23032 MBKW33**	10,33
	2,1	1100	1400	**24032 C**	13
	2	1000	1300	**24032 MB**	12,7
	2	1000	1300	**24032 MBW33**	12,28
	2	1000	1300	**24032 MBK30W33**	12,08
	1,6	850	1100	**24132 C**	25,04
	1,6	850	1100	**24132 CW33**	24,96
	1,6	850	1100	**24132 CK30**	24,8
	1,6	850	1100	**24132 CK30W33**	24,6
	1,6	850	1100	**24132 CYK30W33**	24,6
	1,6	850	1100	**24132 CYW33**	24,96
	1,6	750	1100	**24132 MBW33**	25,38
	2,2	1400	1800	**23132 C**	22,9
	2,1	1200	1600	**23132 MBK**	20,7
	2,1	1200	1600	**23132 MB**	20,95
	2,1	1200	1600	**23132 MBW33**	20,81
	2,1	1200	1600	**23132 MBKW33**	20,1
	2,2	1000	1400	**23232 C**	32,7
	1,7	900	1200	**23232 MBK**	31,7
	1,7	900	1200	**23232 MB**	32,4

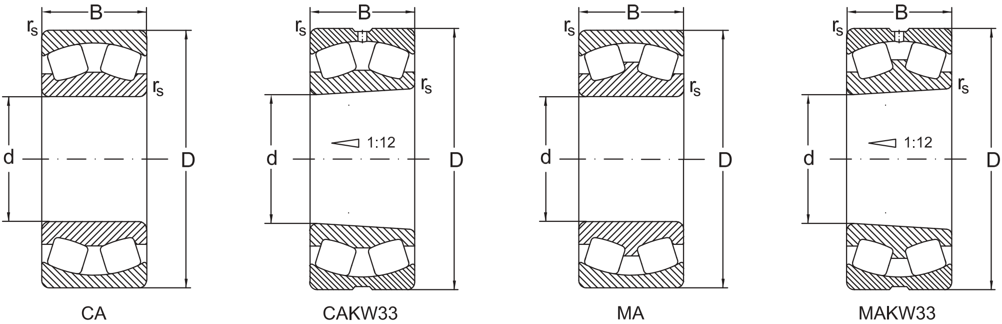
Spherical Roller Bearings



C CKW33 MB MBKW33

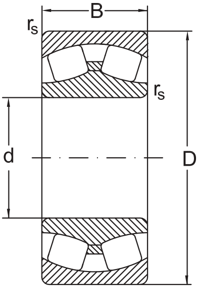
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
160	290	104	3	1180	0,38	1,8	2,7	1830
	290	104	3	1180	0,38	1,8	2,7	1830
	290	80	3	1040	0,26	2,6	3,9	1550
	290	80	3	1040	0,26	2,6	3,9	1550
	290	80	3	1040	0,26	2,6	3,9	1550
	290	80	3	1040	0,26	2,6	3,9	1550
	290	80	3	950	0,29	2,3	3,4	1420
	290	80	3	950	0,29	2,3	3,4	1420
	290	80	3	950	0,29	2,3	3,4	1420
	290	80	3	950	0,29	2,3	3,4	1420
	340	114	4	1660	0,35	1,9	2,9	2350
	340	114	4	1660	0,35	1,9	2,9	2350
	340	114	4	1660	0,35	1,9	2,9	2350
	340	114	4	1660	0,35	1,9	2,9	2350
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	114	4	1520	0,37	1,8	2,7	2160
	340	136	4	1540	0,44	1,5	2,3	2200
170	260	67	2,1	750	0,23	2,9	4,4	1270
	260	67	2,1	750	0,23	2,9	4,4	1270

Spherical Roller Bearings

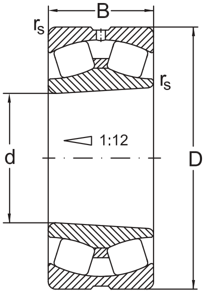


d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
160	1,7	900	1200	**23232 MBW33**	32,1
	1,7	900	1200	**23232 MBKW33**	31,2
	2,5	1300	1700	**22232 C**	25,1
	2,5	1300	1700	**22232 CK**	24,7
	2,5	1300	1700	**22232 CKW33**	24,6
	2,5	1300	1700	**22232 CW33**	24,85
	2,3	1100	1500	**22232 MBK**	22,27
	2,3	1100	1500	**22232 MB**	23,3
	2,3	1100	1500	**22232 MBW33**	22,53
	2,3	1100	1500	**22232 MBKW33**	22,03
	1,8	1000	1300	**22332 C**	52,5
	1,8	1000	1300	**22332 CK**	52,16
	1,8	1000	1300	**22332 CKW33**	51,74
	1,8	1000	1300	**22332 CW33**	52,7
	1,8	900	1200	**22332 MBK**	49,16
	1,8	900	1200	**22332 MAC4F80W33**	50,08
	1,8	900	1200	**22332 MAC4W502**	50,0
	1,8	900	1200	**22332 MAW33**	50,08
	1,8	900	1200	**22332 MAW502**	50,0
	1,8	900	1200	**22332 MB**	50,26
	1,8	900	1200	**22332 MBW33**	49,84
	1,8	900	1200	**22332 MBKW33**	48,74
	1,5	1000	1400	**23332 MAC4F80W33**	61,85
170	2,8	1400	1800	**23034 C**	14,23
	2,8	1400	1800	**23034 CK**	13,95

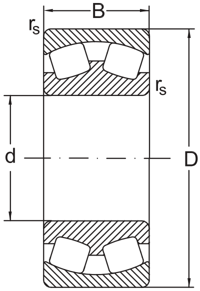
Spherical Roller Bearings



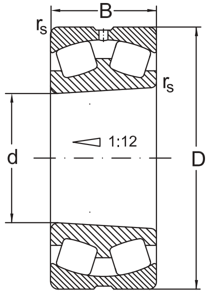
C



CKW33



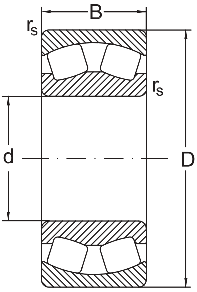
MB



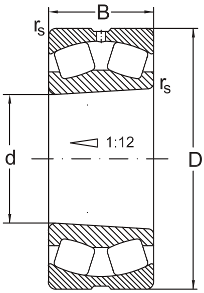
MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
170	260	67	2,1	750	0,23	2,9	4,4	1270
	260	67	2,1	750	0,23	2,9	4,4	1270
	260	67	2,1	680	0,23	2,9	4,4	1170
	260	67	2,1	680	0,23	2,9	4,4	1170
	260	67	2,1	680	0,23	2,9	4,4	1170
	260	67	2,1	680	0,23	2,9	4,4	1170
	260	90	2,1	880	0,34	2	3	1610
	260	90	2,1	880	0,34	2	3	1610
	260	90	2,1	880	0,34	2	3	1610
	260	90	2,1	880	0,34	2	3	1610
	280	109	2,1	1310	0,37	1,8	2,7	2300
	280	109	2,1	1280	0,39	1,7	2,6	2230
	280	109	2,1	1280	0,39	1,7	2,6	2230
	280	109	2,1	1280	0,39	1,7	2,6	2230
	280	109	2,1	1280	0,39	1,7	2,6	2230
	280	109	2,1	1029	0,37	1,8	2,7	1672
	280	109	2,1	1029	0,37	1,8	2,7	1672
	280	88	2,1	1280	0,37	1,8	2,7	2230
	280	88	2,1	990	0,31	2,2	3,2	1650
	280	88	2,1	990	0,31	2,2	3,2	1650
	280	88	2,1	990	0,31	2,2	3,2	1650
	280	88	2,1	990	0,31	2,2	3,2	1650
	310	110	4	1460	0,35	1,9	2,9	2320
	310	110	4	1460	0,35	1,9	2,9	2320
	310	110	4	1460	0,35	1,9	2,9	2320

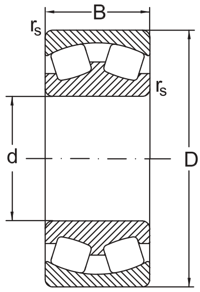
Spherical Roller Bearings



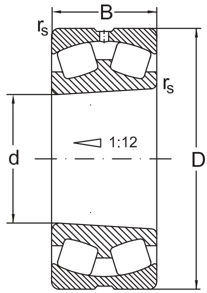
CA



CAKW33



MA

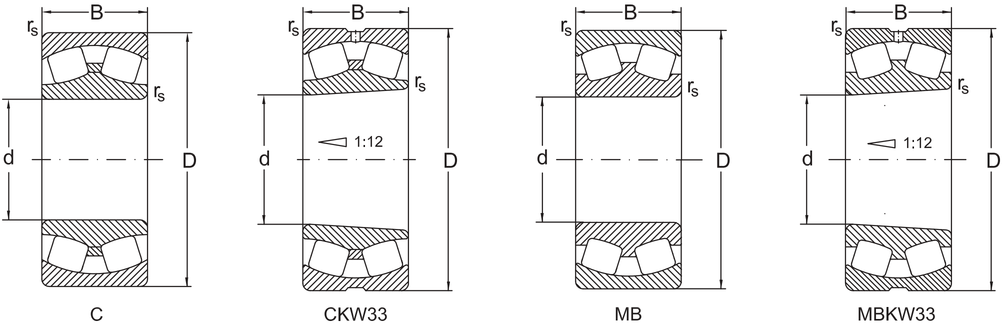


MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
170	2,8	1400	1800	**23034 CKW33**	13,78
	2,8	1400	1800	**23034 CW33**	14,2
	2,8	1200	1600	**23034 MBK**	14,3
	2,8	1200	1600	**23034 MB**	14,5
	2,8	1200	1600	**23034 MBW33**	14,18
	2,8	1200	1600	**23034 MBKW33**	14,08
	2	1000	1300	**24034 MBK30**	17,3
	2	1000	1300	**24034 MB**	17,57
	2	1000	1300	**24034 MBW33**	16,88
	2	1000	1300	**24034 MBK30W33**	16,65
	1,8	850	1100	**24134 C**	27,3
	1,7	750	1000	**24134 CA**	27,7
	1,7	750	1000	**24134 CAW33**	27,47
	1,7	750	1000	**24134 CAK30**	27,41
	1,7	750	1000	**24134 CAK30W33**	27,3
	1,8	650	800	**24134 MBK30W33**	27,94
	1,8	650	800	**24134 MBW33**	28,4
	1,8	1300	1700	**23134 C**	27,3
	2,1	1100	1500	**23134 MBK**	21,46
	2,1	1100	1500	**23134 MB**	21,65
	2,1	1100	1500	**23134 MBW33**	21,5
	2,1	1100	1500	**23134 MBKW33**	21,2
	1,8	900	1200	**23234 CA**	37,25
	1,8	900	1200	**23234 CAK**	36,25
	1,8	900	1200	**23234 CAKW33**	36,1

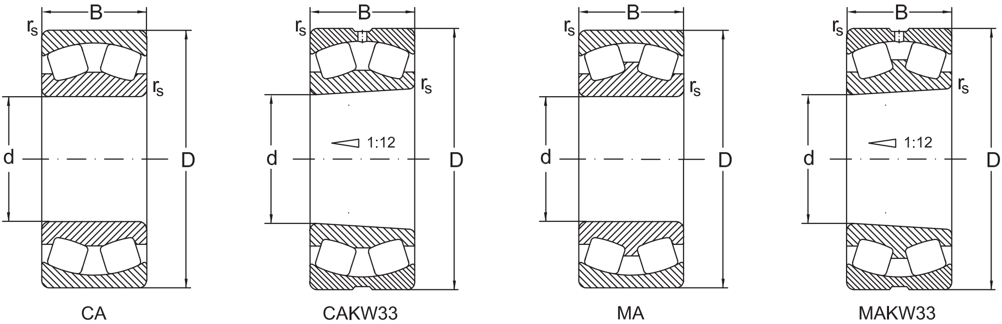
ART BEARINGS

Spherical Roller Bearings



Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
170	310	110	4	1460	0,35	1,9	2,9	2320
	310	110	4	1500	0,35	1,9	2,9	2350
	310	110	4	1500	0,35	1,9	2,9	2350
	310	110	4	1500	0,35	1,9	2,9	2350
	310	110	4	1500	0,35	1,9	2,9	2350
	310	110	4	1340	0,36	1,9	2,8	2120
	310	110	4	1340	0,36	1,9	2,8	2120
	310	86	4	1170	0,27	2,5	3,7	1750
	310	86	4	1170	0,27	2,5	3,7	1750
	310	86	4	1170	0,27	2,5	3,7	1750
	310	86	4	1170	0,27	2,5	3,7	1750
	310	86	4	1080	0,3	2,3	3,4	1610
	310	86	4	1080	0,3	2,3	3,4	1610
	310	86	4	1080	0,3	2,3	3,4	1610
	310	86	4	1080	0,3	2,3	3,4	1610
	360	120	4	1850	0,33	2	3	2590
	360	120	4	1850	0,33	2	3	2590
	360	120	4	1850	0,33	2	3	2590
	360	120	4	1850	0,33	2	3	2590
	360	120	4	1690	0,37	1,8	2,7	2380
	360	120	4	1690	0,37	1,8	2,7	2380
	360	120	4	1690	0,37	1,8	2,7	2380
	360	120	4	1690	0,37	1,8	2,7	2380
	360	120	4	1690	0,37	1,8	2,7	2380
180	250	52	2	454	0,2	3,5	5,2	830

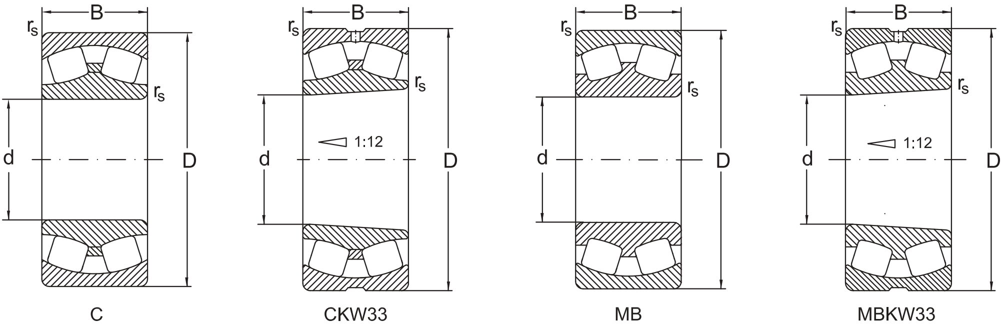
Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
170	1,8	900	1200	**23234 CAW33**	37,17
	1,8	950	1250	**23234 C**	35,82
	1,8	950	1250	**23234 CK**	34,75
	1,8	950	1250	**23234 CKW33**	34,55
	1,8	950	1250	**23234 CW33**	35,67
	1,8	850	1100	**23234 MBW33**	35,9
	1,8	850	1100	**23234 MBKW33**	35,72
	2,5	1200	1600	**22234 C**	32,2
	2,5	1200	1600	**22234 CK**	32
	2,5	1200	1600	**22234 CKW33**	31,66
	2,5	1200	1600	**22234 CW33**	31,8
	2,2	1300	1100	**22234 MBK**	29
	2,2	1100	1400	**22234 MB**	29,4
	2,2	1100	1400	**22234 MBW33**	29,15
	2,2	1100	1400	**22234 MBKW33**	27,51
	2	900	1200	**22334 C**	65,3
	2	900	1200	**22334 CK**	64
	2	900	1200	**22334 CKW33**	63,6
	2	900	1200	**22334 CW33**	64,9
	1,8	850	1100	**22334 MBK**	57,53
	1,8	850	1100	**22334 MAC4F80W33**	59
	1,8	850	1100	**22334 MB**	58,83
	1,8	850	1100	**22334 MBW33**	58,41
	1,8	850	1100	**22334 MBKW33**	56,7
180	3,4	1300	1700	**23936 MBW33**	7,72

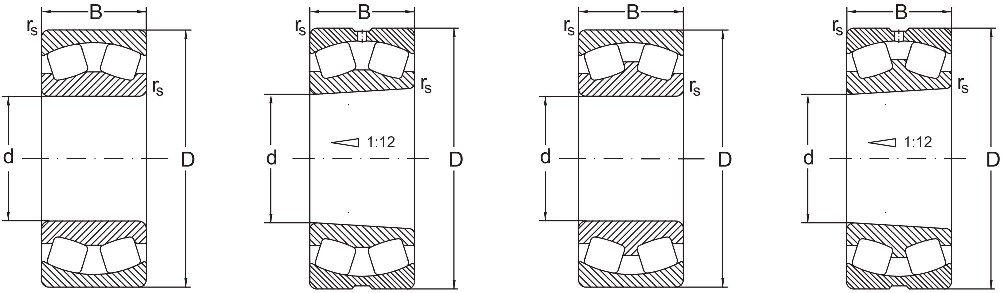
ART BEARINGS

Spherical Roller Bearings



Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
180	280	100	2,1	1030	0,37	1,8	2,7	1900
	280	100	2,1	900	0,36	1,9	2,8	1750
	280	100	2,1	900	0,36	1,9	2,8	1750
	280	100	2,1	900	0,36	1,9	2,8	1750
	280	74	2,1	870	0,24	2,8	4,2	1500
	280	74	2,1	870	0,24	2,8	4,2	1500
	280	74	2,1	870	0,24	2,8	4,2	1500
	280	74	2,1	870	0,24	2,8	4,2	1500
	280	74	2,1	800	0,24	2,8	4,2	1380
	280	74	2,1	800	0,24	2,8	4,2	1380
	280	74	2,1	800	0,24	2,8	4,2	1380
	280	74	2,1	800	0,24	2,8	4,2	1380
	300	118	3	1200	0,4	1,7	2,5	2100
	300	118	3	1400	0,36	1,9	2,8	2560
	300	118	3	1400	0,36	1,9	2,8	2560
	300	118	3	1460	0,4	1,7	2,5	2590
	300	118	3	1460	0,4	1,7	2,5	2590
	300	118	3	1460	0,4	1,7	2,5	2590
	300	118	3	1460	0,4	1,7	2,5	2590
	300	118	3	1460	0,4	1,7	2,5	2590
	300	96	3	1260	0,3	2,3	3,4	2110
	300	96	3	1260	0,3	2,3	3,4	2110
	300	96	3	1260	0,3	2,3	3,4	2110
	300	96	3	1160	0,32	2,1	3,1	1940
	300	96	3	1160	0,32	2,1	3,1	1940

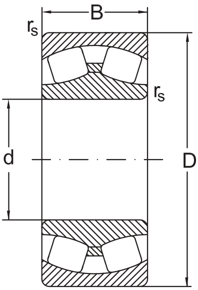
Spherical Roller Bearings



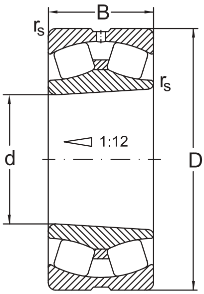
CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
180	1,8	1000	1300	**24036 C**	23
	1,9	900	1200	**24036 MB**	22,9
	1,9	900	1200	**24036 MBW33**	22,79
	1,9	900	1200	**24036 MBK30W33**	22,42
	2,8	1300	1700	**23036 C**	18,76
	2,8	1300	1700	**23036 CK**	18,36
	2,8	1300	1700	**23036 CKW33**	18,13
	2,8	1300	1700	**23036 CW33**	18,53
	2,8	1100	1500	**23036 MBK**	17,2
	2,8	1100	1500	**23036 MB**	17,7
	2,8	1100	1500	**23036 MBW33**	17,03
	2,8	1100	1500	**23036 MBKW33**	16,5
	1,6	600	750	**24136 MBK30W33**	33,32
	1,9	650	900	**24136 CAK30W33**	33,42
	1,9	650	900	**24136 CAW33**	33,96
	1,6	700	950	**24136 C**	33,52
	1,6	700	950	**24136 CW33**	33,42
	1,6	700	950	**24136 CK30**	33,32
	1,6	700	950	**24136 CK30W33**	33,2
	1,6	700	950	**24136 CYW33**	33,42
	2,2	1200	1600	**23136 C**	30,6
	2,2	1200	1600	**23136 CKW33**	29,38
	2,2	1200	1600	**23136 CW33**	30,25
	2,1	1100	1400	**23136 MBK**	28
	2,1	1100	1400	**23136 MB**	28,4

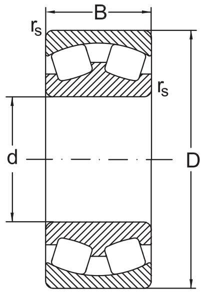
Spherical Roller Bearings



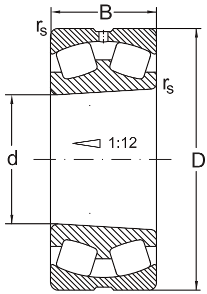
C



CKW33



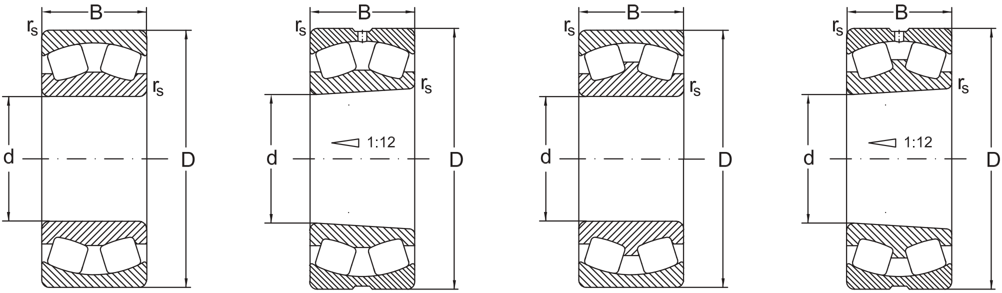
MB



MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
180	300	96	3	1160	0,32	2,1	3,1	1940
	300	96	3	1160	0,32	2,1	3,1	1940
	320	112	4	1420	0,36	1,9	2,8	2330
	320	112	4	1420	0,36	1,9	2,8	2330
	320	112	4	1420	0,36	1,9	2,8	2330
	320	86	4	1210	0,26	2,6	3,9	1870
	320	86	4	1210	0,26	2,6	3,9	1870
	320	86	4	1210	0,26	2,6	3,9	1870
	320	86	4	1210	0,26	2,6	3,9	1870
	320	86	4	1110	0,29	2,3	3,5	1720
	320	86	4	1110	0,29	2,3	3,5	1720
	320	86	4	1110	0,29	2,3	3,5	1720
	320	86	4	1110	0,29	2,3	3,5	1720
	380	126	4	1960	0,32	2,1	3,1	2650
	380	126	4	1860	0,37	1,8	2,7	2500
	380	126	4	1860	0,37	1,8	2,7	2500
	380	126	4	1860	0,37	1,8	2,7	2500
	380	126	4	1860	0,37	1,8	2,7	2500
	380	126	4	1860	0,37	1,8	2,7	2500
190	260	52	2	465	0,18	3,7	5,5	900
	260	52	2	465	0,18	3,7	5,5	900
	290	75	2,1	915	0,23	3	4,4	1530
	290	75	2,1	915	0,23	3	4,4	1530
	290	100	2,1	1050	0,37	1,8	2,7	1980
	290	100	2,1	980	0,34	2	3	1810

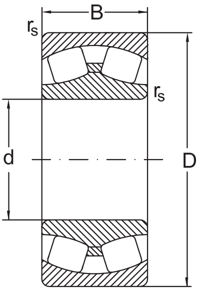
Spherical Roller Bearings



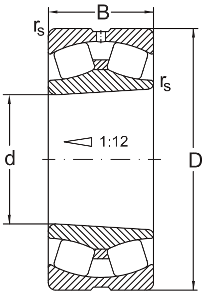
CA CAKW33 MA MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
180	2,1	1100	1400	**23136 MBW33**	28,09
	2,1	1100	1400	**23136 MBKW33**	27,7
	1,8	750	1000	**23236 MBK**	38,5
	1,8	750	1000	**23236 MBW33**	39,81
	1,8	750	1000	**23236 MBKW33**	38,36
	2,5	1100	1500	**22236 C**	33,13
	2,5	1100	1500	**22236 CK**	32,58
	2,5	1100	1500	**22236 CKW33**	32,11
	2,5	1100	1500	**22236 CW33**	32,66
	2,3	1100	1400	**22236 MBK**	29
	2,3	1100	1400	**22236 MB**	29,69
	2,3	1100	1400	**22236 MBW33**	29,54
	2,3	1100	1400	**22236 MBKW33**	28,84
	2,1	900	1200	**22336C**	72,5
	1,8	850	1100	**22336 MBK**	68
	1,8	850	1100	**22336 MAC4F80W33**	68,8
	1,8	850	1100	**22336 MB**	71,2
	1,8	850	1100	**22336 MBW33**	68,71
	1,8	850	1100	**22336 MBKW33**	66,45
190	3,6	1100	1500	**23938 M**	8,46
	3,6	1100	1500	**23938 MBK**	8,2
	2,9	1300	1700	**23038C**	16,08
	2,9	1300	1700	**23038 CK**	15,8
	1,8	950	1200	**24038 C**	25
	2	850	1100	**24038 MB**	24,5

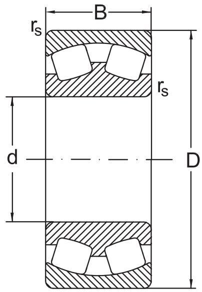
Spherical Roller Bearings



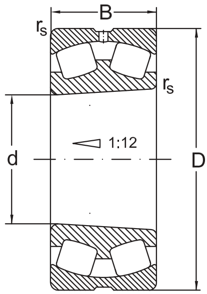
C



CKW33



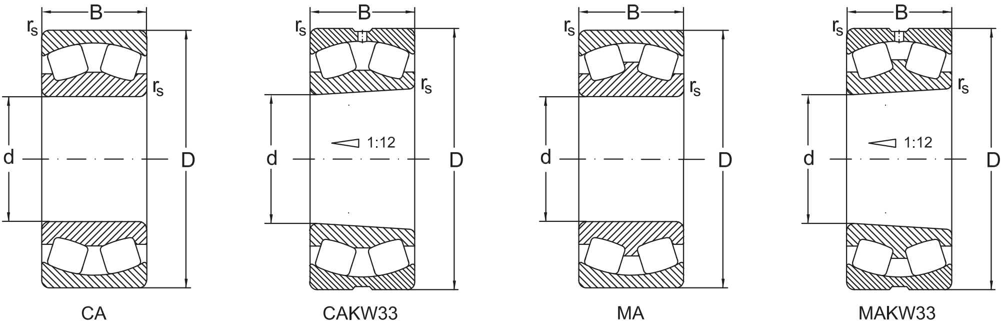
MB



MBKW33

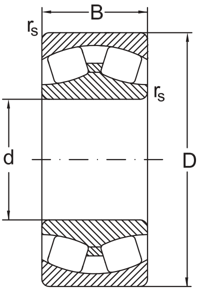
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
190	290	100	2,1	980	0,34	2	3	1810
	320	104	3	1320	0,33	2	3	2290
	320	104	3	1320	0,33	2	3	2290
	320	128	3	1540	0,37	1,8	2,7	2750
	320	128	3	1540	0,37	1,8	2,7	2750
	320	128	3	1330	0,35	1,9	2,9	2320
	320	128	3	1330	0,36	1,9	2,9	2320
	340	92	4	1330	0,26	2,6	3,9	2040
	340	92	4	1330	0,26	2,6	3,9	2040
	340	92	4	1220	0,29	2,3	3,4	1870
	340	120	4	1750	0,35	1,9	2,9	2880
	340	120	4	1750	0,35	1,9	2,9	2880
	340	120	4	1610	0,36	1,9	2,8	2640
	400	132	5	1900	0,37	1,8	2,7	2700
	400	132	5	1900	0,37	1,8	2,7	2700
200	280	60	2,1	525	0,2	3,4	5,1	1020
	280	60	2,1	525	0,2	3,4	5,1	1020
	310	82	2,1	1060	0,23	2,9	4,3	1760
	310	82	2,1	1060	0,23	2,9	4,3	1760
	310	109	2,1	1140	0,35	1,9	2,9	2280
	310	109	2,1	1100	0,35	1,9	2,9	2200
	310	109	2,1	1100	0,35	1,9	2,9	2200
	340	112	3	1370	0,35	1,9	2,9	2460
	340	112	3	1370	0,35	1,9	2,9	2460
	340	140	3	1700	0,4	1,6	2,4	3000

Spherical Roller Bearings

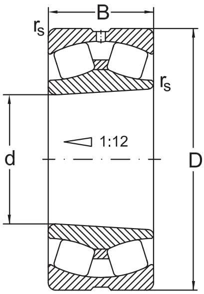


d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
190	2	850	1100	**24038 MBK30**	24
	2	1100	1400	**23138 MB**	36,6
	2	1100	1400	**23138 MBK**	36,09
	1,8	670	900	**24138 CAW33**	41,65
	1,8	670	900	**24138 CAK30W33**	41,4
	1,8	650	850	**24138 MBW33**	41,79
	1,8	650	850	**24138 MBK30W33**	41,4
	2,5	1100	1400	**22238C**	37,2
	2,5	1100	1400	**22238CK**	36,8
	2,3	1000	1300	**22238 MBW33**	36,53
	1,8	850	1100	**23238C**	52,4
	1,8	850	1100	**23238CK**	52,4
	1,8	750	1000	**23238 MBW33**	47,83
	1,8	750	1000	**22338MB**	81,2
	1,8	750	1000	**22338 MBK**	80,5
200	3,3	1100	1400	**23940 MBW33**	11,4
	3,3	1100	1400	**23940 MBKW33**	11
	2,8	1300	1700	**23040 CW33**	22,4
	2,8	1300	1700	**23040 CKW33**	21,8
	1,9	850	1100	**24040 CW33**	31
	1,9	750	1000	**24040 MBW33**	30,5
	1,9	750	1000	**24040 MBK30W33**	29,7
	1,9	1100	1400	**23140 MBW33**	43,5
	1,9	1100	1400	**23140 MBKW33**	43,5
	1,6	800	1000	**24140 CW33**	52,5

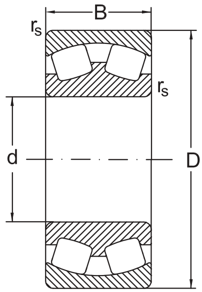
Spherical Roller Bearings



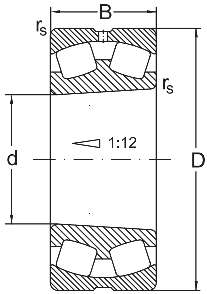
C



CKW33



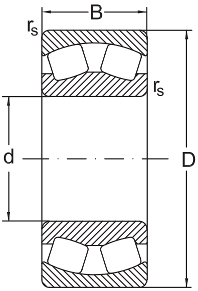
MB



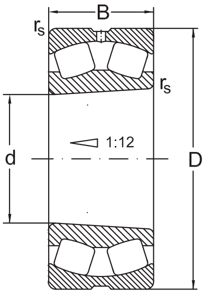
MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
200	340	140	3	1700	0,14	1,6	2,4	3000
	360	98	4	1250	0,29	2,3	3,9	2020
	360	98	4	1250	0,29	2,3	3,9	2020
	360	128	4	1620	0,35	1,9	2,9	2590
	360	128	4	1620	0,35	1,9	2,9	2590
	420	138	5	1910	0,36	1,8	2,8	2750
	420	138	5	1910	0,36	1,8	2,8	2750
220	300	60	2,1	625	0,18	3,8	5,6	1344
	300	60	2,1	625	0,18	3,8	5,6	1344
	340	90	3	1025	0,26	2,6	3,8	1730
	340	90	3	1025	0,26	2,6	3,8	1730
	340	118	3	1400	0,34	2	2,9	2700
	340	118	3	1400	0,34	2	2,9	2700
	370	150	4	1900	0,41	1,6	2,4	3450
	370	150	4	1900	0,41	1,6	2,4	3450
	370	120	4	1515	0,3	2,3	3,4	2509
	370	120	4	1515	0,3	2,3	3,4	2509
	400	108	4	1545	0,29	2,3	3,4	2300
	400	108	4	1545	0,29	2,3	3,4	2300
	400	144	4	2065	0,35	1,9	2,9	3380
	400	144	4	2065	0,35	1,9	2,9	3380
	460	145	5	2380	0,36	1,8	2,8	3407
	460	145	5	2380	0,36	1,8	2,8	3407
240	320	60	2,1	600	0,17	4,1	6	1170
	320	60	2,1	600	0,17	4,1	6	1170

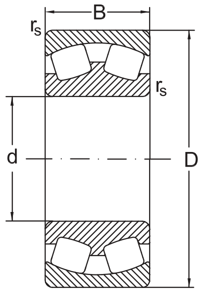
Spherical Roller Bearings



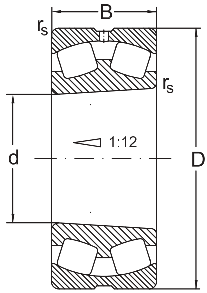
CA



CAKW33



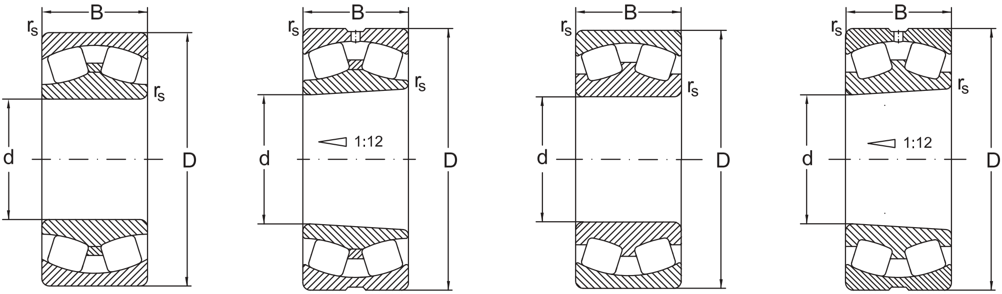
MA



MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
200	1,6	800	1000	**24140 CK30W33**	52,5
	2,3	1100	1400	**22240 CW33**	44,4
	2,3	1100	1400	**22240 CKW33**	44,4
	1,8	750	1000	**23240 CW33**	58,4
	1,8	750	1000	**23240 CKW33**	58,4
	1,8	670	900	**22340 MBW33**	91,8
	1,8	670	900	**22340 MBKW33**	91,8
220	3,7	1100	1500	**23944 MBW33**	13
	3,7	1100	1500	**23944 MBKW33**	13
	2,5	900	1200	**23044 MBW33**	31
	2,5	900	1200	**23044 MBKW33**	31
	1,9	750	1000	**24044 MBW33**	39,5
	1,9	750	1000	**24044 MBK30W33**	39,5
	1,6	700	900	**24144 MBW33**	65,5
	1,6	700	900	**24144 MBK30W33**	65,5
	2,2	1000	1300	**23144 MBKW33**	52
	2,2	1000	1300	**23144 MBW33**	52
	2,3	900	1200	**22244 CW33**	61,4
	2,3	900	1200	**22244 CKW33**	61,4
	1,8	670	900	**23244 CW33**	79,5
	1,8	670	900	**23244 CKW33**	79,5
	1,8	700	950	**22344 CW33**	120
	1,8	700	950	**22344 CKW33**	120
240	4	1000	1300	**23948 MBKW33**	14
	4	1000	1300	**23948 MBW33**	14

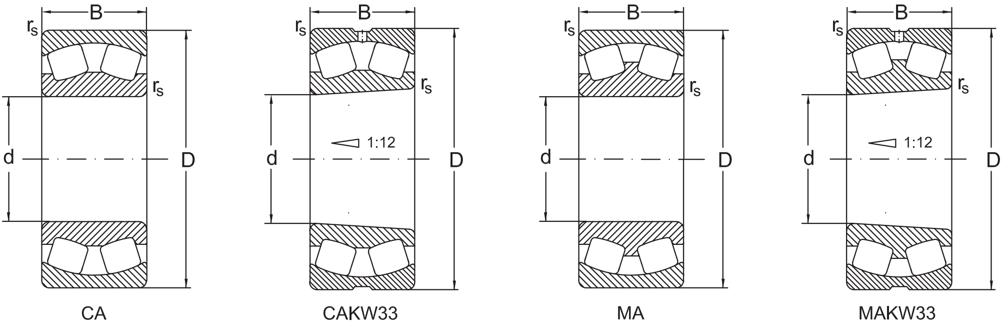
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
240	360	92	3	1160	0,3	2,3	3,4	2200
	360	92	3	1090	0,25	2,7	4,1	1960
	360	92	3	1090	0,25	2,7	4,1	1960
	360	118	3	1460	0,32	2,1	3,1	2841
	360	118	3	1460	0,32	2,1	3,1	2841
	400	128	4	1705	0,3	2,3	3,4	2863
	400	128	4	1705	0,3	2,3	3,4	2863
	400	160	4	1987	0,41	1,7	2,5	3530
	400	160	4	1987	0,41	1,7	2,5	3530
	440	120	4	1845	0,29	2,3	3,4	2763
	440	120	4	1845	0,29	2,3	3,4	2763
	440	160	4	2530	0,35	1,9	2,9	4600
	440	160	4	2530	0,35	1,9	2,9	4600
	500	155	5	2650	0,31	2,2	3,3	4000
	500	155	5	2650	0,31	2,2	3,3	4000
260	360	75	2,1	845	0,19	3,5	5,3	1604
	360	75	2,1	845	0,19	3,5	5,3	1604
	400	104	4	1500	0,26	2,6	3,9	2800
	400	104	4	1500	0,26	2,6	3,9	2800
	400	140	4	1775	0,35	1,9	2,9	3494
	400	140	4	1775	0,35	1,9	2,9	3494
	440	180	4	2500	0,42	1,6	2,4	5100
	440	180	4	2500	0,42	1,6	2,4	5100
	440	144	4	2153	0,31	2,2	3,3	3673
	440	144	4	2153	0,31	2,2	3,3	3673

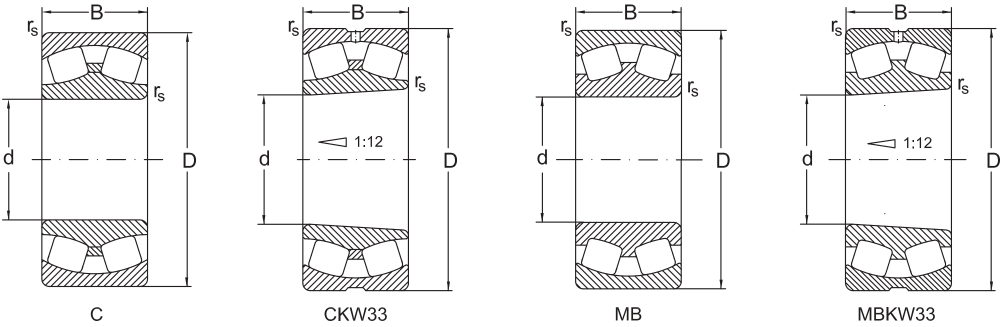
Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
240	2,2	900	1100	**23048 CW33**	34,5
	2,7	800	1000	**23048 MBKW33**	33,9
	2,7	800	1000	**23048 MBW33**	33,9
	2,1	750	1000	**24048 MBK30W33**	42,5
	2,1	750	1000	**24048 MBW33**	42,5
	2,2	900	1200	**23148 MBKW33**	66
	2,2	900	1200	**23148 MBW33**	66
	1,6	530	700	**24148 MBW33**	79,5
	1,6	530	700	**24148 MBK30W33**	79,5
	2,3	850	1100	**22248 CW33**	83,2
	2,3	850	1100	**22248 CKW33**	83,2
	1,8	630	850	**23248 CW33**	109
	1,8	630	850	**23248 CKW33**	109
	2,2	560	750	**22348 MBW33**	151
	2,2	560	750	**22348 MBKW33**	151
260	3,5	850	1100	**23952 MBKW33**	24
	3,5	850	1100	**23952 MBW33**	24
	2,6	750	950	**23052 MBKW33**	49
	2,6	750	950	**23052 MBW33**	49
	1,9	600	800	**24052 MBK30W33**	66
	1,9	600	800	**24052 MBW33**	66
	1,6	480	630	**24152 MBW33**	110
	1,6	480	630	**24152 MBK30W33**	110
	2,2	850	1100	**23152 MBKW33**	92,5
	2,2	850	1100	**23152 MBW33**	92,5

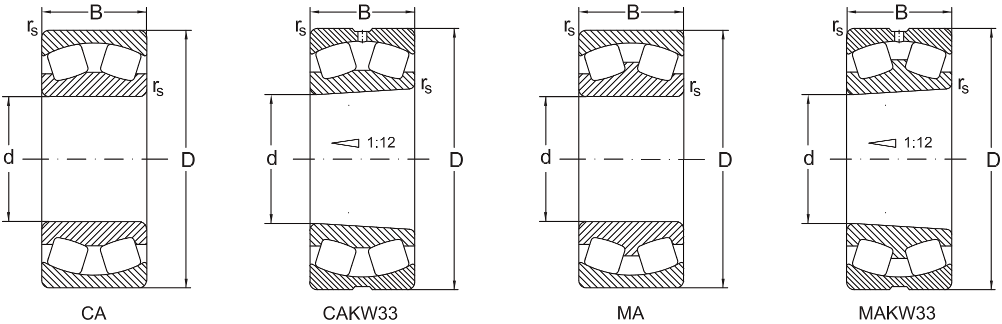
ART BEARINGS

Spherical Roller Bearings



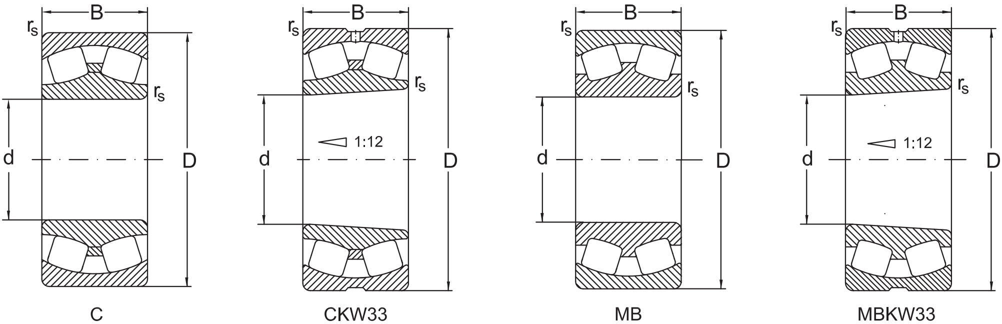
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
260	480	130	5	2190	0,29	2,3	3,4	3300
	480	130	5	2190	0,29	2,3	3,4	3300
	540	165	6	3125	0,36	1,8	2,8	4560
	540	165	6	3125	0,36	1,8	2,8	4560
280	380	75	2,1	950	0,18	3,8	5,6	2000
	380	75	2,1	950	0,18	3,8	5,6	2000
	420	106	4	1560	0,25	2,7	4,1	3000
	420	106	4	1560	0,25	2,7	4,1	3000
	420	140	4	2000	0,33	2	3	4000
	420	140	4	2000	0,33	2	3	4000
	460	146	5	2295	0,3	2,3	3,4	4050
	460	146	5	2295	0,3	2,3	3,4	4050
	460	180	5	2635	0,39	1,7	2,5	4848
	460	180	5	2635	0,39	1,7	2,5	4848
	500	130	5	2330	0,29	2,3	3,4	3600
	500	130	5	2330	0,29	2,3	3,4	3600
	500	176	5	2806	0,35	1,9	2,9	4645
	500	176	5	2806	0,35	1,9	2,9	4645
	580	175	6	3530	0,36	1,8	2,8	5208
	580	175	6	3530	0,36	1,8	2,8	5208
300	420	90	3	1175	0,2	3,4	5,1	2261
	420	90	3	1175	0,2	3,4	5,1	2261
	460	118	4	1960	0,25	2,7	4	3650
	460	118	4	1960	0,25	2,7	4	3650
	460	160	4	2385	0,35	2	2,9	4702

Spherical Roller Bearings



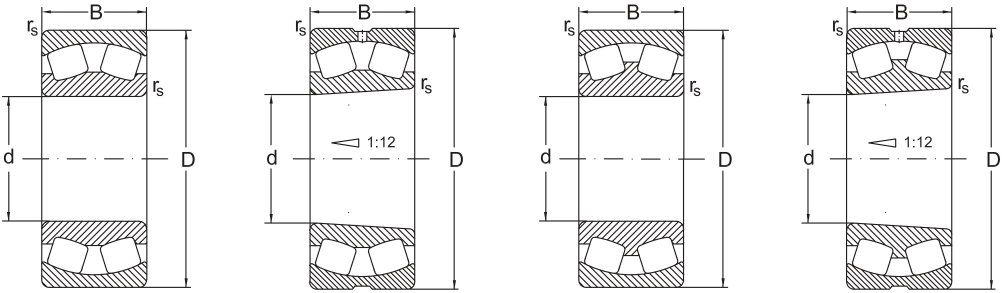
d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
260	2,3	750	1000	**22252 MBW33**	107
	2,3	750	1000	**22252 MBKW33**	107
	1,8	600	800	**22352 CW33**	187
	1,8	600	800	**22352 CKW33**	187
280	3,7	900	1200	**23956 MBKW33**	26
	3,7	900	1200	**23956 MBW33**	26
	2,7	700	900	**23056 MBKW33**	52,5
	2,7	700	900	**23056 MBW33**	52,5
	2	560	750	**24056 MBK30W33**	68,5
	2	560	750	**24056 MBW33**	68,5
	2,2	750	1000	**23156 MBKW33**	98,5
	2,2	750	1000	**23156 MBW33**	98,5
	1,7	400	530	**24156 MBW33**	118
	1,7	400	530	**24156 MBK30W33**	118
	2,3	700	950	**22256 MBW33**	113
	2,3	700	950	**22256 MBKW33**	113
	1,8	480	630	**23256 MBW33**	153
	1,8	480	630	**23256 MBKW33**	153
	1,8	560	750	**22356 CW33**	235
	1,8	560	750	**22356 CKW33**	235
300	3,3	750	1000	**23960 MBKW33**	40
	3,3	750	1000	**23960 MBW33**	40
	2,6	630	800	**23060 MBKW33**	73,6
	2,6	630	800	**23060 MBW33**	73,6
	1,9	560	759	**24060 MBK30W33**	97

Spherical Roller Bearings



Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
300	460	160	4	2385	0,35	2	2,9	4702
	500	160	5	2385	0,3	2,3	3,4	4485
	500	160	5	2385	0,3	2,3	3,4	4485
	500	200	5	3213	0,4	1,7	2,5	6011
	500	200	5	3213	0,4	1,7	2,5	6011
	540	140	5	2655	0,29	2,3	3,4	4230
	540	140	5	2655	0,29	2,3	3,4	4230
320	440	90	3	1215	0,19	3,6	5,4	2409
	440	90	3	1215	0,19	3,6	5,4	2409
	480	121	4	2040	0,25	2,7	4,1	4000
	480	121	4	2040	0,25	2,7	4,1	4000
	480	160	4	2500	0,33	2,1	3,1	5240
	480	160	4	2500	0,33	2,1	3,1	5240
	540	176	5	3115	0,34	2	3	6000
	540	176	5	3115	0,34	2	3	6000
	540	218	5	3750	0,41	1,7	2,5	7300
	540	218	5	3750	0,41	1,7	2,5	7300
	580	150	5	2997	0,29	2,5	3,7	4740
	580	150	5	2997	0,29	2,5	3,7	4740
	580	208	5	4130	0,35	1,9	2,9	7026
	580	208	5	4130	0,35	1,9	2,9	7026
340	440	90	3	1306	0,189	3,8	5,7	2691
	440	90	3	1306	0,189	3,8	5,7	2691
	520	133	5	2360	0,25	2,7	4	4500
	520	133	5	2360	0,25	2,7	4	4500

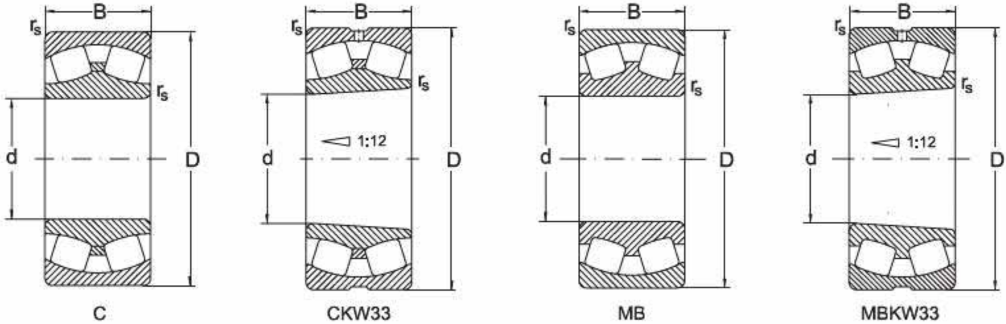
Spherical Roller Bearings



CA CAKW33 MA MAKW33

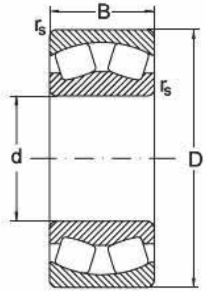
d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
300	1,9	560	759	**24060 MBW33**	97
	2,2	700	950	**23160 MBKW33**	129
	2,2	700	950	**23160 MBW33**	129
	1,6	430	560	**24160 MBW33**	159
	1,6	430	560	**24160 MBK30W33**	159
	2,3	670	900	**22260 CAKW33**	142
	2,3	670	900	**22260 CAW33**	142
320	3,5	670	900	**23964 MBKW33**	42
	3,5	670	900	**23964 MBW33**	42
	2,7	600	750	**23064 MBKW33**	79,5
	2,7	600	750	**23064 MBW33**	79,5
	2	530	700	**24064 MBK30W33**	106
	2	530	700	**24064 MBW33**	106
	1,9	530	670	**23164 MBW33**	165
	1,9	530	670	**23164 MBKW33**	165
	1,6	400	530	**24164 MBW33**	215
	1,6	400	530	**24164 MBK30W33**	215
	2,5	630	580	**22264 CAKW33**	180
	2,5	630	580	**22264 CAW33**	180
	1,8	430	560	**23264 MBW33**	247
	1,8	430	560	**23264 MBKW33**	247
340	3,8	630	850	**23968 CAKW33**	47
	3,8	630	850	**23698 CAW33**	47,8
	2,6	560	700	**23068 CAKW33**	101
	2,6	560	700	**23068 CAW33**	105

Spherical Roller Bearings

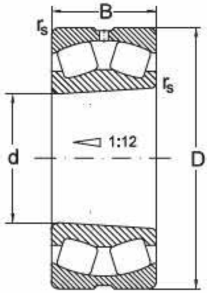


Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	Y_1	Y_2	stat. C_{0r}
mm				kN				kN
340	520	180	5	2912	0,34	2	2,9	5961
	520	180	5	2912	0,34	2	2,9	5961
	580	190	5	3740	0,31	2,2	3,2	6640
	580	190	5	3740	0,31	2,2	3,2	6640
	580	243	5	4400	0,43	1,6	2,3	8500
	580	243	5	4400	0,43	1,6	2,3	8500
360	480	90	3	1030	0,17	4,1	6	3200
	480	90	3	1030	0,17	4,1	6	3200
	540	134	5	2450	0,25	2,7	4,1	4800
	540	134	5	2450	0,25	2,7	4,1	4800
	540	180	5	3150	0,33	2,1	3,1	6530
	540	180	5	3150	0,33	2,1	3,1	6530
	600	192	5	3810	0,33	2,3	3,4	7010
	600	192	5	3810	0,33	2,3	3,4	7010
	600	243	5	4500	0,41	1,6	2,4	9000
	600	243	5	4500	0,41	1,6	2,4	9000
	650	232	6	4880	0,35	1,9	2,9	8490
	650	232	6	4880	0,35	1,9	2,9	8490
380	520	106	4	1785	0,19	3,6	5,3	4000
	520	106	4	1785	0,19	3,6	5,3	4000
	560	135	5	2550	0,25	2,8	4,2	5300
	560	135	5	2550	0,25	2,8	4,2	5300
	560	180	5	3150	0,31	2,2	3,2	6710
	560	180	5	3150	0,31	2,2	3,2	6710
	620	194	5	3890	0,3	2,3	3,4	7540

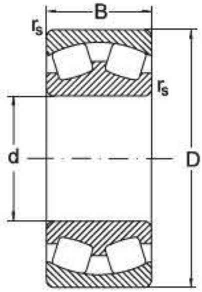
Spherical Roller Bearings



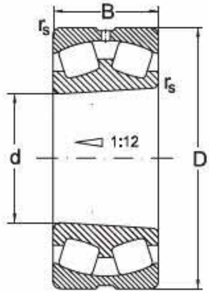
CA



CAKW33

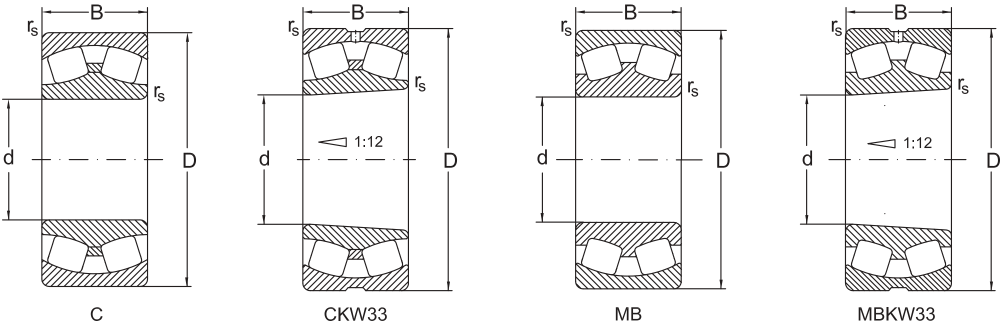


MA



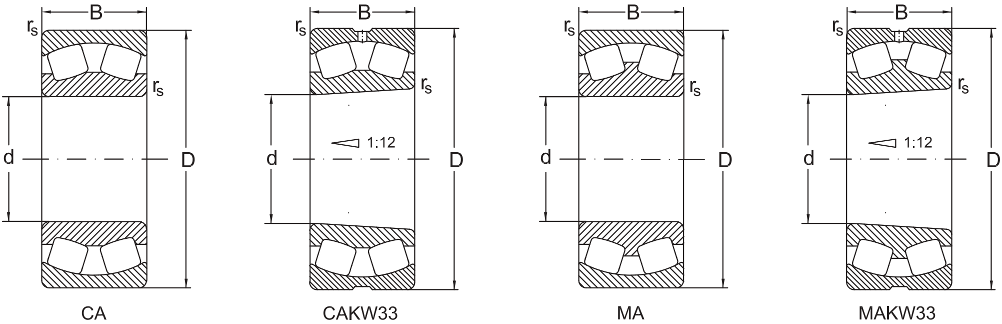
MAKW33

Spherical Roller Bearings



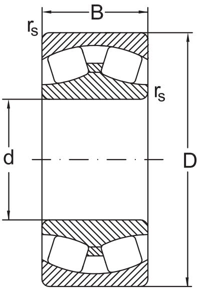
Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
380	620	194	5	3890	0,3	2,3	3,4	7540
	620	243	5	4650	0,39	1,7	2,5	9500
	620	243	5	4650	0,39	1,7	2,5	9500
	680	240	6	5050	0,35	1,9	2,9	9660
	680	240	6	5050	0,35	1,9	2,9	9660
400	540	106	4	1850	0,18	3,7	5,5	3990
	540	106	4	1850	0,18	3,7	5,5	3990
	600	148	5	3050	0,24	2,8	4,1	6200
	600	148	5	3050	0,24	2,8	4,1	6200
	600	200	5	3610	0,33	2,1	3,1	7545
	600	200	5	3610	0,33	2,1	3,1	7545
	650	200	6	4500	0,28	2,4	3,6	7900
	650	200	6	4500	0,28	2,4	3,6	7900
	650	250	6	5100	0,39	1,7	2,6	10400
	650	250	6	5100	0,39	1,7	2,6	10400
	720	256	6	5950	0,35	1,9	2,9	10807
	720	256	6	5950	0,35	1,9	2,9	10807
420	560	106	4	1960	0,18	3,8	5,7	4130
	560	106	4	1960	0,18	3,8	5,7	4130
	620	150	5	3150	0,24	2,8	4,2	6550
	620	150	5	3150	0,24	2,8	4,2	6550
	620	200	5	4000	0,32	2,1	3,2	8800
	620	200	5	4000	0,32	2,1	3,2	8800
	700	224	6	4600	0,33	2	3	9000
	700	224	6	4600	0,33	2	3	9000

Spherical Roller Bearings

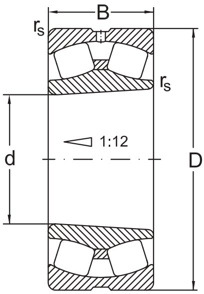


d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
380	2,2	560	750	**23176 CAW33**	241
	1,7	400	500	**24176 CAW33**	279
	1,7	400	500	**24176 CAK30W33**	277
	1,8	400	530	**23276 CAW33**	390
	1,8	400	530	**23276 CAKW33**	367
400	3,6	600	800	**23980 CAW33**	72,9
	3,6	600	800	**23980 CAKW33**	68,2
	2,7	450	560	**23080 CAKW33**	143
	2,7	450	560	**23080 CAW33**	151
	2	430	460	**24080 CAW33**	198
	2	430	460	**24080 CAK30W33**	196
	2,5	530	700	**23180 CAKW33**	261
	2,5	530	700	**23180 CAW33**	270
	1,7	380	480	**24180 CAW33**	326
	1,7	380	480	**24180 CAK30W33**	312
	1,8	380	500	**23280 CAW33**	469
	1,8	380	500	**23280 CAKW33**	442
420	3,8	600	800	**23984 CAKW33**	78
	3,8	600	800	**23984 CAW33**	80,5
	2,8	450	560	**23084 CAKW33**	155
	2,8	450	560	**23084 CAW33**	162
	2,1	380	480	**24084 CAK30W33**	214
	2,1	380	480	**24084 CAW33**	217
	2	500	670	**23184 CAW33**	360
	2	500	670	**23184 CAKW33**	339

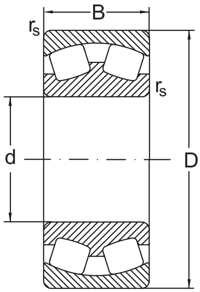
Spherical Roller Bearings



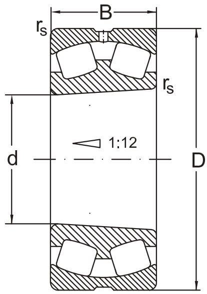
C



CKW33

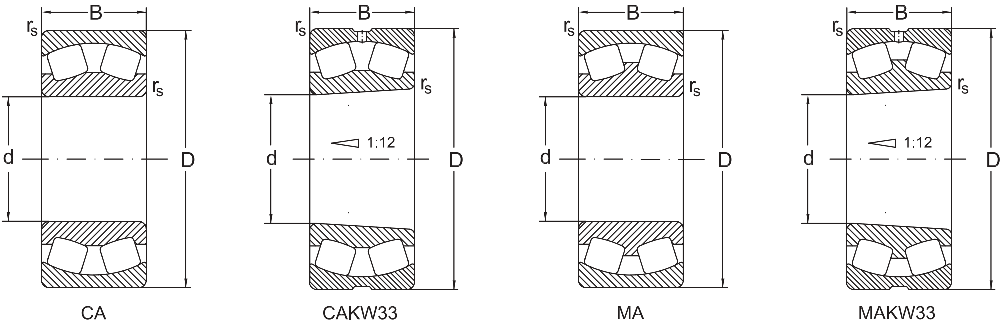


MB



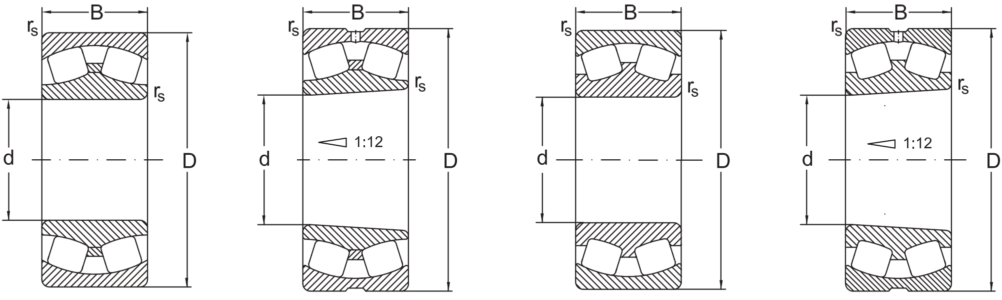
MBKW33

Spherical Roller Bearings



d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
420	2	400	500	**24184 CAW33**	442
	2	400	500	**24184 CAK30W33**	407
	1,8	360	480	**23284 CAW33**	558
	1,8	360	480	**23284 CAKW33**	537
440	3,6	560	750	**23988 CAKW33**	98,3
	3,6	560	750	**23988 CAW33**	101
	2,8	430	530	**23088 CAKW33**	177
	2,8	430	530	**23088 CAW33**	190
	2,1	360	450	**24088 CAK30W33**	247
	2,1	360	450	**24088 CAW33**	250
	2,2	500	670	**23188 CAW33**	381
	2,2	500	670	**23188 CAKW33**	378
	1,7	340	430	**24188 CAW33**	453
	1,7	340	430	**24188 CAK30W33**	451
	1,8	360	480	**23288 CAW33**	615
	1,8	360	480	**23288 CAKW33**	586
460	3,8	530	700	**23992 CAKW33**	103
	3,8	530	700	**23992 CAW33**	111
	2,8	400	500	**23092 CAKW33**	204
	2,8	400	500	**23092 CAW33**	208
	2,1	380	500	**24092 CAK30W33**	279
	2,1	380	500	**24092 CAW33**	282
	2,2	480	630	**23192 CAW33**	447
	2,2	480	630	**23192 CAKW33**	420
	1,7	320	400	**24192 CAW33**	582

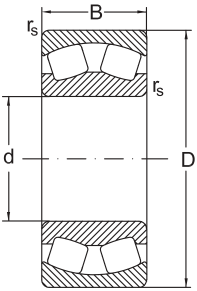
Spherical Roller Bearings



C CKW33 MB MBKW33

Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
460	760	300	7,5	7500	0,39	1,7	2,6	15600
	830	296	7,5	7560	0,35	1,9	2,9	13970
	830	296	7,5	7560	0,35	1,9	2,9	13970
480	650	128	5	2525	0,18	3,8	5,6	5500
	650	128	5	2525	0,18	3,8	5,6	5500
	700	165	6	3800	0,23	2,9	4,3	8150
	700	165	6	3800	0,23	2,9	4,3	8150
	700	218	6	4900	0,3	2,3	3,3	11200
	700	218	6	4900	0,3	2,3	3,3	11200
	790	248	7,5	5800	0,3	2,3	3,4	11800
	790	248	7,5	5800	0,3	2,3	3,4	11800
	790	308	7,5	8000	0,39	1,8	2,6	16600
	790	308	7,5	8000	0,39	1,8	2,6	16600
	870	310	7,5	8800	0,37	1,8	2,7	17000
	870	310	7,5	8800	0,37	1,8	2,7	17000
500	670	128	5	2500	0,17	3,9	5,8	6090
	670	128	5	2500	0,17	3,9	5,8	6090
	720	167	6	3900	0,22	3	4,5	8500
	720	167	6	3900	0,22	3	4,5	8500
	720	218	6	4900	0,29	2,3	3,5	11200
	720	218	6	4900	0,29	2,3	3,5	11200
	830	264	7,5	6550	0,3	2,3	3,4	13200
	830	264	7,5	6550	0,3	2,3	3,4	13200
	830	325	7,5	8650	0,39	1,7	2,6	18300
	830	325	7,5	8650	0,39	1,7	2,6	18300

Spherical Roller Bearings



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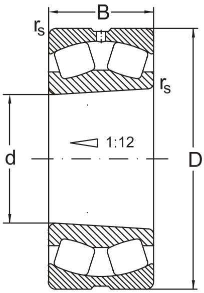
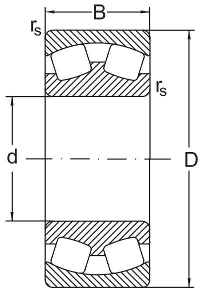


CAKW33



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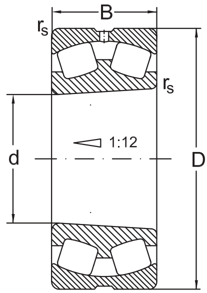
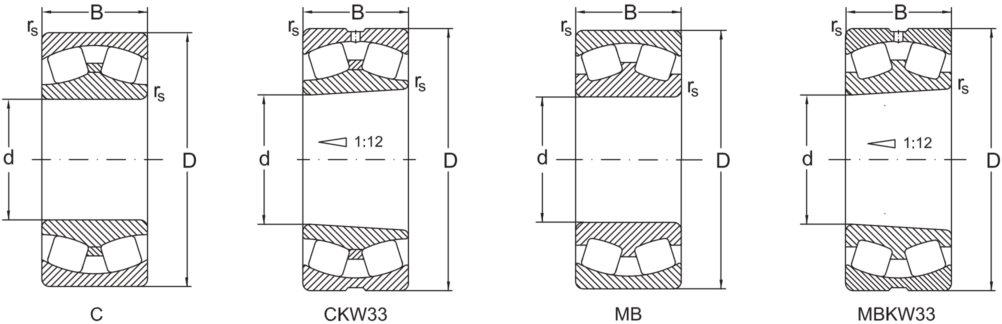


MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
460	1,7	320	400	**24192 CAK30W33**	578
	1,9	340	450	**23292 CAW33**	700
	1,9	340	450	**23292 CAKW33**	685
480	3,7	450	600	**23996 CAW33**	126
	3,7	450	600	**23996 CAKW33**	121
	2,8	380	480	**23096 CAKW33**	208
	2,8	380	480	**23096 CAW33**	222
	2,2	340	430	**24096 CAK30W33**	289
	2,2	340	430	**24096 CAW33**	291
	2,2	450	600	**23196 CAW33**	508
	2,2	450	600	**23196 CAKW33**	470
	1,7	320	400	**24196 CAW33**	705
	1,7	320	400	**24196 CAK30W33**	700
	1,8	340	430	**23296 CAW33**	830
	1,8	340	430	**23296 CAKW33**	806
500	3,8	480	630	**239/500 CAKW33**	124
	3,8	480	630	**239/500 CAW33**	132
	2,9	380	480	**230/500 CAKW33**	219
	2,9	380	480	**230/500 CAW33**	233
	2,3	320	400	**240/500 CAK30W33**	293
	2,3	320	400	**240/500 CAW33**	297
	2,2	430	560	**231/500 CAKW33**	556
	2,2	430	560	**231/500 CAW33**	588
	1,7	300	380	**241/500 CAW33**	725
	1,7	300	380	**241/500 CAK30W33**	717

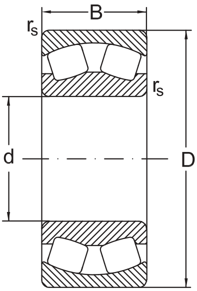
ART BEARINGS

Spherical Roller Bearings



Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
500	920	336	7,5	9650	0,38	1,8	2,7	18300
	920	336	7,5	9650	0,38	1,8	2,7	18300
530	710	136	5	2980	0,18	3,8	5,7	6755
	710	136	5	2980	0,18	3,8	5,7	6755
	780	185	6	4400	0,22	3	4,5	9500
	780	185	6	4400	0,22	3	4,5	9500
	780	250	6	5640	0,31	2,2	3,2	12800
	780	250	6	5640	0,31	2,2	3,2	12800
	870	335	7,5	9500	0,38	1,8	2,6	20000
	870	335	7,5	9500	0,38	1,8	2,6	20000
	870	272	7,5	7625	0,3	2,3	3,4	15000
	870	272	7,5	7625	0,3	2,3	3,4	15000
560	750	140	5	3100	0,17	4	5,9	7650
	750	140	5	3100	0,17	4	5,9	7650
	820	195	6	5100	0,23	2,9	4,4	11000
	820	195	6	5100	0,23	2,9	4,4	11000
	820	258	6	6400	0,31	2,2	3,3	14600
	820	258	6	6400	0,31	2,2	3,3	14600
	920	280	7,5	8294	0,3	2,3	3,4	16295
	920	280	7,5	8294	0,3	2,3	3,4	16295
	920	355	7,5	10600	0,38	1,8	2,6	22400
	920	355	7,5	10600	0,38	1,8	2,6	22400
600	800	150	5	3450	0,17	4	5,9	8650
	800	150	5	3450	0,17	4	5,9	8650
	870	200	6	5700	0,22	3,1	4,6	12500

Spherical Roller Bearings



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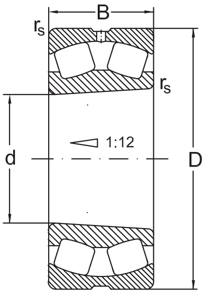
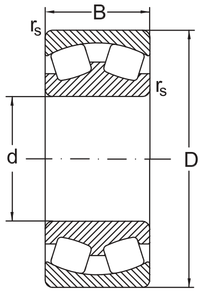


CAKW33



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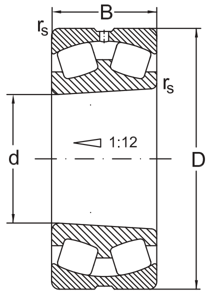
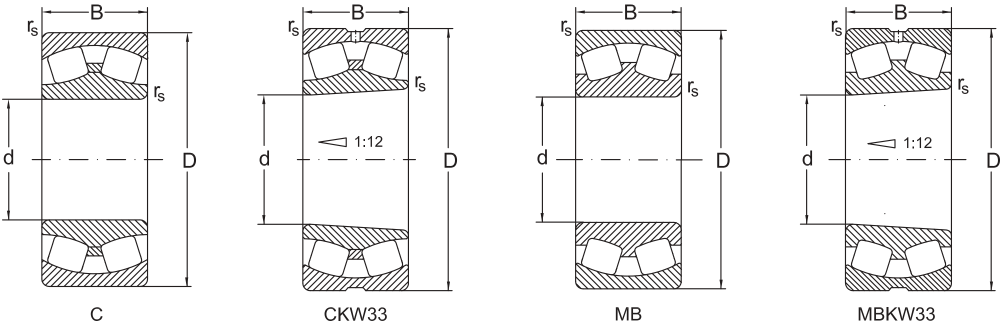


MAKW33

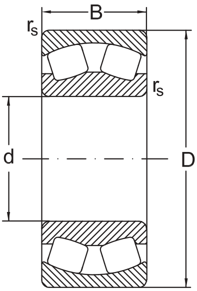
d	y_0	**Speed limit**		**Designation**	**Mass**
		grease	oil	**Bearing**	
mm		min $^{-1}$			kg
500	1,7	320	400	**232/500 CAW33**	1010
	1,7	320	400	**232/500 CAKW33**	985
530	3,8	450	600	**239/530 CAW33**	160
	3,8	450	600	**239/530 CAKW33**	146
	3	340	430	**230/530 CAW33**	321
	3	340	430	**230/530 CAKW33**	291
	2,1	340	450	**240/530 CAW33**	415
	2,1	340	450	**240/530 CAK30W33**	410
	1,7	280	360	**241/530 CAW33**	838
	1,7	280	360	**241/530 CAK30W33**	830
	2,2	400	530	**231/530 CAKW33**	643
	2,2	400	530	**231/530 CAW33**	665
560	3,9	340	430	**239/560 CAKW33**	169
	3,9	340	430	**239/560 CAW33**	181
	2,9	320	400	**230/560 CAKW33**	339
	2,9	320	400	**230/560 CAW33**	358
	2,2	280	360	**240/560 CAK30W33**	469
	2,2	280	360	**240/560 CAW33**	463
	2,2	380	500	**231/560 CAKW33**	737
	2,2	380	500	**231/560 CAW33**	760
	1,7	260	340	**241/560 CAW33**	982
	1,7	260	340	**241/560 CAK30W33**	974
600	3,9	320	400	**239/600 CAKW33**	210
	3,9	320	400	**239/600 CAW33**	224
	3	300	380	**230/600 CAKW33**	388

Spherical Roller Bearings



Dimensions				Basic radial load. Factors				
d	D	B	r_s min.	dyn. C_r	e	y_1	y_2	stat. C_{0r}
mm				kN				kN
600	870	200	6	5700	0,22	3,1	4,6	12500
	870	272	6	7100	0,31	2,2	3,3	16600
	870	272	6	7100	0,31	2,2	3,3	16600
	980	300	7,5	9000	0,31	1,8	2,7	19300
	980	300	7,5	9000	0,31	1,8	2,7	19300
	980	375	7,5	11600	0,38	1,8	2,7	26000
	980	375	7,5	11600	0,38	1,8	2,7	26000
630	850	165	6	4290	0,18	3,8	5,7	9910
	850	165	6	4290	0,18	3,8	5,7	9910
	920	212	7,5	6300	0,31	2,2	3,3	14000
	920	212	7,5	6300	0,31	2,2	3,3	14000
	920	290	7,5	8000	0,31	2,2	3,3	19000
	920	290	7,5	8000	0,31	2,2	3,3	19000
670	900	170	6	4300	0,17	4	5,9	10600
	900	170	6	4300	0,17	4	5,9	10600
	980	230	7,5	7200	0,22	3	4,5	16000
	980	230	7,5	7200	0,22	3	4,5	16000
	980	308	7,5	9000	0,31	2,2	3,3	21600
	980	308	7,5	9000	0,31	2,2	3,3	21600
710	950	180	6	4800	0,18	3,8	5,7	12000
	950	180	6	4800	0,18	3,8	5,7	12000
750	1000	185	6	5200	0,17	4	5,9	12900
	1000	185	6	5200	0,17	4	5,9	12900

Spherical Roller Bearings



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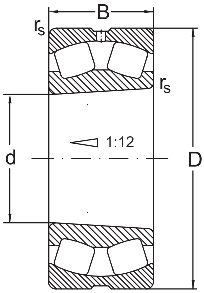

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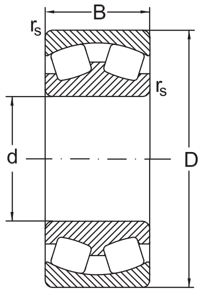

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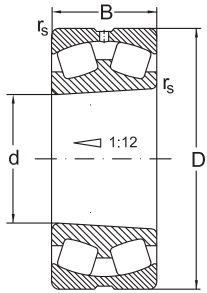


MAKW33

d	y_0	Speed limit		Designation	Mass
		grease	oil	Bearing	
mm		min $^{-1}$			kg
600	3	300	380	**230/600 CAW33**	409
	2,2	260	340	**240/600 CAK30W33**	534
	2,2	260	340	**240/600 CAW33**	540
	2,2	280	360	**231/600 CAW33**	929
	2,2	280	360	**231/600 CAKW33**	901
	1,8	240	320	**241/600 CAW33**	1180
	1,8	240	320	**241/600 CAK30W33**	1170
630	3,7	380	500	**239/630 CAKW33**	283
	3,7	380	500	**239/630 CAW33**	292
	2,2	260	340	**230/630 CAKW33**	496
	2,2	260	340	**230/630 CAW33**	502
	2,2	260	340	**240/630 CAK30W33**	649
	2,2	260	340	**240/630 CAW33**	660
670	3,9	280	360	**239/670 CAKW33**	310
	3,9	280	360	**239/670 CAW33**	320
	2,9	260	340	**230/670 CAKW33**	590
	2,9	260	340	**230/670 CAW33**	600
	2,2	240	320	**240/670 CAK30W33**	795
	2,2	240	320	**240/670 CAW33**	802
710	3,8	260	340	**239/710 CAKW33**	336
	3,8	260	340	**239/710 CAW33**	355
750	3,9	260	340	**239/750 CAKW33**	394
	3,9	260	340	**239/750 CAW33**	426

Thrust Ball Bearings

Standards, Boundary dimensions

Standard plans	DIN 616
Thrust ball bearings single direction	DIN 711
Thrust ball bearings double direction	DIN 715
Seating washers	DIN 711

General

Thrust Ball Bearings are separable axial bearings that are produced in both single and double direction acting design. To assist in simple effective mounting or dismounting the bearing washers, seating's, and cage and ball assemblies, may be individually mounted in their arrangement location.

Thrust ball bearings may accommodate comparatively high axial loads but they must not be exposed to any radial forces.

Due to their specific kinematic behavior, thrust ball bearings are only suitable for low to medium operating speeds.

Furthermore, they require minimum axial loads for their optimum function. Since thrust ball bearings do not compensate any misalignment, they are also frequently used in conjunction with sphered housing washers and seating washers.

Design variants (see drawing on next page)

Thrust ball bearings are produced in both, single direction and double direction design. The most important design variants are shown on the next page.

Single direction thrust ball bearings consist of a **shaft washer**, a **housing washer** and a **ball and cage thrust assembly** (see figure a, b and c).

These bearings are able to accommodate axial loads in one direction only.

Single direction thrust ball bearings of series **511**, **512**, **513** and **514** have plain housing washers, (see figure a).

For applications where some misalignment may occur, single direction thrust ball bearings of the series **532**, **533** and **534** are also available with sphered housing washers, figure b.

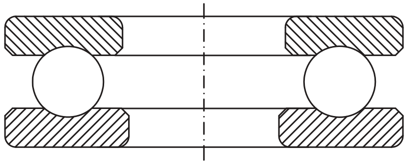
These bearings may be applied either direct to sphered shaped bearings seats or, they may be used together with **seating washers** of series **U2**, **U3** or **U4** (see figure c).

Unlike single direction thrust ball bearing types, **double direction thrust ball bearings** are suitable to guide the shaft in both directions (see figure d, e and f).

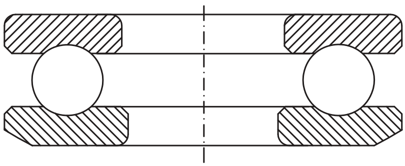
These bearings consist of two washers, **two balls and cage thrust assemblies** with one common **shaft washer** located centrally in between.

Double direction thrust ball bearings are also available in both designs, with **at housing washers** (series **522**, **523** and **524** figure d) and with sphered housing washers (series **542**, **543** and **544** figure e).

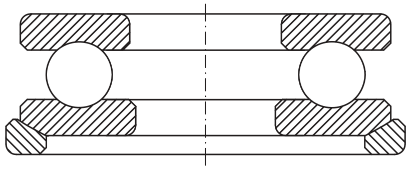
For compensation of possible aligning errors the double direction thrust ball bearings may be used in conjunction with **Seating Washers** (series **U2**, **U3** and **U4**, see figure f).



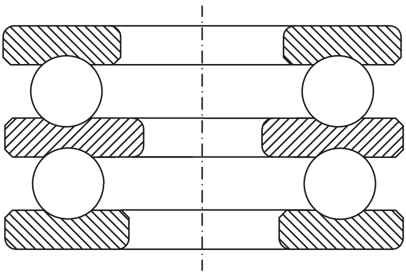
a



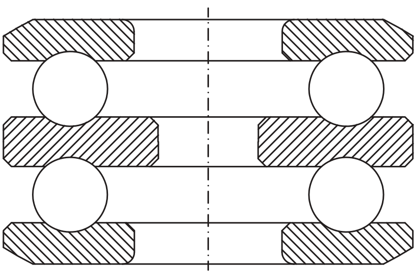
b



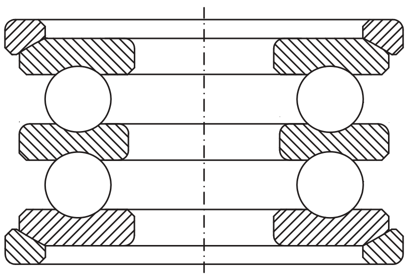
c



d



e



f

Misalignment

All thrust ball bearings with flat housing washers do not allow any misalignment.

The contacting surfaces of both shaft and housing seats must be parallel. Misalignments can only be accommodated by using Thrust Ball bearings with **sphered housing washers**.

Cages

ART thrust ball bearings are normally fitted with pressed steel cages as standard.

For larger thrust ball bearings solid brass cages (suffix **M**), or solid steel cages (suffix **F**), are fitted as standard.

Tolerances

ART thrust ball bearings are produced to normal class tolerance class (**PN**) as standard.

For applications of higher dimensional and geometrical accuracy these bearings are produced to precision tolerance class (e.g. **P6**) on order request.

For detailed values of the tolerance classes see chapter **Bearing tolerances** (see page 39-40).

Minimum load:

Thrust ball bearings require a certain minimum axial load to ensure a satisfactory operating function.

To prevent excessive sliding friction, the minimum axial load applied should be greater than **4%** of the axial bearing dynamic load rating **Ca**.

Where such a minimum axial load is not possible, the load must be increased by effective measures, (i.e. preloading the bearing) using pressure washers or springs.

Equivalent dynamic bearing load

Thrust ball bearings are pure axial bearings, there are not able to accommodate any radial loads, therefore:

$$P=F_a$$

Equivalent static bearing load

For thrust ball bearings:

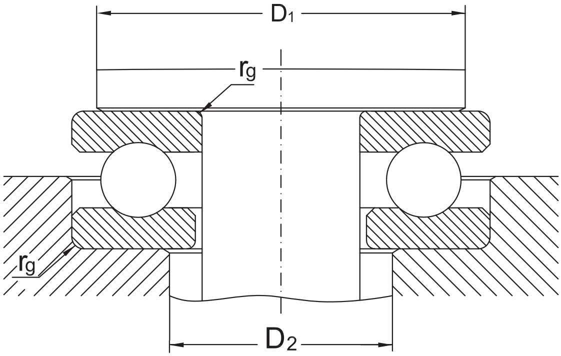
$$P_0=F_a$$

Abutment and Fillet dimensions for thrust ball bearings

The bearing washer must contact adjacent parts with their face sides only. The radii of bearing shoulder fillet radii of the shaft or housing shoulders.

Therefore fillet radius (r_g) must be smaller than the minimum fillet dimension of the bearing rings (r_s) as listed in the bearing tables.

Abutment and Fillet dimensions for Thrust Ball bearings of series 511, 512, 513 and 514 [mm]

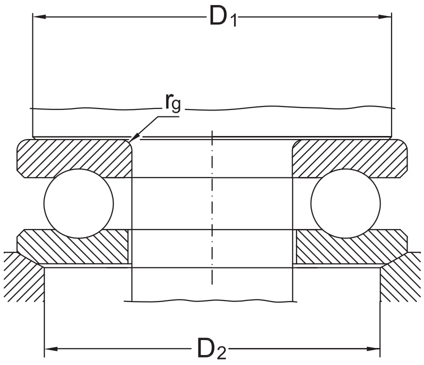


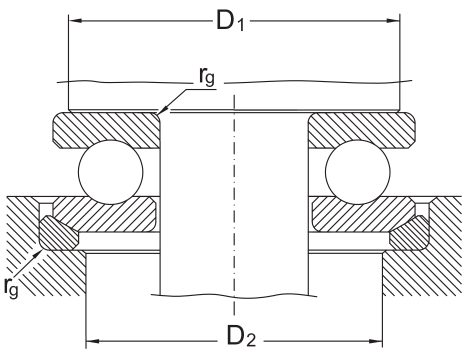
Shaft	Bore reference number	Bearing Series											
		511			512			513			514		
$Ød_1$		D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max
mm													
10	**0**	18	16	0,3	20	16	0,6	-	-	-	-	-	-
12	**1**	20	18	0,3	22	18	0,6	-	-	-	-	-	-
15	**2**	23	20	0,3	25	22	0,6	-	-	-	-	-	-
17	**3**	25	22	0,3	28	24	0,6	-	-	-	-	-	-
20	**4**	29	26	0,3	32	28	0,6	-	-	-	-	-	-
25	**5**	35	32	0,6	38	34	0,6	41	36	1	46	39	1
30	**6**	40	37	0,6	43	39	0,6	48	42	1	54	46	1
35	**7**	45	42	0,6	51	46	1	55	48	1	62	53	1
40	**8**	52	48	0,6	57	51	1	63	55	1	70	60	1
45	**9**	57	53	0,6	62	56	1	69	61	1	78	67	1
50	**10**	62	58	0,6	67	61	1	77	68	1	86	74	1,5
55	**11**	69	64	0,6	76	69	1	85	75	1	94	81	1,5
60	**12**	75	70	1	81	74	1	90	80	1	102	88	1,5
65	**13**	80	75	1	86	79	1	95	85	1	110	95	2
70	**14**	85	80	1	91	84	1	103	92	1	118	102	2
75	**15**	90	85	1	96	89	1	111	99	1,5	126	109	2
80	**16**	95	90	1	101	94	1	116	104	1,5	134	116	2,1
85	**17**	100	95	1	109	101	1	124	111	1,5	142	123	2,1
90	**18**	108	102	1	117	108	1	129	116	1,5	150	130	2,1
100	**20**	121	114	1	130	120	1	142	128	1,5	166	144	2,5
110	**22**	131	124	1	140	130	1	158	142	2	182	158	2,5
120	**24**	141	134	1	150	140	1	174	156	2,1	198	172	3
130	**26**	154	146	1	166	154	1	187	168	2,1	214	186	3
140	**28**	164	156	1	176	164	1	200	180	2,1	224	196	3
150	**30**	174	166	1	189	176	1	210	190	2,1	240	210	3

Abutment and Fillet dimensions for Thrust Ball bearings of series 511, 512 and 513 [mm]

Shaft	Bore reference number	Bearing Series								
		511			512			513		
$Ød_1$		D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max
mm										
160	**32**	184	176	1	199	186	1,5	226	204	2,5
170	**34**	197	188	1	212	198	1,5	236	214	2,5
180	**36**	207	198	1	222	208	1,5	252	228	2,5
190	**38**	220	210	1	238	222	2	268	242	3
200	**40**	230	220	1	248	232	2	284	256	3
220	**44**	250	240	1	268	252	2	-	-	-
240	**48**	276	264	1,5	300	280	2,1	-	-	-
260	**52**	296	284	1,5	320	300	2,1	-	-	-
280	**56**	322	308	1,5	340	320	2,1	-	-	-
300	**60**	348	332	2	372	348	2,5	-	-	-
320	**64**	368	352	2	392	368	2,5	-	-	-
340	**68**	388	372	2	412	388	2,5	-	-	-
360	**72**	408	392	2	444	416	3	-	-	-
380	**76**	428	412	2	-	-	-	-	-	-
400	**80**	448	432	2	-	-	-	-	-	
420	**84**	468	452	2	-	-	-	-	-	-
440	**88**	500	480	2,1	-	-	-	-	-	-
460	**92**	520	500	2,1	-	-	-	-	-	-
480	**96**	540	520	2,1	-	-	-	-	-	-
500	**/500**	560	540	2,1	-	-	-	-	-	-
530	**/530**	596	574	2,5	-	-	-	-	-	-
560	**/560**	626	604	2,5	-	-	-	-	-	-

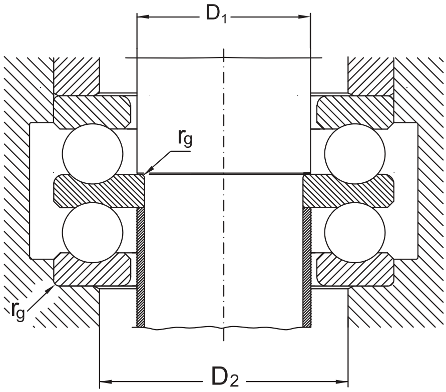
Abutment and Fillet dimensions for Thrust Ball bearings of series 532, 533, and 534 [mm]





Shaft	Bore reference number	Bearing Series								
		532			533			534		
$Ød_1$		D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max
		mm								
10	**0**	20	18	0,6	-	-	-	-	-	-
12	**1**	22	20	0,6	-	-	-	-	-	-
15	**2**	25	24	0,6	-	-	-	-	-	-
17	**3**	28	26	0,6	-	-	-	-	-	-
20	**4**	32	30	0,6	-	-	-	-	-	-
25	**5**	38	36	0,6	41	38	1	46	42	1
30	**6**	43	42	0,6	48	45	1	54	50	1
35	**7**	51	48	1	55	52	1	62	58	1
40	**8**	57	55	1	63	60	1	70	65	1
45	**9**	62	60	1	69	65	1	78	72	1
50	**10**	67	62	1	77	72	1	86	80	1,5
55	**11**	76	72	1	85	80	1	94	88	1,5
60	**12**	81	78	1	90	85	1	102	95	1,5
65	**13**	86	82	1	95	90	1	110	100	2
70	**14**	91	88	1	103	98	1	118	110	2
75	**15**	96	92	1	111	105	1,5	126	115	2
80	**16**	101	98	1	116	110	1,5	134	125	2,1
85	**17**	109	105	1	124	115	1,5	142	130	2,1
90	**18**	117	110	1	129	120	1,5	150	140	2,1
100	**20**	130	125	1	142	135	1,5	166	155	2,5
110	**22**	140	135	1	158	150	2	182	170	2,5
120	**24**	150	145	1	174	165	2	195	185	3
130	**26**	166	160	1,5	187	177	2,1	214	200	3
140	**28**	176	170	1,5	200	190	2,1	-	-	-
150	**30**	189	180	1,5	210	200	2,1	-	-	-
160	**32**	199	190	1,5	-	-	-	-	-	-
170	**34**	212	200	1,5	-	-	-	-	-	-
180	**36**	222	210	1,5	-	-	-	-	-	-
190	**38**	238	230	1,5	-	-	-	-	-	-

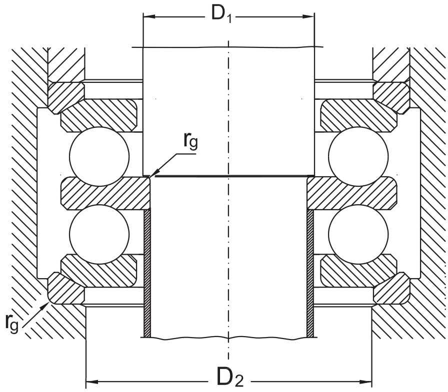
Abutment and Fillet dimensions for Thrust Ball bearings of series 522, 523 and 524 [mm]



Shaft	Bore reference number	Bearing Series												
		522				523				524				
Ød$_1$		D_1 min	D_2 min	r_g max	r_{g1} max	D_1 min	D_2 min	r_g max	r_{g1} max	Shaft	D_1 min	D_2 min	r_g max	r_{g1} max
mm														
10	**2**	15	22	0,6	0,3	-	-	-	-	**-**	-	-	-	-
15	**4**	20	28	0,6	0,3	-	-	-	-	**-**	-	-	-	-
20	**5**	25	34	0,6	0,3	25	36	1	0,3	**15**	25	39	1	0,6
25	**6**	30	39	0,6	0,3	30	42	1	0,3	**20**	30	46	1	0,6
30	**7**	35	46	1	0,3	35	48	1	0,3	**25**	35	53	1	0,6
30	**8**	40	51	1	0,6	40	55	1	0,6	**30**	40	60	1	0,6
35	**9**	45	56	1	0,6	45	61	1	0,6	**35**	45	67	1	0,6
40	**10**	50	61	1	0,6	50	68	1	0,6	**40**	50	74	1,5	0,6
45	**11**	55	69	1	0,6	55	75	1	0,6	**45**	55	81	1,5	0,6
50	**12**	60	74	1	0,6	60	80	1	0,6	**50**	60	88	1,5	0,6
55	**13**	65	79	1	0,6	65	85	1	0,6	**50**	65	95	2	1
55	**14**	70	84	1	1	70	92	1	1	**55**	70	102	2	1
60	**15**	75	89	1	1	75	99	1,5	1	**60**	75	109	2	1
65	**16**	80	94	1	1	80	104	1,5	1	**65**	80	116	2,1	1
70	**17**	85	101	1	1	85	111	1,5	1	**65**	85	123	2,1	1
75	**18**	90	108	1	1	90	116	1,5	1	**70**	90	130	2,1	1
85	**20**	100	120	1	1	100	128	1,5	1	**80**	100	144	2,5	1
95	**22**	110	130	1	1	110	142	2	1	**-**	-	-	-	-
100	**24**	120	140	1	1	120	156	2,1	1	**-**	-	-	-	-
110	**26**	130	154	1,5	1	130	168	2,1	1	**-**	-	-	-	-
120	**28**	140	164	1,5	1	140	180	2,1	1	**-**	-	-	-	-
130	**30**	150	176	1,5	1	150	190	2,1	1	**-**	-	-	-	-
140	**32**	160	186	1,5	1	-	-	-	-	**-**	-	-	-	-
150	**34**	170	198	1,5	1	-	-	-	-	**-**	-	-	-	-

ART BEARINGS

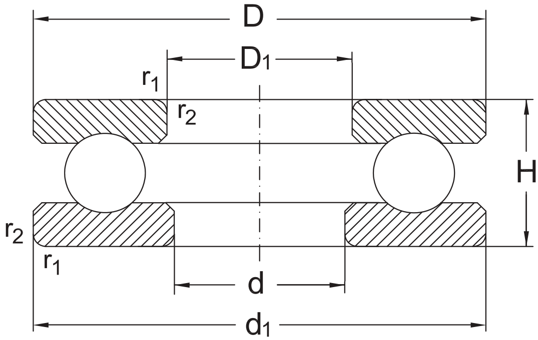
Abutment and Fillet dimensions for Thrust Ball bearings of series 542, 543 and 544 [mm]



Shaft	Bore reference number	Bearing Series												
		542				543				544				
Ød1		D_1 min	D_2 min	r_g max	r_{g1} max	D_1 min	D_2 min	r_g max	r_{g1} max	Shaft	D_1 min	D_2 min	r_g max	r_{g1} max
mm														
10	**2**	15	24	0,6	0,3	-	-	-	-	**-**	-	-	-	-
15	**4**	20	30	0,6	0,3	-	-	-	-	**-**	-	-	-	-
20	**5**	25	36	0,6	0,3	25	38	1	0,3	**15**	25	42	1	0,6
25	**6**	30	42	0,6	0,3	30	45	1	0,3	**20**	30	50	1	0,6
30	**7**	35	48	1	0,3	35	52	1	0,3	**25**	35	58	1	0,6
30	**8**	40	55	1	0,6	40	60	1	0,6	**30**	40	65	1	0,6
35	**9**	45	60	1	0,6	45	65	1	0,6	**35**	45	72	1	0,6
40	**10**	50	62	1	0,6	50	72	1	0,6	**40**	50	80	1,5	0,6
45	**11**	55	72	1	0,6	55	80	1	0,6	**45**	55	88	1,5	0,6
50	**12**	60	78	1	0,6	60	85	1	0,6	**50**	60	95	1,5	0,6
55	**13**	65	82	1	0,6	65	90	1	0,6	**50**	65	100	2	1
55	**14**	70	88	1	1	70	98	1	1	**55**	70	110	2	1
60	**15**	75	92	1	1	75	105	1,5	1	**60**	75	115	2	1
65	**16**	80	98	1	1	80	110	1,5	1	**65**	80	125	2,1	1
70	**17**	85	105	1	1	85	115	1,5	1	**65**	85	130	2,1	1
75	**18**	90	110	1	1	90	120	1,5	1	**70**	90	140	2,1	1
85	**20**	100	125	1	1	100	135	1,5	1	**80**	100	155	2,5	1
95	**22**	110	135	1	1	110	150	2	1	**-**	-	-	-	-
100	**24**	120	145	1	1	120	165	2,1	1	**-**	-	-	-	-
110	**26**	130	160	1,5	1	-	-	-	-	**-**	-	-	-	-

ART BEARINGS

Thrust Ball bearings, single direction



511/ 512/ 513/514

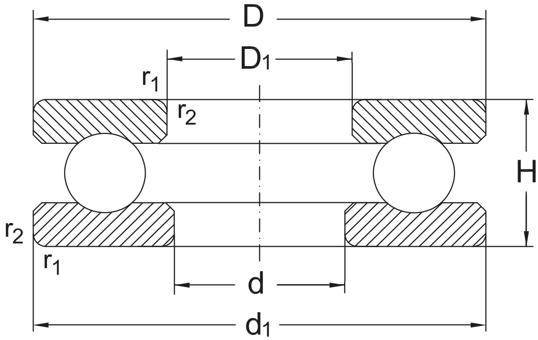
Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
10	24	9	0,3	**51100**	10	14	7000	9500
	26	11	0,6	**51200**	12,7	17,1	6000	8000
12	26	9	0,3	**51101**	10,4	15,4	6700	9000
	28	11	0,6	**51201**	13,2	19	6000	8000
15	28	9	0,3	**51102**	10,5	16,8	6300	8500
	32	11	0,6	**51202**	16,6	25	5000	6700
17	30	9	0,3	**51103**	10,8	18,2	6300	8500
	35	12	0,6	**51203**	17,3	27,5	5000	6700
20	35	10	0,3	**51104**	14,9	26,6	5300	7000
	40	14	0,6	**51204**	22,4	37,7	4300	5600
25	42	11	0,6	**51105**	15,6	30,4	4800	6300
	47	15	0,6	**51205**	28	50,5	3800	5000
	52	18	1	**51305**	35,4	61,5	3150	4200
	60	24	1	**51405**	56	90	2600	3600
30	47	11	0,6	**51106**	18,6	39,9	4300	5600
	52	16	0,6	**51206**	28,1	54,3	3600	4800
	60	21	1	**51306**	42,2	78,7	2900	3900
	70	28	1	**51406**	72	125	2200	3200
35	52	12	0,6	**51107**	19,1	44,4	4000	5300

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
10	24	11	0,02
	26	12	0,03
12	26	13	0,02
	28	14	0,03
15	28	16	0,02
	32	17	0,05
17	30	18	0,03
	35	19	0,05
20	35	21	0,04
	40	22	0,08
25	42	26	0,06
	47	27	0,12
	52	27	0,17
	60	27	0,36
30	47	32	0,07
	52	32	0,13
	60	32	0,26
	70	32	0,58
35	52	37	0,09

ART BEARINGS

Thrust Ball bearings, single direction



511/ 512/ 513/514

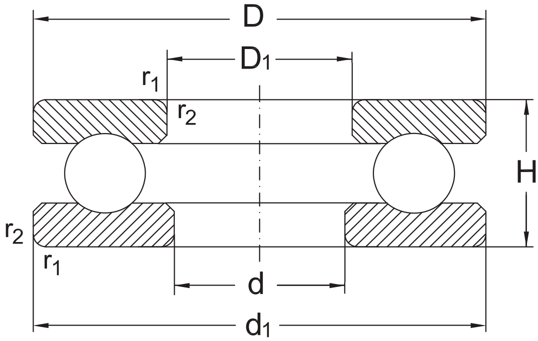
Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
35	62	18	1	**51207**	38,8	78,2	3000	4000
	68	24	1	**51307**	55,4	105	2600	3600
	80	32	1,1	**51407**	86,5	156	2000	3000
40	60	13	0,6	**51108**	26,8	62,9	3400	4500
	68	19	1	**51208**	46,9	98,3	2800	3800
	78	26	1	**51308**	68,4	135	2200	3200
	90	36	1,1	**51408**	112	204	1700	2400
45	65	14	0,6	**51109**	27,2	69,2	3400	4500
	73	20	1	**51209**	49,3	112	2600	3600
	85	28	1	**51309**	78,9	164	2000	3000
	100	39	1,1	**51409**	140	262	1600	2200
50	70	14	0,6	**51110**	28,1	75,5	3200	4300
	78	22	1	**51210**	56,3	129	2400	3400
	95	31	1,1	**51310**	95,3	202	1900	2800
	110	43	1,5	**51410**	156	310	1500	2000
55	78	16	0,6	**51111**	31,1	81,5	2800	3800
	90	25	1	**51211**	68,8	159	2200	3200
	105	35	1,1	**51311**	118	246	1700	2400
	120	48	1,5	**51411**	180	360	1300	1800

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
35	62	37	0,22
	68	37	0,38
	80	37	0,96
40	60	42	0,13
	68	42	0,28
	78	42	0,53
	90	42	1,17
45	65	47	0,15
	73	47	0,30
	85	47	0,61
	100	47	1,60
50	70	52	0,17
	78	52	0,37
	95	52	0,94
	110	52	2,18
55	78	57	0,25
	90	57	0,59
	105	57	1,30
	120	57	2,91

ART BEARINGS

Thrust Ball bearings, single direction



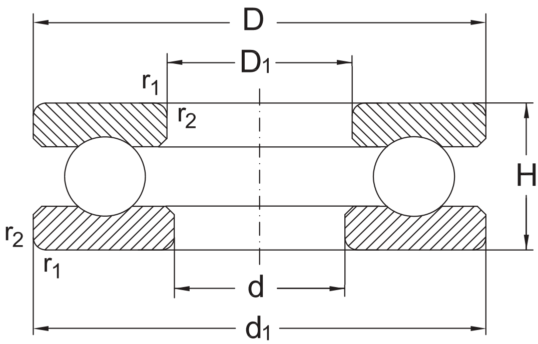
511/ 512/ 513/514

Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
60	85	17	1	**51112**	37,9	98,6	2600	3600
	95	26	1	**51212**	70,4	169	2000	3000
	110	35	1,1	**51312**	123	267	1600	2200
	130	51	1,5	**51412 M**	200	400	1200	1700
65	90	18	1	**51113**	39,2	108	2400	3400
	100	27	1	**51213**	78,5	191	2000	3000
	115	36	1,1	**51313**	127	287	1600	2200
	140	56	2	**51413 M**	216	450	1100	1600
70	95	18	1	**51114**	39,3	113	2400	3400
	105	27	1	**51214**	72,8	189	1900	2800
	125	40	1,1	**51314**	153	341	1400	1900
	150	60	2	**51414 M**	236	500	1100	1600
75	100	19	1	**51115**	47,2	140	2200	3200
	110	27	1	**51215**	73,7	199	1900	2800
	135	44	1,5	**51315**	184	426	1300	1800
	160	65	2	**51415 M**	250	560	1000	1500
80	105	19	1	**51116**	48,5	145	2200	3200
	115	28	1	**51216**	76,1	209	1800	2600
	140	44	1,5	**51316**	181	426	1300	1800
	170	68	2,1	**51416 M**	270	620	950	1400

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
60	85	62	0,33
	95	62	0,65
	110	62	1,37
	130	62	3,70
65	90	67	0,36
	100	67	0,74
	115	67	1,49
	140	68	4,67
70	95	72	0,39
	105	72	0,78
	125	72	1,91
	150	73	5,72
75	100	77	0,52
	110	77	0,83
	135	77	2,61
	160	78	7,06
80	105	82	0,56
	115	82	0,91
	140	82	2,71
	170	83	8,23

Thrust Ball bearings, single direction



511/ 512/ 513/514

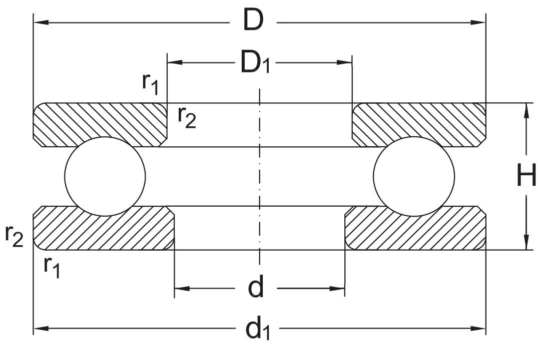
Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
85	110	19	1	**51117**	48	151	2200	3200
	125	31	1	**51217**	98	264	1600	2200
	150	49	1,5	**51317**	290	716	1200	1700
	180	72	2,1	**51417 M**	290	680	900	1300
90	120	22	1	**51118**	62,3	190	1900	2800
	135	35	1,1	**51218**	127	338	1500	2000
	155	50	1,5	**51318**	196	465	1200	1700
	190	77	2,1	**51418 M**	305	750	850	1200
100	135	25	1	**51120**	85	270	1600	2200
	150	38	1,1	**51220**	149	402	1400	1900
	170	55	1,5	**51320**	247	628	1100	1600
	210	85	3	**51420 M**	365	965	750	1000
110	145	25	1	**51122**	86,5	290	1600	2200
	160	38	1,1	**51222**	156	447	1300	1800
	190	63	2	**51322**	319	869	950	1400
	230	95	3	**51422 M**	415	1140	700	950
120	155	25	1	**51124**	90	310	1500	2000
	170	39	1,1	**51224**	170	509	1200	1700
	210	70	2,1	**51324**	325	915	850	1200
	250	102	4	**51424 M**	425	1220	670	900

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
85	110	87	0,60
	125	88	1,22
	150	88	3,53
	177	88	9,79
90	120	92	0,88
	135	93	1,68
	155	93	3,57
	187	93	11,60
100	135	102	1,30
	150	103	2,22
	170	103	4,95
	205	103	15,40
110	145	112	1,45
	160	113	2,41
	187	113	7,70
	225	113	20,80
120	155	122	1,59
	170	123	2,67
	205	123	10,70
	245	123	26,50

ART BEARINGS

Thrust Ball bearings, single direction



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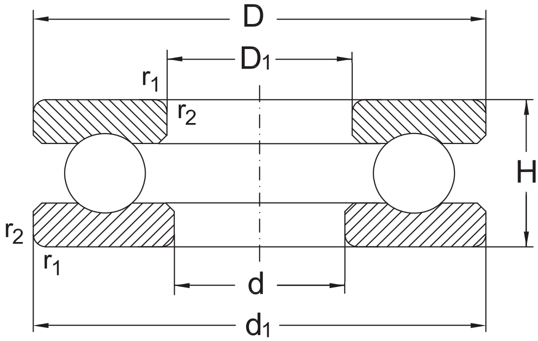
Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
130	170	30	1	**51126**	117	392	1300	1800
	190	45	1,5	**51226**	183	540	1100	1600
	225	75	2,1	**51326 M**	360	1060	800	1100
	270	110	4	**51426 M**	520	1600	600	800
140	180	31	1	**51128**	112	400	1300	1800
	200	46	1,5	**51228**	190	570	1000	1500
	240	80	2,1	**51328 M**	400	1220	750	1000
150	190	31	1	**51130 M**	110	400	1200	1700
	215	50	1,5	**51230 M**	236	735	950	1400
	250	80	2,1	**51330 M**	405	1290	700	950
	300	120	4	**51430 M**	560	1800	560	750
160	200	31	1	**51132 M**	112	430	1200	1700
	225	51	1,5	**51232 M**	245	780	950	1400
	270	87	3	**51332M**	479	1582	670	900
170	215	34	1,1	**51134 M**	132	500	1100	1600
	240	55	1,5	**51234 M**	285	930	850	1200
	280	87	3	**51334 M**	496	1704	670	900
180	225	34	1,1	**51136 M**	134	530	1000	1500
	250	56	1,5	**51236 M**	290	1000	850	1200
	300	95	3	**51336 M**	546	1956	600	800

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
130	170	132	2,37
	187	133	3,99
	220	134	13,00
	265	134	32,80
140	178	142	2,59
	197	143	4,33
	235	144	15,70
150	188	152	2,26
	212	153	6,09
	245	154	16,40
	295	154	43,10
160	198	162	2,39
	222	163	6,56
	265	164	21,30
170	213	172	3,08
	237	173	8,12
	275	174	22,50
180	222	183	3,17
	245	183	8,70
	295	184	28,3

Thrust Ball bearings, single direction



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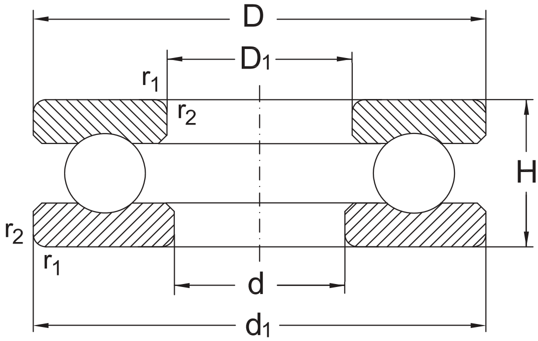
Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
190	240	37	1,1	**51138 M**	170	655	950	1400
	270	62	2	**51238 M**	335	1160	750	1000
	320	105	4	**51338 M**	600	2200	560	750
200	250	37	1,1	**51140 M**	170	655	950	1400
	280	62	2	**51240 M**	340	1220	750	1000
	340	110	4	**51340 M**	656	2414	530	700
220	270	37	1,1	**51144 M**	176	735	850	1200
	300	63	2	**51244 M**	355	1340	700	950
240	300	45	1,5	**51148 M**	232	965	750	1000
	340	78	2,1	**51248 M**	465	1860	600	800
260	320	45	1,5	**51152 M**	236	1020	750	1000
	360	79	2,1	**51252 M**	475	2000	560	750
280	350	53	1,5	**51156 M**	315	1340	670	900
	380	80	2,1	**51256 M**	490	2160	560	750
300	380	62	2	**51160 M**	365	1600	600	800
	420	95	3	**51260 M**	610	2750	480	630
320	400	63	2	**51164 M**	375	1700	560	750
	440	95	3	**51264 M**	620	2900	480	630
340	420	64	2	**51168 M**	380	1800	560	750
	460	96	3	**51268 M**	640	3150	450	600

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
190	237	193	4,08
	265	194	11,70
	315	195	35,70
200	245	203	4,26
	275	204	12,00
	335	205	44,30
220	265	223	4,64
	295	224	13,20
240	297	243	7,69
	335	244	23,00
260	317	263	8,25
	355	264	25,20
280	347	283	12,50
	375	284	26,70
300	376	304	17,70
	415	304	42,30
320	396	324	19,10
	435	325	44,20
340	416	344	20,50
	455	345	47,00

Thrust Ball bearings, single direction



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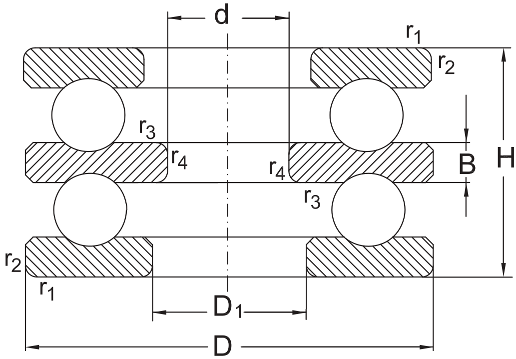
Shaft	Dimension			Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
360	440	65	2	**51172 M**	405	2000	530	700
	500	110	4	**51272 M**	765	3900	400	530
380	460	65	2	**51176 M**	430	2240	500	670
400	480	65	2	**51180 M**	440	2320	500	670
420	500	65	2	**51184 M**	440	2450	480	630
460	560	80	2,1	**51192 M**	530	3100	430	560
500	600	80	2,1	**511/500 M**	550	3350	400	530
530	640	85	3	**511/530 M**	620	3900	360	480
560	670	85	3	**511/560 M**	630	4150	300	380

Thrust Ball bearings, single direction

Shaft	Dimensions		Mass
d	d_1	D_1	Bearing
mm			[kg]
360	436	364	21,50
	495	365	69,50
380	456	384	22,40
400	476	404	23,50
420	495	424	24,40
460	555	464	42,00
500	595	505	44,90
530	635	535	54,80
560	665	565	58,00

Thrust Ball bearings, double direction



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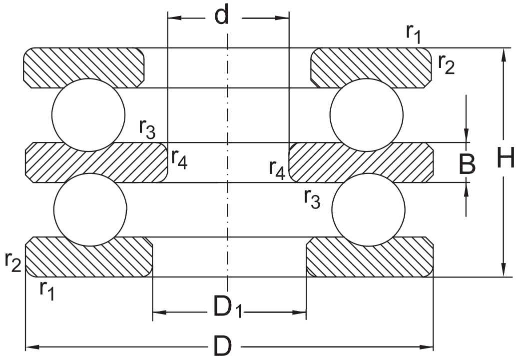
Shaft	Dimension				Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.	r_3, r_4 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm						kN		min $^{-1}$	
10	32	22	0,6	0,3	**52202**	16,6	25	5000	6700
15	40	26	0,6	0,3	**52204**	22,4	37,7	4300	5600
	60	45	1	0,6	**52205**	56	90	2600	3600
20	47	28	0,6	0,3	**52205**	28	50,4	3800	5000
	52	34	1	0,3	**52305**	35,7	61,4	3200	4300
	70	52	1	0,6	**52406**	72	125	2200	3200
25	52	29	0,6	0,3	**52206**	28,1	54,3	3600	4800
	60	38	1	0,3	**52306**	42,8	78,7	3000	4000
	80	59	1,1	0,6	**52407**	86,5	156	2000	3000
30	62	34	1	0,3	**52207**	40,7	83,8	3000	4000
	68	36	1	0,6	**52208**	46,9	98,3	2800	3800
	68	44	1	0,3	**52307**	55,5	105	2600	3600
	78	49	1	0,6	**52308**	69,3	135	2200	3200
	90	65	1,1	0,6	**52408**	112	204	1700	2400
35	73	37	1	0,6	**52209**	47,7	105	2600	3600
	85	52	1	0,6	**52309**	80,8	163	2000	3000
	100	72	1,1	0,6	**52409**	129	245	1600	2200
40	78	39	1	0,6	**52210**	50	111	2400	3400
	95	58	1,1	0,6	**52310**	91,6	186	1900	2800
	110	78	1,5	0,6	**52410**	156	310	1500	2000

Thrust Ball bearings, double direction

Shaft	Dimensions		Mass
d	D1	B	Bearing
mm			[kg]
10	17	5	0,08
15	22	6	0,15
	27	11	0,59
20	27	7	0,22
	27	8	0,32
	32	12	0,92
25	32	7	0,25
	32	9	0,47
	37	14	1,35
30	37	8	0,41
	42	9	55
	37	10	0,68
	42	12	1,01
	42	15	1,92
35	47	9	0,60
	47	12	1,25
	47	17	2,55
40	52	9	0,71
	52	14	1,77
	52	18	3,43

ART BEARINGS

Thrust Ball bearings, double direction



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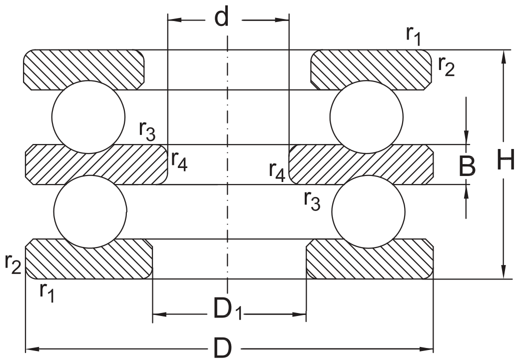
Shaft	Dimension				Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.	r_3, r_4 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm						kN		mn^{-1}	
45	90	45	1	0,6	**52211**	69,4	159	2200	3200
	105	64	1,1	0,6	**52311**	119	246	1700	2400
	120	87	1,5	0,6	**52411**	180	360	1300	1800
50	95	46	1	0,6	**52212**	73,6	179	2000	3000
	110	64	1,1	0,6	**52312**	124	267	1600	2200
	130	93	1,5	0,6	**52412**	200	400	1200	1700
	140	101	2	1	**52413**	216	450	1100	1600
55	100	47	1	0,6	**52213**	74,8	189	2000	3000
	105	47	1	1	**52214**	73,6	189	1900	2800
	115	65	1,1	0,6	**52313**	106	220	1600	2200
	125	72	1,1	1	**52314**	148	339	1400	1900
	150	107	2	1	**52414**	236	500	1100	1600
60	110	47	1	1	**52215**	77,4	209	1900	2800
	135	79	1,5	1	**52315**	171	396	1300	1800
	160	115	2	1	**52415**	250	560	1000	1500
65	115	48	1	1	**52216**	78,5	218	1800	2600
	140	79	1,5	1	**52316**	176	424	1300	1800
	170	120	2	1	**52416**	270	620	950	1400
	180	128	2,1	1,1	**52417**	290	680	900	1300
70	125	55	1	1	**52217**	92,3	251	1600	2200

Thrust Ball bearings, double direction

Shaft	Dimensions		Mass
d	D_1	B	Bearing
mm			[kg]
45	57	10	1,10
	57	15	2,38
	57	20	4,52
50	62	10	1,21
	62	15	2,53
	62	21	5,72
	68	23	7,18
55	67	10	1,34
	72	10	1,47
	67	15	2,73
	72	16	3,66
	73	24	8,76
60	77	10	1,57
	77	18	4,80
	78	26	10,80
65	82	10	1,72
	82	18	4,94
	83	27	12,70
	88	29	15,10
70	88	12	2,39

ART BEARINGS

Thrust Ball bearings, double direction



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Shaft	Dimension				Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.	r_3, r_4 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm						kN		min^{-1}	
70	150	87	1,5	1	**52317**	190	425	1200	1700
	190	135	2,1	1,1	**52418**	305	750	850	1200
75	135	62	1,1	1	**52218**	120	326	1500	2000
	155	88	1,5	1	**52318**	196	465	1200	1700
80	210	150	3	1,1	**52420**	365	965	750	1000
85	150	67	1,1	1	**52220**	147	410	1400	1900
	170	97	1,5	1	**52320**	236	596	1100	1600
95	160	67	1,1	1	**52222**	148	431	1300	1800
	190	110	2	1	**52322 M**	275	720	950	1400
100	170	68	1,1	1,1	**52224**	154	472	1200	1700
	210	123	2,1	1,1	**52324 M**	325	915	850	1200
110	190	80	1,5	1,1	**52226**	203	622	1100	1600
	225	130	2,1	1,1	**52326 M**	360	1060	800	1100
120	200	81	1,5	1,1	**52228**	190	570	1000	1500
	240	140	2,1	1,1	**52328 M**	400	1220	750	1000
130	215	89	1,5	1,1	**52230 M**	236	735	950	1400
140	225	90	1,5	1,1	**52232 M**	245	780	950	1400
150	240	97	1,5	1,1	**52234 M**	285	930	850	1200

Thrust Ball bearings, double direction

Shaft	Dimensions		Mass
d	D_1	B	Bearing
mm			[kg]
70	88	19	6,35
	88	30	17,80
75	93	14	3,22
	93	19	6,80
80	103	33	23,80
85	103	15	4,21
	103	21	8,94
95	113	15	4,63
	113	24	13,90
100	123	15	5,23
	123	27	19,40
110	133	18	7,99
	134	30	23,40
120	143	18	8,66
	144	31	28,20
130	153	20	11,40
140	163	20	12,10
150	173	21	14,90

Cylindrical Roller Thrust Bearings

Standards, Boundary dimensions

Standard plans	DIN 616
Cylindrical roller thrust bearings	DIN 722

General

Cylindrical Roller Thrust Bearings series 811 and 812 are single direction acting separable axial bearings.

Cylindrical roller thrust bearings are insensitive to shock loading and feature much higher load carrying capacity compared to thrust ball bearings. They accommodate very high axial loads but no radial forces. They provide a very rigid bearing assembly for high thrust loading with less space requirement.

Cylindrical roller thrust bearings are of simple design, they consist of a shaft washer (WS), a housing washer (GS), and a cylindrical roller and cage thrust assembly (K), see Abb. 1.

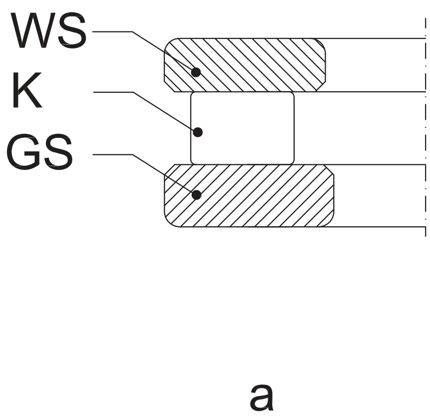
With all cylindrical roller thrust bearings, increased sliding friction can occur at the end of the cylindrical rollers.

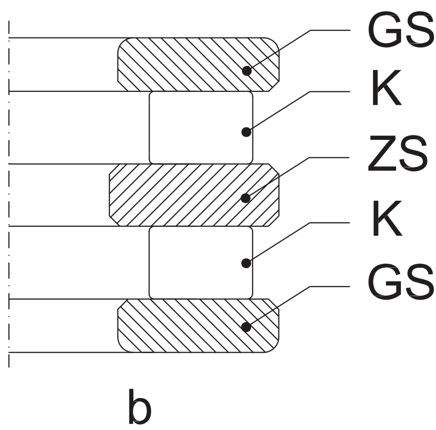
In order to minimize this negative effect, ART cylindrical roller thrust bearings with wider sectional widths are produced using several short rollers in each cage pockets instead of using individual longer rollers.

Due to their specific kinematic behavior, cylindrical roller thrust bearings are only suitable for low speed applications only. Furthermore, they require minimal axial loads for their optimum function.

Design variants

ART cylindrical roller thrust bearings are produced in single direction design only as standard (see Abb. 1a)





Double direction acting cylindrical roller thrust bearings are built using a combination of the components from single direction acting cylindrical roller thrust bearings together with intermediate washers ZS, (see Abb. 1 b).

Such intermediate washers are part of ART supplementary product range and are available on request. For application designs with space restrictions the cylindrical roller and cage thrust assemblies may be used without washers providing the contact faces of adjacent machine parts are machined as bearing raceways, (e.g. hardened and ground, etc.).

The components of cylindrical roller thrust bearing are frequently used either separately or in conjunction with other components in several applications (e.g. to build needle roller thrust assemblies) therefore, they are available as loose parts.

Misalignment

All cylindrical roller thrust bearing type do not allow any misalignment.

The contacting surfaces of both shaft and housing seats must be parallel.

Cages

Small ART cylindrical roller thrust bearings are fitted with shaft – centered polyamide cages as standard.

Polyamide cages are suitable for operating temperatures up to +120ºC. Large cylindrical roller thrust bearings are produced with either solid brass cages (suffix MP), or with solid steel cages, (suffix FP).

Tolerances

ART cylindrical roller thrust bearings are produced to normal class tolerance (PN) as standard.

For applications of higher accuracy these bearings are produced to precision tolerance class (e.g. P6) on order request. For detailed values of the tolerance classes see chapter "Bearing tolerances" (see page 39-40).

Minimum load:

All cylindrical roller thrust bearing require a certain minimum axial load to ensure a satisfactory operating function. To prevent excessive sliding friction, the minimum axial load applied should be greater than 5% of the axial bearing dynamic load rating C_a. Where such a minimum axial load is not possible the load must be increased by effective measures, (i.e. preloading the bearing) using pressure washers or springs.

Equivalent dynamic bearing load

Cylindrical roller thrust bearings are pure axial bearings; they are not able to accommodate any radial loads, therefore:

$$P = F_a$$

Equivalent static bearing load

For cylindrical roller thrust bearings:

$$P_0 = F_a$$

Design of adjacent machine parts

When cylindrical roller and cage thrust assemblies are used without washers, adjacent machines parts must be designed and machined as bearing raceways (e.g. hardened and ground etc.). The maximum permissible axial runout of the adjacent surfaces acting as raceway must also meet the requirements of the respective washers. The bore diameters of ART cylindrical roller and cage thrust assemblies have tolerances according to ISO Tolerance field (E11), whilst the tolerance of their outer diameters lies in the tolerance field (a13).

Cylindrical roller and cage thrust assemblies require an effective guidance when operating at higher speeds.

To avoid excessive wear, at higher speeds, the guiding surface must be ground.

Bearing seats for cylindrical roller thrust bearings

For the design of cylindrical roller thrust bearing seats the following of tolerance fields have proven to be satisfactory in practice:

Centered at	Tolerance field	
	Shaft	Housing
Cylindrical roller and thrust assembly	h8	H9
Shaft washer	h6	-
Housing washer	-	H7

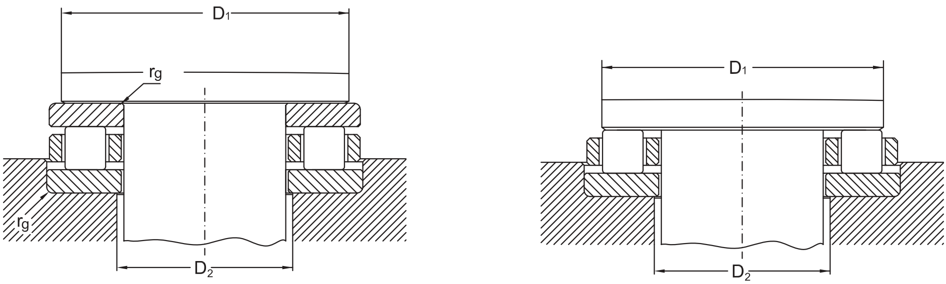
Abutment and Fillet dimensions for cylindrical roller thrust bearings

In case of cylindrical roller thrust bearings, an effective support of the bearing washers over the total width of their raceways by adjacent machine parts is necessary.

The bearing washer must contact adjacent parts with their side face only. The fillet radii of bearing corners must not touch the shoulder fillet radii of the shaft or housing shoulders.

Therefore, the largest fillet radius (r_g) must be smaller than the minimum fillet dimension of the bearing rings (r_s) as listed in the following tables.

Abutment and Fillet dimensions for cylindrical roller thrust bearings, series 811 and 812 [mm]

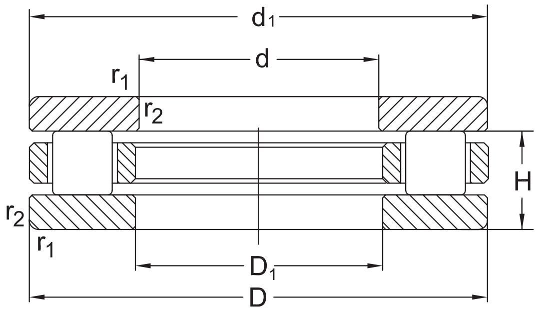


Shaft	Bore reference number	Bearing Series					
		811			812		
Ød		D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max
mm							
15	**2**	25	18	0,3	-	-	-
17	**3**	27	20	0,3	-	-	-
20	**4**	32	23	0,3	-	-	-
25	**5**	39	28	0,6	-	-	-
30	**6**	44	33	0,6	49	33	0,6
35	**7**	49	38	0,6	56	41	1
40	**8**	56	44	0,6	63	45	1
45	**9**	61	49	0,6	68	50	1
50	**10**	66	54	0,6	73	55	1
55	**11**	73	60	0,6	84	61	1
60	**12**	80	65	1	89	66	1
65	**13**	85	70	1	94	71	1
70	**14**	90	75	1	99	76	1
75	**15**	95	80	1	104	81	1
80	**16**	100	85	1	109	86	1
85	**17**	105	90	1	117	93	1
90	**18**	114	96	1	127	98	1
100	**20**	129	106	1	140	110	1
110	**22**	139	116	1	150	120	1
120	**24**	149	126	1	160	130	1
130	**26**	162	138	1	179	141	1,5
140	**28**	172	148	1	189	151	1,5
150	**30**	182	158	1	204	161	1,5

Abutment and Fillet dimensions for cylindrical roller thrust bearings, series 811 and 812 [mm]

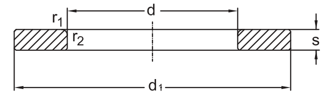
Shaft	Bore reference number	Bearing Series					
		811			812		
Ød		D_1 min	D_2 min	r_g max	D_1 min	D_2 min	r_g max
mm							
160	**32**	192	168	1	214	171	1,5
170	**34**	207	178	1	227	183	1,5
180	**36**	217	188	1	237	193	1,5
190	**38**	230	200	1	256	204	2
200	**40**	240	210	1	266	214	2
220	**44**	260	230	1	286	234	2
240	**48**	288	252	1,5	322	258	2,1
260	**52**	308	272	1,5	342	278	2,1
280	**56**	337	293	1,5	362	298	2,1
300	**60**	365	315	2	398	322	2,5
320	**64**	385	335	2	418	342	2,5
340	**68**	405	355	2	438	362	2,5
360	**72**	425	375	2	475	385	3
380	**76**	445	395	2	495	405	3
400	**80**	465	415	2	515	425	3
420	**84**	485	435	2	552	448	4
440	**88**	522	458	2,1	572	468	4
460	**92**	542	478	2,1	592	488	4
480	**96**	562	498	2,1	621	509	4
500	**/500**	582	518	2,1	641	529	4
530	**/530**	619	551	2,5	680	560	4
560	**/560**	649	581	2,5	715	595	4
600	**/600**	689	621	2,5	764	636	4

Cylindrical Roller Thrust Bearings

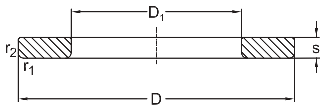


Dimension				Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
30	47	11	0,6	**81106**	28	83	2600	6700
	52	16	0,6	**81206**	50	132	2400	6300
35	52	12	0,6	**81107**	30	93	2200	6000
	62	18	1	**81207**	54	156	1900	5300
40	60	13	0,6	**81108**	42,5	137	1900	5300
	68	19	1	**81208**	76,5	220	1700	4800
45	65	14	0,6	**81109**	45	150	1700	4800
	73	20	1	**81209**	83	255	1600	4500
50	70	14	0,6	**81110**	42,5	143	1500	4300
	78	22	1	**81210**	88	285	1400	4000
55	78	16	0,6	**81111**	52	193	1400	4000
	90	25	1	**81211**	122	390	1200	3600
60	85	17	1	**81112**	73,5	265	1200	3600
	95	26	1	**81212**	114	335	1100	3400
65	90	18	1	**81113**	76,5	285	1100	3400
	100	27	1	**81213**	118	390	950	3000
70	95	18	1	**81114**	71	265	1000	3200
	105	27	1	**81214**	122	440	950	3000
75	100	19	1	**81115**	75	285	950	3000
	110	27	1	**81215**	125	440	900	2800
80	105	19	1	**81116**	76,5	300	900	2800
	115	28	1	**81216**	129	455	850	2600

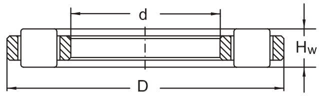
Cylindrical Roller Thrust Bearings



WS 8...



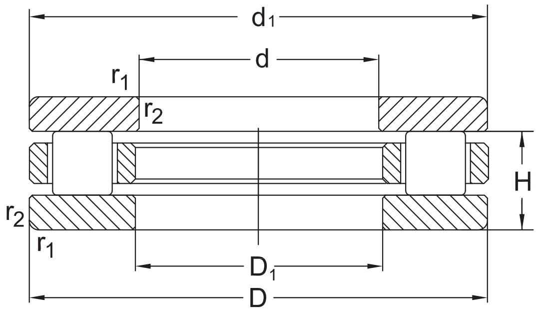
GS 8...



K 8...

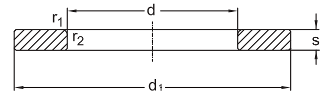
Dimensions				Designation of Bearing Components			Mass
d	d_1	D_1	S	Cylindrical Roller and Cage thrust assembly	Shaft Washer	Housing Washer	
mm							[kg]
30	47	32	3	**K81106**	**WS81106**	**GS81106**	0,06
	52	32	4,25	**K81206**	**WS81206**	**GS81206**	0,13
35	52	37	3,5	**K81107**	**WS81107**	**GS81107**	0,08
	62	37	5,25	**K81207**	**WS81207**	**GS81207**	0,23
40	60	42	3,5	**K81108**	**WS81108**	**GS81108**	0,12
	68	42	5	**K81208**	**WS81208**	**GS81208**	0,27
45	65	47	4	**K81109**	**WS81109**	**GS81109**	0,14
	73	47	5,5	**K81209**	**WS81209**	**GS81209**	0,31
50	70	52	4	**K81110**	**WS81110**	**GS81110**	0,16
	78	52	6,5	**K81210**	**WS81210**	**GS81210**	0,38
55	78	57	5	**K81111**	**WS81111**	**GS81111**	0,23
	90	57	7	**K81211**	**WS81211**	**GS81211**	0,60
60	85	62	4,75	**K81112**	**WS81112**	**GS81112**	0,28
	95	62	7,5	**K81212**	**WS81212**	**GS81212**	0,74
65	90	67	5,25	**K81113**	**WS81113**	**GS81113**	0,33
	100	67	8	**K81213**	**WS81213**	**GS81213**	0,82
70	95	72	5,25	**K81114**	**WS81114**	**GS81114**	0,36
	105	72	8	**K81214**	**WS81214**	**GS81214**	0,87
75	100	77	5,75	**K81115**	**WS81115**	**GS81115**	0,43
	110	77	8	**K81215**	**WS81215**	**GS81215**	0,92
80	105	82	5,75	**K81116**	**WS81116**	**GS81116**	0,46
	115	82	8,5	**K81216**	**WS81216**	**GS81216**	1,02

Cylindrical Roller Thrust Bearings

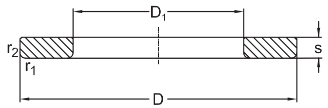


Dimension				Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
85	110	19	1	**81117**	76,5	310	850	2600
	125	31	1	**81217**	153	550	800	2400
90	120	22	1	**81118**	104	415	800	2400
	135	35	1,1	**81218**	190	670	800	2400
100	135	25	1	**81120**	146	585	750	2200
	150	38	1,1	**81220**	224	815	700	2000
110	145	25	1	**81122**	160	655	700	2000
	160	38	1,1	**81222**	232	865	670	1900
120	155	25	1	**81124**	160	680	670	1900
	170	39	1,1	**81224**	245	950	630	1800
130	170	30	1	**81126**	186	780	600	1700
	190	45	1,5	**81226**	365	1400	560	1600
140	180	31	1	**81128**	196	865	560	1600
	200	46	1,5	**81228**	375	1460	530	1500
150	190	31	1	**81130**	204	930	530	1500
	215	50	1,5	**81230**	455	1800	500	1400
160	200	31	1	**81132**	212	980	500	1400
	225	51	1,5	**81232**	465	1900	500	1400
170	215	34	1,1	**81134**	265	1220	500	1400
	240	55	1,5	**81234**	520	2080	480	1300
180	225	34	1,1	**81136**	275	1290	480	1300
	250	56	1,5	**81236**	520	2160	450	1200

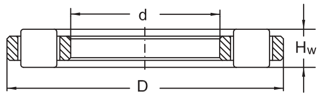
Cylindrical Roller Thrust Bearings



WS 8...



GS 8...

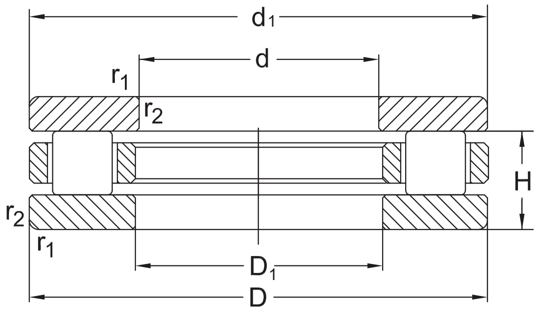


K 8...

Dimensions				Designation of Bearing Components			Mass
d	d_1	D_1	S	Cylindrical Roller and Cage thrust assembly	Shaft Washer	Housing Washer	
mm							[kg]
85	110	87	5,75	**K81117**	**WS81117**	**GS81117**	0,48
	125	88	9,5	**K81217**	**WS81217**	**GS81217**	1,36
90	120	92	6,5	**K81118**	**WS81118**	**GS81118**	0,72
	135	93	10,5	**K81218**	**WS81218**	**GS81218**	1,85
100	135	102	7	**K81120**	**WS81120**	**GS81120**	1,07
	150	103	11,5	**K81220**	**WS81220**	**GS81220**	2,45
110	145	112	7	**K81122**	**WS81122**	**GS81122**	1,12
	160	113	11,5	**K81222**	**WS81222**	**GS81222**	2,70
120	155	122	7	**K81124**	**WS81124**	**GS81124**	1,25
	170	123	12	**K81224**	**WS81224**	**GS81224**	2,98
130	170	132	9	**K81126**	**WS81126**	**GS81126**	1,72
	187	133	13	**K81226**	**WS81226**	**GS81226**	4,37
140	178	142	9,5	**K81128**	**WS81128**	**GS81128**	2,02
	197	143	13,5	**K81228**	**WS81228**	**GS81228**	4,76
150	188	152	9,5	**K81130**	**WS81130**	**GS81130**	2,15
	212	153	14,5	**K81230**	**WS81230**	**GS81230**	6,04
160	198	162	9,5	**K81132**	**WS81132**	**GS81132**	2,28
	222	163	15	**K81232**	**WS81232**	**GS81232**	6,52
170	213	172	10	**K81134**	**WS81134**	**GS81134**	3,01
	237	173	16,5	**K81234**	**WS81234**	**GS81234**	8,12
180	222	183	10	**K81136**	**WS81136**	**GS81136**	3,07
	247	183	17	**K81236**	**WS81236**	**GS81236**	8,69

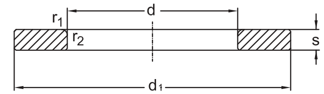
ART BEARINGS

Cylindrical Roller Thrust Bearings

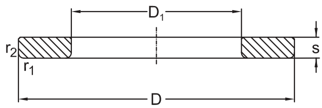


Dimension				Designation	Basical axial load		Speed limit	
d	D	H	r_1, r_2 min.		dyn. C_a	stat. C_{0a}	grease	oil
mm					kN		min^{-1}	
190	240	37	1,1	**81138**	315	1500	450	1200
	270	62	2	**81238**	655	2650	430	1100
200	250	37	1,1	**81140**	325	1600	450	1200
	280	62	2	**81240**	695	2900	430	1100
220	270	37	1,1	**81144**	355	1830	430	1100
	300	63	2	**81244**	735	3200	400	1000
240	300	45	1,5	**81148**	465	2360	380	950
	340	78	2,1	**81248**	980	4250	360	900
260	320	45	1,5	**81152**	500	2650	360	900
	360	79	2,1	**81252**	1040	4650	340	850
280	350	53	1,5	**81156**	670	3450	340	850
	380	80	2,1	**81256**	1060	4900	320	800
300	380	62	2	**81160**	800	4000	300	750
	420	95	3	**81260**	1400	6200	280	700
360	440	65	2	**81172**	900	4900	240	630
	500	110	4	**81272**	1960	9150	220	600
380	460	65	2	**81176**	880	4900	240	630
	520	112	4	**81276**	2000	9500	200	560

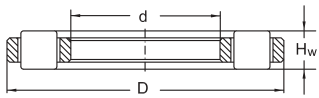
Cylindrical Roller Thrust Bearings



WS 8...



GS 8...

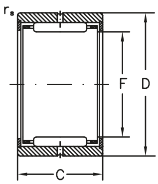


K 8...

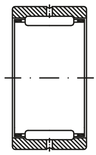
Dimensions				Designation of Bearing Components			Mass
d	d_1	D_1	S	Cylindrical Roller and Cage thrust assembly	Shaft Washer	Housing Washer	
mm							[kg]
190	237	193	11	K81138	WS81138	GS81138	3,99
	267	194	18	K81238	WS81238	GS81238	11,70
200	247	203	11	K81140	WS81140	GS81140	4,17
	277	204	18	K81240	WS81240	GS81240	12,2
220	267	223	11	K81144	WS81144	GS81144	4,65
	297	224	18,5	K81244	WS81244	GS81244	13,4
240	297	243	13,5	K81148	WS81148	GS81148	7,43
	335	244	23	K81248	WS81248	GS81248	23,10
260	317	263	13,5	K81152	WS81152	GS81152	7,99
	355	264	23,5	K81252	WS81252	GS81252	25,1
280	347	283	15,5	K81156	WS81156	GS81156	12
	375	284	24	K81256	WS81256	GS81256	27,1
300	376	304	18,5	K81160	WS81160	GS81160	17,2
	415	304	28,5	K81260	WS81260	GS81260	42,50
360	436	364	20	K81172	WS81172	GS81172	21,4
	495	365	32,5	K81272	WS81272	GS81272	68,7
380	456	384	20	K81176	WS81176	GS81176	22,4
	515	385	33,5	K81276	WS81276	GS81276	73,3

Needle roller bearings

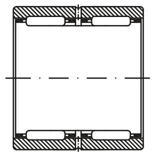
Needle roller bearings without inner ring



RNA
Fw<12mm



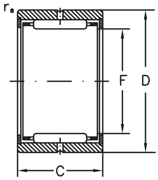
RNA



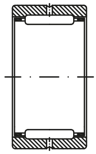
RNA69

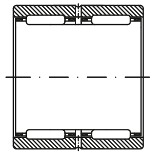
Dimensions				Basic radial load		Speed limit		Designation	Mass
F_w	D	C	r_s min.	dyn. C_r	stat. C_{0r}	grease	oil		
mm				kN		min^{-1}		-	Kg
8	15	12	0,3	3,7	3,95	19000	32000	**RNA081512**	0,008
	15	16	0,3	4,95	5,65	19000	32000	**RNA081516**	0,012
9	16	12	0,3	4,3	4,8	18000	30000	**RNA091612**	0,010
	16	16	0,3	5,6	6,9	18000	30000	**RNA091616**	0,013
10	17	12	0,3	4,5	5,35	17000	28000	**RNA101712**	0,011
	17	16	0,3	5,8	6,5	17000	28000	**RNA101716**	0,014
12	18	15	0,3	5,6	7,75	16000	26000	**RNA121815 TN**	0,012
	19	12	0,3	4,65	5,8	16000	26000	**RNA121912**	0,013
	19	16	0,3	6,15	8,1	16000	26000	**RNA121916**	0,017
	22	12	0,3	5,3	6,65	16000	26000	**RNA122212**	0,021

Needle roller bearings without inner ring



RNA
Fw<12mm

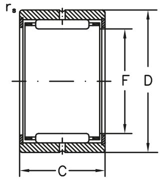

RNA


RNA69

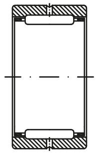
Dimensions				**Basic radial load**		**Speed limit**		**Designation**	**Mass**
F_w	D	C	r_s min.	dyn. C_r	stat. C_{0r}	grease	oil		
mm				kN		min^{-1}		-	Kg
14	22	13	0,3	8,25	9,1	15000	24000	**RNA4900**	0,017
	22	16	0,3	9,8	11,3	15000	24000	**RNA142216**	0,021
	22	20	0,3	11,8	15,4	15000	24000	**RNA142220**	0,028
16	24	13	0,3	9,1	10,6	15000	24000	**RNA4901**	0,018
	24	22	0,3	14,8	20,2	15000	24000	**RNA6901**	0,032
18	28	15	0,3	9,5	11,9	14000	22000	**RNA182815**	0,036
20	28	13	0,3	10,4	13,2	13000	20000	**RNA4902**	0,022
	28	23	0,3	16,8	24,5	13000	20000	**RNA6902**	0,040
22	30	13	0,3	10,7	13,9	11000	18000	**RNA4903**	0,023
	30	23	0,3	18,2	27,8	11000	18000	**RNA6903**	0,043
25	37	17	0,3	20	24,4	9500	16000	**RNA4904**	0,053
	37	30	0,3	33	47,6	9500	16000	**RNA6904**	0,101
30	40	20	0,3	21	33	8000	13000	**RNA304020**	0,065
	42	17	0,3	22,2	28,3	8000	13000	**RNA4905**	0,068
	42	30	0,3	40,1	60,1	8000	13000	**RNA6905**	0,155
35	45	20	0,3	24,2	38,5	7000	11000	**RNA354520**	0,074
	47	17	0,3	23,7	32,1	7000	11000	**RNA4906**	0,140
	47	30	0,3	43,1	49,3	7000	11000	**RNA6906**	0,131
38	48	20	0,3	24,3	41,4	7000	11000	**RNA384820**	0,080
42	55	20	0,6	29,8	45,5	6300	9500	**RNA4907**	0,109
	55	36	0,6	52,7	95	6300	9500	**RNA6907**	0,214
45	55	30	0,3	40,2	86,9	6000	9000	**RNA455530**	0,137
48	62	22	0,6	38,7	60,9	5600	8500	**RNA4908**	0,147
	62	40	0,6	63,8	116	5600	8500	**RNA6908**	0,266
50	62	22	1	35,5	60,3	5300	8000	**RNA506222**	0,153
	62	25	0,6	36,3	76	5300	8000	**RNA506225**	0,157
	62	35	0,6	49,4	114	5300	8000	**RNA506235**	0,209
52	68	22	0,6	46,4	73,9	5000	7500	**RNA4909**	0,197
	68	40	0,6	64,5	123	5000	7500	**RNA6909**	0,283
55	68	25	0,6	38,5	82,2	5000	7500	**RNA556825 TN**	0,181
58	72	22	0,6	45	73,5	4800	7000	**RNA4910**	0,167
	72	40	0,6	67,3	136	4800	7000	**RNA6910**	0,335
60	72	25	0,6	40,2	87	4500	6700	**RNA607225 TN**	0,160
	72	35	0,6	55,7	130	4500	6700	**RNA607235**	0,224

ART BEARINGS

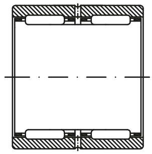
Needle roller bearings without inner ring



RNA
Fw<12mm



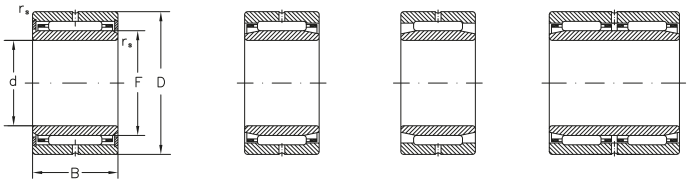
RNA



RNA69

Dimensions				Basic radial load		Speed limit		Designation	Mass
F_w	D	C	r_s min.	dyn. C_r	stat. C_{0r}	grease	oil		
mm				kN		min^{-1}		-	Kg
63	80	25	0,6	59,3	101	4500	6700	**RNA4911**	0,278
	80	45	0,6	83,8	173	4500	6700	**RNA6911**	0,477
68	85	25	1	62	109	4000	6000	**RNA4912**	0,296
	85	45	1	89,1	175	4000	6000	**RNA6912**	0,493
72	90	25	1	58,3	110	3800	5600	**RNA4913**	0,318
	90	45	1	91,3	193	3800	5600	**RNA6913**	0,545
80	95	25	1	53,4	115	3400	5000	**RNA809525**	0,312
	100	30	1	76,5	148	3400	5000	**RNA4914 TN**	0,485
	100	54	1	125	254	3400	5000	**RNA6914**	0,545
85	105	30	1	80,6	158	3200	4800	**RNA4915**	0,504
	105	54	1	127	270	3200	4800	**RNA6915**	0,965
90	110	30	1	84,9	169	3000	4500	**RNA4916**	0,520
	110	54	1	144	316	3000	4500	**RNA6916**	0,973
95	115	26	1	74,3	137	2800	4300	**RNA95/26**	0,523
100	120	35	1,1	98,8	222	2600	4000	**RNA4917**	0,672
	120	63	1,1	143	378	2600	4000	**RNA6917**	1,24
105	125	35	1,1	110	222	2400	3800	**RNA4918**	0,712
	125	63	1,1	144	400	2400	3800	**RNA6918**	1,36
110	130	30	1,1	99,6	210	2200	3600	**RNA110/30**	0,629
	130	35	1,1	105	244	2200	3600	**RNA4919**	0,729
	130	63	1,1	149	411	2200	3600	**RNA6919**	1,48
115	140	40	1,1	124	267	2200	3600	**RNA4920**	1,17
120	140	30	1	102	222	2000	3400	**RNA4822**	0,729
125	150	40	1,1	127	283	2000	3400	**RNA4922**	1,25
130	150	30	1	86,8	228	1800	3000	**RNA4824**	0,730
135	165	45	1,1	170	385	1800	3000	**RNA4924**	1,93
145	165	35	1,1	122	316	1700	2800	**RNA4826**	1,02
150	180	50	1,5	188	421	1700	2800	**RNA4926**	2,25
155	175	35	1,1	128	323	1600	2600	**RNA4828**	1,21
	180	32	1,5	116	258	1600	2600	**RNA155/32**	1,22
160	190	50	1,5	190	484	1600	2600	**RNA4928**	2,50
165	190	40	1,1	150	386	1500	2400	**RNA4830**	1,68

Needle roller bearings



NA
d<9 mm

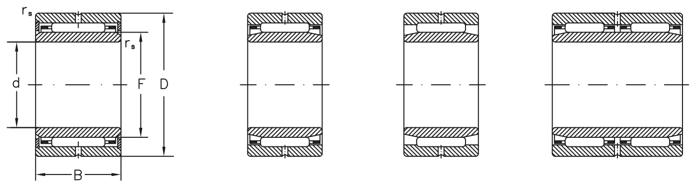
NA

NAV

NA69

Dimensions					Basic radial load		Speed limit		Designation	Mass
d	D	B	r_s min.	F_w	dyn. C_r	stat. C_{0r}	grease	oil		
mm					kN		min^{-1}		-	Kg
5	15	12	0,3	8	3,7	3,95	19000	32000	**NA051512**	0,013
	15	16	0,3	8	4,95	5,65	19000	32000	**NA051516**	0,016
6	16	12	0,3	9	4.3	4.8	18000	30000	**NA061612**	0,014
	16	16	0,3	9	5.6	6.9	18000	30000	**NA061616**	0,018
7	17	12	0,3	10	4.5	5.35	17000	28000	**NA071712**	0,015
	17	16	0,3	10	5.8	6.5	17000	28000	**NA071716**	0,020
9	19	12	0,3	12	4.65	5.8	16000	26000	**NA091912**	0,018
	19	16	0,3	12	6.15	8.1	16000	26000	**NA091916**	0,023
10	22	13	0,3	14	8.25	9.1	15000	24000	**NA4900**	0,024
	22	16	0,3	14	9.8	11.3	15000	24000	**NA102216**	0,031
	22	20	0,3	14	11.8	15.4	15000	24000	**NA102220**	0,038
12	24	13	0,3	16	9.1	10.6	15000	24000	**NA4901**	0,027
	24	22	0,3	16	14.8	20.2	15000	24000	**NA6901**	0,048
15	28	13	0,3	20	10.4	13.2	13000	20000	**NA4902**	0,035
	28	23	0,3	20	16.8	24.5	13000	20000	**NA6902**	0,065
17	30	13	0,3	22	10.7	13.9	11000	18000	**NA4903**	0,039
	30	23	0,3	22	18.2	27.8	11000	18000	**NA6903**	0,074
20	37	17	0,3	25	20.6	24.4	9500	16000	**NA4904**	0,077
	37	30	0,3	25	33	47.6	9500	16000	**NA6904**	0,143
25	42	17	0,3	30	22.2	28.3	8000	13000	**NA4905**	0,096
	42	17	0,3	30	30	42.8	3000	6000	**NA4905 V**	0,100
	42	30	0,3	30	40.1	60.1	8000	13000	**NA6905**	0,170
30	45	20	0,3	35	24.2	38.5	7000	11000	**NA304520**	0,117
	47	17	0,3	35	23.7	32.1	7000	11000	**NA4906**	0,107
	47	30	0,3	35	43.1	69.3	7000	11000	**NA6906**	0,202
35	55	20	0.6	42	29.8	45.5	6300	9500	**NA4907**	0,174
	55	36	0.6	42	52.7	95	6300	9500	**NA6907**	0,330
40	55	30	0.3	45	40.2	86.9	6000	9000	**NA405530**	0,221
	62	22	0.6	48	38.7	60.9	5600	8500	**NA4908**	0,239
	62	22	0.6	48	55	97.1	2000	4000	**NA4908 V**	0,266
	62	40	0.6	48	63.8	116	5600	8500	**NA6908**	0,450
	65	22	1	50	40.7	66.9	5600	8500	**NA406522**	0,290
45	62	25	0.6	50	36.3	76	5300	8000	**NA456225**	0,235
	62	35	0.6	50	49.4	114	5300	8000	**NA456235**	0,330
	62	22	0.6	52	46.4	73.9	5000	7500	**NA4909**	0,285
	68	40	0.6	52	64.5	123	5000	7500	**NA6909**	0,515
50	68	25	0.6	55	38.5	82.2	5000	7500	**NA506825 TN**	0,268
	72	22	0.6	58	45	73.5	4800	7000	**NA4910**	0,280
	72	40	0.6	58	67.3	136	4800	7000	**NA6910**	0,545

Needle roller bearings

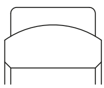
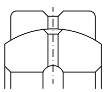
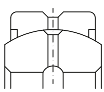


NA d<9 mm | NA | NAV | NA69

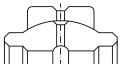
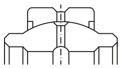
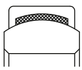
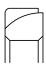
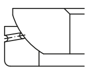
Dimensions					Basic radial load		Speed limit		Designation	Mass
d	D	B	r_s min.	F_w	dyn. C_r	stat. C_{0r}	grease	oil		
mm					kN		min^{-1}		-	Kg
55	72	25	0,6	60	40,2	87	4500	6700	**NA557225 TN**	0,283
	72	35	0,6	60	55,7	130	4500	6700	**NA557235**	0,380
	80	25	1	63	59,3	101	4500	6700	**NA4911**	0,423
	80	25	1	63	80,3	151	1500	3000	**NA4911 V**	0,448
	80	45	1	63	83,3	173	4500	6700	**NA6911**	0,795
60	85	25	1	68	62	109	4000	6000	**NA4912**	0,454
	85	25	1	68	83,4	163	1400	2800	**NA4912 V**	0,480
	85	45	1	68	89,1	175	4000	6000	**NA6912**	0,836
65	90	25	1	72	58,3	110	3800	5600	**NA4913**	0,472
	90	45	1	72	91,3	193	3800	5600	**NA6913**	0,881
70	95	25	1	80	53,4	115	3400	5000	**NA709525**	0,538
	100	30	1	80	76,5	148	3400	5000	**NA4914 TN**	0,725
	100	30	1	80	103	231	1200	2700	**NA4914 V**	0,774
	100	54	1	80	125	254	3400	5000	**NA6914**	1,39
75	105	30	1	85	80,6	80,6	3200	4800	**NA4915**	0,796
	105	54	1	85	127	127	3200	4800	**NA6915**	1,51
80	110	30	1	90	84,9	84,9	3000	4500	**NA4916**	0,870
	110	54	1	90	144	144	3000	4500	**NA6916**	1,48
85	115	26	1	95	74,3	74,3	2800	4300	**NA85/26**	0,830
	120	35	1,1	100	98,8	98,8	2600	4000	**NA4917**	1,28
	120	63	1,1	100	143	143	2600	4000	**NA6917**	2,33
	130	45	1,1	104	121	121	900	1800	**NA4617 V**	2,57
90	125	35	1,1	105	110	110	2400	3800	**NA4918**	1,34
	125	63	1,1	105	144	144	2400	3800	**NA6918**	2,47
95	130	35	1,1	110	105	105	2200	3600	**NA4919**	1,39
	130	63	1,1	110	149	149	2200	3600	**NA6919**	2,63
100	130	30	1,1	110	99,6	99,6	2200	3600	**NA100/30**	1,00
	140	40	1,1	115	174	124	2200	3600	**NA4920**	1,93
110	140	30	1	120	102	102	2000	3400	**NA4822**	1,15
	150	40	1,1	125	127	127	2000	3400	**NA4922**	2,09
120	150	30	1	130	86,8	86,8	1800	3000	**NA4824**	1,23
	165	45	1,1	135	170	170	1800	3000	**NA4924**	2,95
130	165	35	1,1	145	122	122	1700	2800	**NA4826**	1,90
	180	50	1,5	150	188	188	1700	2800	**NA4926**	3,98
140	175	35	1,1	155	128	128	1600	2600	**NA4828**	1,99
	180	32	1,5	155	116	116	1600	2600	**NA140/32**	2,05
	190	50	1,5	160	190	190	1600	2600	**NA4928**	4,32
150	190	40	1,1	165	150	150	1500	2400	**NA4830**	2,85

Spherical plain bearings
Rod ends

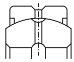
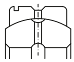
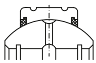
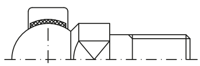
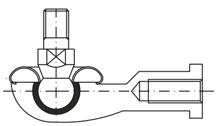
Spherical plain bearings and rod ends URB are manufactured with material of the best quality on machines of high precision, therefore we are able to garantee that they are products of high quality, suitable to a many lot of uses in sector of industry, farming, hydraulics, pneumatics and everywhere it is requested a precision use, or hard loads, or maintenance free. The tolerances of manufacture and assembly respect the rules of standard ISO (and DIN for some series used for hydraulics) and they ae interchangeable with products of the most important manufactures.

Name and number	Equivalent			Bore diameter range (mm)	Design feature
	SKF	INA	IKO		
page 566  Spherical plain radial bearings with fitting crack GE...E GEG...E	GE...E	GE...DO GE...FO	GE...E GE...G	4-12 4-12	Outer ring without single split in axial direction. No lubrication grooves and holes, both outer and inner rings are properly phosphorlylate-treated
page 568  Spherical plain radial bearings with fitting crack GE...ES GEG...ES	GE...ES GEH...ES	GE...DO GE...FO	GE...ES GE...GS	15-3000 15-280	Outer ring with single split in axial direction. Lubrication grooves and holes in the outer and inner rings. Both outer and inner rings are properly phosphorlylate-treated
page 569  Spherical plain radial bearings with two seals and fitting crack GE...ES 2RS GEG...ES 2RS	GE...ES 2RS GEH...ES 2RS	GE...DO 2RS GE...FO 2RS	GE...ES 2RS GE...GS 2RS	15-300 15-280	Outer ring with single split in axial direction. With two seals. Lubrication grooves and holes in the outer and inner rings. Both outer and inner rings are properly phosphorlylate-treated

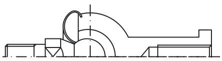
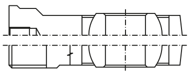
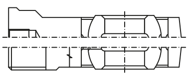
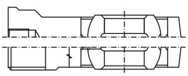
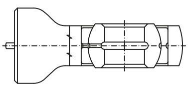
(Continued)

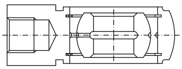
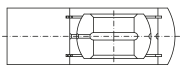
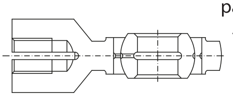
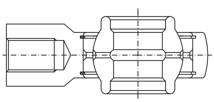
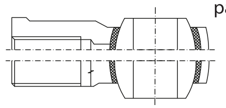
Name and number	Equivalent			Bore diameter range (mm)	Design feature
	SKF	INA	IKO		
page 570  Spherical plain radial bearings with wide inner ring and fitting crack. GEEW...ES	GEG...ES	GE...LO	-	12-100	Outer ring with single split in axial direction. Inner ring with cylindrical extension at either side. Lubrication grooves and holes in the outer and inner rings. Both outer and inner rings are properly phosphorlylate-treated.
page 571  Spherical plain radial bearings with two seals and wide inner ring and fitting crack GEEW...ES 2RS GEEM...ES 2RS	GEM...ES 2RS	GE...HO 2RS	-	20-80 12-100	Outer ring with single split in axial direction. With two seals. Inner ring with cylindrical extension at either side. Lubrication grooves and holes in the outer and inner rings. Both outer and inner rings are properly phosphorlylate-treated
page 572  Maitenance-free spherical plain radial bearings GE...E GE...ET 2RS GEG...C GEG...ET 2RS	GE...C GE...TE 2RS GEH...C GEH...C 2RS	GE...UK GE...UK 2RS GE...FW GE...FW 2RS	GE...EC GE...EL 2RS	4-30 20-140 4-30 30-140	Outer ring pressed around inner ring. To line SF1 material on the surface of spherical plain. Spherical surface of inner ring with chromium plating.
page 575  Angular contact spherical plain bearings GAC...S	GAC...F	GE...SW	-	25-120	Separable outer and inner rings. Lubrication grooves and holes in the outer and inner rings. Both outer and inner rings are properly phosphorlylate-treated.
page 576  Spherical plain thrust bearings GX...S	GX...F	GE...AW	-	10-120	Separable shaft and housingwashers. Lubrication grooves and holes in the housing washer. Both shaft and housing washer are properly phosphorlylate-treated.

(Continued)

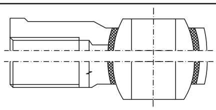
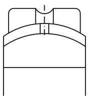
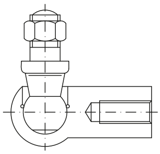
Name and number	Equivalent			Bore diameter range (mm)	Design feature
	SKF	INA	IKO		
page 577  Spherical plain radial bearings with fitting crack. Dimensions in inches. GEZ...ES GEZ...ES 2RS	GEZ...ES GEZ...ES 2RS	GE...ZO GE...ZO 2RS	SBB... SBB...2RS	12,7-152,4 12,7-152,4	As type GE...ES, but dimensions in inches.
page 579  Spherical plain radial bearings with two pieces. GE...XS K	-	-	SB...	12-150	Outer ring with two pieces in axial direction. Lubrication grooves and holes in the outer and inner rings. Both outer and inner rings are properly phosphorlylate-treated
page 581  Spherical plain radial bearings with two seals, two pieces. GEK...XS 2RS	-	-	-	25-60	Outer ring with two axial pieces and two seals. Spherical surface of inner ring with cromium plating. Lubrication grooves and holes in the outer and inner rings.
page 582  Ball joint rod ends with one shank. SQD...C	-	-	-	5-16	Ball joint housing is an outer ring of spherical plain radial bearing. To line SF1 material on the surface of spherical plain.
page 583  Winding shape ball joint rod ends with a dust cover. SQ...C RS	-	-	-	5-22	Ball joint housing is a "L" shaped shank with dust cover with female tread. They are available for right or left hand thread. To line SF1 material on the surface of spherical plain.

(Continued)

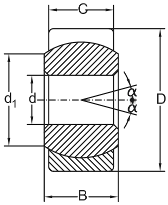
Name and number	Equivalent			Bore diameter range (mm)	Design feature
	SKF	INA	IKO		
page 585  Straight ball joint rod ends with a dust cover. SQZ...C RS	-	-	-	5-22	Ball joint housing is an axial shank with dust cover with femal thread. Stretching rod with right or left hand thread. To line SF1 material on the surface of spherical plain.
pages 587, 592  Combination rod ends SI...E SA...E	SI...E SA...E	GIR...DO GAR...DO	- -	5-12 5-12	Bearings with a streching rod. Stretching rod with right or left-hand, male or female thread. It is made up of a spherical plain radial bearing of type GE...E and rod body.
pages 587, 592  Combination rod ends SI...ES SA...ES SI...ES 2RS SA...ES 2RS	SI...ES/SIA...ES SA...ES/SIA...ES - -	GIR...DO GAR...DO GIR...DO 2RS GAR...DO 2RS	- - - -	15-80 15-80 15-80 15-80	Bearings with a stretching rod. Stretching rod with right or left-hand, male or female thread. It is made up of a spherical plain radial bearing of type GE...ES and rod body. The housing with a lubrication hole or a grease nipple.
pages 587, 592  Combination rod ends SI...C SA...C SI...C 2RS SA...C 2RS	SI...C SA...C SI...TE 2RS SA...TE 2RS	GIR...UK GAR...UK GIR...UK 2RS GAR...UK 2RS	- - - -	15-80 15-80 35-80 35-80	Bearings with a stretching rod. Stretching rod with right or left-hand, male or female thread. It is made up of a spherical plain radial bearing of type GE...ES and rod body. To line SF1 material on the surface of spherical plain.
page 593  Ball joint ends for hydraulics with grease nipple, welding steel body TAC		GK...DO	-	10-18	Round bal joint ends to weld on the bottom of cylinder. Standard dimensions DIN 648. Sliding contact surface: steel/steel

Name and number	Equivalent			Bore diameter range (mm)	Design feature
	SKF	INA	IKO		
page 594  Screwed ball joint ends for hydraulics also with screw lamping device and grease nipple TAPR...N	SIR...ES	GIHR...DO GIHRK...DO	- -	20-120 20-120	Screwed ball joint ends with screw on shank and also with body equipped of clamping screws in hard execution. Sliding contact surface: steel/steel
page 596  Ball joint ends for hydraulics with grease nipple, welding steel body TPN	SCF...ES	GF...DO	-	2020	Ball joint ends in strong execution to weld advisable with alternate loads. Sliding contact surface: steel/steel
page 597  Screw on ball joint ends for hydraulics with screw clamping device and grease nipple TAPR...DO	SIJ...ES	GIHO-K...DO	-	12-100	Ball joint ends with internal thread and clamping device through two screws on two sides Standard DIN 24555. Sliding contact surface: steel/steel
page 598  Screw on ball joint ends for hydraulics with screw clamping device and grease nipple TAPR...CE	SIQG...ES	GIHN-K...LO	-	12-125	Stout ball joint ends with internal thread. Standard DIN 24338 with screws clamping device sliding contact surface: steel/steel
pages 599, 600  Rod ends POS... PHS...	SAKAC...M SIKAC...M	GAKFR...PB GIKFR...PB	POS... PHS...	5-30 5-30	Bearings with a stretching rod. Stretching rod with right or left-hand, male or female thread. To line bronze material on the surface of spherical plain. Spherical surface of ball with chromium plating.

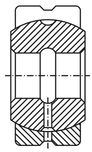
(Continued)

Name and number	Equivalent			Bore diameter range (mm)	Design feature
	SKF	INA	IKO		
 page 600 Maitanance-free rod POS...EC PHS...EC	SAKB...F SIKB...F	GAKFR...PW GIKFR...PW	POS...EC PHS...EC	5-30 5-30	Bearings with a stretching rod with right or left-hand, male or female thread. To line SF1 material on the surface of spherical plain. Spherical surface of ball with chromium plating.
 page 601 Spherical plain radial bearings SSR	-	-	- -	5-30	Outer ring with single split in axial direction. Lubrication grooves and holes in the outer rings. Sliding contact surfaces: bronze/steel.
 page 602 Ball joints rod ends DIN 71802	-	-	- - - -	8-19	Ball joints rod ends with shank and spring clamping.

Spherical plain radial bearings with fitting crack
Two seals and fitting crack, fitting groove
ISO 6124-1979, ISO 6125-1979



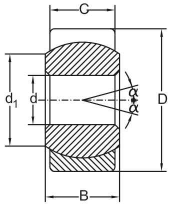
GE....E
GEG....E



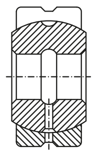
GE....ES
GEG....ES

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
4	12	5	3	6	2	10	16	**GE4 E**	0,0033
5	14	6	4	7	3,4	17	13	**GE5 S**	0,0038
6	14	6	4	8	3,4	17	13	**GE6 S**	0,0042
8	16	8	5	10	5,5	27	15	**GE8 S**	0,0075
10	19	9	6	13	8,1	40	12	**GE10 E**	0,011
12	22	10	7	15	10	54	10	**GE12 E**	0,015
15	26	12	9	18	17	85	8	**GE15 E**	0,027
	26	12	9	18	17	85	8	**GE15 ES-2RS**	0,027
17	30	14	10	20	21	106	10	**GE17 ES**	0,041
	30	14	10	20	21	106	10	**GE17 ES-RS**	0,041
20	35	16	12	24	30	146	9	**GE20 ES**	0,066
	35	16	12	24	30	146	9	**GE20 ES-2RS**	0,066
25	42	20	16	29	48	240	7	**GE25 ES**	0,119
	42	20	16	29	48	240	7	**GE25 ES-2RS**	0,119
30	47	22	18	34	62	310	6	**GE30 ES**	0,153
	47	22	18	34	62	310	6	**GE30 ES-2RS**	0,153
35	55	25	20	39	80	400	6	**GE35 ES**	0,233
	55	25	20	39	80	400	6	**GE35 ES-2RS**	0,233
40	62	28	22	45	100	500	7	**GE40 ES**	0,306
	62	28	22	45	100	500	7	**GE40 ES-2RS**	0,306
45	68	32	25	50	127	640	7	**GE45 ES**	0,427
	68	32	25	50	127	640	7	**GE45 ES-2RS**	0,427
50	75	35	28	55	156	780	6	**GE50 ES**	0,546
	75	35	28	55	156	780	6	**GE50 ES-2RS**	0,546
60	90	44	36	66	245	1220	6	**GE60 ES**	1,045
	90	44	36	66	245	1220	6	**GE60 ES-2RS**	1,045
70	105	49	40	77	315	1560	6	**GE70 ES**	1,55
	105	49	40	77	315	1560	6	**GE70 ES-2RS**	1,55
80	120	55	45	88	400	2000	6	**GE80 ES**	2,31
	120	55	45	88	400	2000	6	**GE80 ES-2RS**	2,31
90	130	60	50	98	490	2450	5	**GE90 ES**	2,75

Spherical plain radial bearings with fitting crack
Two seals and fitting crack, fitting groove
ISO 6124-1979, ISO 6125-1979



GE....E
GEG....E

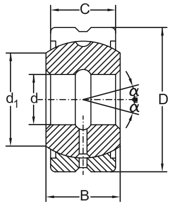


GE....ES
GEG....ES

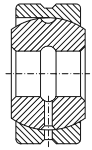
Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
90	130	60	50	98	490	2450	5	**GE90 ES-2RS**	2,75
100	150	70	55	109	610	3050	7	**GE100 ES**	4,45
	150	70	55	109	610	3050	7	**GE100 ES-2RS**	4,45
110	160	70	55	120	655	3250	6	**GE110 ES**	4,82
	160	70	55	120	655	3250	6	**GE110 ES-2RS**	4,82
120	180	85	70	130	950	4750	6	**GE120 ES**	8,05
	180	85	70	130	950	4750	6	**GE120 ES-2RS**	8,05
140	210	90	70	150	1080	5400	7	**GE140 ES**	11,02
	210	90	70	150	1080	5400	7	**GE140 ES-2RS**	11,02
160	230	105	80	170	1370	6800	8	**GE160 ES**	14,01
	230	105	80	170	1370	6800	8	**GE160 ES-2RS**	14,01
180	260	105	80	192	1530	7650	6	**GE180 ES**	18,65
	260	105	80	192	1530	7650	6	**GE180 ES-2RS**	18,65
	260	105	80	192	1530	7650	6	**GE180 DS**	18,65
200	290	130	100	212	2120	10600	7	**GE200 ES**	28,03
	290	130	100	212	2120	10600	7	**GE200 ES-2RS**	28,03
	290	130	100	212	2120	10600	7	**GE200 DS**	28,03
220	320	135	100	238	2320	11600	8	**GE220 ES**	35,91
	320	135	100	238	2320	11600	8	**GE220 ES-2RS**	35,91
	320	135	100	238	2320	11600	8	**GE220 DS**	35,91
240	340	140	100	265	2550	12700	8	**GE240 ES**	39,91
	340	140	100	265	2550	12700	8	**GE240 ES-2RS**	39,91
	340	140	100	265	2550	12700	8	**GE240 DS**	39,91
260	370	150	110	285	3050	15300	7	**GE260 ES**	51,84
	370	150	110	285	3050	15300	7	**GE260 ES-2RS**	51,84
	370	150	110	285	3050	15300	7	**GE260 DS**	51,84
280	400	155	120	310	3550	18000	6	**GE280 ES**	65,36
	400	155	120	310	3550	18000	6	**GE280 ES-2RS**	65,36
	400	155	120	310	3550	18000	6	**GE280 DS**	65,36
300	430	165	120	330	3800	19000	7	**GE300 ES**	78,07
	430	165	120	330	3800	19000	7	**GE300 ES-2RS**	78,07
	430	165	120	330	3800	19000	7	**GE300 DS**	78,07

*The sizes are not binding.

Spherical plain radial bearings with fitting crack
Two seals and fitting crack, fitting groove
ISO 6124-1979, ISO 6125-1979



GE....ES2RS
GEG....ES2RS



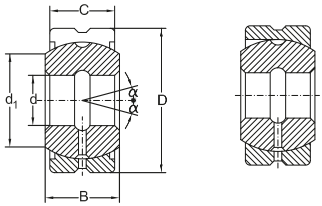
GE....DS
GEG....DS

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
4	14	7	4	7	3,4	17	20	**GEG4 E**	0,0045
5	16	9	5	8	5,5	27	21	**GEG5 S**	0,0066
6	16	9	5	9	5,5	27	21	**GEG6 S**	0,0081
8	19	11	6	11	8,1	40	21	**GEG8 E**	0,014
10	22	12	7	13	10	54	18	**GEG10 E**	0,021
12	26	15	9	16	17	85	18	**GEG12 E**	0,033
15	30	16	10	19	21	106	16	**GEG15 E**	0,049
	30	16	10	19	21	106	16	**GEG15 ES-2RS**	0,049
17	35	20	12	21	30	146	19	**GEG17 ES**	0,083
	35	20	12	21	30	146	19	**GEG17 ES-2RS**	0,083
20	42	25	16	24	48	240	17	**GEG20 ES**	0,153
	42	25	16	24	48	240	17	**GEG20 ES-2RS**	0,153
25	47	28	18	29	62	310	17	**GEG25 ES**	0,203
	47	28	18	29	62	310	17	**GEG25 ES-2RS**	0,203
30	55	32	20	34	80	400	17	**GEG30 ES**	0,304
	55	32	20	34	80	400	17	**GEG30 ES-2RS**	0,304
35	62	35	22	39	100	500	16	**GEG35 ES**	0,408
	62	35	22	39	100	500	16	**GEG35 ES-2RS**	0,408
40	68	40	25	44	127	640	17	**GEG40 ES**	0,542
	68	40	25	44	127	640	17	**GEG40 ES-2RS**	0,542
45	75	43	28	50	156	780	15	**GEG45 ES**	0,713
	75	43	28	50	156	780	15	**GEG45 ES-2RS**	0,713
50	90	56	36	57	245	1220	17	**GEG50 ES**	1,44
	90	56	36	57	245	1220	17	**GEG50 ES-2RS**	1,44
60	105	63	40	67	315	1560	17	**GEG60 ES**	1,60
	105	63	40	67	315	1560	17	**GEG60 ES-2RS**	1,60
70	120	70	45	77	400	2000	16	**GEG70 ES**	3,01
	120	70	45	77	400	2000	16	**GEG70 ES-2RS**	3,01
80	130	75	50	87	490	2450	14	**GEG80 ES**	3,64
	130	75	50	87	490	2450	14	**GEG80 ES-2RS**	3,64

Spherical plain radial bearings with fitting crack

Two seals and fitting crack, fitting groove

ISO 6124-1979, ISO 6125-1979



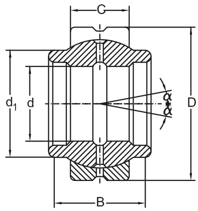
GE....ES2RS
GEG....ES2RS

GE....DS
GEG....DS

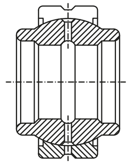
Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
90	150	85	55	98	610	3050	15	**GEG90 ES**	5,22
	150	85	55	98	610	3050	15	**GEG90 ES-2RS**	5,22
100	160	85	55	110	655	3250	14	**GEG100 ES**	6,05
	160	85	55	110	655	3250	14	**GEG100 ES-2RS**	6,05
110	180	100	70	122	950	4750	12	**GEG110 ES**	9,68
	180	100	70	122	950	4750	12	**GEG110 ES-2RS**	9,68
120	210	115	70	132	1080	5400	16	**GEG120 ES**	14,72
	210	115	70	132	1080	5400	16	**GEG120 ES-2RS**	14,72
140	230	130	80	151	1370	6800	16	**GEG140 ES**	19,01
	230	130	80	151	1370	6800	16	**GEG140 ES-2RS**	19,01
160	260	135	80	176	1530	7650	16	**GEG160 ES**	20,02
	260	135	80	176	1530	7650	16	**GEG160 ES-2RS**	20,02
	260	135	80	176	1530	7650	16	**GEG160 DS**	20,02
180	290	155	100	196	2120	10600	14	**GEG180 ES**	32,21
	290	155	100	196	2120	10600	14	**GEG180 ES-2RS**	32,21
	290	155	100	196	2120	10600	14	**GEG180 DS**	32,21
200	320	165	100	220	2320	11600	15	**GEG200 ES**	45,28
	320	165	100	220	2320	11600	15	**GEG200 ES-2RS**	45,28
	320	165	100	220	2320	11600	15	**GEG200 DS**	45,28
220	340	175	100	243	2550	12700	16	**GEG220 ES**	51,12
	340	175	100	243	2550	12700	16	**GEG220 ES-2RS**	51,12
	340	175	100	243	2550	12700	16	**GEG220 DS**	51,12
240	370	190	110	263	3050	15300	15	**GEG240 ES**	65,12
	370	190	110	263	3050	15300	15	**GEG240 ES-2RS**	65,12
	370	190	110	263	3050	15300	15	**GEG240 DS**	65,12
260	400	205	120	285	3550	18000	15	**GEG260 ES**	82,44
	400	205	120	285	3550	18000	15	**GEG260 ES-2RS**	82,44
	400	205	120	285	3550	18000	15	**GEG260 DS**	82,44
280	430	210	120	310	3800	19000	15	**GEG280 ES**	97,21
	430	210	120	310	3800	19000	15	**GEG280 ES-2RS**	97,21
	430	210	120	310	3800	19000	15	**GEG280 DS**	97,21

*The sizes are not binding.

Spherical plain radial bearings with wide inner ring and fitting crack
Two seals and wide inner ring and fitting crack
ISO 61204/2-1982



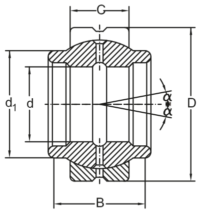
GEEW....ES



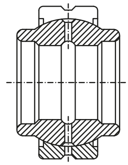
GEEW....ES2RS
GEEM....ES2RS

Dimensions					**Load ratings**			**Designation**	**Mass**
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
12	22	12	7	15,5	10	54	4	**GEEW12 ES**	0,022
	22	12	7	15,5	10	54	4	**GEEW12 ES-2RS***	0,022
15	26	15	9	18,5	17	85	5	**GEEW15 ES**	0,031
	26	15	9	18,5	17	85	5	**GEEW15 ES-2RS**	0,031
16	28	16	9	20	17	85	4	**GEEW16 ES**	0,035
	28	16	9	20	17	85	4	**GEEW16 ES-2RS**	0,035
17	30	17	10	21	21	106	7	**GEEW17 ES**	0,044
	30	17	10	21	21	106	7	**GEEW17 ES-2RS**	0,044
20	35	20	12	25	30	146	4	**GEEW20 ES**	0,071
	35	20	12	25	30	146	4	**GEEW20 ES-2RS**	0,071
25	42	25	16	30,5	48	240	4	**GEEW25 ES**	0,131
	42	25	16	30,5	48	240	4	**GEEW25 ES-2RS**	0,131
30	47	30	18	34	62	310	4	**GEEW30 ES**	0,168
	47	30	18	34	62	310	4	**GEEW30 ES-2RS**	0,168
32	52	32	18	37	62	310	4	**GEEW32 ES**	0,182
	52	32	18	37	62	310	4	**GEEW32 ES-2RS**	0,182
35	55	35	20	40	80	400	4	**GEEW35 ES**	0,253
	55	35	20	40	80	400	4	**GEEW35 ES-2RS**	0,253
40	62	40	22	46	100	500	4	**GEEW40 ES**	0,338
	62	40	22	46	100	500	4	**GEEW40 ES-2RS**	0,338
45	68	45	25	52	127	640	4	**GEEW45 ES**	0,481
	68	45	25	52	127	640	4	**GEEW45 ES-2RS**	0,481
50	75	50	28	57	156	780	4	**GEEW50 ES**	0,558
	75	50	28	57	156	780	4	**GEEW50 ES-2RS**	0,558
60	90	60	36	68	245	1220	3	**GEEW60 ES**	1,15
	90	60	36	68	245	1220	3	**GEEW60 ES-2RS**	1,15
63	95	63	36	71,5	245	1220	4	**GEEW63 ES**	1,23
	95	63	36	71,5	245	1220	4	**GEEW63 ES-2RS**	1,23
70	105	70	40	78	315	1560	4	**GEEW70 ES**	1,71
	105	70	40	78	315	1560	4	**GEEW70 ES-2RS**	1,71

Spherical plain radial bearings with wide inner ring and fitting crack
Two seals and wide inner ring and fitting crack
ISO 61204/2-1982



GEEW....ES

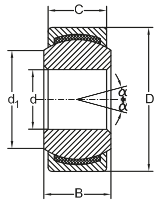

GEEW....ES2RS
GEEM....ES2RS

Dimensions					**Load ratings**			**Designation**	**Mass**
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
80	120	80	45	91	400	2000	4	**GEEW80 ES**	2,39
	120	80	45	91	400	2000	4	**GEEW80 ES-2RS**	2,39
100	150	100	55	113	610	3050	4	**GEEW100 ES**	4,80
	150	100	55	113	610	3050	4	**GEEW100 ES-2RS**	4,80
125	180	125	70	138	950	4750	4	**GEEW125 ES**	8,50
	180	125	70	138	950	4750	4	**GEEW125 ES-2RS**	8,50
20	35	24	12	24	30	146	6	**GEEM20 ES-2RS**	0,073
25	42	29	16	29	48	240	4	**GEEM25 ES-2RS**	0,13
30	47	30	18	34	62	310	4	**GEEM30 ES-2RS**	0,17
35	55	35	20	40	80	400	4	**GEEM35 ES-2RS**	0,25
40	62	38	22	45	100	500	4	**GEEM40 ES-2RS**	0,35
45	68	40	25	52	127	640	4	**GEEM45 ES-2RS**	0,49
50	75	43	28	57	156	780	4	**GEEM50 ES-2RS**	0,60
60	90	54	36	68	245	1220	3	**GEEM60 ES-2RS**	1,15
70	105	65	40	78	315	1560	4	**GEEM70 ES-2RS**	1,65
80	120	74	45	90	400	2000	4	**GEEM80 ES-2RS**	2,50

*The sizes are not binding.

Maintenance free spherical plain radial bearings

GB304.7-81, GB304.9-81 (ISO6124-1979, ISO6125-1979)



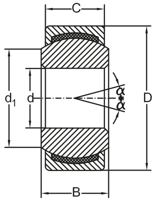
GE....C
GE....ET2RS

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
4	12	5	3	6	2,1	5,4	16	**GE4 C**	0,0033
5	14	6	4	7	3,6	9,1	13	**GE5 C**	0,0038
6	14	6	4	8	3,6	9,1	13	**GE6 C**	0,0042
8	16	8	5	10	5,8	14	15	**GE8 C**	0,0075
10	19	9	6	13	8,6	21	12	**GE10 C**	0,011
12	22	10	7	15	11	28	10	**GE12 C**	0,015
15	26	12	9	18	18	45	8	**GE15 C**	0,027
17	30	14	10	20	22	56	10	**GE17 C**	0,041
20	35	16	12	24	31	78	9	**GE20 C**	0,066
	35	16	12	24	31	78	9	**GE20 ET-2RS**	0,066
25	42	20	16	29	51	127	7	**GE25 C**	0,119
	42	20	16	29	51	127	7	**GE25 ET-2RS**	0,119
30	47	22	18	34	65	166	6	**GE30 C**	0,163
	47	22	18	34	65	166	6	**GE30 ET-2RS**	0,163
35	55	25	20	-	110	220	6	**GE35 ET-2RS**	0,25
40	62	28	22	-	140	280	6	**GE40 ET-2RS**	0,30
45	68	32	25	-	180	350	6	**GE45 ET-2RS**	0,35
50	75	35	28	-	220	430	6	**GE50 ET-2RS**	0,50
60	90	44	36	-	340	690	6	**GE60 ET-2RS**	1,00
70	105	49	40	-	430	870	6	**GE70 ET-2RS**	1,40
80	120	55	45	-	560	1140	6	**GE80 ET-2RS**	2,00
90	130	60	50	-	690	1350	6	**GE90 ET-2RS**	2,50

ART BEARINGS

Maintenance free spherical plain radial bearings

GB304.7-81, GB304.9-81 (ISO6124-1979, ISO6125-1979)

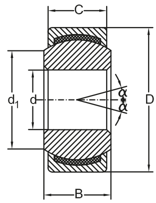


GE....C
GE....ET2RS

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
100	150	70	55	-	850	1700	6	**GE100 ET-2RS**	4,00
110	160	70	55	-	900	1850	6	**GE110 ET-2RS**	4,50
120	180	85	70	-	1300	2700	6	**GE120 ET-2RS**	7,20
140	210	90	70	-	1500	3000	6	**GE140 ET-2RS**	10,00

Maintenance free spherical plain radial bearings

ISO6124-1979, ISO 6125-1979

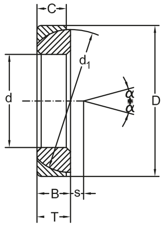


GE....C
GE....ET2RS

Dimensions					**Load ratings**			**Designation**	**Mass**
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
4	14	7	4	7	3,6	9,1	20	**GEG4 C**	0,0045
5	16	9	5	8	5,8	14	21	**GEG5 C**	0,0066
6	16	9	5	9	5,8	14	21	**GEG6 C**	0,0081
8	19	11	6	11	8,8	21	21	**GEG8 C**	0,014
10	22	12	7	13	11	28	18	**GEG10 C**	0,021
12	26	15	9	16	18	45	18	**GEG12 C**	0,033
15	30	16	10	19	22	56	16	**GEG15 C**	0,049
17	35	20	12	21	31	78	19	**GEG17 C**	0,083
20	42	25	16	24	51	127	17	**GEG20 C**	0,153
25	47	28	18	29	65	166	17	**GEG25 C**	0,203
30	55	32	20	34	83	212	17	**GEG30 C**	0,304
	55	32	20	-	110	220	17	**GEG30 ET-2RS**	0,30
35	62	35	22	-	140	270	17	**GEG35 ET-2RS**	0,35
40	68	40	25	-	180	350	15	**GEG40 ET-2RS**	0,50
45	75	43	28	-	220	430	15	**GEG45 ET-2RS**	0,60
50	90	56	36	-	340	680	15	**GEG50 ET-2RS**	1,40
60	105	63	40	-	430	850	15	**GEG60 ET-2RS**	2,00
70	120	70	45	-	550	1100	16	**GEG70 ET-2RS**	2,80
80	130	75	50	-	680	1350	14	**GEG80 ET-2RS**	3,40
90	150	85	55	-	850	1700	15	**GEG90 ET-2RS**	5,00
100	160	85	55	-	900	1800	14	**GEG100 ET-2RS**	5,50
110	180	100	70	-	1300	2700	12	**GEG110 ET-2RS**	9,00
120	210	115	70	-	1500	3000	15	**GEG120 ET-2RS**	14,50
140	230	130	80	-	1900	3500	15	**GEG140 ET-2RS**	18,20

*The sizes are not binding.
ET/C - To line SF1 material on the surface of spherical plain.

Angular contact spherical plain bearings

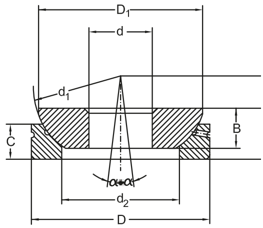


GAC....S

Dimensions							Load ratings			Designation	Mass
d	D	B	C	T	d_1	S	dyn.	stat.	α*		
mm							kN	kN		-	kg
25	47	15	14	15	42	0,6	47,5	236	3,5	**GAC25 S**	0,148
30	55	17	15	17	49,5	1,3	63	315	3	**GAC30 S**	0,208
35	62	18	16	18	55,5	2,1	76,5	390	3	**GAC35 S**	0,268
40	68	19	17	19	62	2,8	90	450	3	**GAC40 S**	0,327
45	75	20	18	20	68,5	3,5	106	530	3	**GAC45 S**	0,416
50	80	20	19	20	74	4,3	118	585	3	**GAC50 S**	0,455
60	95	23	21	23	88,5	5,7	160	800	3	**GAC60 S**	0,714
70	110	25	23	25	102	7,2	208	1040	2,5	**GAC70 S**	1,04
80	125	29	25,5	29	115	8,6	250	1250	2,5	**GAC80 S**	1,54
90	140	32	28	32	128,5	10,1	320	1600	2,5	**GAC90 S**	2,09
100	150	32	31	32	141	11,6	345	1760	2	**GAC100 S**	2,34
110	170	38	34	38	155	13	475	2360	2	**GAC110 S**	3,68
120	180	38	37	38	168	14,5	510	2550	2	**GAC120 S**	3,97

*The sizes are not binding.
On request: sliding contact surface steel / PTFE, example GX...C.

Spherical plain thrust bearing

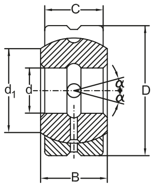


GX....S

Dimensions									Load ratings			Designation	Mass
d	D	H	B	C	d_1	d_2	D_1	S	dyn.	stat.	α*		
mm									kN	kN		-	kg
10	30	9,5	7,5	7	32	15,5	27,5	7	24	120	9	**GX10 S**	0,036
12	35	13	9,5	9,3	38	18	32	8	32,5	163	8	**GX12 S**	0,072
15	42	15	11	10,8	46	22,5	39	10	52	260	8	**GX15 S**	0,108
17	47	16	11,8	11,2	52	27	43,5	11	58,5	300	10	**GX17 S**	0,137
20	55	20	14,5	13,8	60	31	50	12,5	75	375	9	**GX20 S**	0,246
25	62	22,5	16,5	16,7	68	34,5	58,5	14	129	640	7	**GX25 S**	0,415
30	75	26	19	19	82	42	70	17,5	170	850	7	**GX30 S**	0,614
35	90	28	22	20,7	98	50,5	84	22	260	1290	8	**GX35 S**	0,973
40	105	32	27	21,5	114	59	97	24,5	375	1860	9	**GX40 S**	1,59
45	120	36,5	31	25,5	128	67	110	27,5	490	2450	9	**GX45 S**	2,24
50	130	42,5	33	30,5	139	70	120	30	655	3250	7	**GX50 S**	3,14
60	150	45	37	34	160	84	140	35	735	3650	8	**GX60 S**	4,63
70	160	50	42	36,5	176	94,5	153	35	800	4050	8	**GX70 S**	5,37
80	180	50	43,5	38	197	107,5	172	42,5	1040	5200	8	**GX80 S**	6,91
100	210	59	51	46	222	127	198	45	1200	6000	8	**GX100 S**	10,98
120	230	64	53,5	50	250	145	220	52,5	1250	6200	6	**GX120 S**	13,97

*The sizes are not binding.
On request: sliding contact surface steel / PTFE, example GX...C.

Spherical plain radial bearings dimension in inches with fitting crack
Two seals and fitting crack

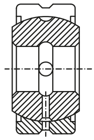


GE.Z....ES

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
12,7	22,225	11,1	9,525	14,1	13,7	41,5	6	**GEZ12 ES**	0,022
15,875	26,988	13,894	11,913	18,3	22,0	65,5	6	**GEZ15 ES**	0,036
19,05	31,75	16,662	14,275	21,8	31,5	95,0	6	**GEZ19 ES**	0,053
22,225	36,513	19,431	16,662	25,4	4,25	127	6	**GEZ22 ES**	0,085
25,4	41,275	22,225	19,05	27,6	56,0	166	6	**GEZ25 ES**	0,121
	41,275	22,225	19,05	27,6	56,0	166	6	**GEZ25 ES-2RS**	0,121
31,75	50,8	27,762	23,8	36,0	86,5	260	6	**GEZ31 ES**	0,232
	50,8	27,762	23,8	36,0	86,5	260	6	**GEZ31 ES-2RS**	0,232
34,925	55,563	30,15	26,187	38,6	102	310	6	**GEZ34 ES**	0,351
	55,563	30,15	26,187	38,6	102	310	6	**GEZ34 ES-2RS**	0,351
38,1	61,913	33,325	28,575	41,2	125	375	6	**GEZ38 ES**	0,422
	61,913	33,325	28,575	41,2	125	375	6	**GEZ38 ES-2RS**	0,422
44,5	71,438	38,887	33,325	50,7	170	510	6	**GEZ44 ES**	0,641
	71,438	38,887	33,325	50,7	170	510	6	**GEZ44 ES-2RS**	0,641
50,8	80,963	44,45	38,1	57,9	224	670	6	**GEZ50 ES**	0,932
	80,963	44,45	38,1	57,9	224	670	6	**GEZ50 ES-2RS**	0,932
57,15	90,488	50,013	42,85	64,9	280	850	6	**GEZ57 ES**	1,33
	90,488	50,013	42,85	64,9	280	850	6	**GEZ57 ES-2RS**	1,33
63,5	100,013	55,55	47,625	73,3	355	1060	6	**GEZ63 ES**	1,85
	100,013	55,55	47,625	73,3	355	1060	6	**GEZ63 ES-2RS**	1,85
69,85	111,125	61,112	52,375	79,1	415	1250	6	**GEZ69 ES**	2,42
	111,125	61,112	32,375	79,1	415	1250	6	**GEZ69 ES-2RS**	2,42
76,2	120,65	66,675	57,15	86,8	500	1500	6	**GEZ76 ES**	3,10
	120,65	66,675	57,15	86,8	500	1500	6	**GEZ76 ES-2RS**	3,10
82,55	130,175	72,238	61,9	94,5	585	1760	6	**GEZ82 ES**	3,82
	130,175	72,238	61,9	94,5	585	1760	6	**GEZ82 ES-2RS**	3,82
88,9	139,7	77,775	66,675	101,6	680	2040	6	**GEZ88 ES**	4,79
	139,7	77,775	66,675	101,6	680	2040	6	**GEZ88 ES-2RS**	4,79

ART BEARINGS

Spherical plain radial bearings dimension in inches
with fitting crack
Two seals and fitting crack



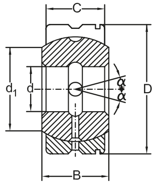
GEZ....ES2RS

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
95,25	149,225	83,337	71,425	108,7	780	2360	6	**GEZ95 ES**	5,78
	149,225	83,337	71,425	108,7	780	2360	6	**GEZ95 ES-2RS**	5,78
101,6	158,75	88,9	76,2	115,8	900	2650	6	**GEZ101 ES**	6,99
	158,75	88,9	76,2	115,8	900	2650	6	**GEZ101 ES-2RS**	6,99
107,95	168,275	94,463	80,95	122,8	1000	3000	6	**GEZ107 ES**	8,41
	168,275	94,463	80,95	122,8	1000	3000	6	**GEZ107 ES-2RS**	8,41
114,3	177,8	100,013	85,725	130,6	1120	3400	6	**GEZ114 ES**	9,79
	177,8	100,013	85,725	130,6	1120	3400	6	**GEZ114 ES-2RS**	9,79
120,65	187,325	105,562	90,475	137,6	1250	3750	6	**GEZ120 ES**	11,5
	187,325	105,562	90,475	137,6	1250	3750	6	**GEZ120 ES-2RS**	11,5
127	196	111,125	95,25	145,3	1400	4150	6	**GEZ127 ES**	13,5
	196	111,125	95,25	145,3	1400	4150	6	**GEZ127 ES-2RS**	13,5
152,4	222,25	120,65	104,775	168,2	1730	5200	5	**GEZ152 ES**	17,5
	222,25	120,65	104,775	168,2	1730	5200	5	**GEZ152 ES-2RS**	17,5

*The sizes are not binding.

ART BEARINGS

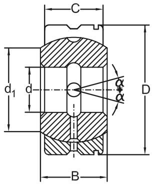
Spherical plain radial bearings with two piece outer ring



GE....XSK

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
12	22	11	9	14	12,9	39,2	7	**GE12 XS-K**	0,019
15	26	13	11	17,5	19,5	57,8	6	**GE15 XS-K**	0,028
20	32	16	14	23	31,3	94,8	4	**GE20 XS-K**	0,053
22	37	19	16	25,5	40,3	122	6	**GE22 XS-K**	0,085
25	42	21	18	29	51,1	155	5	**GE25 XS-K**	0,116
30	50	27	23	36	81,2	248	6	**GE30 XS-K**	0,225
35	55	30	26	40	103	314	5	**GE35 XS-K**	0,302
40	62	33	28	44	122	370	6	**GE40 XS-K**	0,375
45	72	36	31	50,5	152	461	5	**GE45 XS-K**	0,598
50	80	42	36	58,5	225	622	5	**GE50 XS-K**	0,869
55	90	47	40	64,5	253	768	6	**GE55 XS-K**	1,26
60	100	53	45	72,5	321	980	6	**GE60 XS-K**	1,72
65	105	55	47	76	350	1060	5	**GE65 XS-K**	2,05
70	110	58	50	81,5	396	1220	5	**GE70 S-K**	2,23
75	120	64	55	89,5	478	1450	5	**GE75 XS-K**	3,01
80	130	70	60	97,5	571	1730	5	**GE80 XS-K**	3,98
85	135	74	63	100,5	624	1890	6	**GE85 XS-K**	4,31
90	140	76	65	105,5	670	2030	5	**GE90 XS-K**	4,72
95	150	82	70	113,5	776	2350	5	**GE95 XS-K**	6,05
100	160	88	75	121,5	891	2700	5	**GE100 XS-K**	7,43

Spherical plain radial bearings with two piece outer ring

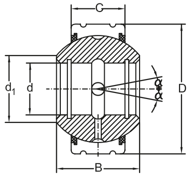


GE....XSK

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
110	170	93	80	130	1010	3070	5	**GE110 XS-K**	8,54
115	180	98	85	132,5	1110	3370	5	**GE115 XS-K**	10,3
120	190	105	90	140	1250	3780	6	**GE120 XS-K**	12,4
130	200	110	95	148,5	1390	4220	5	**GE130 XS-K**	13,8
150	220	120	105	166	1710	5170	5	**GE150 XS-K**	17,1

ART BEARINGS

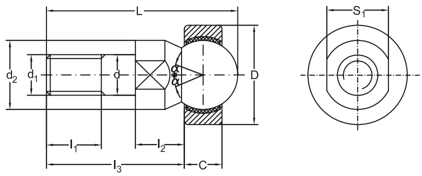
Spherical plain radial bearings with two seals and two piece outer ring



GEK....XS2ES

Dimensions					Load ratings			Designation	Mass
d	D	B	C	d_1 min	dyn.	stat.	α*		
mm					kN	kN		-	kg
25	68	40	28	30	117	590	19	**GEK25 XS-2RS**	0,516
30	70	47	32	37,3	163	813	19	**GEK30 XS-2RS**	0,785
35	80	54	38	44,5	226	1130	17	**GEK35 XS-2RS**	1,23
40	90	64	44	48	298	1490	19	**GEK40 XS-2RS**	1,83
45	100	72	52	54	398	1990	17	**GEK45 XS-2RS**	2,56
50	110	80	58	60	493	2450	17	**GEK50 XS-2RS**	3,43
55	125	90	64	63,2	598	2990	19	**GEK55 XS-2RS**	5,02
60	135	98	72	69,3	732	3660	17	**GEK60 XS-2RS**	6,43

Ball joint ends with one shank

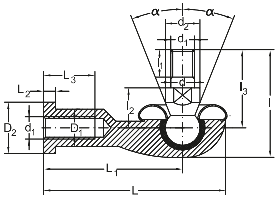


SQD...C

Dimensions										Load ratings			Designation	Mass
d	d_1	d_2 min	L_{max}	l_1 min	l_2	$l_3$max	S_1	C	D	dyn.	stat.	α*		
mm										kN	kN		-	kg
5	M5	9	27,5	8	8	19	7	6	16	2,4	6,2	25	**SQD5 C**	0,014
6	M6	10	33,5	11	8,8	23,8	8	6,75	18	3,2	8,1	25	**SQD6 C**	0,021
8	M8	12	41	12	11,6	28,6	10	9	22	5,5	14	25	**SQD8 C**	0,042
10	M10x1,25	14	49	15	14,2	34,2	11	10,5	26	7,8	20	25	**SQD10 C**	0,067
12	M12x1,25	19	55,1	17	15,1	38,1	16	12	30	10	27	25	**SQD12 C**	0,108
14	M14x1,25	19	70,7	22	16,8	51,3	16	13,5	34	13	35	20	**SQD14 C**	0,167
16	M16x1,25	22	76,3	23	18	54,5	18	15	38	17	45	20	**SQD16 C**	0,238

ART BEARINGS

Winding shape ball joint rod ends

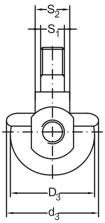


SQ...C RS

Dimensions

d	d_1	d_2 min	d_3 max	l max	l_1 min	l_2	l_3 max	S_1	L max	L_1
mm										
5	M5	9	20	30	8	10	21	7	36	27
	M5	9	20	30	8	10	21	7	36	27
6	M6	10	20	36	11	11	26	8	40,5	30
	M6	10	20	36	11	11	26	8	40,5	30
8	M8	12	24	43,5	12	14	31	10	49	36
	M8	12	24	43,5	12	14	31	10	49	36
10	M10X1,25	14	30	51,5	15	17	37	11	58	43
	M10X1,25	14	30	51,5	15	17	37	11	58	43
12	M12X1,25	19	32	57,5	17	19	42	16	66	50
	M12X1,25	19	32	57,5	17	19	42	16	66	50
14	M14X1,25	19	38	73,5	22	21,5	56	16	75	57
	M14X1,25	19	38	73,5	22	21,5	56	16	75	57
16	M16X1,25	22	44	79,5	23	23,5	60	18	84	64
	M16X1,25	22	44	79,5	23	23,5	60	18	84	64
18	M18X1,25	25	45	90	25	26,5	68	21	93	71
	M18X1,25	25	45	90	25	26,5	68	21	93	71
20	M20X1,25	29	50	90	25	27	68	24	99	77
	M20X1,25	29	50	90	25	27	68	24	99	77
22	M22X1,25	29	52	95	26	28	70	24	109	84
	M22X1,25	29	52	95	26	28	70	24	109	84

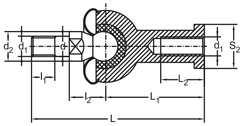
Winding shape ball joint rod ends

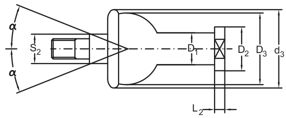


l_2 max	l_3 min	D_1 max	D_2 max	D_3 max	S_2	Load ratings dyn.	stat.	α*	Designation	Mass
						kN	kN		-	kg
4	14	9	12	18	10	2,7	9,2	25	**SQ5 C**	0,025
4	14	9	12	18	10	2,7	9,2	25	**SQ5 C-RS**	0,025
5	14	10	13	20	10	3,6	12	25	**SQ6 C**	0,039
5	14	10	13	20	10	3,6	12	25	**SQ6 C-RS**	0,039
5	17	12,5	16	25	13	5,7	19	25	**SQ8 C**	0,068
5	17	12,5	16	25	13	5,7	19	25	**SQ8 C-RS**	0,068
6,5	21	15	19	29	16	8,2	27	25	**SQ10 C**	0,112
6,5	21	15	19	29	16	8,2	27	25	**SQ10 C-RS**	0,112
6,5	25	17,5	22	31	18	11	37	25	**SQ12 C**	0,164
6,5	25	17,5	22	31	18	11	37	25	**SQ12 C-RS**	0,164
8	26	20	25	35	21	14	48	25	**SQ14 C**	0,254
8	26	20	25	35	21	14	48	25	**SQ14 C-RS**	0,254
8	32	22	27	39	24	16	53	20	**SQ16 C**	0,336
8	32	22	27	39	24	16	53	20	**SQ16 C-RS**	0,336
10	34	25	31	44	27	18	61	20	**SQ18 C**	0,464
10	34	25	31	44	27	18	61	20	**SQ18 C-RS**	0,464
10	35	27,5	34	44	30	18	612	20	**SQ20 C**	0,538
10	35	27,5	34	44	30	18	612	20	**SQ20 C-RS**	0,538
12	41	30	37	50	30	22	75	16	**SQ22 C**	0,713
12	41	30	37	50	30	22	75	16	**SQ22 C-RS**	0,713

*The sizes are not binding.
Avalaible with thread M1,5 (SQ10 and SQ12) and M2 (SQ14 and SQ16)
C - to line SF1 material on the surface of spherical plain. The shank of ball joint housing may be left - hand thread, for left - hand thread, suffix "L" is added to bearings number and thread sign, e. g. SQL6C, M6L - 6H.

Straightball joint rod ends

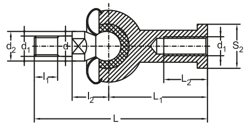


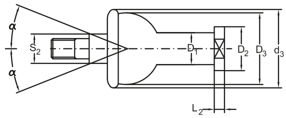


SQZ....C RS

Dimensions

d	d_1	d_2 min	d_3 max	l_1 min	l_2	S_1	L max	L_1	L_2 max	L_3 min
mm										
5	M5	9	20	8	11	7	46	24	4	12
	M5	9	20	8	11	7	46	24	4	12
6	M6	10	20	11	12,2	8	55,2	28	5	15
	M6	10	20	11	12,2	8	55,2	28	5	15
8	M8	12	24	12	16	10	65	32	5	16
	M8	12	24	12	16	10	65	32	5	16
10	M10X1,25	14	30	15	19,5	11	74,5	35	6,5	18
	M10X1,25	14	30	15	19,5	11	74,5	35	6,5	18
12	M12X1,25	19	32	17	21	16	84	40	6,5	20
	M12X1,25	19	32	17	21	16	84	40	6,5	20
14	M14X1,25	19	38	22	23,5	16	104,5	45	8	25
	M14X1,25	19	38	22	23,5	16	104,5	45	8	25
16	M16X1,25	22	44	23	25,5	18	112	50	8	27
	M16X1,25	22	44	23	25,5	18	112	50	8	27
18	M18X1,25	25	45	25	31	21	130,5	58	10	32
	M18X1,25	25	45	25	31	21	130,5	58	10	32
20	M20X1,25	29	50	25	31	24	133	63	10	38
	M20X1,25	29	50	25	31	24	133	63	10	38
22	M22X1,25	29	52	26	33	24	145	70	12	43
	M22X1,25	29	52	26	33	24	145	70	12	43





SQZ....C RS

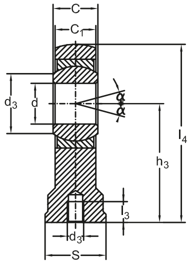
D_1 max	D_2 max	D_3 max	S_2	Load ratings dyn.	stat.	α*	Designation	Mass
				kN	kN		-	kg
9	12	17	10	1,7	5,7	15	**SQZ5 C**	0,025
9	12	17	10	1,7	5,7	15	**SQZ5 C-RS**	0,025
10	13	20	10	2,2	7,5	15	**SQZ6 C**	0,040
10	13	20	10	2,2	7,5	15	**SQZ6 C-RS**	0,040
12,5	16	24	13	3,3	11	15	**SQZ8 C**	0,075
12,5	16	24	13	3,3	11	15	**SQZ8 C-RS**	0,075
15	19	28	16	4,8	16	15	**SQZ10 C**	0,121
15	19	28	16	4,8	16	15	**SQZ10 C-RS**	0,121
17,5	22	32	18	6,6	22	15	**SQZ12 C**	0,187
17,5	22	32	18	6,6	22	15	**SQZ12 C-RS**	0,187
20	25	36	21	8,7	29	11	**SQZ14 C**	0,277
20	25	36	21	8,7	29	11	**SQZ14 C-RS**	0,277
22	27	40	24	10	33	11	**SQZ16 C**	0,361
22	27	40	24	10	33	11	**SQZ16 C-RS**	0,361
25	31	45	27	11	37	11	**SQZ18 C**	0,539
25	31	45	27	11	37	11	**SQZ18 C-RS**	0,539
27,5	34	45	30	11	37	7,5	**SQZ20 C**	0,575
27,5	34	45	30	11	37	7,5	**SQZ20 C-RS**	0,575
30	37	50	30	14	46	7,5	**SQZ22 C**	0,757
30	37	50	30	14	46	7,5	**SQZ22 C-RS**	0,757

*The sizes are not binding.

C - to line SF1 material on the surface of spherical plain. The shank of ball joint housing may be left - hand thread, for left - hand thread, suffix "L" is added to bearings number and thread sign, e. g. SQL6C, M6L - 6H.

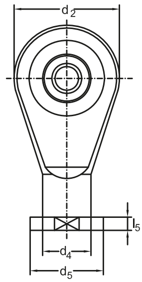
ART BEARINGS

Combination (series e) rod ends
(ISO 6126 - 1982)



Dimensions

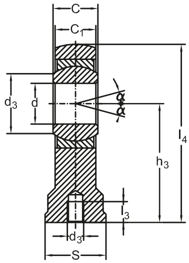
d	B	C_1 max	d_1 min	d_2 max	d_3	h_1	l_3 min	l_4 max	l_5 max	d_4 max
mm										
5	6	4,5	7	21	M5	30	11	42	5	10
6	6	4,5	8	21	M6	30	11	42	5	11
	6	4,5	8	21	M6	30	11	42	5	11
8	8	6,5	10	24	M8	36	15	49	5	13
	8	6,5	10	24	M8	36	15	49	5	13
10	9	7,5	13	29	M10	43	15	58	6,5	16
	9	7,5	13	29	M10	43	15	58	6,5	16
12	10	8,5	15	34	M12	50	18	67	7	18
	10	8,5	15	34	M12	50	18	67	7	18
15	12	10,5	18	40	M14	61	21	81	8	21
	12	10,5	18	40	M14	61	21	81	8	21
	12	10,5	18	40	M14	61	21	81	8	21
17	14	11,5	20	46	M16	67	24	90	10	24
	14	11,5	20	46	M16	67	24	90	10	24
	14	11,5	20	48	M16	67	24	90	10	24
20	16	13,5	24	53	M20x1,5	77	30	104	10	28
	16	13,5	24	53	M20x1,5	77	30	104	10	28
	16	13,5	24	53	M20x1,5	77	30	104	10	28
25	20	18	29	64	M24x2	94	36	126	12	35
	20	18	29	64	M24x2	94	36	126	12	35
	20	18	29	64	M24x2	94	36	126	12	35
30	22	20	34	73	M30x2	110	45	147	15	42
	22	20	34	73	M30x2	110	45	147	15	42
	22	20	34	73	M30x2	110	45	147	15	42



d_5 max	S	Load ratings dyn.	stat.	α*	Designation	Mass
mm		kN	kN	-	-	kg
13	10	3,4	8,1	13	**SI5 E**	0,016
13	11	3,4	8,1	13	**SI6 E**	0,017
13	11	3,4	8,1	13	**SI6 C****	0,017
16	13	5,5	12,9	15	**SI8 E**	0,035
16	13	5,5	12,9	15	**SI8 C****	0,035
19	16	8,1	17,6	12	**SI10 E**	0,061
19	16	8,1	17,6	12	**SI610 C****	0,061
22	18	10,8	24,5	10	**SI12 E**	0,096
22	18	10,8	24,5	10	**SI12 C****	0,096
26	21	17	36	8	**SI15 ES**	0,162
26	21	17	36	8	**SI15 ES-2RS**	0,162
26	21	17	36	8	**SI15 C****	0,162
29	24	21	45	10	**SI17 ES**	0,233
29	24	21	45	10	**SI17 ES-2RS**	0,233
29	24	21	45	10	**SI17 C****	0,233
34	30	30	60	9	**SI20 ES**	0,324
34	30	30	60	9	**SI20 ES-2RS**	0,324
34	30	30	60	9	**SI20 C****	0,324
42	36	48	83	7	**SI25 ES**	0,625
42	36	48	83	7	**SI25 ES-2RS**	0,625
42	36	48	83	7	**SI25 C****	0,625
50	46	62	110	6	**SI30 ES**	0,976
50	46	62	110	6	**SI30 ES-2RS**	0,976
50	46	62	110	6	**SI30 C****	0,976

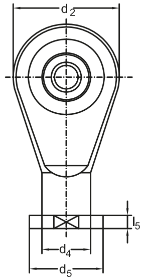
ART BEARINGS

Combination (series e) rod ends
(ISO 6126 - 1982)



Dimensions

d	B	C_1 max	d_1 min	d_2 max	d_3	h_1	l_3 min	l_4 max	l_5 max	d_4 max
mm										
35	25	22	39	82	M36x2	125	60	167	15	48
	25	22	39	82	M36x2	125	60	167	15	48
	25	22	39	82	M36x2	125	60	167	15	48
40	28	24	45	92	M39x2	142	65	190	18	52
	28	24	45	92	M39x2	142	65	190	18	52
	28	24	45	92	M39x2	142	65	190	18	52
45	32	28	50	102	M42x3	145	65	199	20	58
	32	28	50	102	M42x3	145	65	199	20	58
	32	28	50	102	M42x3	145	65	199	20	58
50	35	31	55	112	M45x3	160	68	221	20	62
	35	31	55	112	M45x3	160	68	221	20	62
	35	31	55	112	M45x3	160	68	221	20	62
60	44	39	66	135	M52x3	175	70	247	20	70
	44	39	66	135	M52x3	175	70	247	20	70
	44	39	66	135	M52x3	175	70	247	20	70
70	49	43	77	160	M56x4	200	80	283	20	80
	49	43	77	160	M56x4	200	80	283	20	80
	49	43	77	160	M56x4	200	80	283	20	80
80	55	48	88	180	M64x4	230	85	325	25	95
	55	48	88	180	M64x4	230	85	325	25	95
	55	48	88	180	M64x4	230	85	325	25	95



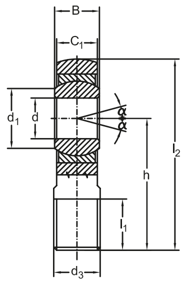
d_5 max	S	Load ratings dyn.	stat.	α*	Designation	Mass
mm		kN	kN	-	-	kg
58	55	80	146	6	**SI35 ES**	1,52
58	55	80	146	6	**SI35 ES-2RS**	1,52
58	55	80	146	6	**SI35 C****	1,52
65	60	100	180	7	**SI40 ES**	2,06
65	60	100	180	7	**SI40 ES-2RS**	2,06
65	60	100	180	7	**SI40 C****	2,06
70	65	127	240	7	**SI45 ES**	2,72
70	65	127	240	7	**SI45 ES-2RS**	2,72
70	65	127	240	7	**SI45 C-2RS****	2,72
75	70	156	290	6	**SI50 ES**	3,57
75	70	156	290	6	**SI50 ES-2RS**	3,57
75	70	156	290	6	**SI50 ES-2RS****	3,57
88	80	245	450	6	**SI60 ES**	5,63
88	80	245	450	6	**SI60 ES-2RS**	5,63
88	80	245	450	6	**SI60 ES-2RS****	5,63
98	85	315	610	6	**SI70 ES**	8,33
98	85	315	610	6	**SI70 ES-2RS**	8,33
98	85	315	610	6	**SI70 ES-2RS****	8,33
110	95	400	750	6	**SI80 ES**	13,04
110	95	400	750	6	**SI80 ES-2RS**	13,04
110	95	400	750	6	**SI80 ES-2RS****	13,04

SIL..ES - for left hand thread. Suffix "L" is added to bearings number and thread sign, eg. SIL30ES. Sliding contact surface: steel/steel. Available with increased thread
*The sizes are not binding.
**Sliding contact surface: steel/PTFE.

ART BEARINGS

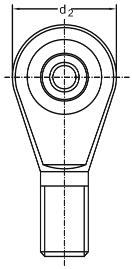
Combination (series e) rod ends

(ISO 6126 - 1982)



SA...E/ES
SA...ES2RS

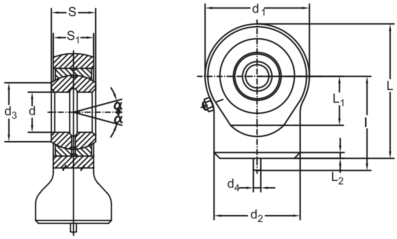
Dimensions									**Load ratings**			**Designation**	**Mass**
d	B	C_1 max	d_1 min	d_2 max	d_3	h	l_1 min	l_2 max	dyn.	stat.	α*		
mm									kN	kN			
5	6	4,5	7	21	M5	36	16	48	3,4	8,1	1	**SA5 E**	0,011
6	6	4,5	8	21	M6	36	16	48	3,4	8,1	13	**SA6 E**	0,013
	6	4,5	8	21	M6	42	21	48	3,4	8,1	13	**SA6 C****	0,013
8	8	6,5	10	24	M8	42	21	55	5,5	12,9	15	**SA8 E**	0,026
	8	6,5	10	24	M8	42	21	55	5,5	12,9	15	**SA8 C****	0,026
10	9	7,5	13	29	M10	48	26	63	8,1	17,8	12	**SA10 E**	0,044
	9	7,5	13	29	M10	48	26	63	8,1	17,8	12	**SA10 C****	0,044
12	10	8,5	15	34	M12	54	28	71	10,8	24,5	10	**SA12 E**	0,066
	10	8,5	15	34	M12	54	28	71	10,8	24,5	10	**SA12 C****	0,066
15	12	105	18	40	M14	63	34	83	17	36	8	**SA15 ES**	0,121
	12	105	18	40	M14	63	34	83	17	36	8	**SA15 ES-2RS**	0,121
	12	105	18	40	M14	63	34	83	17	36	8	**SA15 C****	0,121
17	14	115	20	46	M16	69	36	92	21	45	10	**SA17 ES**	0,172
	14	115	20	46	M16	69	36	92	21	45	10	**SA17 ES-2RS**	0,172
	14	115	20	46	M16	69	36	92	21	45	10	**SA17 C****	0,172
20	16	135	24	53	M20x1,5	78	43	105	30	60	9	**SA20 ES**	0,283
	16	135	24	53	M20x1,5	78	43	105	30	60	9	**SA20 ES-2RS**	0,283
	16	135	24	53	M20x1,5	78	43	105	30	60	9	**SA20 C****	0,283
25	20	18	29	64	M24x2	94	53	126	48	83	7	**SA25 ES**	0,504
	20	18	29	64	M24x2	94	53	126	48	83	7	**SA25 ES-2RS**	0,504
	20	18	29	64	M24x2	94	53	126	48	83	7	**SA25 C****	0,504
30	22	20	34	73	M30x2	110	65	147	62	110	6	**SA30 ES**	0,835
	22	20	34	73	M30x2	110	65	147	62	110	6	**SA30 ES-2RS**	0,835
	22	20	34	73	M30x2	110	65	147	62	110	6	**SA30 C****	0,835



Dimensions									Load ratings			Designation	Mass
d	B	C_1 max	d_1 min	d_2 max	d_3	h	l_1 min	l_2 max	dyn.	stat.	α*		
mm									kN	kN			
35	25	22	39	82	M36x2	140	82	182	80	148	6	**SA35 ES**	1,41
	25	22	39	82	M36x3	140	82	182	80	148	6	**SA35 ES-2RS**	1,41
	25	22	39	82	M36x3	140	82	182	80	146	6	**SA35 C-2RS****	1,41
40	28	24	45	92	M39x3	150	86	198	100	180	7	**SA40 ES**	1,86
	28	24	45	92	M39x3	150	86	198	100	180	7	**SA40 ES-2RS**	1,86
	28	24	45	92	M39x3	150	86	198	100	180	7	**SA40 2RSC****	1,86
45	32	28	50	102	M42x3	163	92	217	127	240	7	**SA45 ES**	2,57
	32	28	50	102	M42x3	163	92	217	127	240	7	**SA45 ES-2RS**	2,57
	32	28	50	102	M42x3	163	92	217	127	240	7	**SA45 C-2RS****	2,57
50	35	31	55	112	M45x3	185	104	246	156	290	6	**SA50 ES**	3,58
	35	31	55	112	M45x3	185	104	246	156	290	6	**SA50 ES-2RS**	3,58
	35	31	55	112	M45x3	185	104	246	156	290	6	**SA50 C-2RS****	3,58
60	44	39	66	135	M52x3	210	115	282	245	450	6	**SA60 ES**	5,73
	44	39	66	135	M52x3	210	115	282	245	450	6	**SA60 ES-2RS**	5,73
	44	39	66	135	M52x3	210	115	282	245	450	6	**SA60 C-2RS****	5,73
70	49	43	77	160	M56x4	235	125	318	315	610	6	**SA70 ES**	7,94
	49	43	77	160	M56x4	235	125	318	315	610	6	**SA70 ES-2RS**	7,94
	49	43	77	160	M56x4	235	125	318	315	610	6	**SA70 C-2RS****	7,94
80	55	48	88	180	M64x4	270	140	365	400	750	6	**SA80 ES**	12,06
	55	48	88	180	M64x4	270	140	365	400	750	6	**SA80 ES-2RS**	12,06
	55	48	88	180	M64x4	270	140	365	400	750	6	**SA80 C-2RS****	12,06

For left hand thread. Suffix "L" is added to bearings number and thread sign, eg. SAL30ES. Sliding contact surface: steel/steel. Available with increased thread
*The sizes are not binding.
**Sliding contact surface: steel/PTFE.

Rod ends for hydraulic components

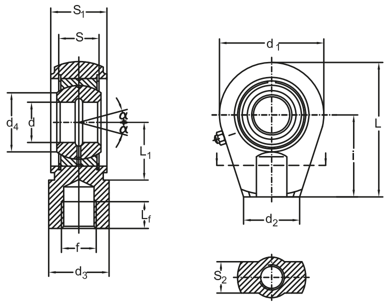


TAC...

Dimensions											Designation
d	S	d_1	l	d_2	d_3	d_4	S_1	L	L_1	L_2	
mm											-
10	9	29	24	15	13	3	7	38,5	14	2	**TAC 210**
12	10	34	27	17,5	15	3	8	44	16	2	**TAC 212**
15	12	40	31	21	18	4	10	51	18	2,5	**TAC 215**
17	14	46	35	24	20,5	4	11	58	20	3	**TAC 217**
20	16	53	38	27,5	24	4	13	65,4	23	3	**TAC 220**
25	20	64	45	33,5	29	4	17	77	27	4	**TAC 225**
30	22	73	51	40	34	4	19	87,5	30	4	**TAC 230**
35	25	82	61	47	39,5	4	21	102	37	4	**TAC 235**
40	28	92	69	52	45	4	23	115	44	5	**TAC 240**
45	32	102	77	58	50,5	6	27	128	48	5	**TAC 245**
50	35	112	88	62	56	6	30	144	58	6	**TAC 250**
60	44	135	100	70	66,5	6	38	167,5	68	8	**TAC 260**
70	49	160	115	80	77,5	6	42	195	78	10	**TAC 270**
80	55	180	141	95	89	6	47	231	91	10	**TAC 280**

Contact surface: steel / steel
The sizes are not binding.

Rod ends for hydraulic components



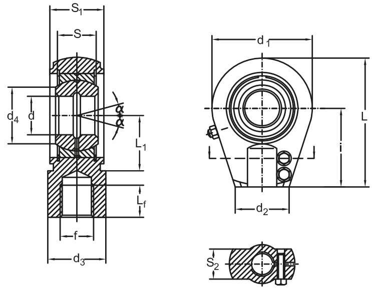
TAPR...N

Dimensions													Designation
d	S	d_1	l	L_f	d_2	d_3	d_4	S_1	S_2	L	L_1	f	
mm													-
20	16	56	50	17	36	25	24	19	17	80	25	M16x1,5	**TAPR 420 N**
25	20	56	50	17	36	25	29	23	21	80	28	M16x1,5	**TAPR 425 N**
30	22	64	60	23	40	32	34	28	26	94	30	M22x1,5	**TAPR 430 N**
35	25	78	70	29	50	40	39,5	30	28	112	38	M28x1,5	**TAPR 435 N**
40	28	94	85	36	60	49	45	35	33	135	45	M35x1,5	**TAPR 440 N**
50	35	116	105	46	72	61	56	40	37	168	55	M45x1,5	**TAPR 450 N**
60	44	130	130	59	90	75	66,5	50	46	200	65	M58x1,5	**TAPR 460 N**
70	49	154	150	66	100	86	77,5	55	51	232	75	M65x1,5	**TAPR 470 N**
80	55	176	170	81	125	102	89	60	55	265	80	M80x2	**TAPR 480 N**
90	60	206	210	101	146	124	98	65	60	323	90	M100x2	**TAPR 490 N**
100	70	230	235	111	166	138	109,5	70	65	360	105	M110x2	**TAPR 495 N**
110	70	265	265	125	190	152	121	80	75	407,5	115	M120x3	**TAPR 496 N**
120	85	340	310	135	257	172	135,5	90	85	490	140	M130x5	**TAPR 497 N**

Contact surface: steel / steel
The sizes are not binding.

ART BEARINGS

Rod ends for hydraulic components

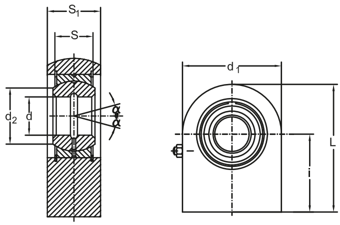


TAPR...U

Dimensions													Designation
d	S	d_1	l	L_f	d_2	d_3	d_4	S_1	S_2	L	L_1	f	
mm													-
20	16	56	50	17	36	25	24	19	17	80	25	M16x1,5	**TAPR 520 U**
25	20	56	50	17	36	25	29	23	21	80	28	M16x1,5	**TAPR 525 U**
30	22	64	60	23	40	32	34	28	26	94	30	M16x1,5	**TAPR 530 U**
35	25	78	70	29	50	40	39,5	30	28	112	38	M28x1,5	**TAPR 535 U**
40	28	94	85	36	60	49	45	35	33	135	45	M35x1,5	**TAPR 540 U**
50	35	116	105	46	72	61	56	40	37	168	55	M45x1,5	**TAPR 550 U**
60	44	130	130	59	90	75	66,5	50	46	200	65	M58x1,5	**TAPR 560 U**
70	49	154	150	66	100	86	77,5	55	51	232	75	M65x1,5	**TAPR 570 U**
80	55	176	170	81	125	102	89	60	55	265	80	M80x2	**TAPR 580 U**
90	60	206	210	101	146	124	98	65	60	323	90	M100x2	**TAPR 590 U**
100	70	230	235	111	168	138	109,5	70	65	360	105	M110x2	**TAPR 595U**
110	70	265	265	125	190	152	121	80	75	407,5	115	M120x3	**TAPR 596 U**
120	85	340	310	135	257	172	135	90	85	490	140	M130x5	**TAPR 597 U**

Contact surface: steel / steel
The sizes are not binding.

Rod ends for hydraulic components



TPN....

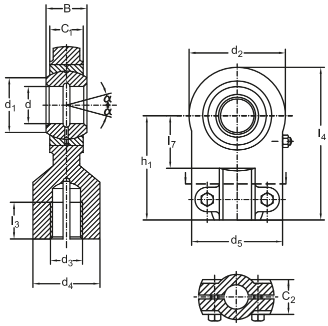
Dimensions							Designation
d	S	d_1	i	d_2	S_1	L	
mm							-
20	16	50	38	24	19	63	**TPN 320**
25	20	55	45	29	23	72,5	**TPN 325**
30	22	65	51	34	28	83,5	**TPN 330**
35	25	83	61	39,5	30	102,5	**TPN 335**
40	28	100	69	45	35	119	**TPN 340**
45	32	110	77	50,5	40	132	**TPN 345**
50	35	123	88	56	40	149,5	**TPN 350**
60	44	140	100	66,5	50	170	**TPN 360**
70	49	164	115	77,5	55	197	**TPN 370**
80	55	180	141	89	60	231	**TPN 380**
90	60	226	150	98	65	263	**TPN 390**
100	70	250	170	109,5	70	295	**TPN 395**
110	70	295	185	121	80	332,5	**TPN 396**
120	85	360	210	135,5	90	390	**TPN 397**

Contact surface: steel / steel
The sizes are not binding.

ART BEARINGS

Rod ends for hydraulic components

DIN 24555



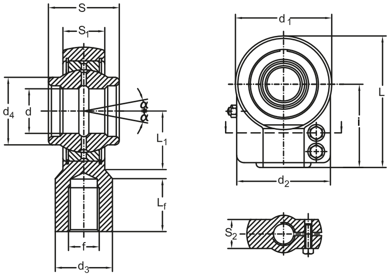
TAPR...DO

Dimensions													Designation
d	B	d_2	d_1	d_3	d_4	d_5	C_1	C_2	h_1	l_3	l_4	l_7	
mm													-
12	10	32	15	M10x1,25	17	40	8	13	42	15	58	18	**TAPR 701 DO**
16	14	42	20	M12x1,25	21	45	11	13	48	17	69	22	**TAPR 702 DO**
20	16	50	25	M14x1,5	25	55	13	17	58	19	83	28	**TAPR 703 DO**
25	20	62	29	M16x1,5	30	62	-	68	23	99	34		**TAPR 704 DO**
30	22	76	34	M20x1,5	36	80	19	-	85	29	123	38	**TAPR 705 DO**
40	28	96	45	M27x2	45	90	23	-	105	37	153	48	**TAPR 706 DO**
50	35	116	55	M33x2	55	105	30	-	130	46	188	62	**TAPR 707 DO**
60	44	150	66	M42x2	68	134	38	-	150	57	255	74	**TAPR 708 DO**
80	55	195	88	M48x2	78	156	47	-	185	64	282,5	98	**TAPR 709 DO**
100	70	235	109	M64x3	100	190	57	-	240	86	357,5	122	**TAPR 710 DO**

Contact surface: steel / steel
The sizes are not binding.

Rod ends for hydraulic components

DIN 24338



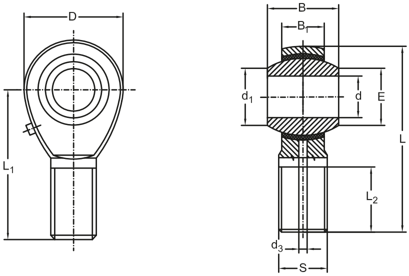
TAPR...CE

Dimensions													**Designation**
d	S	d_1	l	L_f	d_2	d_3	d_4	S_1	S_2	L	L_1	f	
mm													-
12	12	32	38	17	32	16	15,5	10,5	12	54	14	M12x1,25	**TAPR 612 CE**
16	16	40	44	19	40	21	20	13	11,5	64	18	M14x1,5	**TAPR 616 CE**
20	20	47	52	23	47	25	25	17	14	77	22	M16x1,5	**TAPR 620 CE**
25	25	58	65	29	54	30	30,5	21	17	96	27	M20x1,5	**TAPR 625 CE**
32	32	70	80	37	66	38	38	27	22	118	32	M27x2	**TAPR 632 CE**
40	40	89	97	46	80	47	46	32	26	145,5	41	M33x2	**TAPR 640 CE**
50	50	108	120	57	96	58	57	40	32	179	50	M24x2	**TAPR 650 CE**
63	63	132	140	64	114	70	71,5	52	38	211	62	M48x2	**TAPR 663 CE**
70	70	155	160	76	135	80	79	57	42	245	70	M56x2	**TAPR 670 CE**
80	80	168	180	86	148	90	91	66	48	270	78	M64x3	**TAPR 680 CE**
90	90	185	195	91	160	100	99	72	52	296	85	M72x3	**TAPR 690 CE**
100	100	210	210	96	178	110	113	84	62	322	98	M80x3	**TAPR 695 CE**
110	110	235	235	101	190	125	124	88	62	364	105	M90x3	**TAPR 696 CE**
125	125	264	260	106	200	135	138	103	72	405	120	M100x3	**TAPR 697 CE**

Contact surface: steel / steel
The sizes are not binding.

Rod ends

ISO 6126 - 1982

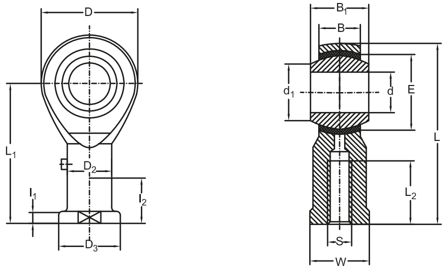


POS
POS...EC

Dimensions									Load ratings		Designation	Mass
d	d_1	B_1	E	B	D	S	L_1	L_2	dyn.	stat.		
mm									kN	kN	-	kg
5	7,7	8	11,11	7	16	M5x0,8	33	20	3,2	7	**POS5***	0,014
	7,7	8	11,11	7,5	18	M5	33	20	3,2	7	**POS5 EC****	0,014
6	9	9	12,70	7	18	M6x1	36	22	3,5	8	**POS6***	0,019
	8,9	9	12,70	7,5	20	M6	36	22	3,5	8	**POS6 EC****	0,019
8	10,4	12	15,88	9	22	M8x1,25	42	25	5,8	13	**POS8***	0,036
	10,3	12	15,88	9,5	24	M8	42	25	5,8	13	**POS8 EC****	0,036
10	12,9	14	19,05	11	26	M10x1,5	48	29	8,6	18	**POS10***	0,060
	12,9	14	19,05	11,5	30	M10	48	29	8,6	18	**POS10 EC****	0,070
12	15,4	16	22,23	12	30	M12x1,75	54	33	11,5	24	**POS12***	0,089
	15,4	16	22,23	12,5	34	M12	54	33	11,5	24	**POS12 EC***	0,110
14	16,9	19	25,40	14	34	M14x2	60	36	17,5	36	**POS14***	0,129
	16,8	19	25,40	14,5	38	M14	60	36	17,5	36	**POS14 EC****	0,130
16	19,4	21	28,58	15	38	M16x2	66	40	20	40	**POS16***	0,181
	19,3	21	28,58	15,5	42	M16	66	40	20	40	**POS16 EC****	0,220
17	20,6	22	30,16	16	40	M16x1,5	69	42	22	45	**POS17***	0,206
18	21,9	23	31,75	17	42	M18x1,5	72	44	27	50	**POS18***	0,250
	21,8	23	31,75	17,5	46	M18x1,5	72	44	27	50	**POS18 EC****	0,290
20	24,4	25	34,93	18	46	M20x1,5	78	47	31	60	**POS20***	0,333
	24,3	25	34,93	18,5	50	M20x1,5	78	47	31	60	**POS20 EC****	0,360
22	25,9	28	38,10	20	50	M22x1,5	84	51	43	72	**POS22***	0,430
	25,8	28	38,1	21	56	M22x1,5	84	51	43	72	**POS22 EC****	0,490
25	29,5	31	42,86	22	56	M24x2	94	57	50	85	**POS25***	0,575
	29,5	31	42,86	23	60	M24x2	94	57	50	85	**POS25 EC****	0,65
28	32,3	35	47,59	25	66	M27x2	103	62	60	90	**POS28***	0,800
	32,2	35	47,59	26	66	M27x2	103	62	60	90	**POS28 EC****	0,870
30	34,9	37	50,80	26	67	M30x2	110	66	66	110	**POS30***	0,996
	34,8	37	50,80	27	70	M30x2	110	66	66	110	**POS30 EC****	1,060

*For left hand thread, suffix "L" is added to bearings number and thread sign, eg. TSML. Sliding contact surface: steel/steel. Available with increased thread. Sliding contact surface: steel/bronze.
**For left hand thread, suffix "L" is added to bearings number and thread sign, eg. TSML...C. Sliding contact surface: steel/steel. Available with increased thread. Sliding contact surface: steel/PTFE. The sizes are not binding.

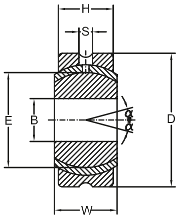
Rod ends
ISO 6126 - 1982



PHS
PHS...EC

Dimensions													**Load ratings**		**Designation**	**Mass**
d	d_1	B_1	E	B	D	S	L_1	L_2	D_2	D_3	l_1	W	dyn.	stat.		
mm													kN	kN	-	kg
5	7,7	8	11,11	7	16	M5x0,8	27	8	9	12	4	9	3,2	7	**PHS5**	0,018
	7,7	8	11,11	7,5	18	M5	27	8	9	12	4	10	3,2	7	**PHS5 EC**	0,018
6	9,0	9	12,71	7	18	M6x1	30	9	10	13	5	11	3,5	8	**PHS6**	0,026
	8,9	9	12,71	7,5	20	M6	30	9	10	13	5	10	3,5	8	**PHS6 EC**	0,026
8	10,4	12	15,88	9	22	M8x1,25	36	12	12,5	16	5	14	5,8	13	**PHS8**	0,045
	10,3	12	15,88	9,5	24	M8	36	12	12,5	16	5	13	5,8	13	**PHS8 EC**	0,045
10	12,9	14	19,05	11	26	M10x1,5	43	15	15	19	6,5	17	8,6	18	**PHS10**	0,076
	12,9	14	19,05	11	26	M10x1,25	43	15	15	19	6,5	17	8,6	18	**PHS10,1**	0,076
	12,9	14	19,05	11,5	30	M10	43	15	15	19	6,5	16	8,6	18	**PHS10 EC**	0,088
	12,9	14	19,05	11,5	30	M10x1,25	43	15	15	19	6,5	16	8,6	18	**PHS10,1 EC**	0,088
12	15,4	16	22,23	12	30	M12x1,75	50	18	17,5	22	6,5	19	11,5	24	**PHS12**	0,114
	15,4	16	22,23	12	30	M12x1,25	50	18	17,5	22	6,5	19	11,5	24	**PHS12,1**	0,114
	15,4	16	22,23	12,5	34	M12	50	18	17,5	22	6,5	18	11,5	24	**PHS12 EC**	0,120
	15,4	16	22,23	12,5	34	M12x1,25	50	18	17,5	22	6,5	18	11,5	24	**PHS12,1 EC**	0,120
14	16,9	19	25,40	14	34	M14x2	57	21	20	25	8	22	17,5	36	**PHS14**	0,158
	16,8	19	25,40	14,5	38	M14	57	21	20	25	8	21	17,5	36	**PHS14 EC**	0,140
16	19,4	21	28,58	15	38	M16x2	64	24	22	27	8	22	20	40	**PHS16**	0,200
	19,4	21	28,58	15	38	M16x1,5	64	24	22	27	8	22	20	40	**PHS16,1**	0,200
	19,3	21	28,58	15,5	42	M16	64	24	22	27	8	24	20	40	**PHS16 EC**	0,240
	19,3	21	28,58	15,5	42	M16x1,5	64	24	22	27	8	24	20	40	**PHS16,1 EC**	0,240
17	20,6	22	30,16	16	40	M16x1,5	67	25	24	31	10	27	22	45	**PHS17**	0,259
18	21,9	23	31,75	17	42	M18x1,5	71	27	25	31	10	27	27	50	**PHS18**	0,288
	21,8	23	31,75	17,5	46	M18	71	27	25	31	10	27	27	50	**PHS18 EC**	0,320
20	24,4	25	34,93	18	46	M20x1,5	77	30	27,5	37	10	30	31	60	**PHS20**	0,372
	24,3	25	34,93	18,5	50	M20	77	30	27,5	37	10	30	31	60	**PHS20 EC**	0,430
22	25,9	28	38,10	20	50	M22x1,5	84	33	30	37	12	32	43	72	**PHS22**	0,475
	25,8	28	38,10	21	56	M22	84	33	30	37	12	34	43	72	**PHS22 EC**	0,610
	29,6	31	42,86	22	56	M24x2	94	36	33,5	42	12	36	50	85	**PHS25**	0,673
25	29,5	31	42,86	23	60	M24	94	36	33,5	42	12	36	50	85	**PHS25 EC**	0,810
28	32,3	35	47,59	25	66	M27x2	103	41	37	46	14	41	60	90	**PHS28**	0,950
	32,2	35	47,59	26	66	M27	103	41	37	46	14	41	60	90	**PHS28 EC**	1,120
30	34,9	37	50,80	26	67	M30x2	110	45	40	50	15	41	66	110	**PHS30**	1,050
	34,8	37	50,80	27	70	M30	110	45	40	50	15	46	66	110	**PHS30 EC**	1,350

Spherical plain bearings



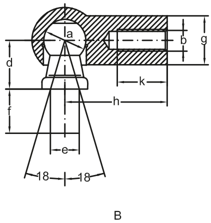
SSR

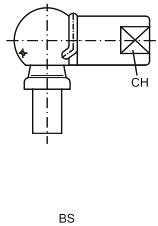
Dimensions									Max static load ratings		Designation	Mass
B	W	H	O	D	R	S	E	α	dyn.	stat.		
mm									kN	kN	-	kg
5	8	7	7,71	16	0,5	1,5	11,11	24	9,30	2,30	**SSR5**	0,010
6	9	7	8,96	18	0,5	1,5	12,7	28	10,70	2,70	**SSR6**	0,012
8	12	9	10,4	22	0,5	1,5	15,88	25	17,20	4,30	**SSR8**	0,024
10	14	11	12,92	26	0,5	1,5	19,05	23	25,10	6,30	**SSR10**	0,040
12	16	12	15,43	30	1	2	22,23	24	32,00	8,00	**SSR12**	0,058
14	19	14	16,86	34	1	2	25,4	23	42,70	10,70	**SSR14**	0,086
15	20	14	18,2	36	1	2	26,99	24	45,30	11,30	**SSR15**	0,098
16	21	15	19,39	38	1	2	28,58	24	51,40	12,90	**SSR16**	0,116
17	22	16	20,63	40	1	2,5	30,16	23	57,90	14,50	**SSR17**	0,135
18	23	17	21,89	42	1,5	2,5	31,75	23	64,80	162,0	**SSR18**	0,157
20	25	18	24,38	46	1,5	2,5	34,93	24	75,40	18,90	**SSR20**	0,200
22	28	20	25,84	50	1,5	2,5	38,1	23	91,40	22,90	**SSR22**	0,262
25	31	22	29,6	56	1,5	3	42,86	23	113,20	28,30	**SSR25**	0,362
28	35	25	32,29	62	1,5	3	47,83	22	142,90	35,70	**SSR28**	0,500
30	37	26	34,81	67	2	3	50,8	23	158,50	39,60	**SSR30**	0,608

Materials: - housing - steel
- insert - bronze
- ball - chrome steel

The sizes are not binding.

Ball joint rod end with spring clamping
DIN 71802



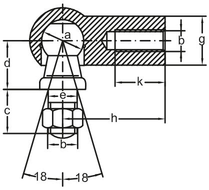


Dimensions									Mass
a H9/h8	b	d	e h11	f	g	h	k	CH*	B and BS
mm								-	kg
8	M5	9	5	4	8	22	10,2	**7**	12,85
8	M5	9	5	7,5	8	22	10,2	**7**	13,35
10	M6	11	6	4,5	10	25	11,5	**8**	21,3
10	M6	11	6	8	10	25	11,5	**8**	22
13	M8	13	8	5	13	30	14	**11**	43,2
13	M8	13	8	10	13	30	14	**11**	45
16	M10	16	10	6	16	35	15,5	**13**	82,3
16	M10	16	10	13	16	35	15,5	**13**	86,6
19	M14x1,5	20	14	12	22	45	21,5	**17**	181
19	M14x2	20	14	18	22	45	21,5	**17**	188,7

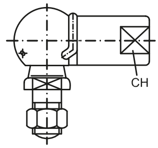
Surface: zinc - plating FeZN7 Uni 4721 - or coarse oiled surface by request.
*Clamping plains.
C45 special.
The sizes are not binding.

Ball joint rod end with spring clamping and safety ring

DIN 71802



A



AS

Dimensions											**Mass**
a H9/h8	b	c	d	e h11	g	h	L_1	L_2	k	CH*	A and AS
mm										-	g
8	M5	10	9	5	8	22	25,2	28,5	10,2	**7**	15,2
10	M6	12	11	6	10	25	30,2	32,5	11,5	**8**	25,2
13	M8	16	13	8	13	30	38,2	39,5	14	**11**	53,1
16	M10	19	16	10	16	35	47,5	47	15,5	**13**	102,8
19	M14x1,5	27	20	14	22	45	62,5	60	21,5	**17**	220,9
19	M14x2	27	20	14	22	45	62,5	60	21,5	**17**	220,9

Surface: zinc - plating FeZN7 Uni 4721 - or coarse oiled surface by request.
*Clamping plains.
C45 special.
The sizes are not binding.

ART BEARINGS

Linear ball bearings bushing

Load Rating

Basic dynamic load rating

This term is arrived at based on an evaluation of a number of identical linear systems individually run in the same conditions, if 90% of them can run with the load with a constant value in a constant direction) for a distance of 50 km without damage caused by rolling fatigue. This is the basis of the rating.

Allowable static moment

This term defines the allowable limit value of static moment load with reference to the amount of permanent deformation similar to that used for evaluation of basic rated load (Co).

Static safety factor

This factor is used based on the application condition as swown in Table 1.

Basic static load rating

This term defines a static load such that, at the contacting position where the maximum stress is exercised, the sum of the permanent deformation of the rolling elements and that of the rolling plane is 0,0001 time of the diameter of the rolling elements.

Static safety factors

Table 1

Condition of use	Low limit of fs
When the shaft has less deflection and shock	1 to 2
When elastic deformation should be considered with respect to pinch load	2 to 4
When the equipment is subject to vibration and impacts	3 to 5

Rating life

Rating life of the linear system

As long as linear system reciprocates while being loaded, continous stress acts on the linear system to couse flaking on the rolling bodies and planes because of material fatigue. The travelling distance of linear system until the first flaking occurs is called the life of the system. The life of the dimensions, structure, material, heat treatment and processing method, when used in the same conditions. This variation is brought about from the essential variations in the material fatigue itself. The rating life defined below is used as an index for the life expectancy of the linear system.

Rating life

Rating life is the total travelling distance that 90% of a group of systems of the same size can reach without causing any flaking when they operate under the same conditions.

The rating life can be obtained from the following equation with the basic dynamic load rating and the load on the linear system:

For ball type:

$$L = \left(\frac{C}{P}\right)^3 \times 50$$

where:

L - rating life, km,
C - basic dynamic load rating, N,
P - load, N.

Consideration and influence of vibration impact loads and distribution of load should be taken into account when designing a linear motion system. It is difficult to calculate the actual load.

The rating life is also affected by the operating temperature. In these conditions, the expression (1) is arranged as follows:

For ball type:

$$L = \left(\frac{f_H^3 \times f_T \times f_C}{f_W \times P}\right) \times 50$$

where:

- L - rating life, km,
- f_H - hardness factor (see figure 1),
- C - basic dynamic load rating, N,
- f_T - temperature coefficient (see figure 2),
- P - load, N,
- f_C - contact coefficient (see table 2),
- f_W - load coefficient (see table 3).

The rating life in hours can be calculated by obtaining the travelling distance per unit time. The rating life in hours can be obtained from the following expression when the stroke length and the number of strokes are constant:

$$L_h = \frac{L \times 10^3}{2\, l_s \times n_1 \times 60},$$

where:

- L_h - rating life in hours, hr,
- l_s - stroke length, m
- L - rating life, km,
- n_1 - no of trokes per minute, cpm.

Hardness factor

The shaft be sufficiently hardened when a linear bushing is used. If not properly hardened, permissible load is lowered and the life of the bushing will be shortened

Fig. 1

Temperature coefficient

If the temperature of the linear system exceeds 100°C, Hardness of the linear system and the shaft lowers to decresure the permissible load compared to that of the linear system used at room temperature rise shortens the rating life.

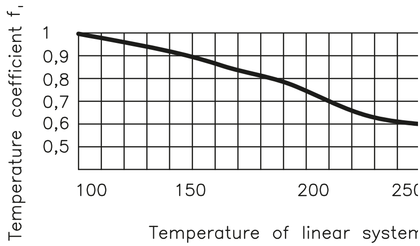


Fig. 2

Contact coefficient

Generally two or more linear bushing are used on one shaft. Thus, the load on each linear system differs depending on each precessing accuracy. Because the linear bushing are not loaded equally, the number of linear bushing per shaft changes the permissible load of system.

Contact coefficient

Table 2

Number of linear system per shaft	Contact coefficient f_c
1	1,00
2	0,81
3	0,72
4	0,66
5	0,61

Load coefficient

When calculating the load on the linear system, it is necessary to accurately obtain object weight, inertial force based on motion speed, moment load, and each transition as time passes. However, it is difficult to calculate those values accurately because reciprocating motion involves the repetition of start and stop as well as vibration and impact. A more practical approach is to obtain the load coefficient by taking the actual oprating conditions into account.

Load coefficient	
	Table 3
Operating Conditions	**f_w**
Operation at low speed (15 m/min. or less) without impulsive shock from outside	1,0 to 1,5
Operation at intermediate speed (60 m/min. or less) without impulsive shock	1,5 to 2,0
Operation at high speed (over 60 m/min.) with impulsive shock from outside	2,0 to 3,5

Frictional resistance

The static frictional resitance of the ART linear system is so low as to be only slightly different from the kinetic frictional resitance, enabling smooth linear movement from low to high speeds. In general, the friction resitance is expressed by the following equation.

F = µ W+f,

where:

F - frictional resitance,
µ - coefficient of friction,
W - load weight,
f - sealing resistance.

The frictional resistance of each ART linear system depends on the model, load weight, speed, and lubricant. The sealing resistance depends on lip interference and lubricant, regardless of the load weigh. The sealing resistance of one linear system is about 200 to 500 gf. The coefficient of friction depends on the load weight, moment load, and preload. Table 6 shows the coefficient of kinetic friction of each type of linear system which has been instaled and lucricated properly and applied with normal load (P/C=0,2)

Coefficient of linear system friction		
		Table 4
Linear System Type	**Models**	**Ambient Working Temperature**
Linear Bushing	LM LME LMB	0,002 to 0,003

Ambient working temperature

The ambient working temperature range for each ART linear system depends on the model. Consult ART on use outside the recommended temperature range.

Temperature conversion equation:

$$C = \frac{5}{9}(F - 32)$$

$$F = 32 + \frac{9}{5}C$$

Ambient working temperature		
		Table 5
Linear System Type	**Models**	**Ambient Working Temperature**
Linear Bushing	LM LME LMB	-20 to 80°C

Lubrication and dust prevention

Using ART linear systems without lubrication increases the abrasion of the rolling elements, shortening the life span. The ART linear systems, therefore require appropriate lubrication. For lubrication ART recommends turbine oil conforming to ISO Standards G32 to G68 or lithium base soap grease no. 2. Some ART linear systems are sealed to block dust out and seal lubricant in. If used in a harsh or corrosive environment, however, apply a protective cover to the part involving linear motion.

Structure and features

The ART linear bushing consists of an outer cylinder, ball retainer, balls and two end rings. The ball retainer which holds the balls, in the recirculating trucks inheld inside the outer cylinder by end rings.

Those parts are assembled to optimize their required function. The outer cylinder is maintained sufficient hardness by heat treatment, therefore if ensures the bushings projected travel life and satisfactory durability.

The ball retainer is made from synthetics to reduce running noise.

High precision and rigidity

The URB linear bushing is reduced from a solid steel outer cylinder and incorporates an industrial strenght resin retainer.

Ease of assembly

The standard type of URB linear bushing can be loaded from any direction. Precision control is possible using only the shaft supporter, and the mounting surface can be machined easily.

Ease of replacement

URB linear bushing od each type are completely interchangeable because of their standardized dimensions and strict precision control. Replacement because of wear or damage is therefore easy and accurate.

Variety of types

URB offers a full line of linear bushing: The standard, integral single - retainer closed type, the clearance adjustable type and the open type. The user can choose from among these according to the application requirements to be met.

Linear ball bushing designation

Designation			
Group I	Group II	Group III	Group IV
Type	Nominal shaft diameter	Modification	Seal

Example:
LM 25 UU AJ

Type:
LM - metric dimension series most widely used in Japan,
LME - metric dimension series generally used in Europe,
LMB - inch dimension series used mainly in USA.

Modification:
No entry - standard type,
AJ - adjustable type,
OP - open type.

Seal:
No entry - no seal,
U - seal on one side,
UU - seals on both sides.

Tolerance

Note that precision of inscribed circle diameters and outside diameters for the clearance adjustable type (...-AJ) and the open type (...-OP) indicates the value obtained before the corresponding type is subjected to cutting process.

Load rating and life expextancy

The life of a linear bushing can be obtained from the following equation with the basic dynamic load rating and the load applied to the bush:

$$L = \left(\frac{f_H \times f_T \times f_C}{f_W \times P} \times \frac{C}{P}\right)^3 \times 50$$

where:
L - ratedlife, km,
C - basic dynamic load rating, N
P - working load, N,
f_w - load coefficient,
f_H - hardness factor (see page 607),
f_T - temperature coefficient (see page 607),
f_C - contact coefficient (see page 607).

The lifespan of a linear bushing in hours can be obtained by calculating the travelling distance per unit time.
The lifespan can be obtained from the following equation if the stroke lenght and the number of strokes are constant:

$$L_h = \left(\frac{L \times 10^3}{2 \times l_s \times n_1 \times 60}\right)$$

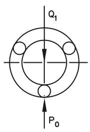
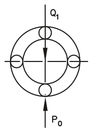
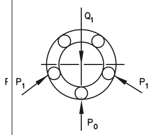
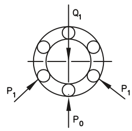
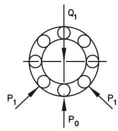
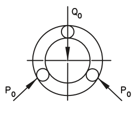
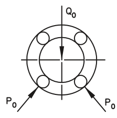
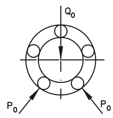
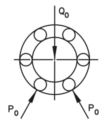
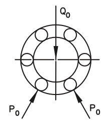
where:
L_h - lifespan, hr,
l_s - stroke lenght, m,
L - rated life, km,
n_1 - number of strokes per minute, cpm.

Relation between ball circuits and load rating

The URB linear bushing includes ball circuits that are spaced equally and circumferentially. The load rating varies according to the loaded position on the circumference.

The value in the dimension table indicates the load rating when the load is placed on top of one ball circuit. If the URB linear bushing is used with two ball circuits loaded uniformly, the load raing will be greater. The following table shows the values by the number of ball circuits in such cases:

Table 6

Row position load ratio	Number of rows				
	3	4	5	6	8
Row position load ratio	 $Q_1 = P_0$	 $Q_1 = P_0$	 $Q_1 = 1{,}106P_0$	 $Q_1 = 1{,}1354P_0$	 $Q_1 = 1{,}841P_0$
Row position	 $Q_0 = P_0$	 $Q_0 = 1{,}414P_0$	 $Q_0 = 1{,}618P_0$	 $Q_0 = 1{,}732P_0$	 $Q_0 = 2{,}052P_0$
Load ratio	$Q_0/Q_1 = 1$	$Q_0/Q_1 = 1{,}414$	$Q_0/Q_1 = 1{,}463$	$Q_0/Q_1 = 1{,}280$	$Q_0/Q_1 = 1{,}115$

Sample calculations

Obtaining the rated life and lifespan the URB linear bushing used in the following conditions:

Linear bushing	LM20
Stroke lenght	50 mm
Number of strokes per minute	50 cpm
Load per bush	490 N

The basic dynamic load rating of the linear bushing is 882N from the dimension table. From equation (1) therefore, the rated life is obtained as follows:

$$L = \left(\frac{f_H \times f_T \times f_C}{f_W \times P} \times \frac{C}{P}\right)^3 \times 50 = \left(\frac{882}{490}\right)^3 \times 50 = 292\,\text{km},$$

where:

$$F_H = f_T = f_C = f_W = 1.0$$

From equation (2), the lifespan is obtained as followes:

$$L_h = \left(\frac{L \times 10^3}{2 \times l_s \times n_1 \times 60}\right) = \left(\frac{292 \times 10^3}{2 \times 0{,}05 \times 50 \times 60}\right) = 973\,\text{hr}$$

Selecting the linear bushing type satisfying the following conditions:

Number of linear bushing used	4
Stroke lenght	1 m
Traveling speed	10 m/min
Number of strokes per minute	5 cpm
Lifespan	10 hr
Total load	980 N

From equation (2), the travelling distance within the lifespan is obtained as follows

$$L = 2 \times l_s \times n_1 \times 60 \times L_h = 6\,000\,\text{km}$$

From equation (1), the basic dynamic load rating is obtained as follows:

$$C = \sqrt[3]{\frac{L}{50}} \times \left(\frac{f_W}{f_H + f_T + f_C}\right) \times P = 1492\,\text{N}$$

Assume the following with a pair of shafts each with two linear bushing:

$$f_C = 0{,}81,\ f_W = f_T = f_H = 1$$

As a result, LM30 is selected from the dimension table as the URB linear bushing type satisfying the value of C.

ART BEARINGS

Clearance and fit

When a standard-type ART linear bushing is used with a shaft, inadequate clearance, adjustment may cause early bush failure and/or poor, rough traveling.

The clearance adjustable linear bush and open linear bush can be clearance adjusted when assembled in the housing which can control the outside cylinder diameter. However, too much clearance adjustment increases the deformation of the outside cylinder, to affect its precision and life. Therefore, the appropriate clearance between the bush and shaft, and clearance between the bush and housing are required according to the application. Table 7 shows recommended fit of the bush:

Table 7

Division / Model	Shaft Normal fit High class	Transitional	Housing Loose fit	Tight fit
LM	g6	h6	H7	J7
LMB				
LME	h6	j6	H7	J7

Note. The clearance may be zero or negative. Please attention the movement.

Shaft and housing

To optimize performance of the ART linear bushing high precision of the shaft and housing is required.

Shaft

The rolling balls in the ART linear bushing are in point contact with the shaft surface. Therefore, the shaft dimensions, tolerance, surface finish and hardness greatly afect the travelling performance of the bush. The shaft should be manufactered with due attention to the following points:

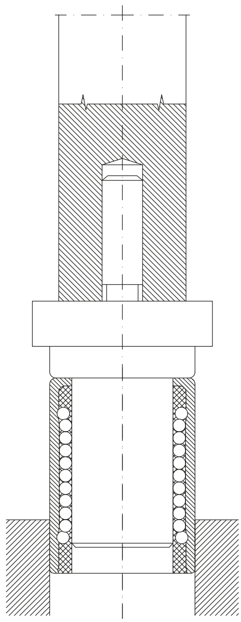
- Since the surface finish critically affects smooth rolling of balls, grind the shaft at 1,5 S or better.
- The best hardness of the shaft is HRC 60 to 64; Hardness less than HRC 60 decreases the life considerably, and hence reduces the permissible load. On the other hand, hardness over HRC 64 accelerates ball wear.
- The shaft diameter for the clearance adjustable linear bush and open linear bush should as much as possible be of the lower value of the inscribed circle diameter in the specification table. Do not set the shaft diameter to the upper value.
- Zero clearance or negative clearance increases the frictional resistance slightly. If the negative clearance is too tight, the deformation of the outside cylinder will become larger, to shorten the bush life.

Housing

There is a wide range of housing differing in design, machining and mounting. For the fitness and shapes of housing see in table 8 and the folowing section on mounting.

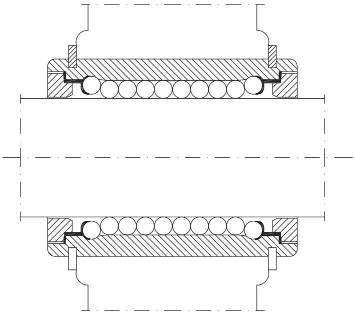
Mounting

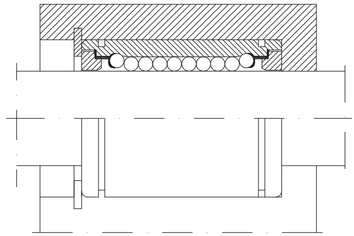
When inserting the linear bush into the bushing do not hit the linear bush on the side ring holding the retainer but apply the cylinder circumference with a proper jig and push the linear bush into the housing by hand or lightly knock it in. In inserting the shaft after mounting the bush, be careful not to shock the balls. Note that if two shafts are used in parallel, the parallelism is the most important factor to assure the smooth linear movement. Take care in setting the shafts.

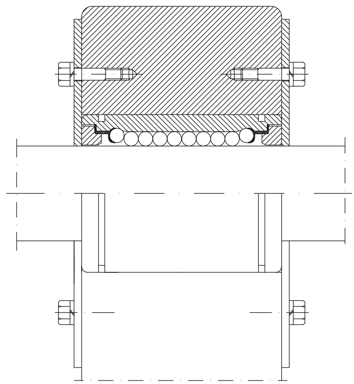


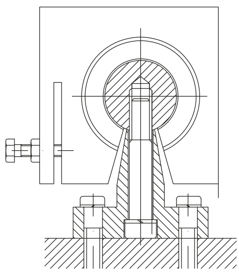
Exemples of mounting

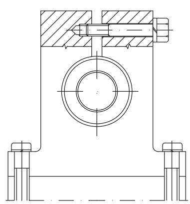
The popular way to mount a linear bush is to operate it with an appropriate interference. It is recommended, however, to make a loose fit in principle because otherwise precision is apt to be minimized. The following examples show assembling of the inserted bush in terms of designing and mounting for reference.











ART BEARINGS

ART ball bushing interchangeability list

Ball bushing compact type

ART	NTN	STAR	INA	SKF	FAG
KH...	KH...	0658 - 0... -00	KH...	LBBR...	LNA...
				LBBS...	LFA
KH... PP	KH...LL	0658 - 2... -40	KN...PP	LBBR...2LS	LNA...2RS
				LBBS...2LS	LFA...2RS

Ball bushing resin retainer

ART	NB	INA	SKF	THK	IKO	THOMSON	EASE
LME	KB...G	KB	LBAR/LBCR	LME...	LBE...	MA M...	SDE
LME...UU	KB...GUU	KB...PP	LBAR/LBCR...2LS	LME...UU	LBE...UU	MA M...WW	SDE...UU
LME...AJ	KB...GAJ	KBS...	LBAS...	LME...AJ	LBE...AJ	MA M...ADJ	SDE...AJ
LME...UUAJ	KB...GUUAJ	KBS...PP	LBAS...2LS	LME...UUAJ	LBE...UUAJ	MA M...ADJ WW	SDE...UUAJ
LME...OP	KB...GOP	KBO...	LBAT/LBCT...	LME...OP	LBE...OP	MA M...OPN	SDE...OP
LME...UUOP	KB...GUUOP	KBO...PP	LBAT/LBCT...2LS	LME...UUOP	LBE...UUOP	MA M...OPN WW	SDE...UUOP

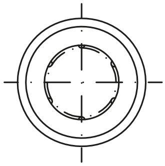
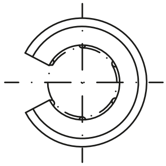
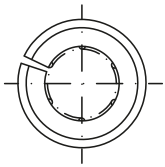
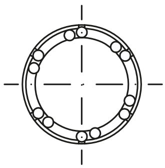
The above types are metric dimension series generally used in Europe.

ART	NB	THK	EASE
LM	SM...G	LM...	SDM
LM...UU	SM...GUU	LM...UU	SDM...UU
LM...AJ	SM...GAJ	LM...AJ	SDM...AJ
LM...UUAJ	SM...GUUAJ	LM...UUAJ	SDM...UUAJ
LM...OP	SM...GOP	LM...OP	SDM...OP
LM...UUOP	SM...GUUOP	LM...UUOP	SDM...UUOP

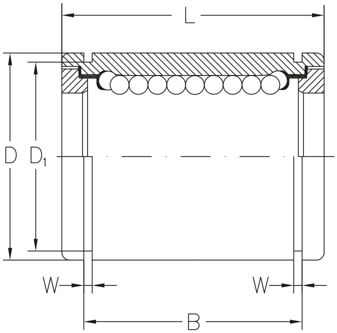
The above types are metric dimension series generally used in Japan and other countries.

ART	NB	THK	EASE
LMB	SW...G	LMB...	SDB
LMB...UU	SW...GUU	LMB...UU	SDB...UU
LMB...AJ	SW...GAJ	LMB...AJ	SDB...AJ
LMB...UUAJ	SW...GUUAJ	LMB...UUAJ	SDB...UUAJ
LMB...OP	SW...GOP	LMB...OP	SDB...OP
LMB...UUOP	SW...GUUOP	LMB...UUOP	SDB...UUOP

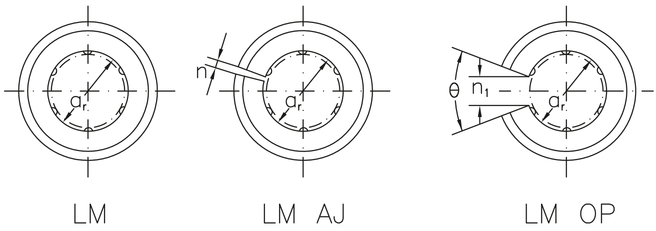
The above types are inch dimension series generally used in US.

Standard type 	page 615 - 620	
Open type 	page 615 - 620	One ball circuit (50° - 80°) is removed to allow an opening slot to fit over rail supports.
Adjustable type 	page 615 - 620	This type has a slot in the outside cylinder. This design allows for clearance adjustment.
Drawn cup type 	page 621	This type linear ball bushing consist of thin walled drawn cups, plastic cages and grade 10 steel balls. Bushings are available with seals at one or both ends.

Linear ball bushing



Nominal part no.						Nominal shaft diameter
Standard type	Seal type	Ball circuit	Mass	Adjustable type	Open type	Tolerance
-	-		gr	-	-	mm
LM5	**LM5 UU**	4	4	**-**	**-**	$5^{\ 0}_{-0,008}$
LM6	**LM6 UU**	4	8	**LM6 AJ**	**-**	$6^{\ 0}_{-0,009}$
LM8 S	**LM8 SUU**	4	11	**LM8 SAJ**	**-**	8
LM8	**LM8 UU**	4	16	**LM8 AJ**	**-**	8
LM10	**LM10 UU**	4	30	**LM10 AJ**	**-**	10
LM12	**LM12 UU**	4	31,5	**LM12 AJ**	**LM12 OP**	12
LM13	**LM13 UU**	4	43	**LM13 AJ**	**LM13 OP**	13
LM16	**LM16 UU**	4	69	**LM16 AJ**	**LM16 OP**	16
LM20	**LM20 UU**	5	87	**LM20 AJ**	**LM20 OP**	$20^{\ 0}_{-0,010}$
LM25	**LM25 UU**	6	220	**LM25 AJ**	**LM25 OP**	25
LM30	**LM30 UU**	6	250	**LM30 AJ**	**LM30 OP**	30
LM35	**LM35 UU**	6	390	**LM35 AJ**	**LM35 OP**	$35^{\ 0}_{-0,012}$
LM40	**LM40 UU**	6	585	**LM40 AJ**	**LM40 OP**	40
LM50	**LM50 UU**	6	1580	**LM50 AJ**	**LM50 OP**	50
LM60	**LM60 UU**	6	2000	**LM60 AJ**	**LM60 OP**	$60^{\ 0}_{-0,015}$



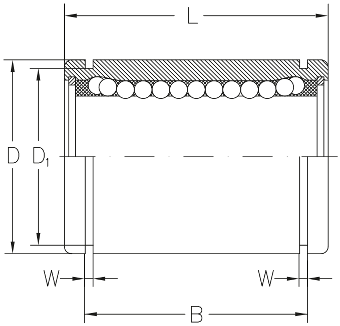
Major dimensions and tolerance

D Tolerance	L Tolerance	B Tolerance	W	D1	H	h1		Eccentricity max	Radial clearance max	Basic load C	Rating C_0	Nominal part no.
mm								µm		kN		
$10^{\ 0}_{-0,009}$	$15^{\ 0}_{-0,012}$	$10,2^{\ 0}_{-0,2}$	1,1	9,6	-	-	-	8	-3	0,17	0,21	**LM5**
$12^{\ 0}_{-0,011}$	$19^{\ 0}_{-0,02}$	$13,5^{\ 0}_{-0,2}$	1,1	11,5	1	-	-	12	-5	0,21	0,27	**LM6**
$15^{\ 0}_{-0,011}$	$17^{\ 0}_{-0,02}$	$11,5^{\ 0}_{-0,2}$	1,1	14,3	1	-	-	12	-5	0,18	0,23	**LM8S**
$15^{\ 0}_{-0,011}$	$24^{\ 0}_{-0,02}$	$17,5^{\ 0}_{-0,2}$	1,1	14,3	1	-	-	12	-5	0,27	0,41	**LM8**
$19^{\ 0}_{-0,013}$	$29^{\ 0}_{-0,02}$	$22^{\ 0}_{-0,2}$	1,3	18	1	-	-	12	-5	0,38	0,56	**LM10**
$21^{\ 0}_{-0,013}$	$30^{\ 0}_{-0,02}$	$23^{\ 0}_{-0,2}$	1,3	20	1,5	8	80º	12	-5	0,42	0,61	**LM12**
$23^{\ 0}_{-0,013}$	$32^{\ 0}_{-0,02}$	$23^{\ 0}_{-0,2}$	1,3	22	1,5	9	80º	12	-7	0,52	0,79	**LM13**
$28^{\ 0}_{-0,013}$	$37^{\ 0}_{-0,02}$	$26,5^{\ 0}_{-0,2}$	1,6	27	1,5	11	80º	12	-7	0,79	1,2	**LM16**
$32^{\ 0}_{-0,016}$	$42^{\ 0}_{-0,02}$	$30,5^{\ 0}_{-0,2}$	1,6	30,5	1,5	11	60º	15	-9	0,88	1,4	**LM20**
$40^{\ 0}_{-0,016}$	$59^{\ 0}_{-0,03}$	$41^{\ 0}_{-0,3}$	1,85	38	2	12	50º	15	-9	1	1,6	**LM25**
$45^{\ 0}_{-0,016}$	$64^{\ 0}_{-0,03}$	$44,5^{\ 0}_{-0,3}$	1,85	43	2,5	15	50º	15	-9	1,6	2,8	**LM30**
$52^{\ 0}_{-0,019}$	$70^{\ 0}_{-0,03}$	$49,5^{\ 0}_{-0,3}$	2,1	49	2,5	17	50º	20	-13	1,7	3,2	**LM35**
$60^{\ 0}_{-0,019}$	$80^{\ 0}_{-0,03}$	$60,5^{\ 0}_{-0,3}$	2,1	57	3	20	50º	20	-13	2,2	4,1	**LM40**
$70^{\ 0}_{-0,022}$	$100^{\ 0}_{-0,03}$	$74^{\ 0}_{-0,3}$	2,6	76,5	3	25	50º	20	-13	3,9	8,1	**LM50**
$80^{\ 0}_{-0,022}$	$110^{\ 0}_{-0,03}$	$85^{\ 0}_{-0,3}$	3,15	86,5	3	30	50º	25	-16	4,8	10,2	**LM60**

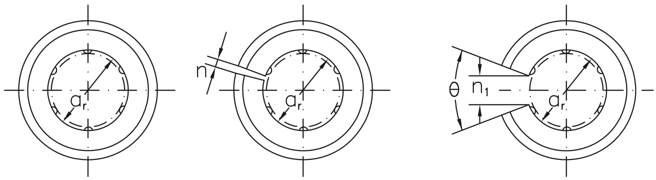
LM < Built-in synthetics resin retainers >
This type is a metric dimension series widely used in Japan and other countries.

ART BEARINGS

Linear ball bushing



Nominal part no.						Nominal shaft diameter
Standard type	Seal type	Ball circuit	Mass	Adjustable type	Open type	Tolerance
-	-		gr	-	-	mm
LME5	**LME5 UU**	3	11	**LME5 AJ**	**-**	5 $^{+0,008}_{0}$
LME8	**LME8 UU**	4	20	**LME8 AJ**	**-**	8
LME12	**LME12 UU**	4	41	**LME12 AJ**	**LME12 OP**	12
LME16	**LME16 UU**	4	57	**LME16 AJ**	**LME16 OP**	16 $^{+0,009}_{-0,001}$
LME20	**LME20 UU**	5	91	**LME20 AJ**	**LME20 OP**	20
LME25	**LME25 UU**	6	215	**LME25 AJ**	**LME25 OP**	25 $^{+0,011}_{-0,001}$
LME30	**LME30 UU**	6	325	**LME30 AJ**	**LME30 OP**	30
LME40	**LME40 UU**	6	705	**LME40 AJ**	**LME40 OP**	40 $^{+0,013}_{-0,002}$
LME50	**LME50 UU**	6	1130	**LME50 AJ**	**LME50 OP**	50
LME60	**LME60 UU**	6	2220	**LME60 AJ**	**LME60 OP**	60



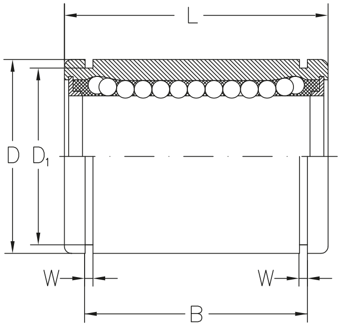
LME LME AJ LME OP

Major dimensions and tolerance

D Tolerance	L Tolerance	B Tolerance	W	D1	H	h1		Eccentricity max	Radial clearance max	Basic load C	Rating C_0	Nominal part no.
mm								µm		kgF		
12 $^{0}_{-0,008}$	22 $^{0}_{-0,02}$	14,5 $^{0}_{-0,2}$	1,1	11,5	1	-	-	12	-5	21	27	**LME5**
16 $^{0}_{-0,008}$	25 $^{0}_{-0,02}$	16,5 $^{0}_{-0,2}$	1,1	15,2	1	-	-	12	-5	21	41	**LME8**
22 $^{0}_{-0,009}$	32 $^{0}_{-0,02}$	22,9 $^{0}_{-0,2}$	1,3	21	1,5	7,5	78°	12	-7	52	79	**LME12**
26 $^{0}_{-0,009}$	36 $^{0}_{-0,02}$	24,9 $^{0}_{-0,2}$	1,3	24,9	1,5	10	78°	12	-7	59	91	**LME16**
32 $^{0}_{-0,011}$	45 $^{0}_{-0,02}$	31,5 $^{0}_{-0,2}$	1,6	30,3	2	10	60°	15	-9	88	140	**LME20**
40 $^{0}_{-0,011}$	58 $^{0}_{-0,03}$	44,1 $^{0}_{-0,3}$	1,85	37,5	2	12,5	60°	15	-9	100	160	**LME25**
47 $^{0}_{-0,011}$	68 $^{0}_{-0,03}$	52,1 $^{0}_{-0,3}$	1,85	44,5	2	12,5	50°	15	-9	160	280	**LME30**
62 $^{0}_{-0,013}$	80 $^{0}_{-0,03}$	60,6 $^{0}_{-0,3}$	2,15	59	3	16,8	50°	17	-13	220	410	**LME40**
75 $^{0}_{-0,013}$	100 $^{0}_{-0,03}$	77,6 $^{0}_{-0,3}$	2,65	72	3	21	50°	17	-13	390	810	**LME50**
90 $^{0}_{-0,015}$	125 $^{0}_{-0,04}$	101,7 $^{0}_{-0,4}$	3,15	86,5	3	27,2	54°	20	-13	480	1020	**LME60**

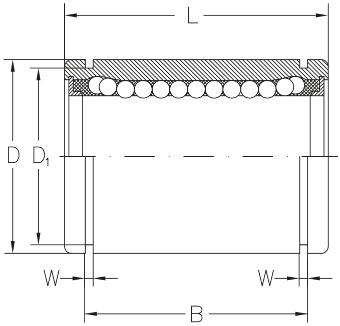
LM < Built-in synthetics resin retainers >
This type is a metric dimension series generally used in Europe.

Linear ball bushing



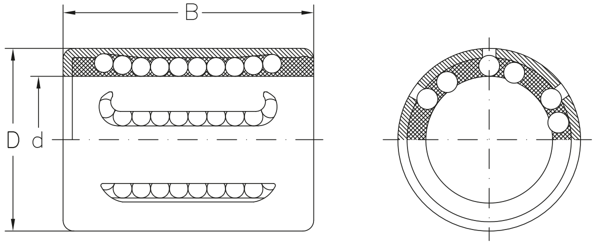
Nominal diameter	Nominal part no. Standard type	Seal type	Ball circuit	Mass	Adjustable type	Open type	Nominal shaft diameter	Tolerance	Major dimensions and tolerance D	Tolerance
inch/mm	-	-		kg	-	-	inch/mm			
1/4 6,350	**LMB4**	**LMB4 UU**	4	0,008	**LMB4 AJ**	**-**	0,250 6,350	0 -0,0040	0,5000 12,700	0 -0,00045
										0 -0,011
3/8 9,525	**LMB6**	**LMB6 UU**	4	0,014	**LMB6 AJ**	**-**	0,3750 9,525		0,6250 15,875	0 -0,00050
1/2 12,700	**LMB8**	**LMB8 UU**	4	0,037	**LMB8 AJ**	**LMB8 OP**	0,5000 12,700	0 -0,0090	0,8750 22,225	0 -0,013
5/8 15,875	**LMB10**	**LMB10 UU**	4	0,076	**LMB10 AJ**	**LMB10 OP**	0,625 15,875		1,1250 28,575	
3/4 19,050	**LMB12**	**LMB12 UU**	5	0,095	**LMB12 AJ**	**LMB12 OP**	0,7500 19,050	0 -0,0040	1,2500 31,750	0 -0,00065
1 25,400	**LMB16**	**LMB16 UU**	6	0,200	**LMB16 AJ**	**LMB16 OP**	1,0000 25,400		1,5625 39,688	
1-1/4 31,750	**LMB20**	**LMB20 UU**	6	0,440	**LMB20 AJ**	**LMB20 OP**	1,2500 31,750	0 -0,0050	2,0000 50,800	0 -0,00075
1-1/2 38,000	**LMB24**	**LMB24 UU**	6	0,670	**LMB24 AJ**	**LMB24 OP**	1,5000 38,100		2,3750 60,325	0 -0,019
2 50,800	**LMB32**	**LMB32 UU**	6	0,114	**LMB32 AJ**	**LMB32 OP**	2,0000 50,800	0 -0,0010	3,0000 76,200	0 -0,00090
										0 -0,022

LM < Built-in synthetics resin retainers >
This type is a metric dimension series widely used in Japan and other countries



L	Tolerance	B	Tolerance	W	D1	h	h1	θ	Eccen-tricity max	Radial clearance max	Basic load rating C	C_0	Nominal part no.
inch/mm													
0,7500	0	0,5110	0	0,390	0,4687	0,04			0,0005	-0,0001			
19,050	-0,008	12,98	-0,008	0,992	11,906	1	-	-	12	-3	206	265	**LMB4**
	0		0										
	-0,200		-0,200										
0,8750		0,6358		0,390	0,5880	0,04			0,0005	-0,0001			
22,225		16,15		0,992	14,935	1	-	-	12	-3	225	314	**LMB6**
1,2500		0,9625		0,0459	0,8209	0,06	0,34		0,0005	-0,0001			
31,750		24,46		1,168	20,853	1,5	7,9375	80º	12	-4	510	764	**LMB8**
1,5000		1,1039		0,0559	1,0590	0,06	0,375		0,0005	-0,0001			
38,100		28,04		1,422	26,899	1,5	9,525	80º	12	-4	774	1180	**LMB10**
1,6250		1,1657		0,0559	1,1760	0,06	0,4375		0,0006	-0,0002			
41,275		29,61		1,422	29,870	1,5	11,1125	60º	15	-6	862	1370	**LMB12**
2,2500	0	1,7547	0	0,0679	1,4687	0,06	0,5625		0,0006	-0,0002			
57,150	-0,012	44,57	-0,012	1,727	37,306	1,5	14,2875	50º	15	-6	980	1570	**LMB16**
2,6250	0	2,0047	0	0,0679	1,8859	0,10	0,625		0,0008	-0,0003			
66,675	-0,300	50,92	-0,300	1,727	47,904	2,5	15,875	50º	20	-8	1570	2740	**LMB20**
3,000		2,4118		0,0859	2,2389	0,12	0,75		0,0008	-0,0003			
76,200		61,26		2,184	56,870	3	19,05	50º	20	-8	2180	4020	**LMB24**
4,000		3,1917		0,1029	2,8379	0,12	1,0		0,0010	-0,0005			
101,600		81,07		2,616	72,085	3	25,40	50º	25	-13	3820	7940	**LMB32**
	0												
	-0,022												

Standard linear ball bushing
Steel drawn cup/cage plastic



Dimensions			Load capacity		Designation	Mass
d	D	B	dyn.	stat.	bearing	
mm					-	g
6	12	22	400	239	**KH0622**	7
8	15	24	435	280	**KH0824**	12
10	17	26	500	370	**KH1026**	14,5
12	19	28	620	510	**KH1228**	18,5
14	21	28	620	520	**KH1428**	20,5
16	24	30	800	620	**KH1630**	27,5
20	28	30	950	790	**KH2030**	32,5
25	35	40	1990	1670	**KH2540**	66
30	40	50	2800	2700	**KH3050**	95
40	52	60	4400	4450	**KH4060**	182
50	62	70	5500	6300	**KH5070**	252

Pillow blocks

Feature

The spherical outside surface ball bearings of ART are deep groove ball bearings with wide and narrow inner rings, consisting of insert bearings (SA200, SB200, UC200, UEL200, UK200, UCX00 and UC300) and various housing. The type of bearing units are defined according to the different mounting methods of the bearings to shafts: the set-screws type, the adapter type, the accentric locking collar type.

The ART housing are mainly casting housing. There are pressed steel plate housing as well align with ease during operation and can be conveniently mounted or dismounted.

The bearing units can operate satisfactorily under working conditions, especially for machines operating in dusty or muddy surroundings. Thus, they are widely used in agricultural, construction and transmission machineries, etc.

There are various types of sealing devices for our products, such as synthetic rubber seals, slinger with synthetic rubber seals and triple lip seals etc.

Sufficient lubricating grease has been put into the bearing during manufacturing, which can act as lubricating as well as rust proof. No more grease is needed to put in during the lubricating period when the bearings operate under normal conditions. Lubricating grease can be added from the fittings when the relubricate bearings operate under hard conditions.

The outer ring of the bearing, has spherical outside surface which can be fitted to the concave spherical surface of the housing, and the fit between them can be clearance fit or interference fit according to different conditions. This combination provides self-alignment between the self-contained bearing and the housing, and compensates for a certain alignment errors or flexing of the shaft when the bearing is in operation. This definitely increases the bearing service life.

Lubrication

The Spherical Outside Surface Ball Bearings of ART generally use CG-2 rust proof lithium based lubricating grease, with physical chemical properties shown in the following table 1. Grease iss filled in the spherical outside surface ball bearings during manufacturing.

Static safety factors

Table 1

Density 1/mm	Without operation Operated 60 times	268 260
Dropping point ºC		128
Mechanical impurities pc/gr	10-25 µm	within 1000
	25-75 µm	within 500
	above 75 µm	0
Base oil kinematical viscosity 40º cst		80,3

The bearings usually operate below the temperature of 120ºC (the measuring temperature of the outer rings is 100ºC). Grease life reduction has to be taken into account when the bearing continues to operate at a temperature should not be lower than -30ºC.

The permissible speed of rotation is connected with the fit between shaft and bearing. It is reconnected with the fit between shaft and bearing. It is recommended that, under normal operating conditions, the fit between the bearing and the shaft is h7. Looser fit allowing lower speed is recommended when heavier load is applied.

Tolerance for bearing units

Tolerances on inner rings of bearing with cylindrical bore
Unit: 0.001 mm

Table 2

Nominal bore diameter		Cylindrical bore						Radial run-out
		bore diameter dm		d		width Bi		
d		deviations		deviations		deviations		
over	incl.	high	low	high	low	high	low	max.
mm								
10	18	+18	0	+22	-4	0	-120	12
18	30	+21	0	+25	-4	0	-120	15
30	50	+25	0	+30	-5	0	-120	18
50	80	+30	0	+36	-6	0	-150	22
80	120	+35	0	+42	-7	0	-200	28
120	150	+40	0	+48	-8	0	-250	35

Note: dm is defined as the arithmetical mean of the largest and smallest diameter obtained by two-point measurements.

Tolerances on inner rings of bearings with tapered bore
Unit: 0.001 mm

Table 3

Nominal bore diameter		Δd		Δd1-Δd	
d		deviations			
over	incl.	high	low	max.	min.
mm					
18	30	+33	0	+21	0
30	50	+39	0	+25	0
50	80	+46	0	+30	0
80	120	+54	0	+35	0
120	150	+63	0	+40	0

Note: The deviation from nominal taper are defined by the limits of (Δd1-Δd), where Δd1 is actual deviations of d1 from nominal diameter at the largest end of bore and Δd is actual deviation of d from bearing bore nominal diameter.
d1 is obtained by the following formula:
d1 = d + 0.083333 B, where B is width of the bearing inner ring.
The nominal taper angle = 2º 23′9,4″.

Please refer to the figures 1.

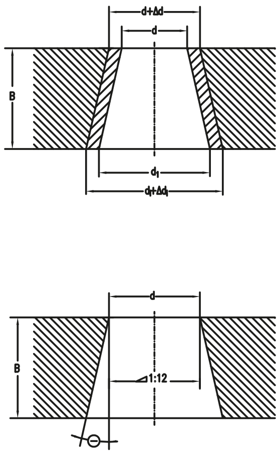


Fig. 1

Tolerances on outer ring
Unit: 0.001 mm

Table 4

Nominal bore diameter D over	incl.	D_m deviations high	low	Radial run-out max.
mm				
40	50	0	-11	20
50	80	0	-13	25
80	120	0	-15	35
120	150	0	-18	40
150	160	0	-25	45

Note: D_m is defined as the arithmetical means of the largest and the smallest diameter obtained by two-point measurement.
The low deviation of outside diameter D_m does not apply within the distance of 1/4 the width of outer ring from the sides.

Tolerance for distance "h" between the radial plane passing through center of outer ring and a side of inner ring
Unit: 0.001 mm

Table 5

Nominal bore diameter d over	incl.	n deviations
mm		
40	50	± 200
50	80	± 250
80	120	± 300
120	160	± 350

Please refer to the figures 2.

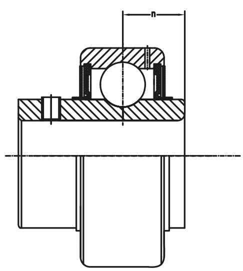


Fig. 2

Chamfer dimensions

Table 6

Nominal dimensions r	r max.	r min.
mm		
1	1.5	0.6
1.5	2	1
2	2.5	1.5
2.5	3	2
3	3.5	2.5
3.5	4	3
4	4.5	3.5
5	6	4

Please refer to the figures 3.

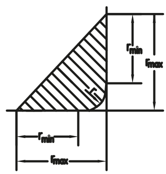


Fig. 3

Center height tolerances for pillow block type housing

Please refer to below figures 4 and table 7

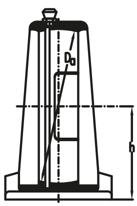


Fig. 4

Tolerances for flaged type housing (F, FS, FL, FT, FA, FB, FC)

Please refer below figures 5a, 5b and table 8a, 8b.

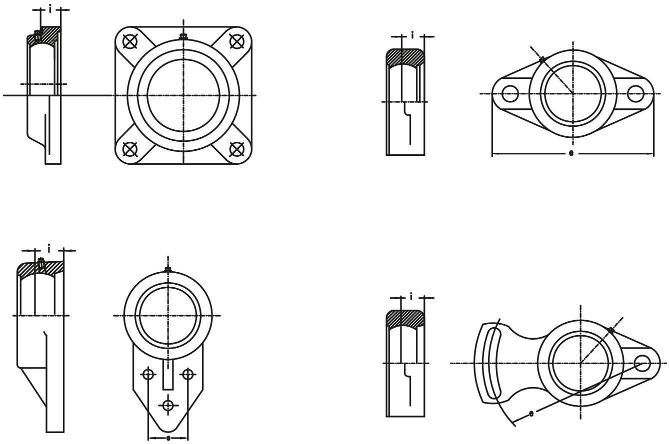


Fig. 5a

Tolerances for flanged type housings (F, FS, FL, FT, FA, FB)
Center height tolerances for pillow block type housings
Unit: 0.001 mm

Table 7

Housing number						**h** deviations
mm						
			AK204			
P203			AK205	PA203		
P204			AK206	PA204	PH204	
P205		P305	AK207	PA205	PH205	
P206	PX05	P306	AK208	PA206	PH206	±150
P207	PX06	P307	AK209	PA207	PH207	
P208	PX07	P308	AK210	PA208	PH208	
P209	PX08	P309	AK211	PA209	PH209	
P210	PX09	P310	AK212	PA210	PH210	
P211	PX10	P311	AK213	PA211	PH211	
P212	PX11	P312	AK214	PA212	PH212	
P213	PX12	P313	AK215	PA213	PH213	
P214	PX13	P314			PH214	
P215	PX14	P315			PH215	±200
P216	PX15	P316			PH216	
P217	PX16					
P218						

Unit: 0.001 mm

Table 8a

Housing number								e deviations	i deviations
mm									
F204		FL204		FT204	FS204	FA204	FB204		
F205	F305	FL205	FL305	FT205	FS205	FA205	FB205		
F206	F306	FL206	FL306	FT206	FS206	FA206	FB206		
F207	F307	FL207	FL307	FT207	FS207	FA207	FB207	±700	±500
F208	F308	FL208	FL308	FT208	FS208	FA208	FB208		
F209	F309	FL209	FL309	FT209	FS209	FA209	FB209		
F210	F310	FL210	FL310	FT210	FS210	FA210	FB210		
F211	F311	FL211	FL311	FT211	FS211	FA211	FB211		
F212	F312	FL212	FL312	FT212	FS212	FA212	FB212		
F213	F313	FL213	FL313	FT213	FS213	FA213	FB213		
F214	F314	FL214	FL314	FT214	FS214				
F215	F315	FL215	FL315		FS215			±1000	±800
F216		FL216							
F217		FL217							
F218		FL218							

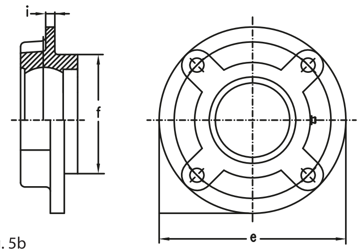


Fig. 5b

Tolerance for take-up type housing (T,ST)

Please refer to below figure 6 and table 9a, 9b.

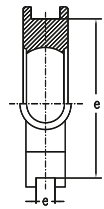


Fig. 6

Tolerance for flaged type housing (FC)
Unit: 0.001 mm

Table 8b

Housing number	f deviations high	f deviations low	e deviations	i deviations	Radial run-out of machined pilot max
mm					
FC 204					
FC 205	0	-46			
FC 206					
FC 207			± 700	± 500	200
FC 208					
FC 209	0	-54			
FC 210					
FC 211					
FC 212					
FC 213					
FC 214					
FC 215	0	-63	± 1000	± 800	300
FC 216					
FC 217					
FC 218	0	-72			

Tolerances for take-up type housing (T)
Unit: 0,001 mm

Table 9a

Housing number	k deviations high	k deviations low	e deviations	Parallelism of guide max
mm				
T204	+200		0	500
T210	0		- 500	
T211	+300		0	600
T217	0		- 800	

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Tolerances for take-up type housing (ST)
Unit: 0.001 mm

Table 9b

Housing number	k deviations high	k deviations low	e deviations	Parallelism of guide max
mm				
ST204	+500		± 250	500
ST210	-250			
ST211	+1000		± 250	600
ST215	- 250			

Note:
Dam = (Da max + Da min) / 2
Da max - maximum measured value of Da
Da min - minimum measured value of Da

Dimensional tolerances for spherical inside diameter of housing are classified as H7 for clearance fit and J7 for interference fit.

As the self - contained for bearings are equipped with locking-pin, clearance fit H7 is normally applied.

Tolerances on spherical inside diameter
Unit: 0.001 mm

Table 10

Nominal spherical inside diameter D_a over	incl.	**Symbol H7** D_{am} deviations high	deviations low	**Symbol J7** D_a deviations high	deviations low	D_{am} high	deviations low	Da high	low
mm									
30	50	+25	0	+30	-5	+14	-11	+19	- 16
50	80	+30	0	+36	-6	+18	-12	+24	- 18
80	120	+35	0	+42	-7	+22	-13	+29	- 20
120	180	+40	0	+48	-8	+26	-14	+34	- 22
180	250	+46	0	+55	-9	+30	-16	+39	- 25

Machining tolerances

Table 11

Nominal dimension over	incl.	**Dimensional** tolerance
mm		
4	16	± 0,2
16	63	± 0,3
63	250	± 0,5

Casting tolerances on lenght

Table 12

Nominal dimension over	incl.	**Dimensional** tolerance
mm		
up	100	± 1,5
100	200	± 2,0
200	400	± 3,0
400	800	± 4,0

Casting tolerances on thickness

Table 13

Nominal dimension over	incl.	**Dimensional** tolerance
mm		
up	5	± 1
5	10	± 1,5
10	20	± 2
20	30	± 3
30	50	± 3,5

One side maching tolerances

Table 14

Nominal dimension over	incl.	**Dimensional** tolerance
mm		
up	5	± 1
5	100	± 1,5
100	200	± 2
200	400	± 3

Note:
Dimensional tolerances and deviations are for ordinary grade;
Dimensional tolerances on lenght and thickness may be added with deviations on draft taper.

Radial internal clearance of bearings

The radial internal clearance of the bearing for the unit is the same as the value of ISO 5753, the internal radial clearance for the spherical outside surface ball bearing is usually greater than that for the same size of deep groove ball bearing. The clearance for the cylindrical bore bearing is shown in table 15, while the clearance for the tapered bore bearing is shown in table 16.

Radial internal clearance of cylindrical bore bearings
(with set-screws and eccentric locking collar)
Unit: 0,001 mm

Table 15

Nominal bore diameter		**Clearance symbol**					
d		C2		normal		c3	
over	incl.	min.	max.	min.	max.	min.	max.
mm							
10	18	3	18	10	25	18	33
18	24	5	20	12	28	20	36
24	30	5	20	12	28	23	41
30	40	6	20	13	33	28	46
40	50	6	23	14	36	30	51
50	65	8	28	18	43	38	61
65	80	10	30	20	51	46	71
80	100	12	36	24	58	53	84
100	120	15	41	28	66	61	97
120	140	18	48	33	88	71	114

Radial internal clearance of tapered bore bearings
(with adapter sleeve)
Unit: 0,001 mm

Table 16

Nominal bore diameter		**Clearance symbol**					
d		C2		normal		c3	
over	incl.	min.	max.	min.	max.	min.	max.
mm							
10	18	10	25	18	33	25	45
18	24	12	28	20	36	28	48
24	30	12	28	23	43	30	61
30	40	13	33	28	46	40	64
40	50	14	36	30	51	45	73
50	65	18	43	38	61	55	90
65	80	20	51	46	71	65	105
80	100	24	58	53	84	75	120
100	120	28	66	61	97	90	140
120	140	33	81	71	114	150	160

Bearing Size selection

The bearing size is usually selected according to the required life and reliability under a specific type of load charged on the spherical outside surface ball bearing

The load applied to the bearing operating under static or slow oscillating and rotating (n<10r/min) condition is defined as dynamic load.

The load capacity of the bearing is expressed by the basic dynamic load rating which is shown in the spherical outside surface ball bearing's table.

Under normal mounting, lubricating and maintaining conditions, the operating bearing will have fatigue flaking due to the repeating action of variable load charged on the contact area between the rings and rolling elements. Generally, the fatigue flaking is the cause of normal damage of rolling bearings. Therefore, the usual bearing life refers to the bearing fatigue life. The life of group of apparently identical bearings operating under a considerable dispersion. For this reason, the bearing life is closely connected with the damaging probability or the reliability requirement.

The radial rating load of ball bearing with 90% reliability and 500 hours minimum life is shown in figure 7.

Life:	The life of a rolling bearing is defined as the total number of revolution which the bearing is capable of enduring before the first evidence of fatigue flaking develops on any one rings or rolling elements.
Reliability:	The reliability is the percentage of the bearings of a group of apparently identical bearings operating under identical conditions which can expect to attain or exceed a certain defined life. The reliability of individual bearings is the probability of the bearing to attain or exceed a defined life.
Basic rating life:	For a group of apparently identical rolling bearings operating under identical conditions, the basic rating life is defined as the total number of revolutions that 90% of the bearings can be expected to complete or exceed.

Basic rating life

The fatigue rating life of spherical outside surface ball bearings is calculated by the following formula:

$$L_{10} = \left(\frac{C}{P}\right)^3, \text{ or } \frac{C}{P} = L_{10}^{1/3}$$

where:

L_{10} - basic rating life, 10^6r

P - basic dynamic load rating, N

N - equivalent dynamic bearing load, N

The basic dynamic load rating C is a hypothetical constant load with a fixed direction under which the bearing can attain a basic life of one milion revolutions theoretically. For radial bearings, the load refers to the radial load.

The equivalent dynamic bearing load P is a constant load with a fixed direction under which the bearing life is identical to that of the bearing operating under actual load.

For a bearing operating with a constant rotation speed, the basic rating life can be expressed in terms of operating hours:

$$L_{10h} = \frac{10^6}{60\,n}\left(\frac{C}{P}\right)^3, \text{ or } L_{10h} = \frac{10^6}{60\,n}\ L_{10h} = \frac{16666}{n}\left(\frac{C}{P}\right)^3$$

where:

L_{10h} - basic rating life, h

n - bearing operating speed of rotation, r/min

For easier calculation, 500 hours as base of rating life is taken, and the speed factor f_n and the life factor f_h is introduced.

$$f_n = \left(\frac{331/3}{n}\right),\ f_h = \left(\frac{L_{10h}}{500}\right)$$

In this, the formula is simplified to:

$$C = \frac{f_h}{f_n} P\ ,$$

The values of f_h and f_n can be found in figure 7 by referring to the operation speed n and the anticipated bearing service life L_{10h}. Then, with the radial load (or the equivalent dynamic bearing load), the basic dynamic load rating can be determined according to the spherical outside surface ball bearing's table. If the bearing operate under indeterminate loads and rotaion speed, the following formula should be applied when calculating the bearing life:

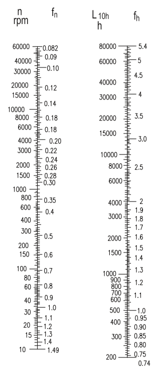
$$P_m = \sqrt[3]{\frac{1}{N}\int_0^N P^3 dN}$$

where:

P_m - mean equivalent dynamic bearing load, N

P - equivalent dynamic bearing load, N

N - total revolution numbers with one load changing cycle, r



Anticipated bearing service life

When selecting a bearing, one should usually predetermine an appropriate service life according to the relevant machine type, operating condition and reliability requirement. Generally the anticipated bearing service life can be determined by refering to the maintenance period of a machine.

Calculating method of equivalent dynamic bearing load P.

The basic equivalent dynamic bearing load is determined under a hypothetical condition. When calculating the bearing life, the actual load has to be converted to dynamic bearing load which is in conformity with the load condition determining the dynamic load rating. General equation for calculating the equivalent dynamic bearing load:

$$P = XF_r + YF_a,$$

where:

- P - equivalent dynamic bearing load, N
- F_r - actual radial load, N
- F_a - actual axial load, N
- X - radial factor
- Y - thrust factor

The values of X and Y are determined by the ratio between the applied axial load Fa and the basic static load rating C0. The axial load which the spherical outside surface ball bearing can carry is determined by the mounting method of the bearing on the shaft.

For bearing of set-screw Locking type or eccentric Locking collar type, if flexible shafts are applied and the set-screws are tightened enough, the axial load Fa which the bearings can carry not surpass 20% of the radial load Fr.

For bearing of adapter sleeve Locking type, if the nut is properly tightened, the axial load Fa can be maximally 15% to 20% of the radial load.

The value of radial and thrust factors X and Y for spherical outside surface ball bearings can be obtained from the following Table 17.

When twist load is applied to the bearing, the equivalent dynamic bearing load is calculated by the following equation:

$$P_m = f_m P$$

where:

- P_m - equivalent dynamic bearing load when considering twist load
- f_m - twist load factor, which is defined as follows:
  - when the twist load is small: fm = 1,5
  - when the twist load is big: fm = 2

Example of bearing size selection

When shocking load is applied to the bearing, the equivalent dynamic bearing load can be calculated by the following equation:

$$P_d = f_d P$$

where:

- P_d - equivalent dynamic bearing load when considerating shocking load
- f_d - shocking load factor, which is defined as follows:
  - when no shocking load or mirror shocking load is applied: fd = 1-1,2
  - when adequate shocking load is applied: fd = 1,2 - 1,8

How to select the size of bearing: one spherical outside surface ball bearings is to operate at a rotation speed of 1000r/min under only a radial load of F_r = 3000 N, with a basic rating life of a least 20,000 hours.

Select the bearing size

From the required rotation speed it can be found that: f_n = 0,322 (figure 7 shows about 0,32, refer to page 631).

From the required basic rating life (anticipated service life), it can be found that:

f_h = 3,42 (figure 7 shows about 3,4, refer to page 631).

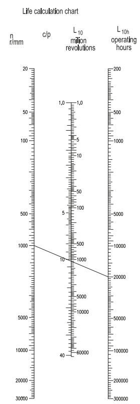
Under only radial load, i.e.

$$P = Fr = 3000 \text{ N}$$

Therefore,

$$C = \frac{\int h}{\int n} P = \frac{3{,}42}{0{,}322} = 31{,}863 \text{ N}$$

A simplified way to calculate the bearing life can be applied by using figure 8.



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Radial and thrust factors X and Y for spherical outiside surface ball bearings

Table 17

Clearance for normal						Clearance for C3				
$\frac{Fa}{Ca}$	$\frac{Fa}{Fr} \leq e$		$\frac{Fa}{Fr} > e$		e	$\frac{Fa}{Fr} \leq e$		$\frac{Fa}{Fr} > e$		e
	X	Y	X	Y		X	Y	X	Y	
0,025	1	0	0,56	2	0,22	1	0	0,46	1,74	0,3
0,04	1	0	0,56	1,8	0,24	1	0	0,46	1,61	0,33
0,07	1	0	0,56	1,6	0,27	1	0	0,46	1,46	0,36
0,13	1	0	0,56	1,4	0,31	1	0	0,46	1,3	0,41
0,25	1	0	0,56	1,2	0,37	1	0	0,46	1,14	0,47
0,5	1	0	0,56	1	0,44	1	0	0,46	1	0,54

By connecting n and the required basic rating life L_{10h} with a straight line, it can be found that C/P value is 10,6.

As is know, P = F_r = 3000 N, thus the required basic dynamic load rating is:

C = 3000 x 10,6 = 31,800, N

In this way, we can select the shperical outside surface ball bearings inside this catalogue (refer to pages 699-705).

Adjusted rating life equation

The basic rating life L10 calculated with bearing life calculation formula can be applied to calculate the rating life of bearings made of ordinary bearing steel (i.e. bearing life with reliability of 90%)

Due to more and more of machinery products demanding higher reliability and better quality steel (ISO 281/1-1977), an adjusted rating life calculation equation is suggested. i.e.

L_n = a1 a2 a3 L10

For spherical outside surface ball bearing:

L_n = a1 a2 a3 $(C/P)^3$

where:

Ln - under specified material and lubricating conditions, bearing life with (100-n)% no breaking probability (i.e. reability).

a1 - life adjustment factor for reability (table 18)

a2 - life adjustment factor materials (table 19)

a3 - life adjustment factor for operating conditions (table 20)

Life adjustment factor for reability a_1

Table 18

Reability	90	95	96	97	98	99
%						
L_n	L_{10}	L_5	L_4	L_3	L_2	L_1
a1	1	0,62	0,53	0,44	0,33	0,21

Life adjustment factor for materials a_2

Table 19

Normal chromium bearing steel		a2 = 1
Special smelted bearing steel	Vacuum degassed bearing steel	a2 = 3
	Vacuum resmelted bearing steel	a2 = 5
When material hardness lowered by high frequency	tempering	a2 < 1

Life adjustment factor for operating conditions a_3

Table 20

When under normal operating conditions: - properly mounted - sufficiently lubricated - without outside matters intrustion	a3 = 1
When under operating temperature, the spherical outside surface ball bearings lubricating grease viscosity lower than 13 mm^2/s	a3 < 1

Selection of shaft

The shaft on which bearing units are mounted shall be free from band and flexure.

For the units with cylindrical bore (with set-screws or eccentric locking collar) clearance fit is usually adopted for mounting the units on the shaft, and shaft tolerances in table 21 are recommended for such loose fit, but for high speed or highly accurate operation or such application which is accompanied by heavy shock loads, interference fit is to be adopted. Table 22 shows recommended shaft with inerference fit, the eccentric locking collar may omitted.

Tapered bore bearings permit wider tolerances of the shaft since they are locked to the shaft by means of adapted sleeves.

Recommended shaft tolerances for tapered bore bearings listed in table 23.

Shaft tolerances for clearance fit for bearing with cylindrical bore

Table 21

Shaft diameter		Deviation of tolerances in saft							
		For lower speed		For medium speed		For rather high speed		For high speed	
over	incl.	h9		h8		h7		J6	
mm		max.	min.	max.	min.	max.	min.	max.	min.
10	18	0	-43	0	-27	0	-18	+8	-3
18	30	0	-52	0	-33	0	-21	+9	-4
30	50	0	-62	0	-39	0	-25	+11	-5
50	80	0	-74	0	-46	0	-30	+12	-7
80	120	0	-87	0	-54	0	-35	+13	-9
120	180	0	-100	0	-63	0	-40	+14	-11

Shaft tolerances for interference fit for bearing with cylindrical bore

Table 22

Shaft diameter		Deviation of tolerances in saft							
		Higher speed		Rather heavy load		Highest load		Heavy load	
over	incl.	m6		m7		m6		m7	
mm		max.	min.	max.	min.	max.	min.	max.	min.
10	18	+18	+7	+25	+7	+23	+12	+30	+12
18	30	+21	+8	+29	+8	+28	+15	+36	+15
30	50	+25	+9	+34	+9	+33	+17	+42	+17
50	80	+30	+11	+41	+11	+39	+20	+50	+20
80	120	+35	+13	+48	+13	+45	+23	+58	+23
120	180	+40	+15	+55	+15	+52	+27	+67	+27

Shaft tolerances for bearing with tapered bore

Table 23

Shaft diameter		Deviation of tolerances For shot shaft		Deviation of tolerances For shot shaft	
over	incl.	h9		h10	
mm		max.	min.	max.	min.
10	18	0	-43	0	-70
18	30	0	-52	0	-84
30	50	0	-62	0	-100
50	80	0	-74	0	-120
80	120	0	-87	0	-140
120	180	0	-100	0	-160

Mounting of bearing units on shaft

The bearing units can be easy installed in principle at any place. However, in order to have a long service life, it is desirable that the mounting base if flat and rigid.

In case of either the vibration is caused to the bearing, the alternating movement takes place, the load applied to the bearing is large, or the shaft rotation speed is rapid, it is desired to provide with the filed seat or concave section at the part where the set-screws contact with the shaft. If large thrust load is charged, it is recommended that joggling tightened with nuts be used to install the bearing most effectively to the shaft: as shown in figure 9.

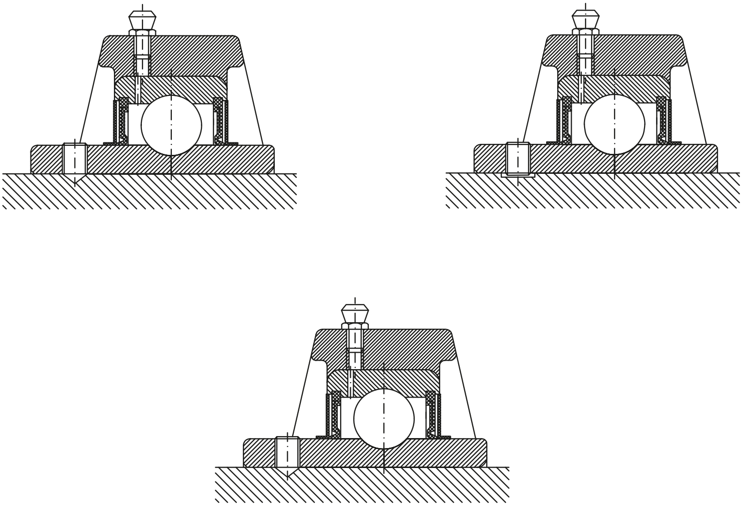


Fig. 9

Bearings units with adapter sleeve

Bearing unit with adapter sleeve permits wider shaft tolerance and can be used in applications where vibrations and shocks are heavly.

Mounting processes of these units as follows:

First, the sleeve is instaled to an arbitrary position. After the shark proof washer is inserted, the nut is tightened.

The proper nut tightening condition can be obtained if it is tightened enough by hand and then rotated by 2/5 to 3/5 revolution with a spanner.

After tightening the nut, bend the shark proof washer within the slot. Otherwise, the nut may be loosened and creep may be caused between the shaft and sleeve. It is necessary the nut can not be tightened too much.

Bearings units with eccentric locking collar

The eccentric part of the collar mates with the inner ring of the bearing which is made eccentric with the collar. When locked to the shaft by hand in direction of the shaft rotation, the eccentric locking collar tightens automatically to the shaft by force of working radial load. Then, lock the set-srews provided on the collar to fix the eccentric collar to the shaft. At the shaft rotation force or load is not charged on the set-screws directly, it will not loosen during operation.

Bearing units with set-screws

There are two set-screws located at two places on one side of the wide inner ring 120 apart with which the bearing units can be mounted to the shaft. When mounting the bearing to the shaft, the torque shown in the following table 23 is recommended to tighten the set screws to shaft.

The material for cast iron housing

The material of cast iron housing under ISO/DIS GG20, the mechanical properties please refer to table 24.

Proper tightening torque of set-screws

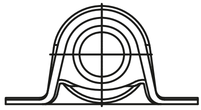
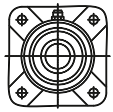
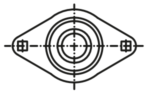
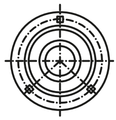
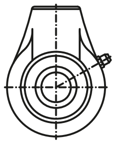
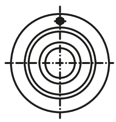
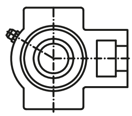
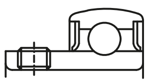
Table 24

Set-screws type	Bearing type	Tightening torque		
mm	inch		N.m	lbf.in
M 5x0,8	No. 10-32 UNF	SB 201 - SB 203, UC 201 - UC 203	3 - 3,5	28
M 6x1	1/4-28 UNF	SB 204 - SB 207, UC 204 - UC 206 SA 201 - SA 206, UEL 201 - UEL 205 UC X05, UC 305 - UC 306	3,5 - 4	30 - 35,4
M 8x1	5/16-24 UNF	SB 208, UC 207 - UC 209 SA 207 - SA 210, UEL 206 - UEL 210 UC X06 - UC X08, UC 307	8,0 - 8,5	69 - 73,5
M 10X1,25	3/8-24 UNF	UC 210 - UC 212 SA 211, UEL 211 - UEL 215 UC X09 - UC X11, UC308 - 309	16,5 - 17,5	144 - 152
M 12X1,25	7/16-20 UNF	UC 213 - UC 218 UC X12 - UC X16 UC 310 - UC 314	26,5 - 27,5	235 - 243
M 14X1,5	1/2-20 UNF	UC 315 - UC 316	33,5 - 34,5	296 - 304

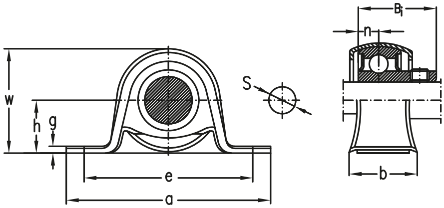
The mechanical properties of cast iron housing

Table 25

Number	Major wall thickness of casting piece	Strain stress	Hardness m6
	mm	N/mm^2	HB
ISO/DIS GG20	2,5-10	220	
U.S.A. Grade 35	>10-20	195	170 - 220
JIS FC20	>20-30	170	
	30-50	160	

Pillow block type	
Flanged units type	
Two bolts flanged units type	
Flanged cartridge units type	
Hanger units type	
Cylindrical cartridge units type	
Take up units type	
Insert bearings	

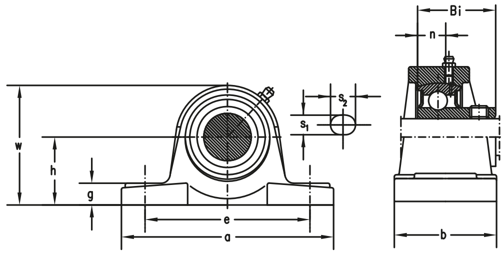
Standard duty pillow blocks pressed steel housing set screws type



Shaft dia.	Nominal dimensions									Bolt size	Unit number	Bearing number	Housing number
	h	a	e	b	s	g	w	Bi	n				
mm											-		
12	22,2	86	68	25	9,5	3,2	43,8	22	6	M8	**SBPP201**	**SB201**	**PP203**
15	22,2	86	68	25	9,5	3,2	43,8	22	6	M8	**SBPP202**	**SB202**	**PP203**
17	22,2	86	68	25	9,5	3,2	43,8	22	6	M8	**SBPP203**	**SB203**	**PP203**
20	25,4	98	76	32	9,5	3,2	50,5	25	7	M8	**SBPP204**	**SB204**	**PP204**
25	28,6	108	86	32	11,5	4	56,6	27	7,5	M10	**SBPP205**	**SB205**	**PP205**
30	33,3	117	95	38	11,5	4	66,3	29	8	M10	**SBPP206**	**SB206**	**PP206**
35	39,7	129	106	42	11,5	4,6	78	32	8,5	M10	**SBPP207**	**SB207**	**PP207**

Note: Inch sizes available on request.

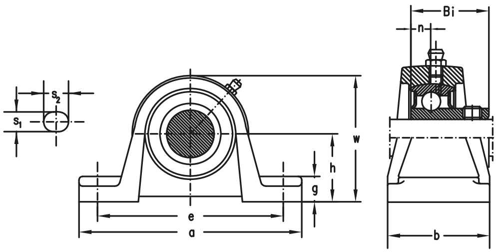
Standard duty pillow blocks cast housing
set screws type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	31,8	128	98	38	11	14	14	63	25	7	M10	**SBAK204**	**SB204**	**AK204**
25	33,3	140	105	40	11	14	15	66,5	27	7,5	M10	**SBAK205**	**SB205**	**AK205**
30	39,7	160	121	44	14	19	17	79	29	8	M12	**SBAK206**	**SB206**	**AK206**
35	46	167	127	48	14	19	18	91	32	8,5	M12	**SBAK207**	**SB207**	**AK207**
40	49,2	181	140	52	14	19	19	98	34	9,5	M12	**SBAK208**	**SB208**	**AK208**

Note: Inch sizes available on request.

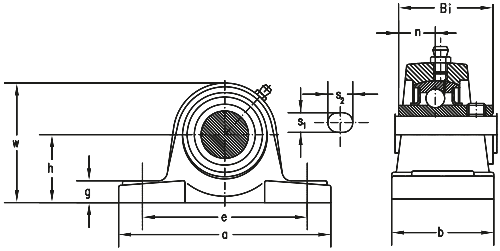
Standard duty pillow blocks cast housing set screws type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	33,3	127	96	35	13	16	14	65	25	7,0	M10	**SBP204**	**SB204**	**P204**
25	36,5	140	105	36	13	19	15	71	27	7,5	M10	**SBP205**	**SB205**	**P205**
30	42,9	160	121	42	14	19	16	84	29	8	M12	**SBP206**	**SB206**	**P206**
35	47,6	167	127	45	15	19	17	94	32	8,5	M12	**SBP207**	**SB207**	**P207**
40	49,2	180	137	49	15	21	18	100	34	9,5	M12	**SBP208**	**SB208**	**P208**

Note: Inch sizes available on request.

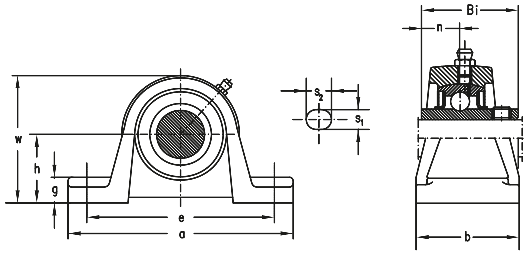
Standard duty pillow blocks cast housing set screws type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	31,8	128	98	38	11	14	14	63	31	12,7	M10	**UCAK204**	**UC204**	**AK204**
25	33,3	140	105	40	11	14	15	66,5	34	14,3	M10	**UCAK205**	**UC205**	**AK205**
30	39,7	160	121	44	14	19	17	79	38,1	15,9	M12	**UCAK206**	**UC206**	**AK206**
35	46,0	167	127	48	14	19	18	91	42,9	17,5	M12	**UCAK207**	**UC207**	**AK207**
40	49,2	181	140	52	14	19	19	98	49,2	19	M12	**UCAK208**	**UC208**	**AK208**
45	52,4	189	146	54	14	19	20	105	49,2	19	M12	**UCAK209**	**UC209**	**AK209**
50	55,6	203	159	57	17,5	21	21	111,5	51,6	19	M16	**UCAK210**	**UC210**	**AK210**
55	61,9	232	181	60	18	24	23	123	55,6	22,2	M16	**UCAK211**	**UC211**	**AK211**
60	68,3	241	191	64	18	24	25	136	65,1	25,4	M16	**UCAK212**	**UC212**	**AK212**
65	74,6	262	203	70	21	28	27	147,5	65,1	25,4	M20	**UCAK213**	**UC213**	**AK213**
70	77,8	266	210	74	21	28	28	153,5	74,6	30,2	M20	**UCAK214**	**UC214**	**AK214**
75	82,6	304	241	78	22	32	30	162	77,8	33,3	M20	**UCAK215**	**UC215**	**AK215**

Note: Inch sizes available on request.

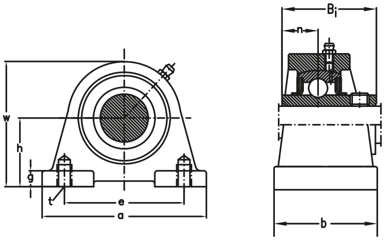
Standard duty pillow blocks cast housing set screws type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
12	30,2	127	96	38	13	16	11	60,7	31	12,7	M10	**UCP201**	**UC201**	**P203**
15	30,2	127	96	38	13	16	11	60,7	31	12,7	M10	**UCP202**	**UC202**	**P203**
17	30,2	127	96	38	13	16	11	60,7	31	12,7	M10	**UCP203**	**UC203**	**P203**
20	33,3	127	96	35	13	16	14	65,0	31	12,7	M10	**UCP204**	**UC204**	**P204**
25	36,5	140	105	36	13	19	15	71,0	34	14,3	M10	**UCP205**	**UC205**	**P205**
30	42,9	160	121	42	14	19	16	84,0	38,1	15,9	M12	**UCP206**	**UC206**	**P206**
35	47,6	167	127	45	15	19	17	94,0	42,9	17,5	M12	**UCP207**	**UC207**	**P207**
40	49,2	180	137	49	15	21	18	100,0	49,2	19	M12	**UCP208**	**UC208**	**P208**
45	54	189	146	50	15	21	20	107,5	49,2	19	M12	**UCP209**	**UC209**	**P209**
50	57,2	204	159	56	19	22	21	114,0	51,6	19	M16	**UCP210**	**UC210**	**P210**
55	63,5	217	172	58	19	22	22	126	55,6	22,2	M16	**UCP211**	**UC211**	**P211**
60	69,9	238	186	64	19	25	24	139	65,1	25,4	M16	**UCP212**	**UC212**	**P212**
65	76,2	262	203	70	23	29	26	149	65,1	25,4	M20	**UCP213**	**UC213**	**P213**
70	79,4	266	210	72	23	29	27	155	74,6	30,2	M20	**UCP214**	**UC214**	**P214**
75	82,6	274	217	74	25	29	28	161,6	77,8	33,3	M20	**UCP215**	**UC215**	**P215**
80	88,9	292	232	78	25	30	30	174	82,6	33,3	M20	**UCP216**	**UC216**	**P216**
85	95,2	310	247	83	25	30	32	186	85,7	34,1	M20	**UCP217**	**UC217**	**P217**
90	101,6	326	262	88	27	30	33	198	96	39,7	M22	**UCP218**	**UC218**	**P218**

Note: Inch sizes available on request.

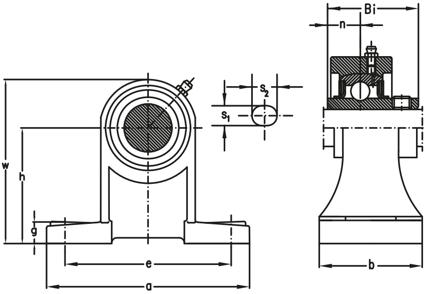
Standard duty pillow blocks cast housing set screws type



Shaft dia.	Nominal dimensions h	a	e	b	g	w	f	t	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
12	30,2	76	52	40	11	62	13	M10	31	12,7	M10	**UCPA201**	**UC201**	**PA204**
15	30,2	76	52	40	11	62	13	M10	31	12,7	M10	**UCPA202**	**UC202**	**PA204**
17	30,2	76	52	40	11	62	13	M10	31	12,7	M10	**UCPA203**	**UC203**	**PA204**
20	30,2	76	52	40	11	62	13	M10	31	12,7	M10	**UCPA204**	**UC204**	**PA204**
25	36,5	84	56	38	12	72	15	M10	34	14,3	M10	**UCPA205**	**UC205**	**PA205**
30	42,9	94	66	48	13	84	18	M14	38,1	15,9	M14	**UCPA206**	**UC206**	**PA206**
35	47,6	110	80	48	13	95	20	M14	42,9	17,5	M14	**UCPA207**	**UC207**	**PA207**
40	49,2	116	84	54	13	100	20	M14	49,2	19	M14	**UCPA208**	**UC208**	**PA208**
45	54,2	120	90	60	13	108	25	M14	49,2	19	M14	**UCPA209**	**UC209**	**PA209**
50	57,2	130	94	60	14	116	25	M16	51,6	19	M16	**UCPA210**	**UC210**	**PA210**
55	63,5	140	104	66	14	125	25	M16	55,6	22,2	M16	**UCPA211**	**UC211**	**PA211**
60	69,9	150	114	68	15	138	25	M16	65,1	25,4	M16	**UCPA212**	**UC212**	**PA212**
65	76,2	160	124	70	15	150	25	M16	65,1	25,4	M16	**UCPA213**	**UC213**	**PA213**

Note: Inch sizes available on request.

Standard duty pillow blocks cast housing set screws type

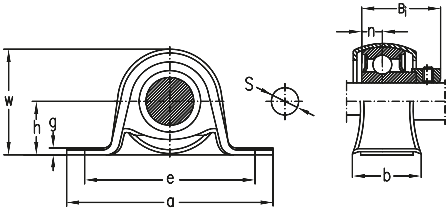


Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
12	70	127	95	40	12	16	13	101	30	12,7	M10	**UCPH201**	**UC201**	**PH204**
15	70	127	95	40	12	16	13	101	30	12,7	M10	**UCPH202**	**UC202**	**PH204**
17	70	127	95	40	12	16	13	101	31	12,7	M10	**UCPH203**	**UC203**	**PH204**
20	70	127	95	40	12	16	13	101	31	12,7	M10	**UCPH204**	**UC204**	**PH204**
25	80	140	105	50	13	19	16	114	34	14,3	M10	**UCPH205**	**UC205**	**PH205**
30	90	165	121	50	17	21	18	130	38,1	15,9	M14	**UCPH206**	**UC206**	**PH206**
35	95	167	127	60	17	21	19	140	42,9	17,5	M14	**UCPH207**	**UC207**	**PH207**
40	100	184	137	66	17	21	20	150	49,2	19,0	M14	**UCPH208**	**UC208**	**PH208**
45	105	190	146	70	17	21	20	158	49,2	19,0	M14	**UCPH209**	**UC209**	**PH209**
50	110	204	159	70	19	22	22	165	51,6	19,0	M16	**UCPH210**	**UC210**	**PH210**
55	120	217	171	75	19	22	23	181	55,6	22,2	M16	**UCPH211**	**UC211**	**PH211**
60	130	236	186	80	19	22	24	197	65,1	25,4	M16	**UCPH212**	**UC212**	**PH212**
65	140	258	203	85	23	28	26	213	65,1	25,4	M20	**UCPH213**	**UC213**	**PH213**
70	150	266	210	90	23	28	27	227	74,6	30,2	M20	**UCPH214**	**UC214**	**PH214**
75	160	274	217	95	23	28	28	240	77,8	33,3	M20	**UCPH215**	**UC215**	**PH215**
80	170	290	232	100	24	28	30	256	82,6	33,3	M20	**UCPH216**	**UC216**	**PH216**

Note: Inch sizes available on request.

ART BEARINGS

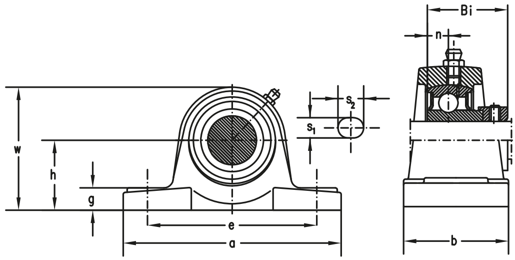
Standard duty pillow blocks pressed steel housing eccentric locking collar type



Shaft dia.	Nominal dimensions h	a	e	b	s	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
12	22,2	86	68	25	9,5	3,2	43,8	28,5	6	M8	**SAPP201**	**SA201**	**PP203**
15	22,2	86	68	25	9,5	3,2	43,8	28,5	6	M8	**SAPP202**	**SA202**	**PP203**
17	22,2	86	68	25	9,5	3,2	43,8	28,5	6	M8	**SAPP203**	**SA203**	**PP203**
20	25,4	98	76	32	9,5	3,2	50,5	29,7	7	M8	**SAPP204**	**SA204**	**PP204**
25	28,6	108	86	32	11,5	4	56,6	30,5	7,5	M10	**SAPP205**	**SA205**	**PP205**
30	33,3	117	95	38	11,5	4	66,3	33,9	8	M10	**SAPP206**	**SA206**	**PP206**
35	39,7	129	106	42	11,5	4,6	78	37,5	8,5	M10	**SAPP207**	**SA207**	**PP207**

Note: Inch sizes available on request.

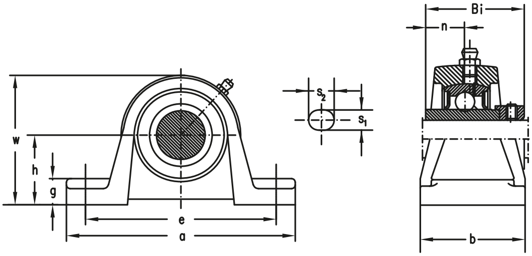
Standard duty pillow blocks pressed steel housing eccentric locking collar type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	31,8	128	98	38	11	14	14	63,0	29,5	7,0	M10	**SAAK204**	**SA204**	**AK204**
25	33,3	140	105	40	11	14	15	66,5	30,5	7,5	M10	**SAAK205**	**SA205**	**AK205**
30	39,7	160	121	44	14	19	17	79	33,9	8	M12	**SAAK206**	**SA206**	**AK206**
35	46	167	127	48	14	19	18	91	37,5	8,5	M12	**SAAK207**	**SA207**	**AK207**
40	49,2	181	140	52	14	19	19	98	40,5	9,5	M12	**SAAK208**	**SA208**	**AK208**
45	52,4	189	146	54	14	19	20	105	42,2	10	M12	**SAAK209**	**SA209**	**AK209**
50	55,6	203	159	57	17,5	21	21	111,5	43,7	10,5	M16	**SAAK210**	**SA210**	**AK210**
55	61,9	232	181	60	18	24	23	123	48,4	11,5	M16	**SAAK211**	**SA211**	**AK211**

Note: Inch sizes available on request.

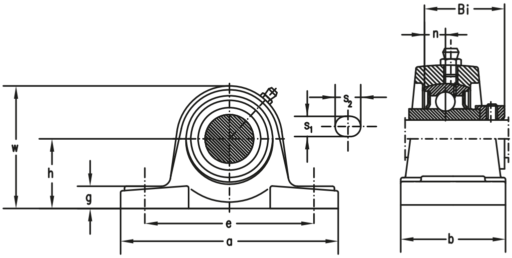
Standard duty pillow blocks cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	33,3	127	96	35	13	16	14	65	29,5	7	M10	**SAP204**	**SA204**	**P204**
25	36,5	140	105	36	13	19	15	71	30,5	7,5	M10	**SAP205**	**SA205**	**P205**
30	42,9	160	121	42	14	19	16	84	33,9	8	M12	**SAP206**	**SA206**	**P206**
35	47,6	167	127	45	15	19	17	94	37,5	8,5	M12	**SAP207**	**SA207**	**P207**
40	49,2	180	137	49	15	21	18	100	40,5	9,5	M12	**SAP208**	**SA208**	**P208**
45	54	189	146	50	15	21	20	107,5	42,2	10	M12	**SAP209**	**SA209**	**P209**
50	57,2	204	159	56	19	22	21	114	43,7	10,5	M16	**SAP210**	**SA210**	**P210**
55	63,5	217	172	58	19	22	22	126	48,4	11,5	M16	**SAP211**	**SA211**	**P211**

Note: Inch sizes available on request.

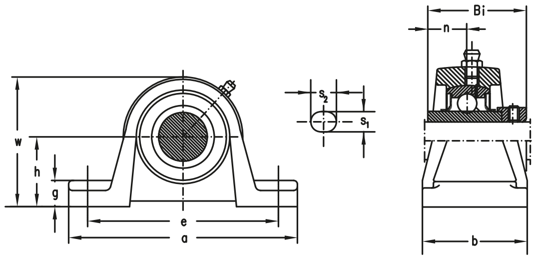
Standard duty pillow blocks cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	31,8	128	98	38	11	14	14	63,0	43,5	17	M10	**UELAK204**	**UEL204**	**AK204**
25	33,3	140	105	40	11	14	15	66,5	44,3	17,4	M10	**UELAK205**	**UEL205**	**AK205**
30	39,7	160	121	44	14	19	17	79,0	48,3	18,2	M12	**UELAK206**	**UEL206**	**AK206**
35	46,0	167	127	48	14	19	18	91,0	51,1	18,8	M12	**UELAK207**	**UEL207**	**AK207**
40	49,2	181	140	52	14	19	19	98,0	56,3	21,4	M12	**UELAK208**	**UEL208**	**AK208**
45	52,4	189	146	54	14	19	20	105,0	56,3	21,4	M12	**UELAK209**	**UEL209**	**AK209**
50	55,6	203	159	57	17,5	21	21	111,5	62,7	24,6	M16	**UELAK210**	**UEL210**	**AK210**
55	61,9	232	181	60	18	24	23	123	71,3	27,7	M16	**UELAK211**	**UEL211**	**AK211**
60	68,3	241	191	64	18	24	25	136	77,7	30,9	M16	**UELAK212**	**UEL212**	**AK212**
65	74,6	262	203	70	21	28	27	147,5	85,7	34,1	M20	**UELAK213**	**UEL213**	**AK213**
70	77,8	266	210	74	21	28	28	153,5	85,7	34,1	M20	**UELAK214**	**UEL214**	**AK214**
75	82,6	304	241	78	21	32	30	162	92,1	37,3	M20	**UELAK215**	**UEL215**	**AK215**

Note: Inch sizes available on request.

Standard duty pillow blocks cast housing eccentric locking collar type

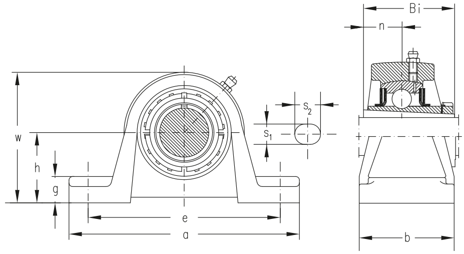


Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
12	30,2	127	96	38	13	16	11	60,7	43,5	17,0	M10	**UELP201**	**UEL201**	**P203**
15	30,2	127	96	38	13	16	11	60,7	43,5	17,0	M10	**UELP202**	**UEL202**	**P203**
17	30,2	127	96	38	13	16	11	60,7	43,5	17,0	M10	**UELP203**	**UEL203**	**P203**
20	33,3	127	96	35	13	16	14	65,0	43,5	17,0	M10	**UELP204**	**UEL204**	**P204**
25	36,5	140	105	36	13	19	15	71,0	44,3	17,4	M10	**UELP205**	**UEL205**	**P205**
30	42,9	160	121	42	14	19	16	84,0	48,3	18,2	M12	**UELP206**	**UEL206**	**P206**
35	47,6	167	127	45	15	19	17	94,0	51,1	18,8	M12	**UELP207**	**UEL207**	**P207**
40	49,2	180	137	49	15	21	18	100,0	56,3	21,4	M12	**UELP208**	**UEL208**	**P208**
45	54	189	146	50	15	21	20	107,5	56,3	21,4	M12	**UELP209**	**UEL209**	**P209**
50	57,2	204	159	56	19	22	21	114,0	62,7	24,6	M16	**UELP210**	**UEL210**	**P210**
55	63,5	217	172	58	19	22	22	126	71,3	27,7	M16	**UELP211**	**UEL211**	**P211**
60	69,9	238	186	64	19	25	24	139	77,7	30,9	M16	**UELP212**	**UEL212**	**P212**
65	76,2	262	203	70	23	25	26	149	85,7	34,1	M20	**UELP213**	**UEL213**	**P213**
70	79,4	266	210	72	23	29	27	155	85,7	34,1	M20	**UELP214**	**UEL214**	**P214**
75	82,6	274	217	74	25	29	28	161,6	92,1	37,3	M20	**UELP215**	**UEL215**	**P215**

Note: Inch sizes available on request.

ART BEARINGS

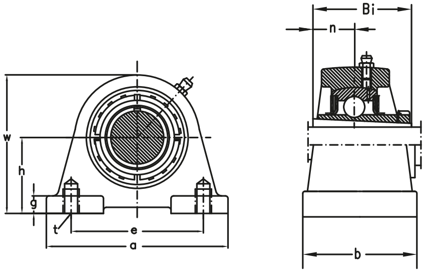
Standard duty pillow blocks cast housing adapter type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	36,5	140	105	36	13	19	15	71	35	M10	**UKP205**	**UK205**	**P205**
25	42,9	160	121	42	14	19	16	84	38	M12	**UKP206**	**UK206**	**P206**
30	47,6	167	127	45	15	19	17	94	43	M12	**UKP207**	**UK207**	**P207**
35	49,2	180	137	49	15	21	18	100	46	M12	**UKP208**	**UK208**	**P208**
40	54	189	146	50	15	21	20	107,5	50	M12	**UKP209**	**UK209**	**P209**
45	57,2	204	159	56	19	22	21	114	55	M16	**UKP210**	**UK210**	**P210**
50	63,5	217	172	58	19	22	22	126	59	M16	**UKP211**	**UK211**	**P211**
55	69,9	238	186	64	19	25	24	139	62	M16	**UKP212**	**UK212**	**P212**
60	76,2	262	203	70	23	29	26	149	65	M20	**UKP213**	**UK213**	**P213**

Note: Inch sizes available on request.

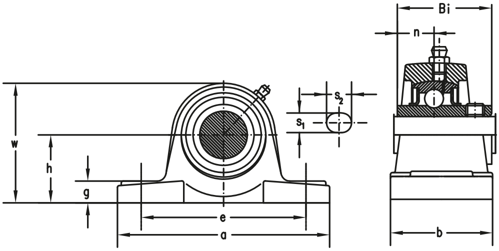
Standard duty pillow blocks cast housing adapter type



Shaft dia.	Nominal dimensions h	a	e	b	g	w	f	t	Bi	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	36,5	84	56	38	12	72	15	M10	35	M10	**UKPA205**	**UK205**	**PA205**
25	42,9	94	66	48	13	84	18	M14	38	M14	**UKPA206**	**UK206**	**PA206**
30	47,6	110	80	48	13	95	20	M14	43	M14	**UKPA207**	**UK207**	**PA207**
35	49,2	116	84	54	13	100	20	M14	46	M14	**UKPA208**	**UK208**	**PA208**
40	54,2	120	90	60	13	108	25	M14	50	M14	**UKPA209**	**UK209**	**PA209**
45	57,2	130	94	60	14	116	25	M16	55	M16	**UKPA210**	**UK210**	**PA210**
50	63,5	140	104	66	14	125	25	M16	59	M16	**UKPA211**	**UK211**	**PA211**
55	69,9	150	114	68	15	138	25	M16	62	M16	**UKPA212**	**UK212**	**PA212**
60	76,2	160	124	70	15	150	25	M16	65	M16	**UKPA213**	**UK213**	**PA213**

Note: Inch sizes available on request.

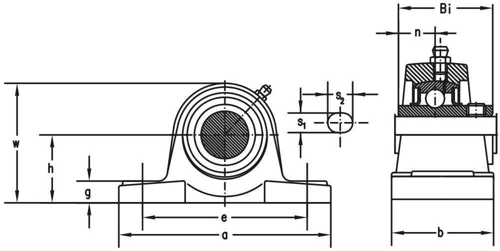
Medium duty pillow blocks cast housing
set screws type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
25	44,4	159	119	51	17	20	17	85	38,1	15,9	M14	**UCPX05**	**UCX05**	**PX05**
30	47,6	175	127	54	17	20	20	93	42,9	17,5	M14	**UCPX06**	**UCX06**	**PX06**
35	54	203	144	57	17	20	21	105	49,2	19	M14	**UCPX07**	**UCX07**	**PX07**
40	58,7	222	156	65	20	23	23	112	49,2	19	M16	**UCPX08**	**UCX08**	**PX08**
45	58,7	222	156	67	20	23	25	116	51,6	19	M16	**UCPX09**	**UCX09**	**PX09**
50	63,5	240	171	71	20	23	25	126	55,6	22,2	M16	**UCPX10**	**UCX10**	**PX10**
55	69,8	260	184	79	25	28	29	137	65,1	25,4	M20	**UCPX11**	**UCX11**	**PX11**
60	76,2	280	203	81	25	28	31	149	65,1	25,4	M20	**UCPX12**	**UCX12**	**PX12**
65	76,2	286	203	83	25	28	33	152	74,6	30,2	M20	**UCPX13**	**UCX13**	**PX13**
70	88,9	320	229	85	27	30	34	170	77,8	33,3	M22	**UCPX14**	**UCX14**	**PX14**
75	88,9	330	229	92	27	30	35	175	82,6	33,3	M22	**UCPX15**	**UCX15**	**PX15**
80	101,6	378	283	99	27	30	37	194	85,7	34,1	M22	**UCPX16**	**UCX16**	**PX16**

Note: Inch sizes available on request.

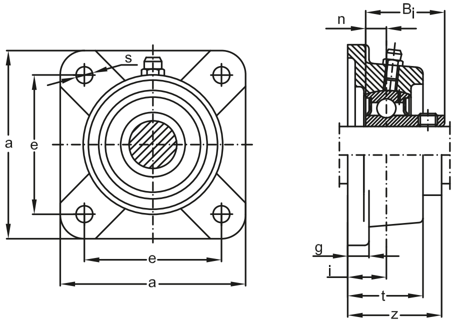
Heavy duty pillow blocks cast housing set screws type



Shaft dia.	Nominal dimensions h	a	e	b	s_1	s_2	g	w	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
25	45	173	132	45	17	20	15	85	38	15	M14	**UCP305**	**UC305**	**P305**
30	50	180	140	50	17	20	15	95	43	17	M14	**UCP306**	**UC306**	**P306**
35	56	210	160	56	17	25	19	106	48	19	M14	**UCP307**	**UC307**	**P307**
40	60	218	170	62	18	25	19	116	52	19	M14	**UCP308**	**UC308**	**P308**
45	67	244	190	66	20	26	23	129	57	22	M16	**UCP309**	**UC309**	**P309**
50	75	271	212	74	20	30	26	143	61	22	M16	**UCP310**	**UC310**	**P310**
55	80	300	236	80	20	32	29	154	66	25	M16	**UCP311**	**UC311**	**P311**
60	85	325	250	85	23	35	31	164	71	26	M20	**UCP312**	**UC312**	**P312**
65	90	335	260	90	25	38	33	176	75	30	M20	**UCP313**	**UC313**	**P313**
70	95	360	280	93	27	40	34	187	78	33	M22	**UCP314**	**UC314**	**P314**
75	100	380	290	100	27	40	35	198	82	32	M22	**UCP315**	**UC315**	**P315**
80	106	400	300	105	27	40	37	210	86	34	M22	**UCP316**	**UC316**	**P316**

Note: Inch sizes available on request.

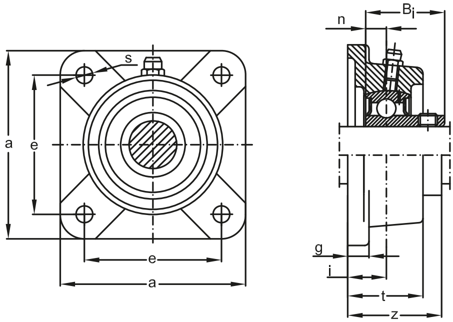
Standard duty flanged units cast housing set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	86	63,5	19	15	29,5	11,5	37,0	25	7,0	M10	**SBFS204**	**SB204**	**FS204**
25	93	70,0	19	15	30,0	11,5	38,5	27	7,5	M10	**SBFS205**	**SB205**	**FS205**
30	106	82,5	20	16	32,5	13,0	41,0	29	8,0	M12	**SBFS206**	**SB206**	**FS206**
35	116	92,0	21	17	35,0	13,0	44,5	32	8,5	M12	**SBFS207**	**SB207**	**FS207**
40	129	101,5	24	17	39,0	14,0	48,5	34	9,5	M12	**SBFS208**	**SB208**	**FS208**

Note: Inch sizes available on request.

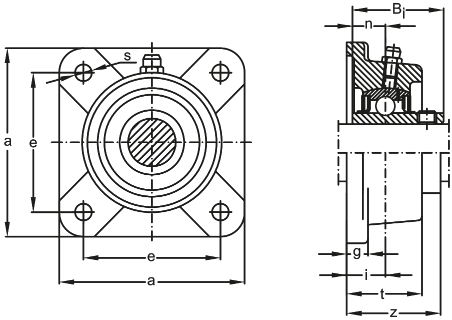
Standard duty flanged units cast housing set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	86	64	15	12	25,5	12	33,0	25	7,0	M10	**SBF204**	**SB204**	**F204**
25	95	70	16	13	27,0	12	35,5	27	7,5	M10	**SBF205**	**SB205**	**F205**
30	108	83	18	13	31,0	12	39,0	29	8,0	M10	**SBF206**	**SB206**	**F206**
35	117	92	19	15	34,0	14	42,5	32	8,5	M12	**SBF207**	**SB207**	**F207**
40	130	102	21	15	36,0	16	45,5	34,0	9,5	M14	**SBF208**	**SB208**	**F208**

Note: Inch sizes available on request.

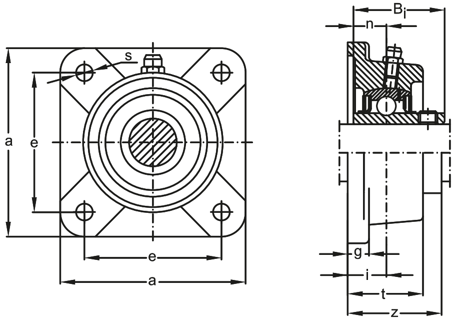
Standard duty flanged units cast housing
set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	86	63,5	19	15	29,5	11,5	37,3	31,0	12,7	M10	**UCFS204**	**UC204**	**FS204**
25	93	70,0	19	15	30,0	11,5	38,7	34,0	14,3	M10	**UCFS205**	**UC205**	**FS205**
30	106	82,5	20	16	32,5	13,0	42,2	38,1	15,9	M12	**UCFS206**	**UC206**	**FS206**
35	116	92,0	21	17	35,0	13,0	46,4	42,9	17,5	M12	**UCFS207**	**UC207**	**FS207**
40	129	101,5	24	17	39,0	14,0	54,2	49,2	19,0	M12	**UCFS208**	**UC208**	**FS208**
45	135	105,0	24	18	40,0	16,0	54,2	49,2	19,0	M14	**UCFS209**	**UC209**	**FS209**
50	143	111,0	28	20	45,0	16,0	60,6	51,6	19,0	M14	**UCFS210**	**UC210**	**FS210**
55	162	130,0	31	21	49,0	17,0	64,4	55,6	22,2	M14	**UCFS211**	**UC211**	**FS211**
60	175	143,0	34	22	53,5	17,0	73,7	65,1	25,4	M14	**UCFS212**	**UC212**	**FS212**
65	184	149,0	38	22	58,0	18,0	77,7	65,1	25,4	M16	**UCFS213**	**UC213**	**FS213**
70	188	152,0	38	23	60,0	18,0	82,4	74,6	30,2	M16	**UCFS214**	**UC214**	**FS214**
75	200	152,4	41	24	62,0	20,0	85,5	77,8	33,3	M16	**UCFS215**	**UC215**	**FS215**

Note: Inch sizes available on request.

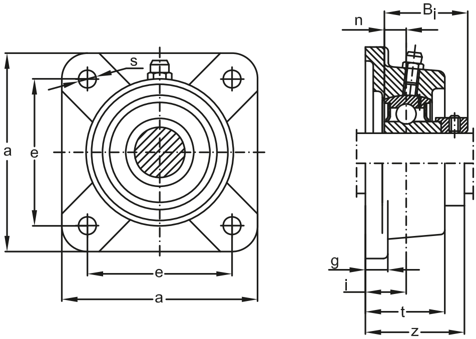
Standard duty flanged units cast housing set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
12	86	64	15	12	25,5	12	33,3	31,0	12,7	M10	**UCF201**	**UC201**	**F204**
15	86	64	15	12	25,5	12	33,3	31,0	12,7	M10	**UCF202**	**UC202**	**F204**
17	86	64	15	12	25,5	12	33,3	31,0	12,7	M10	**UCF203**	**UC203**	**F204**
20	86	64	15	12	25,5	12	33,3	31,0	12,7	M10	**UCF204**	**UC204**	**F204**
25	95	70	16	13	27	12	35,7	34,0	14,3	M10	**UCF205**	**UC205**	**F205**
30	108	83	18	13	31	12	40,2	38,1	15,9	M10	**UCF206**	**UC206**	**F206**
35	117	92	19	15	34	14	44,4	42,9	17,5	M12	**UCF207**	**UC207**	**F207**
40	130	102	21	15	36	16	51,2	49,2	19	M14	**UCF208**	**UC208**	**F208**
45	137	105	22	16	38	16	52,2	49,2	19	M14	**UCF209**	**UC209**	**F209**
50	143	111	22	16	40	16	54,6	51,6	19	M14	**UCF210**	**UC210**	**F210**
55	162	130	25	18	43	19	58,4	55,6	22,2	M16	**UCF211**	**UC211**	**F211**
60	175	143	29	18	48	19	68,7	65,1	25,4	M16	**UCF212**	**UC212**	**F212**
65	187	149	30	22	50	19	69,7	65,1	25,4	M16	**UCF213**	**UC213**	**F213**
70	193	152	31	22	54	19	75,4	74,6	30,2	M16	**UCF214**	**UC214**	**F214**
75	200	159	34	22	56	19	78,5	77,8	33,3	M16	**UCF215**	**UC215**	**F215**
80	208	165	34	24	58	23	83,3	82,6	33,3	M20	**UCF216**	**UC216**	**F216**
85	220	175	36	26	63	23	87,6	85,7	34,1	M20	**UCF217**	**UC217**	**F217**
90	235	187	40	26	68	23	96,3	96,0	39,7	M20	**UCF218**	**UC218**	**F218**

Note: Inch sizes available on request.

Standard duty flanged units cast housing eccentric locking collar type

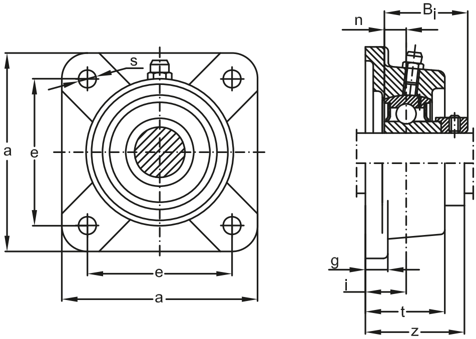


Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	86	63,5	19	15	29,5	11,5	41,5	29,5	7,0	M10	**SAFS204**	**SA204**	**FS204**
25	93	70,0	19	15	30,0	11,5	42,0	30,5	7,5	M10	**SAFS205**	**SA205**	**FS205**
30	106	82,5	20	16	32,5	13,0	45,9	33,9	8,0	M12	**SAFS206**	**SA206**	**FS206**
35	116	92,0	21	17	35,0	13,0	50,0	37,5	8,5	M12	**SAFS207**	**SA207**	**FS207**
40	129	101,5	24	17	39,0	14,0	55,0	40,5	9,5	M12	**SAFS208**	**SA208**	**FS208**
45	135	105,0	24	18	40,0	16,0	56,2	42,2	10,0	M14	**SAFS209**	**SA209**	**FS209**
50	143	111,0	28	20	45,0	16,0	61,2	43,7	10,5	M14	**SAFS210**	**SA210**	**FS210**
55	162	130,0	31	21	49,0	17,0	67,9	48,4	11,5	M14	**SAFS211**	**SA211**	**FS211**

Note: Inch sizes available on request.

ART BEARINGS

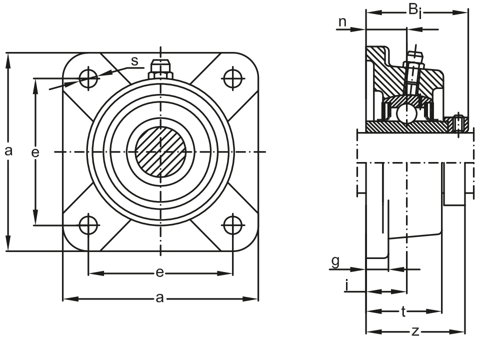
Standard duty flanged units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	86	64	15	12	25,5	12	37,5	29,5	7,0	M10	**SAF204**	**SA204**	**F204**
25	95	70	16	13	27,0	12	39,0	30,5	7,5	M10	**SAF205**	**SA205**	**F205**
30	108	83	18	13	31,0	12	43,9	33,9	8,0	M10	**SAF206**	**SA206**	**F206**
35	117	92	19	15	34,0	14	48,0	37,5	8,5	M12	**SAF207**	**SA207**	**F207**
40	130	102	21	15	36,0	16	52,0	40,5	9,5	M14	**SAF208**	**SA208**	**F208**
45	137	105	22	16	38,0	16	54,2	42,2	10,0	M14	**SAF209**	**SA209**	**F209**
50	143	111	22	16	40,0	16	55,2	43,7	10,5	M14	**SAF210**	**SA210**	**F210**
55	162	130	25	18	43,0	19	61,9	48,4	11,5	M16	**SAF211**	**SA211**	**F211**

Note: Inch sizes available on request.

Standard duty flanged units cast housing eccentric locking collar type

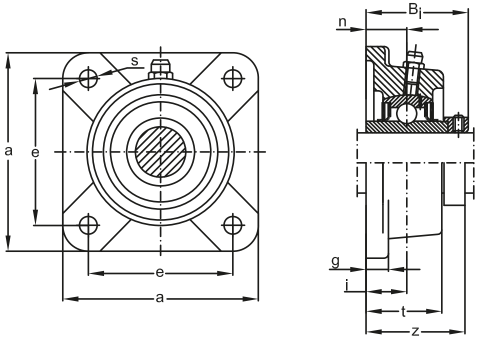


Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm										-			
20	86	63,5	19	15	29,5	11,5	45,5	43,5	17	M10	**UELFS204**	**UEL204**	**FS204**
25	93	70	19	15	30	11,5	45,9	44,3	17,4	M10	**UELFS205**	**UEL205**	**FS205**
30	106	82,5	20	16	32,5	13,0	50,1	48,3	18,2	M12	**UELFS206**	**UEL206**	**FS206**
35	116	92	21	17	35	13	53,3	51,1	18,8	M12	**UELFS207**	**UEL207**	**FS207**
40	129	101,5	24	17	39	14	58,9	56,3	21,4	M12	**UELFS208**	**UEL208**	**FS208**
45	135	105	24	18	40	16	58,9	56,3	21,4	M14	**UELFS209**	**UEL209**	**FS209**
50	143	111	28	20	45	16	66,1	62,7	24,6	M14	**UELFS210**	**UEL210**	**FS210**
55	162	130	31	21	49	17	74,6	71,3	27,7	M14	**UELFS211**	**UEL211**	**FS211**
60	175	143	34	22	53,5	17	80,8	77,7	30,9	M14	**UELFS212**	**UEL212**	**FS212**
65	184	149	38	22	58	18	89,6	85,7	34,1	M16	**UELFS213**	**UEL213**	**FS213**
70	188	152	38	23	60	18	89,6	85,7	34,1	M16	**UELFS214**	**UEL214**	**FS214**
75	200	152,4	41	24	62	20	95,8	92,1	37,3	M16	**UELFS215**	**UEL215**	**FS215**

Note: Inch sizes available on request.

ART BEARINGS

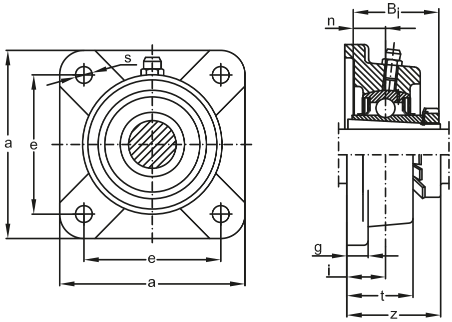
Standard duty flanged units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
12	86	64	15	12	25,5	12	41,5	43,5	17	M10	**UELF201**	**UEL201**	**F204**
15	86	64	15	12	25,5	12	41,5	43,5	17	M10	**UELF202**	**UEL202**	**F204**
17	86	64	15	12	25,5	12	41,5	43,5	17	M10	**UELF203**	**UEL203**	**F204**
20	86	64	15	12	25,5	12	41,5	43,5	17	M10	**UELF204**	**UEL204**	**F204**
25	95	70	16	13	27	12	42,9	44,3	17,4	M10	**UELF205**	**UEL205**	**F205**
30	108	83	18	13	31	12	48,1	48,3	18,2	M10	**UELF206**	**UEL206**	**F206**
35	117	92	19	15	34	14	51,3	51,1	18,8	M12	**UELF207**	**UEL207**	**F207**
40	130	102	21	15	36	16	55,9	56,3	21,4	M14	**UELF208**	**UEL208**	**F208**
45	137	105	22	16	38	16	56,9	56,3	21,4	M14	**UELF209**	**UEL209**	**F209**
50	143	111	22	16	40	16	60,1	62,7	24,6	M14	**UELF210**	**UEL210**	**F210**
55	162	130	25	18	43	19	68,6	71,3	27,7	M16	**UELF211**	**UEL211**	**F211**
60	175	143	29	18	48	19	75,8	77,7	30,9	M16	**UELF212**	**UEL212**	**F212**
65	187	149	30	22	50	19	81,6	85,7	34,1	M16	**UELF213**	**UEL213**	**F213**
70	193	152	31	22	54	19	82,6	85,7	34,1	M16	**UELF214**	**UEL214**	**F214**
75	200	159	34	22	56	19	88,8	92,1	37,3	M16	**UELF215**	**UEL215**	**F215**

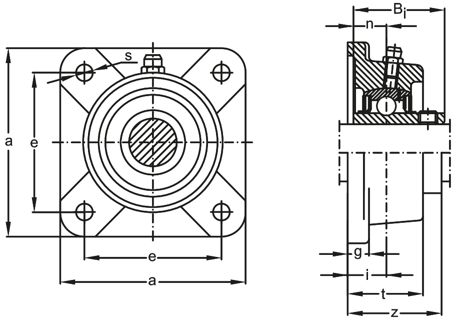
Note: Inch sizes available on request.

Standard duty flanged units cast housing adapter type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
20	95	70	16	13	27	12	35,5	35		M10	**UKF205**	**UK205**	**F205**
25	108	83	18	13	31	12	39,0	38		M10	**UKF206**	**UK206**	**F206**
30	117	92	19	15	34	14	42,5	43		M12	**UKF207**	**UK207**	**F207**
35	130	102	21	15	36	16	46,5	46		M14	**UKF208**	**UK208**	**F208**
40	137	105	22	16	38	16	48,5	50		M14	**UKF209**	**UK209**	**F209**
45	143	111	22	16	40	16	50,0	55		M14	**UKF210**	**UK210**	**F210**
50	162	130	25	18	43	19	54,5	59		M16	**UKF211**	**UK211**	**F211**
55	175	143	29	18	48	19	61,0	62		M16	**UKF212**	**UK212**	**F212**
60	187	149	30	22	50	19	64,0	65		M16	**UKF213**	**UK213**	**F213**

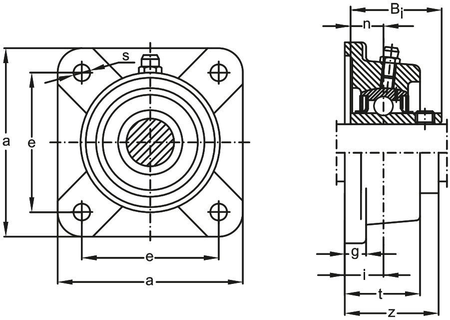
Medium duty flanged units cast housing set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
25	108	82,5	18	13	30	12	40,2	38,1	15,9	M10	**UCFX05**	**UCX05**	**FX05**
30	117	92,0	19	14	34	16	44,4	42,9	17,5	M14	**UCFX06**	**UCX06**	**FX06**
35	130	101,5	21	14	38	16	51,2	49,2	19,0	M14	**UCFX07**	**UCX07**	**FX07**
40	137	105,0	22	14	40	19	52,2	49,2	19,0	M16	**UCFX08**	**UCX08**	**FX08**
45	143	111,0	23	14	40	19	55,6	51,6	19,0	M16	**UCFX09**	**UCX09**	**FX09**
50	162	130,0	26	20	44	19	59,4	55,6	22,2	M16	**UCFX10**	**UCX10**	**FX10**
55	175	143,0	29	20	49	19	68,7	65,1	25,4	M16	**UCFX11**	**UCX11**	**FX11**
60	187	149	34	21	59	19	73,7	65,1	25,4	M16	**UCFX12**	**UCX12**	**FX12**
65	187	149	34	21	59	19	78,4	74,6	30,2	M18	**UCFX13**	**UCX13**	**FX13**
70	197	152	37	24	60	23	81,5	77,8	33,3	M20	**UCFX14**	**UCX14**	**FX14**
75	197	152	40	24	68	23	89,3	82,6	33,3	M20	**UCFX15**	**UCX15**	**FX15**
80	214	171	40	24	70	23	91,6	85,7	34,1	M20	**UCFX16**	**UCX16**	**FX16**

Note: Inch sizes available on request.

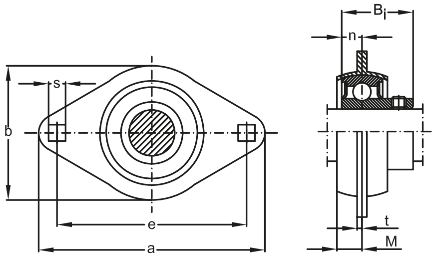
Heavy duty flanged units cast housing set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm											-		
25	108	80	16	13	29	16	39	38	15	M14	**UCF305**	**UC305**	**F305**
30	125	95	18	15	32	16	44	43	17	M14	**UCF306**	**UC306**	**F306**
35	135	100	20	16	36	19	49	48	19	M16	**UCF307**	**UC307**	**F307**
40	150	112	23	17	40	19	56	52	19	M16	**UCF308**	**UC308**	**F308**
45	160	125	25	18	44	19	60	57	22	M16	**UCF309**	**UC309**	**F309**
50	175	132	28	20	48	23	67	61	22	M20	**UCF310**	**UC310**	**F310**
55	185	140	30	20	52	23	71	66	25	M20	**UCF311**	**UC311**	**F311**
60	193	150	33	22	56	23	78	71	26	M20	**UCF312**	**UC312**	**F312**
65	208	166	33	22	58	23	78	75	30	M20	**UCF313**	**UC313**	**F313**
70	226	178	36	25	61	25	81	78	33	M22	**UCF314**	**UC314**	**F314**
75	236	184	39	25	66	25	89	82	32	M22	**UCF315**	**UC315**	**F315**
80	250	196	38	27	68	31	90	86	34	M27	**UCF316**	**UC316**	**F316**

Note: Inch sizes available on request.

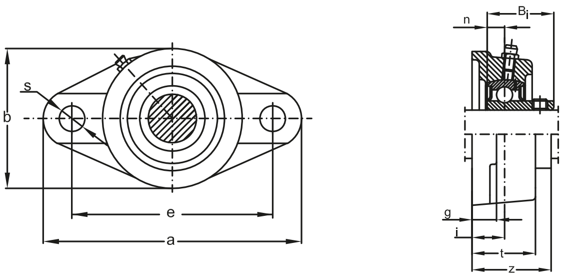
Standard duty two bolts flanged units pressed steel housing set screws type



Shaft dia.	Nominal dimensions								Bolt size	Unit number	Bearing number	Housing number
	a	e	M	t	s	b	Bi	n				
mm										-		
12	81	63,5	7,0	2,0	7,1	59	22	6	M6	**SBPFL201**	**SB201**	**PFL203**
15	81	63,5	7,0	2,0	7,1	59	22	6	M6	**SBPFL202**	**SB202**	**PFL203**
17	81	63,5	7,0	2,0	7,1	59	22	6	M6	**SBPFL203**	**SB203**	**PFL203**
20	90	71,5	8,0	2,0	9	67	25	7	M8	**SBPFL204**	**SB204**	**PFL204**
25	95	76,0	9,0	2,0	9	71	27	7,5	M8	**SBPFL205**	**SB205**	**PFL205**
30	113	90,5	9,5	2,6	11	84	29	8	M10	**SBPFL206**	**SB206**	**PFL206**
35	122	100	11	2,6	11	94	32	8,5	M10	**SBPFL207**	**SB207**	**PFL207**

Note: Inch sizes available on request.

Standard duty two bolts flanged units cast housing set screws type

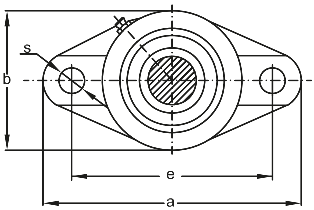


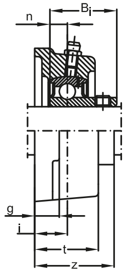
Shaft dia.	Nominal dimensions a	e	i	g	t	s	b	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	112,5	90	19	15	29,5	10	61	37	25	7	M8	**SBFT204**	**SB204**	**FT204**
25	123	99	19	15	30	11,5	70	38,5	27	7,5	M10	**SBFT205**	**SB205**	**FT205**
30	142	116,5	20	16	32,5	11,5	82	41	29	8	M10	**SBFT206**	**SB206**	**FT206**
35	158	130	21	17	36	13	94	44,5	32	8,5	M10	**SBFT207**	**SB207**	**FT207**
40	172	143,5	24	17	39	13	103	48,5	34	9,5	M10	**SBFT208**	**SB208**	**FT208**

Note: Inch sizes available on request.

ART BEARINGS

Standard duty two bolts flanged units cast housing set screws type

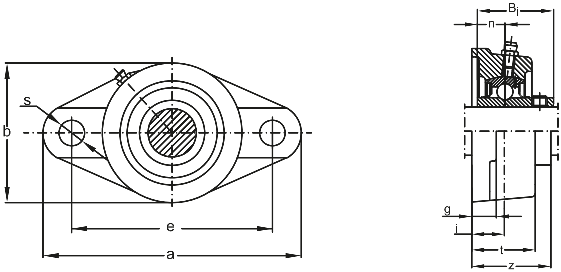




Shaft dia.	Nominal dimensions a	e	i	g	t	s	b	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	113	90	15	11	25,5	12	60	33	25	7	M10	**SBFL204**	**SB204**	**FL204**
25	130	99	16	13	27	16	68	35,5	27	7,5	M14	**SBFL205**	**SB205**	**FL205**
30	148	117	18	13	31	16	80	39	29	8	M14	**SBFL206**	**SB206**	**FL206**
35	161	130	19	14	34	16	90	42,5	32	8,5	M14	**SBFL207**	**SB207**	**FL207**
40	175	144	21	14	36	16	100	45,5	34	9,5	M14	**SBFL208**	**SB208**	**FL208**

Note: Inch sizes available on request.

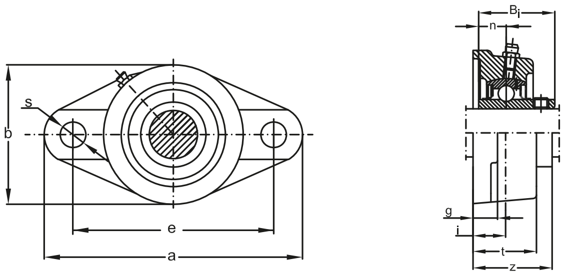
Standard duty two bolts flanged units cast housing set screws type



Shaft dia.	Nominal dimensions										Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	s	b	z	Bi	n				
mm												-		
20	112,5	90	19	15	29,5	10	61	37,3	31	12,7	M8	**UCFT204**	**UC204**	**FT204**
25	123	99	19	15	30	11,5	70	38,7	34	14,3	M10	**UCFT205**	**UC205**	**FT205**
30	142	116,5	20	16	32,5	11,5	82	42,2	38,1	15,9	M10	**UCFT206**	**UC206**	**FT206**
35	158	130	21	17	36	13	94	46,4	42,9	17,5	M10	**UCFT207**	**UC207**	**FT207**
40	172	143,5	24	17	39	13	103	54,2	49,2	19	M10	**UCFT208**	**UC208**	**FT208**
45	180	148,5	24	18	40	15	108	54,2	49,2	19	M12	**UCFT209**	**UC209**	**FT209**
50	190	157	28	20	45	15	114	60,6	51,6	19	M12	**UCFT210**	**UC210**	**FT210**
55	217	184	31	21	48	16,5	128	64,4	55,6	22,2	M14	**UCFT211**	**UC211**	**FT211**
60	237	202	34	21	53	16,5	138	73,7	65,1	25,4	M14	**UCFT212**	**UC212**	**FT212**
65	256	210	38	22	56	21	152	77,7	65,1	25,4	M20	**UCFT213**	**UC213**	**FT213**
70	264	216	38	23	58	21	157	82,4	74,6	30,2	M20	**UCFT214**	**UC214**	**FT214**

Note: Inch sizes available on request.

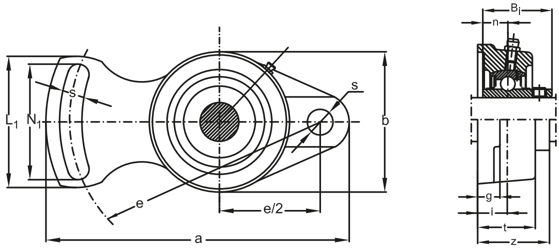
Standard duty two bolts flanged units cast housing set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	b	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
12	113	90	15	11	25,5	12	60	33,3	31	12,7	M10	**UCFL201**	**UC201**	**FL201**
15	113	90	15	11	25,5	12	60	33,3	31	12,7	M10	**UCFL202**	**UC202**	**FL202**
17	113	90	15	11	25,5	12	60	33,3	31	12,7	M10	**UCFL203**	**UC203**	**FL203**
20	113	90	15	11	25,5	12	60	33,3	31	12,7	M10	**UCFL204**	**UC204**	**FL204**
25	130	99	16	13	27	16	68	35,7	34	14,3	M14	**UCFL205**	**UC205**	**FL205**
30	148	117	18	13	31	16	80	40,2	38,1	15,9	M14	**UCFL206**	**UC206**	**FL206**
35	161	130	19	14	34	16	90	44,4	42,9	17,5	M14	**UCFL207**	**UC207**	**FL207**
40	175	144	21	14	36	16	100	51,2	49,2	19	M14	**UCFL208**	**UC208**	**FL208**
45	188	148	22	16	38	19	108	52,2	49,2	19	M16	**UCFL209**	**UC209**	**FL209**
50	197	157	22	16	40	19	115	54,6	51,6	19	M16	**UCFL210**	**UC210**	**FL210**
55	224	184	25	18	43	19	130	58,4	55,6	22,2	M16	**UCFL211**	**UC211**	**FL211**
60	250	202	29	18	48	23	140	68,7	65,1	25,4	M20	**UCFL212**	**UC212**	**FL212**
65	258	210	30	20	50	23	155	69,7	65,1	25,4	M20	**UCFL213**	**UC213**	**FL213**
70	265	216	31	20	54	23	160	75,4	74,6	30,2	M20	**UCFL214**	**UC214**	**FL214**
75	275	225	34	20	56	23	165	78,5	77,8	33,3	M20	**UCFL215**	**UC215**	**FL215**
80	290	233	34	22	58	25	180	83,3	82,6	33,3	M22	**UCFL216**	**UC216**	**FL216**
85	305	248	36	22	63	25	190	87,6	85,7	34,1	M22	**UCFL217**	**UC217**	**FL217**
90	320	265	40	23	68	25	205	96,3	96	39,7	M22	**UCFL218**	**UC218**	**FL218**

Note: Inch sizes available on request.

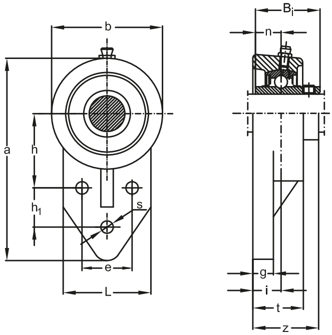
Standard duty flanged units cast housing special type set screws type



Shaft dia.	Nominal dimensions												Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	s	N_1	b	L_1	z	Bi	n				
mm														-		
12	102	78	15	12	25,5	10	40	60	54	33,3	31	12,7	M8	**UCFA201**	**UC201**	**FA201**
15	102	78	15	12	25,5	10	40	60	54	33,3	31	12,7	M8	**UCFA202**	**UC202**	**FA202**
17	102	78	15	12	25,5	10	40	60	54	33,3	31	12,7	M8	**UCFA203**	**UC203**	**FA203**
20	102	78	15	12	25,5	10	40	60	54	33,3	31	12,7	M8	**UCFA204**	**UC204**	**FA204**
25	125	98	16	14	27	12	51	68	65	34,7	34	14,3	M10	**UCFA205**	**UC205**	**FA205**
30	144	117	18	14	31	12	58	80	72	40,2	38,1	15,9	M10	**UCFA206**	**UC206**	**FA206**
35	161	130	19	16	34	14	66	90	82	45,4	42,9	17,5	M12	**UCFA207**	**UC207**	**FA207**
40	175	144	21	16	36	14	71	100	87	52,2	49,2	19	M12	**UCFA208**	**UC208**	**FA208**
45	178	146	22	16	38	16	72	108	88	52,2	49,2	19	M14	**UCFA209**	**UC209**	**FA209**
50	188	155	22	16	39	16	75	114	92	54,6	51,6	19	M14	**UCFA210**	**UC210**	**FA210**
55	216	182	25	18	42,5	16	84	128	102	58,4	55,6	22,2	M14	**UCFA211**	**UC211**	**FA211**
60	238	202	29	19	47,5	18	104	140	122	68,7	65,1	25,4	M16	**UCFA212**	**UC212**	**FA212**
65	248	210	30	20	49	18	106	152	126	69,7	65,1	25,4	M16	**UCFA213**	**UC213**	**FA213**

Note: Inch sizes available on request.

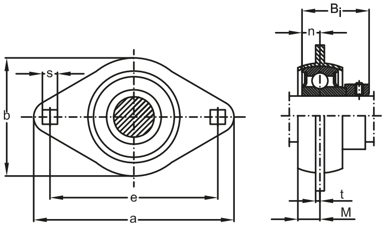
Standard duty flanged units cast housing special type set screws type



Shaft dia.	Nominal dimensions a	e	i	g	t	s	h	h_1	L	b	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm															-		
12	109	32	15	11	25,5	10	42	27	52	60	33,3	31	12,7	M8	**UCFB201**	**UC201**	**FB201**
15	109	32	15	11	25,5	10	42	27	52	60	33,3	31	12,7	M8	**UCFB202**	**UC202**	**FB202**
17	109	32	15	11	25,5	10	42	27	52	60	33,3	31	12,7	M8	**UCFB203**	**UC203**	**FB203**
20	109	32	15	11	25,5	10	42	27	52	60	33,3	31	12,7	M8	**UCFB204**	**UC204**	**FB204**
25	116	34	16	13	27	10	45	27	56	68	35,7	34	14,3	M8	**UCFB205**	**UC205**	**FB205**
30	132	40	18	13	31	10	50	29	65	80	40,2	38,1	15,9	M8	**UCFB206**	**UC206**	**FB206**
35	144	46	19	14	33	10	55	32	70	90	44,4	42,9	17,5	M8	**UCFB207**	**UC207**	**FB207**
40	164	50	21	16	35	12	60	41	78	100	51,2	49,2	19	M10	**UCFB208**	**UC208**	**FB208**
45	175	54	22	16	38	12	65	43	80	108	52,2	49,2	19	M10	**UCFB209**	**UC209**	**FB209**
50	184	58	22	16	39	12	68	46	86	114	54,6	51,6	19	M10	**UCFB210**	**UC210**	**FB210**
55	207	62	25	18	42,5	14	78	50	90	128	58,4	55,6	22,2	M12	**UCFB211**	**UC211**	**FB211**
60	224	66	29	19	47,5	14	84	55	94	140	68,7	65,1	25,4	M12	**UCFB212**	**UC212**	**FB212**
65	244	70	30	20	49	14	92	60	102	152	69,7	65,1	25,4	M12	**UCFB213**	**UC213**	**FB213**

Note: Inch sizes available on request.

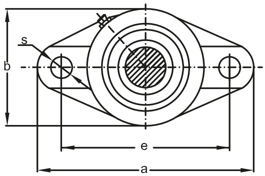
Standard duty two bolts flanged units pressed steel housing eccentric locking collar type

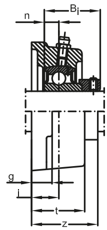


Shaft dia.	Nominal dimensions a	e	M	t	s	b	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm										-		
12	81	63,5	7	2	7,1	59	28,5	6	M6	**SAPFL201**	**SA201**	**PFL201**
15	81	63,5	7	2	7,1	59	28,5	6	M6	**SAPFL202**	**SA202**	**PFL202**
17	81	63,5	7	2	7,1	59	28,5	6	M6	**SAPFL203**	**SA203**	**PFL203**
20	90	71,5	8	2	9	67	29,5	7	M8	**SAPFL204**	**SA204**	**PFL204**
25	95	76	9	2	9	71	30,5	7,5	M8	**SAPFL205**	**SA205**	**PFL205**
30	113	90,5	9,5	2,6	11	84	33,9	8	M10	**SAPFL206**	**SA206**	**PFL206**
35	122	100	11	2,6	11	94	37,5	8,5	M10	**SAPFL207**	**SA207**	**PFL207**

Note: Inch sizes available on request.

Standard duty two bolts flanged units cast housing eccentric locking collar type

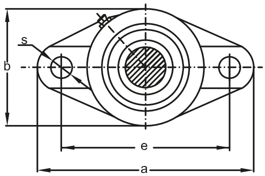


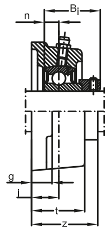


Shaft dia.	Nominal dimensions										Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	s	b	z	Bi	n				
mm												-		
20	112,5	90	19	15	29,5	10	61	41,5	29,5	7	M8	**SAFT204**	**SA204**	**FT204**
25	123	99	19	15	30	11,5	70	42	30,5	7,5	M10	**SAFT205**	**SA205**	**FT205**
30	142	116,5	20	16	32,5	11,5	82	45,9	33,0	8	M10	**SAFT206**	**SA206**	**FT206**
35	158	130	21	17	36	13	94	50	37,5	8,5	M10	**SAFT207**	**SA207**	**FT207**
40	172	143,5	24	17	39	13	103	55	40,5	9,5	M10	**SAFT208**	**SA208**	**FT208**
45	180	148,5	24	18	40	15	108	56,2	42,2	10	M12	**SAFT209**	**SA209**	**FT209**
50	190	157	28	20	45	15	114	61,2	43,7	10,5	M12	**SAFT210**	**SA210**	**FT210**
55	217	184	31	21	48	16,5	128	67,9	48,4	11,5	M14	**SAFT211**	**SA211**	**FT211**

Note: Inch sizes available on request.

Standard duty two bolts flanged units cast housing eccentric locking collar type

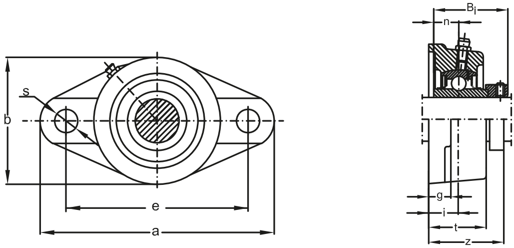




Shaft dia.	Nominal dimensions a	e	i	g	t	s	b	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm												-		
20	113	90	15	11	25,5	12	60	37,5	29,5	7	M10	**SAFL204**	**SA204**	**FL204**
25	130	99	16	13	27	16	68	39	30,5	7,5	M14	**SAFL205**	**SA205**	**FL205**
30	148	117	18	13	31	16	80	43,9	33,9	8	M14	**SAFL206**	**SA206**	**FL206**
35	161	130	19	14	34	16	90	48	37,5	8,5	M14	**SAFL207**	**SA207**	**FL207**
40	175	144	21	14	36	16	100	52	40,5	9,5	M14	**SAFL208**	**SA208**	**FL208**
45	188	148	22	16	38	19	108	54,2	42,2	10	M16	**SAFL209**	**SA209**	**FL209**
50	197	157	22	16	40	19	115	55,2	43,7	10,5	M16	**SAFL210**	**SA210**	**FL210**
55	224	184	25	18	43	19	130	61,9	48,4	11,5	M16	**SAFL211**	**SA211**	**FL211**

Note: Inch sizes available on request.

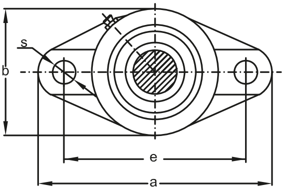
Standard duty two bolts flanged units cast housing eccentric locking collar type

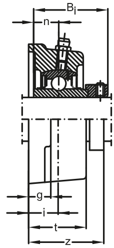


Shaft dia.	Nominal dimensions										Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	s	b	z	Bi	n				
mm														
20	112,5	90	19	15	29,5	10	61	45,5	43,5	17	M8	**UELFT204**	**UEL204**	**FT204**
25	123	99	19	15	30	11,5	70	45,9	44,3	17,4	M10	**UELFT205**	**UEL205**	**FT205**
30	142	116,5	20	16	32,5	11,5	82	50,1	48,3	18,2	M10	**UELFT206**	**UEL206**	**FT206**
35	158	130	21	17	36	13	94	53,3	51,1	18,8	M10	**UELFT207**	**UEL207**	**FT207**
40	172	143,5	24	17	39	13	103	58,9	56,3	21,4	M10	**UELFT208**	**UEL208**	**FT208**
45	180	148,5	24	18	40	15	108	58,9	56,3	21,4	M12	**UELFT209**	**UEL209**	**FT209**
50	190	157	28	20	45	15	114	66,1	62,7	24,6	M12	**UELFT210**	**UEL210**	**FT210**
55	217	184	31	21	48	16,5	128	74,6	71,3	27,7	M14	**UELFT211**	**UEL211**	**FT211**
60	237	202	34	21	53	16,5	138	80,8	77,7	30,9	M14	**UELFT212**	**UEL212**	**FT212**
65	256	210	38	22	56	21	152	89,6	85,7	34,1	M20	**UELFT213**	**UEL213**	**FT213**
70	264	216	38	23	58	21	157	89,6	85,7	34,1	M20	**UELFT214**	**UEL214**	**FT214**

Note: Inch sizes available on request.

Standard duty two bolts flanged units cast housing eccentric locking collar type

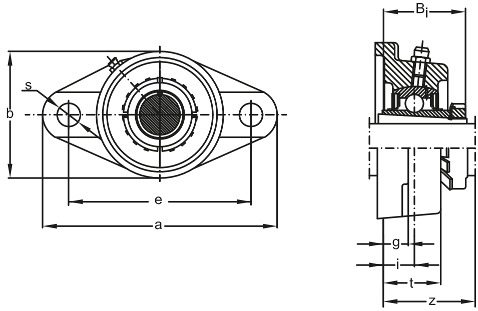




Shaft dia.	Nominal dimensions a	e	i	g	t	s	b	z	Bi	n	Bolt size	Unit number	Bearing number	Housing number
mm														
12	113	90	15	11	25,5	60	12	41,5	43,5	17	M10	**UELFL201**	**UEL201**	**FL201**
15	113	90	15	11	25,5	60	12	41,5	43,5	17	M10	**UELFL202**	**UEL202**	**FL202**
17	113	90	15	11	25,5	60	12	41,5	43,5	17	M10	**UELFL203**	**UEL203**	**FL203**
20	113	90	15	11	25,5	60	12	41,5	43,5	17	M10	**UELFL204**	**UEL204**	**FL204**
25	130	99	16	13	27	68	16	42,9	44,3	17,4	M14	**UELFL205**	**UEL205**	**FL205**
30	148	117	18	13	31	80	16	48,1	48,3	18,2	M14	**UELFL206**	**UEL206**	**FL206**
35	161	130	19	14	34	90	16	51,3	51,1	18,8	M14	**UELFL207**	**UEL207**	**FL207**
40	175	144	21	14	36	100	16	55,9	56,3	21,4	M14	**UELFL208**	**UEL208**	**FL208**
45	188	148	22	16	38	108	19	56,9	56,3	21,4	M16	**UELFL209**	**UEL209**	**FL209**
50	197	157	22	16	40	115	19	60,1	62,7	24,6	M16	**UELFL210**	**UEL210**	**FL210**
55	224	184	25	18	43	130	19	68,6	71,3	27,7	M16	**UELFL211**	**UEL211**	**FL211**
60	250	202	29	18	48	140	23	75,8	77,3	30,9	M20	**UELFL212**	**UEL212**	**FL212**
65	258	210	30	20	50	155	23	81,6	85,7	34,1	M20	**UELFL213**	**UEL213**	**FL213**
70	265	216	31	20	54	160	23	82,6	85,7	34,1	M20	**UELFL214**	**UEL214**	**FL214**
75	275	255	34	20	56	165	23	88,8	92,1	37,3	M20	**UELFL215**	**UEL215**	**FL215**

Note: Inch sizes available on request.

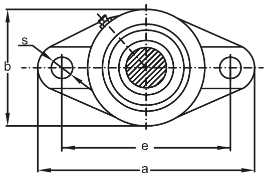
Standard duty two bolts flanged units cast housing adapter type

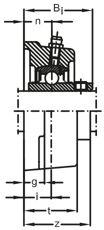


Shaft dia.	Nominal dimensions									Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	b	s	z	Bi				
mm													
20	130	99	16	13	27	68	16	35,5	35	M14	**UKFL205**	**UK205**	**FL205**
25	148	117	18	13	31	80	16	39	38	M14	**UKFL206**	**UK206**	**FL206**
30	161	130	19	14	34	90	16	42,5	43	M14	**UKFL207**	**UK207**	**FL207**
35	175	144	21	14	36	100	16	46,5	46	M14	**UKFL208**	**UK208**	**FL208**
40	188	148	22	16	38	108	19	48,5	50	M16	**UKFL209**	**UK209**	**FL209**
45	197	157	22	16	40	115	19	50	55	M16	**UKFL210**	**UK210**	**FL210**
50	224	184	25	18	43	130	19	54,5	59	M16	**UKFL211**	**UK211**	**FL211**
55	250	202	29	18	48	140	23	61	62	M20	**UKFL212**	**UK212**	**FL212**
60	258	210	30	20	50	155	23	64	65	M20	**UKFL213**	**UK213**	**FL213**

Note: Inch sizes available on request.

Medium duty two bolts flanged units cast housing set screws type



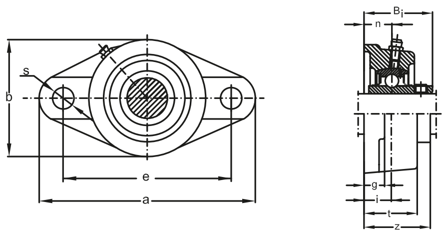


Shaft dia.	Nominal dimensions										Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	b	s	z	Bi	n				
mm														
25	141	117	18	13	30	83	12	40,2	38,1	15,9	M10	**UCFLX05**	**UCX05**	**FLX05**
30	156	130	19	15	34	95	16	44,4	42,9	17,5	M14	**UCFLX06**	**UCX06**	**FLX06**
35	171	144	22	16	38	105	16	51,2	49,2	19	M14	**UCFLX07**	**UCX07**	**FLX07**
40	179	148	22	16	40	111	16	52,2	49,2	19	M14	**UCFLX08**	**UCX08**	**FLX08**
45	189	157	23	16	40	116	16	55,6	51,6	19	M14	**UCFLX09**	**UCX09**	**FLX09**
50	216	184	26	18	44	133	19	59,4	55,6	22,2	M16	**UCFLX10**	**UCX10**	**FLX10**

Note: Inch sizes available on request.

ART BEARINGS

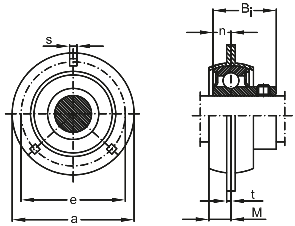
Heavy duty two bolts flanged units cast housing set screws type



Shaft dia.	Nominal dimensions										Bolt size	Unit number	Bearing number	Housing number
	a	e	i	g	t	b	s	z	Bi	n				
mm														
25	150	113	16	13	29	80	19	39	38	15	M16	**UCFL305**	**UC305**	**FL305**
30	180	134	18	15	32	90	23	44	43	17	M20	**UCFL306**	**UC306**	**FL306**
35	185	141	20	16	36	100	23	49	48	19	M20	**UCFL307**	**UC307**	**FL307**
40	200	158	23	17	40	112	23	56	52	19	M20	**UCFL308**	**UC308**	**FL308**
45	230	177	25	18	44	125	25	60	57	22	M22	**UCFL309**	**UC309**	**FL309**
50	240	187	28	19	48	140	25	67	61	22	M22	**UCFL310**	**UC310**	**FL310**
55	250	198	30	20	52	150	25	71	66	25	M22	**UCFL311**	**UC311**	**FL311**
60	270	212	33	22	56	160	31	78	71	26	M27	**UCFL312**	**UC312**	**FL312**
65	295	240	33	25	58	175	31	78	75	30	M27	**UCFL313**	**UC313**	**FL313**
70	315	250	36	28	61	185	35	81	78	33	M30	**UCFL314**	**UC314**	**FL314**
75	320	260	39	30	66	195	35	89	82	32	M30	**UCFL315**	**UC315**	**FL315**
80	355	285	38	32	68	210	38	90	86	34	M33	**UCFL316**	**UC316**	**FL316**

Note: Inch sizes available on request.

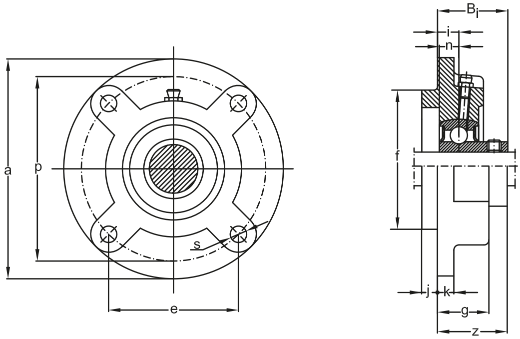
Standard duty flanged cartridge units pressed steel housing set screws type



Shaft dia.	Nominal dimensions							Bolt size	Unit number	Bearing number	Housing number
	a	e	t	s	M	Bi	n				
mm											
12	81	63,5	2	7,1	7	22	6	M6	**SBPF203**	**SB201**	**PF201**
15	81	63,5	2	7,1	7	22	6	M6	**SBPF203**	**SB202**	**PF202**
17	81	63,5	2	7,1	7	22	6	M6	**SBPF203**	**SB203**	**PF203**
20	90	71,5	2	9	8	25	7	M8	**SBPF204**	**SB204**	**PF204**
25	95	76	2	9	9	27	7,5	M8	**SBPF205**	**SB205**	**PF205**
30	113	90,5	2,6	11	9,5	29	8	M10	**SBPF206**	**SB206**	**PF206**
35	122	100	2,6	11	11	32	8,5	M10	**SBPF207**	**SB207**	**PF207**

Note: Inch sizes available on request.

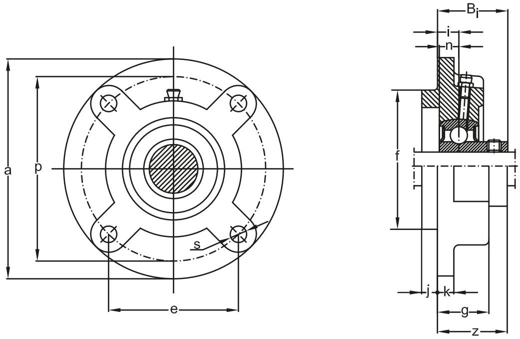
Standard duty flanged cartridge units cast housing set screws type



Shaft dia.	Nominal dimensions												Bolt size	Unit number	Bearing number	Housing number
	a	p	e	i	s	j	k	g	f	z	Bi	n				
mm														-		
20	100	78	55,1	10	12	5	6	20,5	62	28	25	7	M10	**SB204**	**SBFC204**	**FC204**
25	115	90	63,6	10	12	6	7	21	70	29,5	27	7,5	M10	**SB205**	**SBFC205**	**FC205**
30	125	100	70,7	10	12	8	8	23	80	31	29	8	M10	**SB206**	**SBFC206**	**FC206**
35	135	110	77,8	11	14	9	9	26	90	34,5	32	8,5	M12	**SB207**	**SBFC207**	**FC 207**
40	145	120	84,8	11	14	9	9	26	100	35,5	34	9,5	M12	**SB208**	**SBFC208**	**FC208**

Note: Inch sizes available on request.

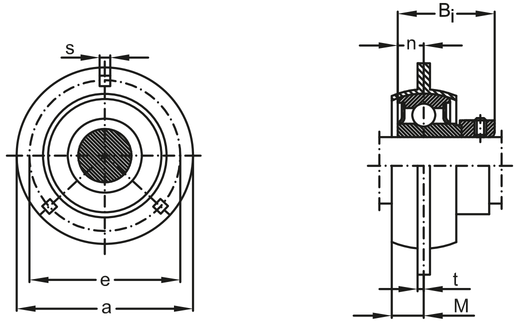
Standard duty flanged cartridge units cast housing set screws type



Shaft dia.	Nominal dimensions												Bolt size	Unit number	Bearing number	Housing number
	a	p	e	i	s	j	k	g	f	z	Bi	n				
mm													-			
12	100	78	55,1	10	12	5	6	20,5	62	28,3	31	12,7	M10	**UCFC201**	**UC201**	**FC201**
15	100	78	55,1	10	12	5	6	20,5	62	28,3	31	12,7	M10	**UCFC202**	**UC202**	**FC202**
17	100	78	55,1	10	12	5	6	20,5	62	28,3	31	12,7	M10	**UCFC203**	**UC203**	**FC203**
20	100	78	55,1	10	12	5	6	20,5	62	28,3	31	12,7	M10	**UCFC204**	**UC204**	**FC204**
25	115	90	63,6	10	12	6	7	21	70	29,7	34	14,3	M10	**UCFC205**	**UC205**	**FC205**
30	125	100	70,7	10	12	8	8	23	80	32,2	38,1	15,9	M10	**UCFC206**	**UC206**	**FC206**
35	135	110	77,8	11	14	8	9	26	90	36,4	42,9	17,5	M12	**UCFC207**	**UC207**	**FC207**
40	145	120	84,8	11	14	10	9	26	100	41,2	49,2	19	M12	**UCFC208**	**UC208**	**FC208**
45	160	132	93,3	10	16	12	10	26	105	40,2	49,2	19	M14	**UCFC209**	**UC209**	**FC209**
50	165	138	97,6	10	16	12	14	28	110	42,6	51,6	19	M14	**UCFC210**	**UC210**	**FC210**
55	185	150	106,1	13	19	12	13	30	125	46,4	55,6	22,2	M16	**UCFC211**	**UC211**	**FC211**
60	195	160	113,1	17	19	12	15	36	135	56,7	65,1	25,4	M16	**UCFC212**	**UC212**	**FC212**
65	205	170	120,2	16	19	14	15	35	145	55,7	65,1	25,4	M16	**UCFC213**	**UC213**	**FC213**
70	215	177	125,1	17	19	14	16	38	150	61,4	74,6	30,2	M16	**UCFC214**	**UC214**	**FC214**
75	220	184	130,1	18	19	16	17	39	160	62,5	77,8	33,3	M16	**UCFC215**	**UC215**	**FC215**
80	240	200	141,4	18	23	16	18	42	170	67,3	82,6	33,3	M20	**UCFC216**	**UC216**	**FC216**
85	250	208	147,1	18	23	18	20	45	180	69,6	85,7	34,1	M20	**UCFC217**	**UC217**	**FC217**
90	265	220	155,5	22	23	20	18	50	190	78,3	96	39,7	M20	**UCFC218**	**UC218**	**FC218**

ART BEARINGS

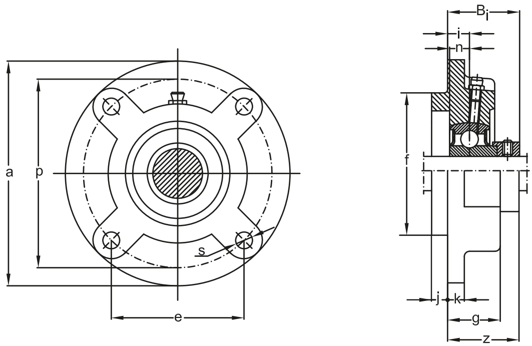
Standard duty flanged cartridge units pressed steel housing set screws type



Shaft dia.	Nominal dimensions							Bolt size	Unit number	Bearing number	Housing number
	a	e	t	s	M	Bi	n				
mm									-		
12	81	63,5	2	7,1	7	28,5	6	M6	**SAPF201**	**SA201**	**PF201**
15	81	63,5	2	7,1	7	28,5	6	M6	**SAPF202**	**SA202**	**PF202**
17	81	63,5	2	7,1	7	28,5	6	M6	**SAPF203**	**SA203**	**PF203**
20	90	71,5	2	9	8	29,5	7	M8	**SAPF204**	**SA204**	**PF204**
25	95	76	2	9	9	30,5	7,5	M8	**SAPF205**	**SA205**	**PF205**
30	113	90,5	2,6	11	9,5	33,9	8	M10	**SAPF206**	**SA206**	**PF206**
35	122	100	2,6	11	11	37,5	8,5	M10	**SAPF207**	**SA207**	**PF207**

Note: Inch sizes available on request.

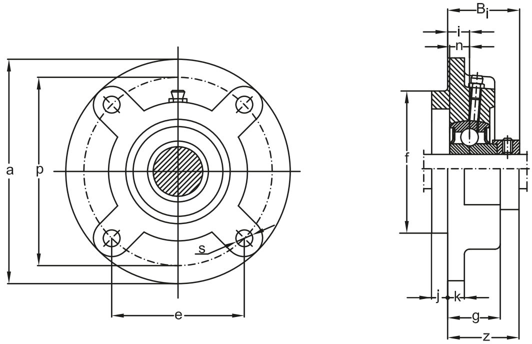
Standard duty flanged cartridge units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions												Bolt size	Unit number	Bearing number	Housing number
	a	p	e	i	s	j	k	g	f	z	Bi	n				
mm														-		
20	100	78	55,1	10	12	5	6	20,5	62	32,5	29,5	7	M10	**SAFC204**	**SA204**	**FC204**
25	115	90	63,6	10	12	6	7	21	70	33	30,5	7,5	M10	**SAFC205**	**SA205**	**FC205**
30	125	100	70,7	10	12	8	8	23	80	35,9	33,9	8	M10	**SAFC206**	**SA206**	**FC206**
35	135	110	77,8	11	14	8	9	26	90	40	37,5	8,5	M12	**SAFC207**	**SA207**	**FC207**
40	145	120	84,8	11	14	10	9	26	100	42	40,5	9,5	M12	**SAFC208**	**SA208**	**FC208**
45	160	132	93,3	10	16	12	10	26	105	42,2	42,2	10	M14	**SAFC209**	**SA209**	**FC209**
50	165	138	97,6	10	16	12	14	28	110	43,2	43,7	10,5	M14	**SAFC210**	**SA210**	**FC210**
55	185	150	106,1	13	19	12	13	30	125	49,9	48,4	11,5	M16	**SAFC211**	**SA211**	**FC211**

Note: Inch sizes available on request.

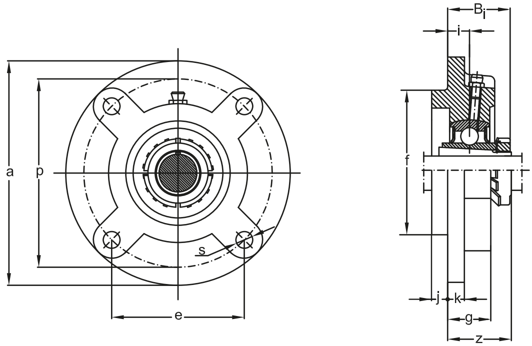
Standard duty flanged cartridge units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions												Bolt size	Unit number	Bearing number	Housing number
	a	p	e	i	s	j	k	g	f	z	Bi	n				
mm																
12	100	78	55,1	10	12	5	6	20,5	62	36,5	43,5	17	M10	**UELFC201**	**UEL201**	**FC201**
15	100	78	55,1	10	12	5	6	20,5	62	36,5	43,5	17	M10	**UELFC202**	**UEL202**	**FC202**
17	100	78	55,1	10	12	5	6	20,5	62	36,5	43,5	17	M10	**UELFC203**	**UEL203**	**FC203**
20	100	78	55,1	10	12	5	6	20,5	62	36,5	43,5	17	M10	**UELFC204**	**UEL204**	**FC204**
25	115	90	63,6	10	12	6	7	21	70	36,9	44,3	17,4	M10	**UELFC205**	**UEL205**	**FC205**
30	125	100	70,7	10	12	8	8	23	80	40,1	48,3	18,2	M10	**UELFC206**	**UEL206**	**FC206**
35	135	110	77,8	11	14	8	9	26	90	43,3	51,1	18,8	M12	**UELFC207**	**UEL207**	**FC207**
40	145	120	84,8	11	14	10	9	26	100	45,9	56,3	21,4	M12	**UELFC208**	**UEL208**	**FC208**
45	160	132	93,3	10	16	12	10	26	105	44,9	56,3	21,4	M14	**UELFC209**	**UEL209**	**FC209**
50	165	138	97,6	10	16	12	14	28	110	48,1	62,7	24,6	M14	**UELFC210**	**UEL210**	**FC210**
55	185	150	106,1	13	19	12	13	30	125	56,6	71,3	27,7	M16	**UELFC211**	**UEL211**	**FC211**
60	195	160	113,1	17	19	12	15	36	135	63,8	77,7	30,9	M16	**UELFC212**	**UEL212**	**FC212**
65	205	170	120,2	16	19	14	15	35	145	67,6	85,7	34,1	M16	**UELFC213**	**UEL213**	**FC213**
70	215	177	125,1	17	19	14	16	38	150	68,6	85,7	34,1	M16	**UELFC214**	**UEL214**	**FC214**
75	220	184	130,1	18	19	16	17	39	160	72,8	92,1	37,3	M16	**UELFC215**	**UEL215**	**FC215**

Note: Inch sizes available on request.

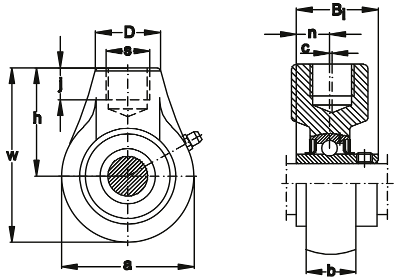
Standard duty flanged cartridge units cast housing adapter type



Shaft dia.	Nominal dimensions											Bolt size	Unit number	Bearing number	Housing number
	a	p	e	i	s	j	k	g	f	z	Bi				
mm															
20	115	90	63,6	10	12	6	7	21	70	29,5	35	M10	**UKFC205**	**UK205**	**FC205**
25	125	100	70,7	10	12	8	8	23	80	31	38	M10	**UKFC206**	**UK206**	**FC206**
30	135	110	77,8	11	14	8	9	26	90	34,5	43	M12	**UKFC207**	**UK207**	**FC207**
35	145	120	84,8	11	14	10	9	26	100	36,5	46	M12	**UKFC208**	**UK208**	**FC208**
40	160	132	93,3	10	16	12	10	26	105	36,5	50	M14	**UKFC209**	**UK209**	**FC209**
45	165	138	97,6	10	16	12	14	28	110	38	55	M14	**UKFC210**	**UK210**	**FC210**
50	185	150	106,1	13	19	12	13	30	125	42,5	59	M16	**UKFC211**	**UK211**	**FC211**
55	195	160	113,1	17	19	12	15	36	135	49	62	M16	**UKFC212**	**UK212**	**FC212**
60	205	170	120,2	16	19	14	15	35	145	50	65	M16	**UKFC213**	**UK213**	**FC213**

Note: Inch sizes available on request.

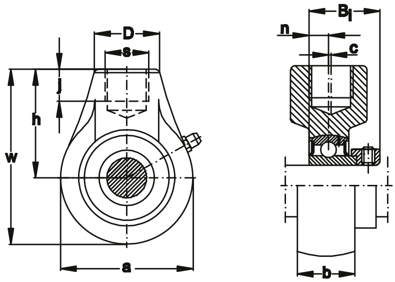
Standard duty hanger units set screws type



Shaft dia.	Nominal dimensions										Unit number	Bearing number	Housing number
	a	w	c	b	h	s	n	D	j	Bi			
mm													
12	64	96	0	22	64	RP 3/4	40	19	31	12,7	**UCHA201**	**UC201**	**HA201**
15	64	96	0	22	64	RP 3/4	40	19	31	12,7	**UCHA202**	**UC202**	**HA202**
17	64	96	0	22	64	RP 3/4	40	19	31	12,7	**UCHA203**	**UC203**	**HA203**
20	64	96	0	22	64	RP 3/4	40	19	31	12,7	**UCHA204**	**UC204**	**HA204**
25	78	103	0	23	64	RP 3/4	40	19	34	14,3	**UCHA205**	**UC205**	**HA205**
30	78	103	0	25	64	RP 3/4	40	19	38,1	15,9	**UCHA206**	**UC206**	**HA206**
35	92	116	0	26	70	RP 3/4	40	19	42,9	17,5	**UCHA207**	**UC207**	**HA207**
40	96	121	2	30	73	RP 3/4	40	19	49,2	19	**UCHA208**	**UC208**	**HA208**
45	108	136	5	30	82	RP 1	48	21	49,2	19	**UCHA209**	**UC209**	**HA209**
50	115	140,5	5	32	83	RP 1	48	21	51,6	19	**UCHA210**	**UC210**	**HA210**
55	126	150	7	33	87	RP 1-1/4	60	24	55,6	22,2	**UCHA211**	**UC211**	**HA211**
60	142	173	9	36	102	RP 1-1/4	60	28	65,1	25,4	**UCHA212**	**UC212**	**HA212**
65	166	200	9,5	38	117	RP 1-1/2	70	32	65,1	25,4	**UCHA213**	**UC213**	**HA213**
70	166	200	9,5	40	117	RP 1-1/2	70	32	74,6	30,2	**UCHA214**	**UC214**	**HA214**
75	166	200	9,5	40	117	RP 1-1/2	70	32	77,8	33,3	**UCHA215**	**UC215**	**HA215**

Note: Inch sizes available on request.

Standard duty hanger units set screws type

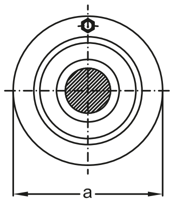


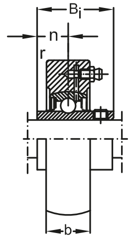
Shaft dia.	Nominal dimensions										Unit number	Bearing number	Housing number
	a	w	c	b	h	s	n	D	j	Bi			
mm													
20	64	96	0	22	64	RP 3/4	40	19	29,5	7	**SAHA204**	**SA204**	**HA204**
25	78	103	0	23	64	RP 3/4	40	19	30,5	7,5	**SAHA205**	**SA205**	**HA205**
30	78	103	0	25	64	RP 3/4	40	19	33,9	8	**SAHA206**	**SA206**	**HA206**
35	92	116	0	26	70	RP 3/4	40	19	37,5	8,5	**SAHA207**	**SA207**	**HA207**
40	96	121	2	30	73	RP 3/4	40	19	40,5	9,5	**SAHA208**	**SA208**	**HA208**
45	108	136	5	30	82	RP 1	48	21	42,2	10	**SAHA209**	**SA209**	**HA209**
50	115	140,5	5	32	83	RP 1	48	21	43,7	10,5	**SAHA210**	**SA210**	**HA210**
55	126	150	7	33	87	RP 1-1/4	60	24	48,4	11,5	**SAHA211**	**SA211**	**HA211**

Note: Inch sizes available on request.

ART BEARINGS

Standard duty cylindrical cartridge units set screws type

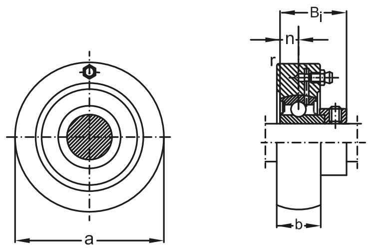




Shaft dia.	Nominal dimensions a	b	r	Bi	n	Unit number	Bearing number	Housing number
mm						-		
12	72	20	2	31	12,7	**UCC201**	**UC201**	**C204**
15	72	20	2	31	12,7	**UCC202**	**UC202**	**C204**
17	72	20	2	31	12,7	**UCC203**	**UC203**	**C204**
20	72	20	2	31	12,7	**UCC204**	**UC204**	**C204**
25	80	22	2	34	14,3	**UCC205**	**UC205**	**C205**
30	85	27	2	38,1	15,9	**UCC206**	**UC206**	**C206**
35	90	28	2	42,9	17,5	**UCC207**	**UC207**	**C207**
40	100	30	2,5	49,2	19	**UCC208**	**UC208**	**C208**
45	110	31	2,5	49,2	19	**UCC209**	**UC209**	**C209**
50	120	33	2,5	51,6	19	**UCC210**	**UC210**	**C210**
55	125	35	2,5	55,6	22,2	**UCC211**	**UC211**	**C211**
60	130	38	2,5	65,1	25,4	**UCC212**	**UC212**	**C212**
65	140	40	3	65,1	25,4	**UCC213**	**UC213**	**C213**

Note: Inch sizes available on request.

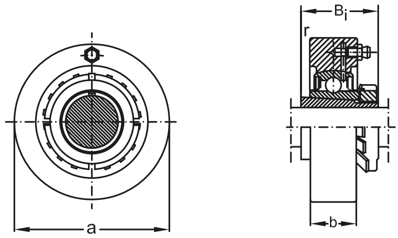
Standard duty cylindrical cartridge units eccentric locking collar type



Shaft dia.	Nominal dimensions a	b	r	Bi	n	Unit number	Bearing number	Housing number
mm						-		
20	72	20	2	7	29,5	**SAC204**	**SA204**	**C204**
25	80	22	2	7,5	30,5	**SAC205**	**SA205**	**C205**
30	85	27	2	8	33,9	**SAC206**	**SA206**	**C206**
35	90	28	2	8,5	37,5	**SAC207**	**SA207**	**C207**
40	100	30	2,5	9,5	40,5	**SAC208**	**SA208**	**C208**
45	110	31	2,5	10	42,2	**SAC209**	**SA209**	**C209**
50	120	33	2,5	10,5	43,7	**SAC210**	**SA210**	**C210**
55	125	35	2,5	11,5	48,4	**SAC211**	**SA211**	**C211**

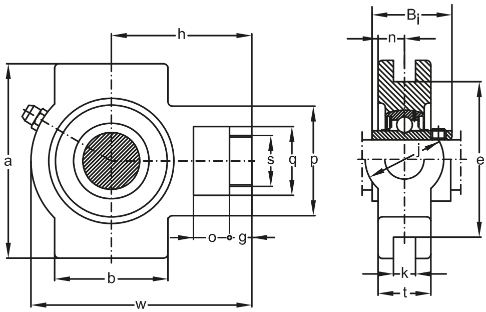
Note: Inch sizes available on request.

Standard duty cylindrical cartridge units adapter type



Shaft dia.	Nominal dimensions a	b	r	Bi	Unit number	Bearing number	Housing number
mm					-		
20	80	22	2	35	**UKC205**	**UK205**	**C205**
25	85	27	2	38	**UKC206**	**UK206**	**C206**
30	90	28	2	43	**UKC207**	**UK207**	**C207**
35	100	30	2,5	46	**UKC208**	**UK208**	**C208**
40	110	31	2,5	50	**UKC209**	**UK209**	**C209**
45	120	33	2,5	55	**UKC210**	**UK210**	**C210**
50	125	35	2,5	59	**UKC211**	**UK211**	**C211**
55	130	38	2,5	62	**UKC212**	**UK212**	**C212**
60	140	40	3	65	**UKC213**	**UK213**	**C213**

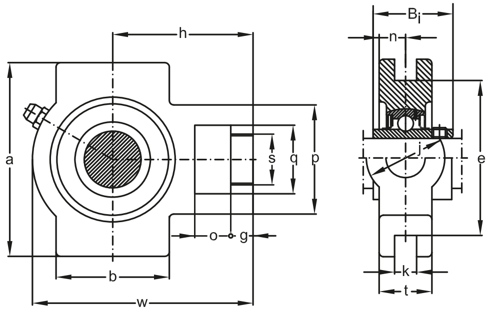
Standard duty take-up units cast housing set screws type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	n	Unit number	Bearing number	Housing number
mm																-		
20	16	10	51	32	19	51	13,5	76	89	94	32	21	61	31	12,7	**UCST204**	**UC204**	**ST204**
25	16	10	51	32	19	51	13,5	76	89	97	32	24	62	34	14,3	**UCST205**	**UC205**	**ST205**
30	16	10	56	37	22	57	13,5	89	102	113	37	28	70	38,1	15,9	**UCST206**	**UC206**	**ST206**
35	16	13	64	37	22	64	13,5	89	102	129	37	30	78	42,9	17,5	**UCST207**	**UC207**	**ST207**
40	19	16	83	49	29	83	17,5	101	114	144	49	33	88	49,2	19	**UCST208**	**UC208**	**ST208**
45	19	16	83	49	29	83	17,5	101	117	144	49	35	87	49,2	19	**UCST209**	**UC209**	**ST209**
50	19	16	83	49	29	86	17,5	101	117	149	49	37	90	51,6	19	**UCST210**	**UC210**	**ST210**
55	25	19	102	64	35	95	27	130	146	171	64	38	106	55,6	22,2	**UCST211**	**UC211**	**ST211**
60	32	19	102	64	35	102	27	130	146	194	64	42	119	65,1	25,4	**UCST212**	**UC212**	**ST212**
65	32	21	111	70	41	121	27	151	167	224	70	44	137	65,1	25,4	**UCST213**	**UC213**	**ST213**
70	32	21	111	70	41	121	27	151	167	224	70	46	137	74,6	30,2	**UCST214**	**UC214**	**ST214**
75	32	21	111	70	41	121	27	151	167	232	70	48	140	77,8	33,3	**UCST215**	**UC215**	**ST215**

Note: Inch sizes available on request.

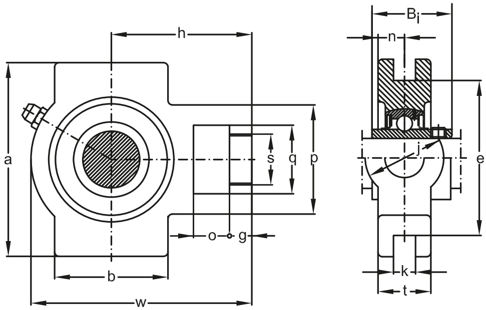
Standard duty take-up units cast housing set screws type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	n	Unit number	Bearing number	Housing number
mm																-		
12	16	10	51	32	19	51	12	76	89	94	32	21	61	31	12,7	**UCT201**	**UC201**	**T204**
15	16	10	51	32	19	51	12	76	89	94	32	21	61	31	12,7	**UCT202**	**UC202**	**T204**
17	16	10	51	32	19	51	12	76	89	94	32	21	61	31	12,7	**UCT203**	**UC203**	**T204**
20	16	10	51	32	19	51	12	76	89	94	32	21	61	31	12,7	**UCT204**	**UC204**	**T204**
25	16	10	51	32	19	51	12	76	89	97	32	24	62	34	14,3	**UCT205**	**UC205**	**T205**
30	16	10	56	37	22	57	12	89	102	113	37	28	70	38,1	15,9	**UCT206**	**UC206**	**T206**
35	16	13	64	37	22	64	12	89	102	129	37	30	78	42,9	17,5	**UCT207**	**UC207**	**T207**
40	19	16	83	49	29	83	16	102	114	144	49	33	88	49,2	19	**UCT208**	**UC208**	**T208**
45	19	16	83	49	29	83	16	102	117	144	49	35	87	49,2	19	**UCT209**	**UC209**	**T209**
50	19	16	83	49	29	86	16	102	117	149	49	37	90	51,6	19	**UCT210**	**UC210**	**T210**
55	25	19	102	64	35	95	22	130	146	171	64	38	106	55,6	22,2	**UCT211**	**UC211**	**T211**
60	32	19	102	64	35	102	22	130	146	194	64	42	119	65,1	25,4	**UCT212**	**UC212**	**T212**
65	32	21	111	70	41	121	26	151	167	224	70	44	137	65,1	25,4	**UCT213**	**UC213**	**T213**
70	32	21	111	70	41	121	26	151	167	224	70	46	137	74,6	30,2	**UCT214**	**UC214**	**T214**
75	32	21	111	70	41	121	26	151	167	232	70	48	140	77,8	33,3	**UCT215**	**UC215**	**T215**
80	32	21	111	70	41	121	26	165	184	235	70	51	140	82,6	33,3	**UCT216**	**UC216**	**T216**
85	38	29	124	73	48	157	30	173	198	260	73	54	162	85,7	34,1	**UCT217**	**UC217**	**T217**

Note: Inch sizes available on request.

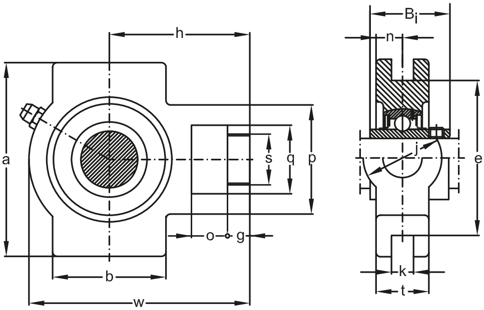
Standard duty take-up units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	n	Unit number	Bearing number	Housing number
mm																-		
20	16	10	51	32	19	51	13,5	76	89	94	32	21	61	29,5	7	**SAST204**	**SA204**	**ST204**
25	16	10	51	32	19	51	13,5	76	89	97	32	24	62	30,5	7,5	**SAST205**	**SA205**	**ST205**
30	16	10	56	37	22	57	13,5	89	102	113	37	28	70	33,9	8	**SAST206**	**SA206**	**ST206**
35	16	13	64	37	22	64	13,5	89	102	129	37	30	78	37,5	8,5	**SAST207**	**SA207**	**ST207**
40	19	16	83	49	29	83	17,5	101	114	144	49	33	88	40,5	9,5	**SAST208**	**SA208**	**ST208**
45	19	16	83	49	29	83	17,5	101	117	144	49	35	87	42,2	10	**SAST209**	**SA209**	**ST209**
50	19	16	83	49	29	86	17,5	101	117	149	49	37	90	43,7	10,5	**SAST210**	**SA210**	**ST210**
55	25	19	102	64	35	95	27	130	146	171	64	38	106	48,4	11,5	**SAST211**	**SA211**	**ST211**

Note: Inch sizes available on request.

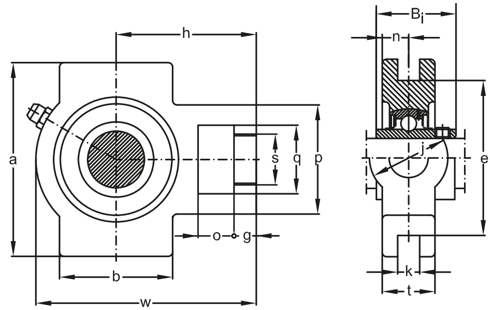
Standard duty take-up units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	n	Unit number	Bearing number	Housing number
mm																-		
20	16	10	51	32	19	51	12	76	89	94	32	21	61	29,5	7	**SAT204**	**SA204**	**T204**
25	16	10	51	32	19	51	12	76	89	97	32	24	62	30,5	7,5	**SAT205**	**SA205**	**T205**
30	16	10	56	37	22	57	12	89	102	113	37	28	70	33,9	8	**SAT206**	**SA206**	**T206**
35	16	13	64	37	22	64	12	89	102	129	37	30	78	37,5	8,5	**SAT207**	**SA207**	**T207**
40	19	16	83	49	29	83	16	102	114	144	49	33	88	40,5	9,5	**SAT208**	**SA208**	**T208**
45	19	16	83	49	29	83	16	102	117	144	49	35	87	42,2	10	**SAT209**	**SA209**	**T209**
50	19	16	83	49	29	86	16	102	117	149	49	37	90	43,7	10,5	**SAT210**	**SA210**	**T210**
55	25	19	102	64	35	95	22	130	146	171	64	38	106	48,4	11,5	**SAT211**	**SA211**	**T211**

Note: Inch sizes available on request.

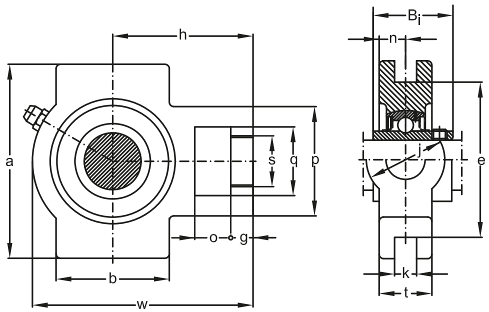
Standard duty take-up units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	n	Unit number	Bearing number	Housing number
mm																-		
20	16	10	51	32	19	51	13,5	76	89	94	32	21	61	43,5	17	**UELST204**	**UEL204**	**ST204**
25	16	10	51	32	19	51	13,5	76	89	97	32	24	62	44,3	17,4	**UELST205**	**UEL205**	**ST205**
30	16	10	56	37	22	57	13,5	89	102	113	37	28	70	48,3	18,2	**UELST206**	**UEL206**	**ST206**
35	16	13	64	37	22	64	13,5	89	102	129	37	30	78	51,1	18,8	**UELST207**	**UEL207**	**ST207**
40	19	16	83	49	29	83	17,5	101	114	144	49	33	88	56,3	21,4	**UELST208**	**UEL208**	**ST208**
45	19	16	83	49	29	83	17,5	101	117	144	49	35	87	56,3	21,4	**UELST209**	**UEL209**	**ST209**
50	19	16	83	49	29	86	17,5	101	117	149	49	37	90	62,7	24,6	**UELST210**	**UEL210**	**ST210**
55	25	19	102	64	35	95	27	130	146	171	64	38	106	71,3	27,7	**UELST211**	**UEL211**	**ST211**
60	32	19	102	64	35	102	27	130	146	194	64	42	119	77,7	30,9	**UELST212**	**UEL212**	**ST212**
65	32	21	111	70	41	121	27	151	167	224	70	44	137	85,7	34,1	**UELST213**	**UEL213**	**ST213**
70	32	21	111	70	41	121	27	151	167	224	70	46	137	85,7	34,1	**UELST214**	**UEL214**	**ST214**
75	32	21	111	70	41	121	27	151	167	232	70	48	140	92,1	37,3	**UELST215**	**UEL215**	**ST215**

Note: Inch sizes available on request.

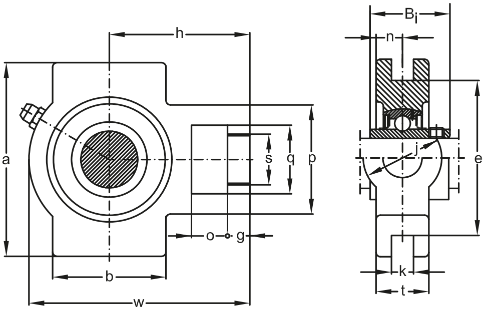
Standard duty take-up units cast housing eccentric locking collar type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	n	Unit number	Bearing number	Housing number
mm																-		
12	16	12	51	32	19	51	12	76	89	94	32	21	61	43,5	17	**UELT201**	**UEL201**	**T204**
15	16	12	51	32	19	51	12	76	89	94	32	21	61	43,5	17	**UELT202**	**UEL202**	**T204**
17	16	12	51	32	19	51	12	76	89	94	32	21	61	43,5	17	**UELT203**	**UEL203**	**T204**
20	16	12	51	32	19	51	12	76	89	94	32	21	61	43,5	17	**UELT204**	**UEL204**	**T204**
25	16	12	51	32	19	51	12	76	89	97	32	24	62	44,3	17,4	**UELT205**	**UEL205**	**T205**
30	16	12	56	37	22	57	12	89	102	113	37	28	70	48,3	18,2	**UELT206**	**UEL206**	**T206**
35	16	15	64	37	22	64	12	89	102	129	37	30	78	51,1	18,8	**UELT207**	**UEL207**	**T207**
40	19	18	83	49	29	83	16	102	114	144	49	33	88	56,3	21,4	**UELT208**	**UEL208**	**T208**
45	19	18	83	49	29	83	16	102	117	144	49	35	87	56,3	21,4	**UELT209**	**UEL209**	**T209**
50	19	18	83	49	29	86	16	102	117	149	49	37	90	62,7	24,6	**UELT210**	**UEL210**	**T210**
55	25	21	102	64	35	95	22	130	146	171	64	38	106	71,3	27,7	**UELT211**	**UEL211**	**T211**
60	32	21	102	64	35	102	22	130	146	194	64	42	119	77,7	30,9	**UELT212**	**UEL212**	**T212**
65	32	23	111	70	41	121	26	151	167	224	70	44	137	85,7	34,1	**UELT213**	**UEL213**	**T213**
70	32	23	111	70	41	121	26	151	167	224	70	46	137	85,7	34,1	**UELT214**	**UEL214**	**T214**
75	32	23	111	70	41	121	26	151	167	232	70	48	140	92,1	37,3	**UELT215**	**UEL215**	**T215**

Note: Inch sizes available on request.

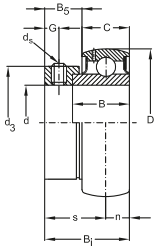
Standard duty take-up units cast housing adapter type



Shaft dia.	Nominal dimensions o	g	p	q	s	b	k	e	a	w	j	t	h	Bi	Unit number	Bearing number	Housing number
mm															-		
20	16	12	51	32	19	51	12	76	89	97	32	24	62	35	**UKT205**	**UK205**	**T205**
25	16	12	56	37	22	57	12	89	102	113	37	28	70	38	**UKT206**	**UK206**	**T206**
30	16	15	64	37	22	64	12	89	102	129	37	30	78	43	**UKT207**	**UK207**	**T207**
35	19	18	83	49	29	83	16	102	114	144	49	33	88	46	**UKT208**	**UK208**	**T208**
40	19	18	83	49	29	83	16	102	117	144	49	35	87	50	**UKT209**	**UK209**	**T209**
45	19	18	83	49	29	86	16	102	117	149	49	37	90	55	**UKT210**	**UK210**	**T210**
50	25	21	102	64	35	95	22	130	146	171	64	38	106	59	**UKT211**	**UK211**	**T211**
55	32	21	102	64	35	102	22	130	146	194	64	42	119	62	**UKT212**	**UK212**	**T212**
60	32	23	111	70	41	121	26	151	167	224	70	44	137	65	**UKT213**	**UK213**	**T213**

ART BEARINGS

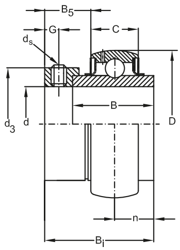
Standard duty spherical outside surface ball bearings set screws type



Shaft dia. d	Nominal dimensions D	Bi	C	n	s	G	d_s	Bearing number	Basic load ratings dyn. C_r	stat. C_{or}
mm								-	N	
12	40	22	12	6	16	4	M5X0,8	**SB201**	9,6	4,6
15	40	22	12	6	16	4	M5X0,8	**SB202**	9,6	4,6
17	40	22	12	6	16	4	M5X0,8	**SB203**	9,6	4,6
20	47	25	14	7	18	5	M6X1	**SB204**	12,8	6,65
25	52	27	15	7,5	19,5	5,5	M6X1	**SB205**	14	7,85
30	62	29	16	8	21	6	M6X1	**SB206**	19,5	11,3
35	72	32	17	8,5	23,5	6,5	M6X1	**SB207**	25,7	15,3
40	80	34	19	9,5	24,5	7	M8X1	**SB208**	29,1	17,8

Note: Inch sizes available on request.

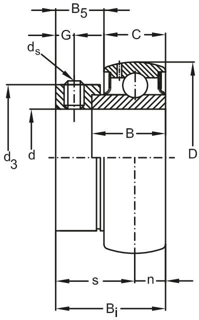
Standard duty spherical outside surface ball bearings set screws type



Shaft dia. d	Nominal dimensions D	Bi	C	n	s	G	F	d_s	Bearing number	Basic load ratings dyn. C_r	stat. C_{or}
mm									-	N	
12	47	31	16	12,7	18,3	5	3,5	M5X0,8	**UC201**	12,8	6,65
15	47	31	16	12,7	18,3	5	3,5	M5X0,8	**UC202**	12,8	6,65
17	47	31	16	12,7	18,3	5	3,5	M5X0,8	**UC203**	12,8	6,65
20	47	31	16	12,7	18,3	5	3,5	M6X1	**UC204**	12,8	6,65
25	52	34	17	14,3	19,7	5,5	4	M6X1	**UC205**	14	7,85
30	62	38,1	19	15,9	22,2	6	4,2	M6X1	**UC206**	19,5	11,3
35	72	42,9	20	17,5	25,4	6,5	4,3	M8X1	**UC207**	25,7	15,3
40	80	49,2	21	19	30,2	8	4,2	M8X1	**UC208**	29,1	17,8
45	85	49,2	22	19	30,2	8	4,2	M8X1	**UC209**	32,5	20,4
50	90	51,6	23	19	32,6	9	4,8	M10X1,25	**UC210**	35	23,2
55	100	55,6	25	22,2	33,4	9	5,3	M10X1,25	**UC211**	43,5	29,2
60	110	65,1	27	25,4	39,7	10,5	5,3	M10X1,25	**UC212**	52,5	36
65	120	65,1	28	25,4	39,7	12	6	M12X1,25	**UC213**	57,5	40
70	125	74,6	30	30,2	44,4	12	6	M12X1,25	**UC214**	62	44
75	130	77,8	30	33,3	44,5	12	6	M12X1,25	**UC215**	66	49,5
80	140	82,6	33	33,3	49,3	14	6,3	M12X1,25	**UC216**	72,5	53
85	150	85,7	35	34,1	51,6	14	6,5	M12X1,25	**UC217**	83,5	64
90	160	96	37	39,7	56,3	14	6,5	M12X1,25	**UC218**	96	71,5

Note: Inch sizes available on request.

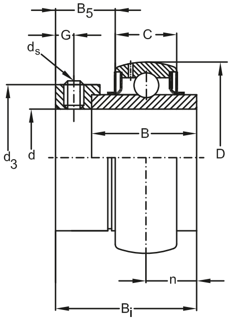
Standard duty spherical outside surface ball bearings eccentric locking collar type



Shaft dia.	Nominal dimensions										Bearing number	Basic load ratings	
d	D	B_i	B	C	n	s	G	d_s	d_3	B_5		dyn C_r	stat. C_{0r}
mm											-	N	
12	40	28,5	19	12	6	22,5	4,8	M6X1	28,6	13,5	**SA201**	9,6	4,6
15	40	28,5	19	12	6	22,5	4,8	M6X1	28,6	13,5	**SA202**	9,6	4,6
17	40	28,5	19	12	6	22,5	4,8	M6X1	28,6	13,5	**SA203**	9,6	4,6
20	47	29,5	20	14	7	22,5	4,8	M6X1	33,3	13,5	**SA204**	12,8	6,65
25	52	30,5	21	15	7,5	23	4,8	M6X1	38,1	13,5	**SA205**	14	7,85
30	62	33,9	22	16	8	25,9	6	M6X1	44,5	15,9	**SA206**	19,5	11,3
35	72	37,5	24	17	8,5	29	6,8	M8X1	55,6	17,5	**SA207**	25,7	15,3
40	80	40,5	27	19	9,5	31	6,8	M8X1	60,3	18,3	**SA208**	29,1	17,8
45	85	42,2	28,7	20	10	32,2	6,8	M8X1	63,5	18,3	**SA209**	32,5	20,4
50	90	43,7	30,2	21	10,5	33,2	6,8	M8X1	69,9	18,3	**SA210**	35	23,2
55	100	48,8	32,4	23	11,5	36,9	8	M10X1,25	76,2	18,3	**SA211**	43,5	29,2

Note: Inch sizes available on request.

Standard duty spherical outside surface ball bearings eccentric locking collar type

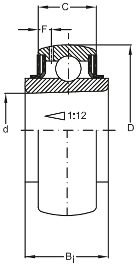


Shaft dia.	Nominal dimensions										Bearing number	Basic load ratings	
d	D	B_i	C	n	B	G	d_3	B_5	F	d_s		dyn C_r	stat. C_{0r}
mm											-	N	
12	47	43,5	16	17	34	4,8	33,3	13,5	3,5	M6X1	**UEL201**	12,8	6,65
15	47	43,5	16	17	34	4,8	33,3	13,5	3,5	M6X1	**UEL202**	12,8	6,65
17	47	43,5	16	17	34	4,8	33,3	13,5	3,5	M6X1	**UEL203**	12,8	6,65
20	47	43,5	16	17	34	4,8	33,3	13,5	3,5	M6X1	**UEL204**	12,8	6,65
25	52	44,3	17	17,4	34,8	4,8	38,1	13,5	4	M6X1	**UEL205**	14	7,85
30	62	48,3	19	18,2	36,4	6	44,5	15,9	4,2	M8X1	**UEL206**	19,5	11,3
35	72	51,1	20	18,8	37,6	6,8	55,6	17,5	4,3	M8X1	**UEL207**	25,7	15,3
40	80	56,3	21	21,4	42,8	6,8	60,3	18,3	4,2	M8X1	**UEL208**	29,1	17,8
45	85	56,3	22	21,4	42,8	6,8	63,5	18,3	4,2	M8X1	**UEL209**	32,5	20,4
50	90	62,7	23	24,6	49,2	6,8	69,9	18,3	4,8	M8X1	**UEL210**	35	23,2
55	100	71,3	25	27,7	55,4	8	76,2	20,7	5,3	M10X1,25	**UEL211**	43,5	29,2
60	110	77,7	27	30,9	61,8	8	84	22,3	5,3	M10X1,25	**UEL212**	52,5	36
65	120	85,7	28	34,1	68,2	8,7	86	23,5	6	M10X1,25	**UEL213**	57,5	40
70	125	85,7	30	34,1	68,2	8,7	96	23,9	6	M10X1,25	**UEL214**	62	44
75	130	92,1	30	37,3	74,6	8,7	102	23,9	6	M10X1,25	**UEL215**	66	49,5

Note: Inch sizes available on request.

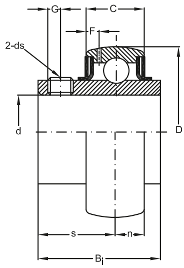
ART BEARINGS

Standard duty spherical outside surface ball bearings adapter type



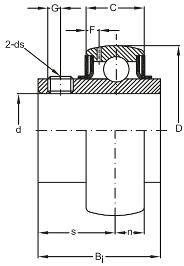
Shaft dia.	Nominal dimensions				Bearing number	Basic load ratings	
d	D	B_i	C	F		dyn C_r	stat. C_{0r}
mm					-	N	
20	52	21	17	4.2	**UK205**	14	7,85
25	62	25	19	4,5	**UK206**	19,5	11,3
30	72	27	20	4,2	**UK207**	25,7	15,3
35	80	29	21	4,2	**UK208**	29,1	17,8
40	85	30	22	4,2	**UK209**	32,5	20,4
45	90	31	23	5	**UK210**	35	23,2
50	100	33	27	6,3	**UK211**	43,5	29,2
55	110	36	27	5,3	**UK212**	52,5	36
60	120	36	28	6	**UK213**	57,5	40

Medium duty spherical outside surface ball bearings set screws type



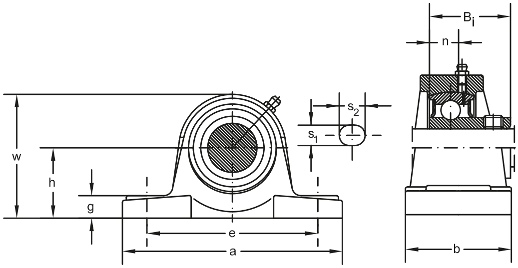
Shaft dia.	Nominal dimensions								Bearing number	Basic load ratings	
d	D	B_i	C	n	s	G	F	d_s		dyn C_r	stat. C_{0r}
mm									-	N	
25	62	38,1	19	15,9	22,2	6	5	M6X1	**UCX05**	19,5	11,3
30	72	42,9	22	17,5	25,4	6,5	5,8	M8X1	**UCX06**	25,7	15,3
35	80	49,2	21	19	30,2	8	6,3	M8X1	**UCX07**	29,1	17,8
40	85	49,2	22	19	30,2	8	6,8	M8X1	**UCX08**	32,5	20,4
45	90	51,6	23	19	32,6	9	6,5	M10X1,25	**UCX09**	35	23,2
50	100	55,6	25	22,2	33,4	9	7,2	M10X1,25	**UCX10**	43,5	29,2
55	110	65,1	27	25,4	39,7	10,5	8,2	M10X1,25	**UCX11**	52,5	36
60	120	65,1	28	25,4	39,7	12	8	M12X1,25	**UCX12**	57,5	40
65	125	74,6	30	30,2	44,4	12	9	M12X1,25	**UCX13**	62	44
70	130	77,8	30	33,3	44,5	12	9	M12X1,25	**UCX14**	66	49,5
75	140	82,6	33	33,3	49,3	14	10,3	M12X1,25	**UCX15**	72,5	53
80	150	85,7	35	34,1	51,6	14	11	M12X1,25	**UCX16**	83,2	63,8

Heavy duty spherical outside surface ball bearings set screws type



Shaft dia.	Nominal dimensions								Bearing number	Basic load ratings	
d	D	B_i	C	n	s	G	F	d_s		dyn C_r	stat. C_{0r}
mm									-	N	
25	62	38	21	15	23	6	4,3	M6X1	**UC305**	21,2	10,9
30	72	43	24	17	26	6	5,5	M6X1	**UC306**	26,7	15
35	80	48	25	19	29	8	5,3	M8X1	**UC307**	33,5	19,1
40	90	52	28	19	33	10	5,5	M10X1,25	**UC308**	40,5	24
45	100	57	30	22	35	10	6	M10X1,25	**UC309**	53	32
50	110	61	32	22	39	12	6,1	M12X1,25	**UC310**	62	38,5
55	120	66	34	25	41	12	6,4	M12X1,25	**UC311**	71,5	45
60	130	71	36	26	45	12	6,7	M12X1,25	**UC312**	82	52
65	140	75	38	30	45	12	6,9	M12X1,25	**UC313**	92,5	60
70	150	78	40	33	47	12	7,2	M12X1,25	**UC314**	104	68
75	160	82	42	32	50	14	7,5	M14X1,5	**UC315**	113	77
80	170	86	44	34	52	14	7,5	M14X1,5	**UC316**	122	86

SSUCP series pillow blocks
Normal duty with set screw lock and grease fitting

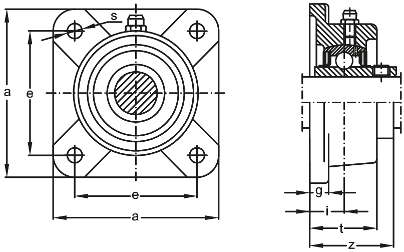


Dimensions											Unit no.	Bolt size	Bearing no.	Housing no.
d	B	n	b	h	g	w	a	e	s_1	s_2				
mm											-	mm		
12	27,4	11,5	38	30,2	14	62	127	95	12	19	**SSUCP201**	M10	**SSUC201**	**SSP203**
15	27,4	11,5	38	30,2	14	62	127	95	12	19	**SSUCP202**	M10	**SSUC202**	**SSP203**
17	27,4	11,5	38	30,2	14	62	127	95	12	19	**SSUCP203**	M10	**SSUC203**	**SSP203**
20	31	12,7	38	33,3	15	65	127	95	12	19	**SSUCP204**	M10	**SSUC204**	**SSP204**
25	34,1	14,3	38	36,5	16	70	140	105	15	19	**SSUCP205**	M10	**SSUC205**	**SSP205**
30	38,1	15,9	48	42,9	18	83	165	121	15	21	**SSUCP206**	M12	**SSUC206**	**SSP206**
35	42,9	17,5	48	47,6	19	94	167	127	15	21	**SSUCP207**	M12	**SSUC207**	**SSP207**
40	49,2	19	54	49,2	19	100	184	137	15	23	**SSUCP208**	M12	**SSUC208**	**SSP208**
45	49,2	19	54	54	20	108	190	146	15	23	**SSUCP209**	M12	**SSUC209**	**SSP209**
50	51,6	19	60	57,2	22	114	206	159	19	23	**SSUCP210**	M16	**SSUC210**	**SSP210**

Note: Grease fitting 1/4 - 28 UNF

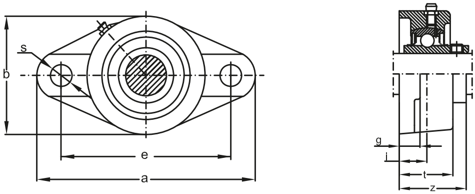
ART BEARINGS

SSUCF series four bolt flanges
Normal duty with set screw lock and grease fitting



Dimensions								Unit no.	Bolt size	Bearing no.	Housing no.
d	z	t	g	i	s	a	e				
mm								-	mm		
12	30,9	24	11	15	12	76	54	**SSUCF201**	M10	**SSUC201**	**SSF203**
15	30,9	24	11	15	12	76	54	**SSUCF202**	M10	**SSUC202**	**SSF203**
17	20,9	24	11	15	12	76	54	**SSUCF203**	M10	**SSUC203**	**SSF203**
20	33,3	25	11	15	12	86	63,5	**SSUCF204**	M10	**SSUC204**	**SSF204**
25	35,8	26,5	13	16	12	95	70	**SSUCF205**	M10	**SSUC205**	**SSF205**
30	40,2	30	13	18	15	108	82,5	**SSUCF206**	M12	**SSUC206**	**SSF206**
35	44,4	33	14	19	15	117	92	**SSUCF207**	M12	**SSUC207**	**SSF207**
40	51,2	36	14	21	15	130	101,5	**SSUCF208**	M12	**SSUC208**	**SSF208**
45	52,2	38	14	22	15	137	105	**SSUCF209**	M12	**SSUC209**	**SSF209**
50	54,6	39	15	22	19	143	111	**SSUCF210**	M16	**SSUC210**	**SSF210**

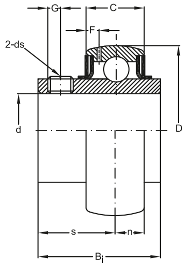
SSUCFL series two bolt flanges
Normal duty with set screw lock and grease fitting



Dimensions									Unit no.	Bolt size	Bearing no.	Housing no.
d	z	t	g	i	b	s	a	e				
mm									-	mm		
12	30,9	24	11	15	55	12	98,5	76,5	**SSUCFL201**	M10	**SSUC201**	**SSFL203**
15	30,9	24	11	15	55	12	98,5	76,5	**SSUCFL202**	M10	**SSUC202**	**SSFL203**
17	30,9	24	11	15	55	12	98,5	76,5	**SSUCFL203**	M10	**SSUC203**	**SSFL203**
20	33,3	25	11	15	60	12	112	90	**SSUCFL204**	M10	**SSUC204**	**SSFL204**
25	35,8	26,5	13	16	68	12	124	99	**SSUCFL205**	M10	**SSUC205**	**SSFL205**
30	40,2	30	13	18	80	15	141	116,5	**SSUCFL206**	M12	**SSUC206**	**SSFL206**
35	44,4	33	14	19	90	15	155,5	130	**SSUCFL207**	M12	**SSUC207**	**SSFL207**
40	51,2	36	14	21	100	15	171,5	143,5	**SSUCFL208**	M12	**SSUC208**	**SSFL208**
45	52,2	38	14	22	108	15	179	148,5	**SSUCFL209**	M12	**SSUC209**	**SSFL209**
50	54,6	39	15	22	115	19	189	157	**SSUCFL210**	M16	**SSUC210**	**SSFL210**

Note: Grease fitting 1/4 - 28 UNF

SSUC series bearing insert
Normal duty with set screw lock



Dimensions								Basic load ratings		Designation
d H7	D H5	B	S	r_{min}	C	d_s	G	C_r*	C_{0r}	
mm								N		
12	40	27,4	11,5	0,6	14	M5 x 0,5	4	7350	4750	**SSUC201**
15	40	27,4	11,5	0,6	14	M5 x 0,5	4	7350	4750	**SSUC202**
17	40	27,4	11,5	0,6	14	M5 x 0,5	4	7350	4750	**SSUC203**
20	47	31	12,7	1	17	M6 x 0,75	5	9800	6550	**SSUC204**
25	52	34,1	14,3	1	17	M6 x 0,75	5	10800	7800	**SSUC205**
30	62	38,1	15,9	1	19	M6 x 0,75	5	15000	11200	**SSUC206**
35	72	42,9	17,5	1,1	20	M8 x 1	7	19600	15300	**SSUC207**
40	80	49,2	19	1,1	21	M8 x 1	8	23600	19000	**SSUC208**
45	85	49,2	19	1,1	22	M8 x 1	8	25500	21600	**SSUC209**
50	90	51,6	19	1,1	24	M10 x 1	10	27000	23200	**SSUC210**

Note: *Multiply the load "Cr" by 1,3 if the tolerance of mounted shaft is "h6" or higher.

Cam Rollers

Standards, Boundary dimensions

Standard plans DIN 616

General

Cam Rollers are non - separable radial bearings. They are special variants of either radial **deep groove bearings** or **double row angular contact ball bearings**.

Cam roller run either directly on a guide track or against a surface that has been machined for a guidance.

To achieve this cam rollers feature an extra thick - walled outer ring this enables cam roller to accept high radial forces, including shock loads.

As cam rollers often run misaligned they are generally used with crowned outer ring syrfaces.

Cam rollers normally run outside the machine compartment, under extreme operating conditions, in the presence of heavy contaminations (i.e. dust and dirt, etc).

For this reason, cam rollers are produced and fitted with contacting seals.

Some types of the Double Row cam rollers are also available with shields.

Design variants

(see also drawings on following pages)

Cam rollers are readily available in several design variants. For the most common designs see drawings on page 713.

Single Row Cam Rollers

Cam rollers of the narrow series (series **3612..** and **3612.. R**, are based on the proven sealed single row deep groove ball bearings, (suffix **.2RS**) for their internal design.

The **ART cam rollers**, series **3612..** and **3612..R**, respectively, are produced with **.2RS**. - type contacting seals as standard. These seals provide a very effective and efficient sealing of the bearing compartment against penetration by foreign particles even under unfavourable operating conditions.

The narrow **ART cam rollers**, series **3612** are available with either cylindrical (without extra suffix) or crowned outer ring diameter (suffix **R**) as standard.

The radius of crowning on single row cam rollers for the series **3612.. R**, is standardised at **R = 400 mm, irrespective of their outer diameter**.

Double Row Cam Rollers

The internal design of **ART double row cam rollers** (series **305** and **306**) are based on the double row angular contact ball bearings of the series **32..** (for series **305**) or 33.. (for series **306** cam rollers), respectively.

ART double row cam rollers have contact angles of 25° they also feature polyamide cages as standard.

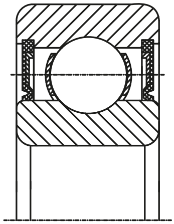
Double row cam rollers are widely used with pressed steel shields, (suffix **.2Z**), they are also available with **rubbing seals** (suffix **.2RS**) as standard.

As for single row rollers, **ART double row cam** rollers are produced with either a, cylindrical or sphered outer ring diameters.

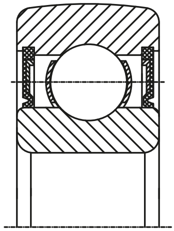
The radius of crowning of double row cam roller outer diameter is also **standardised at R = 400 mm**.

Material of seals

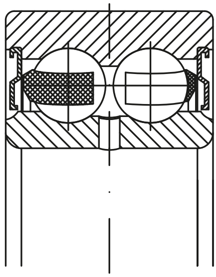
For the contacting seal of sealed **ART - cam**



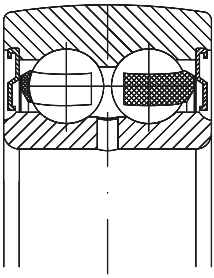
3612...



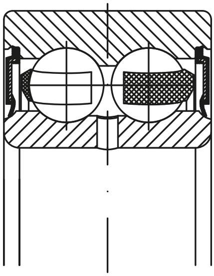
3612...R



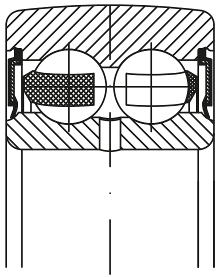
3057...2Z
3067...2Z



3058...2Z
3068...2Z



3057...2RS
3067...2RS



3058...2RS
3068...2RS

rollers (suffix **.2RS**) a wear - resistant **synthetic rubber (NBR)** is used as standard material.

This seal material is suitable for operating temperatures of **-30°C** up to **+120°C**.

On request, the **ART** - cam rollers are supplied with alternative seal materials, such as high - temperature **FPM** - contacting seals.

Grease filling

ART cam rollers incorporating either seals or shieds (suffixes) are supplied grease filled from the factory with a proven high quality, lithium soap based rolling bearing grease suitable for operating temperatures of **-30°C** up to **+110°C**.

Although cam rollers, operating under normal conditions, run generally maintenance free.

Some application require additional lubrication where high speeds, heavy dust, permanent operating temperatures over 70°C exist.

Double Row cam rollers only feature a lubrication hole in the inner rings to provide a simple and effective relubricating method.

Where relubrication is necessary, it is emphasised that, undue pressure by the regreasing metgod may cause unnecessary damage to either the seals or shields.

ART cam rollers are be supplied with special grease filles according to customer specification or with varialbe grease fill volumes than the standard.

Cages

Single Row Cam Rollers are standard fitted with pressed steel cages as standard. **Double Row Cam Rollers** feature solid polyamide cages as standard.

Tolerances

ART cam rollers, with cylindrical outer ring diameter, are produced to normal class tolerances (**PN**) as standard.

For cam rollers with sphered outer ring diameters the outer ring diameter tolerance is double the standard value.

For detailed tolerance values see in the chapter "**Bearing tolerances**" page 28.

Internal clearance

ART cam rollers are produced with **normal internal clearance** group (**CN**) **as standard** according to DIN 620.

ART cam rollers are also produced to other internal clearances.

Load carrying capability

Unlike the "normal" rolling element bearings, the outer ring of cam rollers contact their adjacent mating surface on a very small contacting area, this causes deformations of the outer ring.

These deformations are considered by the recommanded maximum values for the permissible dynamic and static radial loads as shown in by the product tables.

Equivalent dynamic load

Cam rollers must be calculated as rolling element bearings:

$$\mathbf{P = F_r}$$

But, **P** must be ≤ **F_r max**
(for **F_r** max see product tables)

Equivalent static bearing load

For Cam rollers:

$$\mathbf{P_0 = F_r}$$

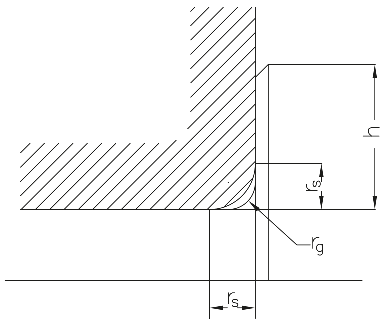
But, **P_0** must be ≤ **F_{0r} max**
(for **F_{0r}** max see product tables)

Abutment and Fillet dimensions for cam rollers

The bearing inner ring must contact adjacent surfaces with their side faces only. The radius of inner ring corners must not touch the fillet radius of the shaft shoulder.

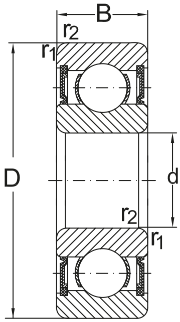
Therefore, the largest fillet radius (**r_g**) must be smaller than the minimum fillet dimension of the cam roller inner rings (**r_s**) as listed in the product tables.

Since cam rollers normally have point loaded inner rings, their shaft fits may be rather loose, (i.e. according to ISO - tolerance fields g6, h6 or j6).

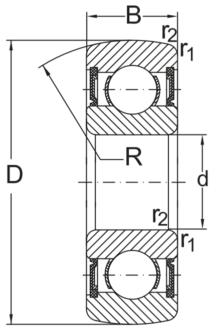


r_{smin}	r_{gmax}	h_{min}
0.6	0.6	2.1
1	1	2.8
1.1	1	3.5
1.5	1.5	4.5
2	2	5.5

Cam Rollers, Single Row



3612...



3612...R

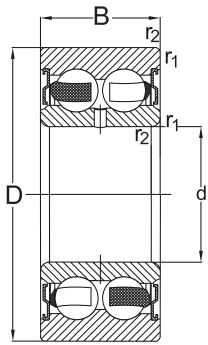
Dimensions					Designation	
D	d	B	R	r_1, r_2 min.	With cylindrical outer ring	With sphered outer ring
mm						
32	10	9	400	0,6	**361200**	**361200 R**
35	12	10	400	0,6	**361201**	**361201 R**
40	15	11	400	0,6	**361202**	**361202 R**
47	17	12	400	0,6	**361203**	**361203 R**
52	20	14	400	1	**361204**	**361204 R**
62	25	15	400	1	**361205**	**361205 R**
72	30	16	400	1	**361206**	**361206 R**
80	35	17	400	1,1	**361207**	**361207 R**
85	40	18	400	1,1	**361208**	**361208 R**
90	45	19	400	1,1	**361209**	**361209 R**

Cam Rollers, Single Row

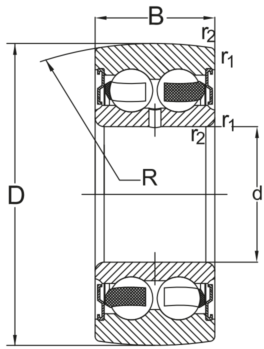
Abutment and fillet dimensions see on page 714

Speed rating	Load ratings as bearing dyn. C_r	stat. C_{0r}	as cam roller dyn. C_{LR}	stat. C_{0LR}	Max. permissible radial load dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	Mass
min^{-1}	kN				kN		kg
17000	5,1	2,4	4,6	2	3,4	4,9	0,041
15000	6,8	3,1	6,2	2,6	3,3	4,7	0,052
13000	7,8	3,8	7,1	3,2	5	7,2	0,074
12000	9,6	4,8	8,8	4,2	8,2	11,6	0,11
10000	12,7	6,6	11,4	5,4	7,4	10,6	0,16
8500	14	7,8	12,7	6,8	12,9	18	0,24
7500	19,5	11,2	17,4	9,3	14,3	20,4	0,34
6300	25,5	15,3	22,1	11,8	12,7	18	0,43
5000	32,5	19,8	22,8	13,6	13,4	23,1	0,45
4500	32,5	20,4	22,5	13,7	13,3	22,8	0,50

Cam Rollers, Double Row



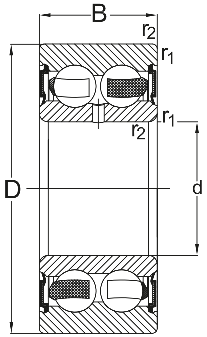
3057...2Z
3067...2Z



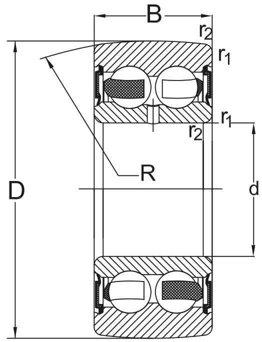
3058...2Z
3068...2Z

Dimensions					Designation	
D	d	B	R	r_1, r_2 min.	With cylindrical outer ring	With sphered outer ring
mm						
32	10	14	400	0,6	**305700 2Z**	**305800 2Z**
	10	14	400	0,6	**305700 2RS**	**305800 2RS**
35	12	15,9	400	0,6	**305701 2Z**	**305801 2Z**
	12	15,9	400	0,6	**305701 2RS**	**305801 2RS**
40	15	15,9	400	0,6	**305702 2Z**	**305802 2Z**
	15	15,9	400	0,6	**305702 2RS**	**305802 2RS**
47	17	17,5	400	0,6	**305703 2Z**	**305803 2Z**
	17	17,5	400	0,6	**305703 2RS**	**305803 2RS**
	15	19	400	1,0	**306702 2Z**	**306802 2Z**
	15	19	400	1,0	**306702 2RS**	**306802 2RS**
52	20	20,6	400	1	**305704 2Z**	**305804 2Z**
	20	20,6	400	1	**305704 2RS**	**305804 2RS**
	17	22,2	400	1,0	**306703 2Z**	**306803 2Z**
	17	22,2	400	1,0	**306703 2RS**	**306803 2RS**
62	25	20,6	400	1	**305705 2Z**	**305805 2Z**
	25	20,6	400	1	**305705 2RS**	**305805 2RS**

Cam Rollers, Double Row



3057...2RS
3067...2RS

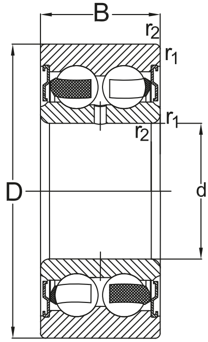


3058...2RS
3068...2RS

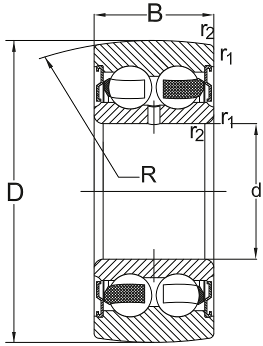
Abutment and fillet dimensions see on page 714

Speed rating	Load ratings as bearing dyn. C_r	stat. C_{0r}	as cam roller dyn. C_{LR}	stat. C_{0LR}	Max. permissible radial load dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	Mass
min^{-1}	kN				kN		kg
13000	7,8	4,5	7,4	4,1	9	12,9	0,062
8500	7,8	4,5	7,4	4,1	9	12,9	0,062
11000	10,6	5,9	10	5,2	8,3	12	0,078
7300	10,6	5,9	10	5,2	8,3	12	0,078
10000	11,9	7,1	11,1	6,4	12,2	17,6	0,10
6500	11,9	7,1	11,1	6,4	12,2	17,6	0,10
9000	14,6	9	13,8	8,3	19,3	27,5	0,16
6000	14,6	9	13,8	8,3	19,3	27,5	0,16
10000	17,7	10,3	14,6	9,2	12,5	18,4	0,15
6500	17,7	10,3	14,6	9,2	12,5	18,4	0,15
8000	19,5	12,5	18,2	11	17	24,5	0,22
5300	19,5	12,5	18,2	11	17	24,5	0,22
9500	21,1	12,5	17,2	11	15,5	22,2	0,20
6300	21,1	12,5	17,2	11	15,5	22,2	0,20
7000	21,2	14,6	19,9	13,4	30,5	44	0,32
4500	21,2	14,6	19,9	13,4	30,5	44	0,32

Cam Rollers, Double Row



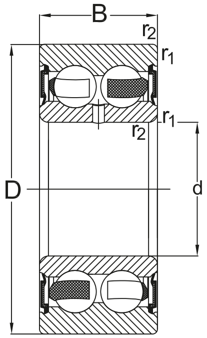
3057...2Z
3067...2Z



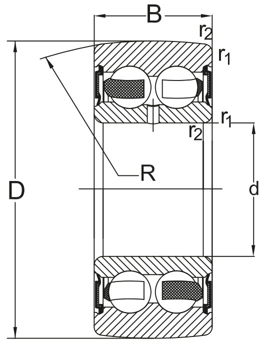
3058...2Z
3068...2Z

Dimensions					Designation	
D	d	B	R	r_1, r_2 min.	With cylindrical outer ring	With sphered outer ring
mm						
62	20	22,2	400	1,1	**306704 2Z**	**306804 2Z**
	20	22,2	400	1,1	**306704 2RS**	**306804 2RS**
72	30	23,8	400	1	**305706 2Z**	**305806 2Z**
	30	23,8	400	1	**305706 2RS**	**305806 2RS**
	25	25,4	400	1,1	**306705 2Z**	**306805 2Z**
	25	25,4	400	1,1	**306705 2RS**	**306805 2RS**
80	35	27	400	1,1	**305707 2Z**	**305807 2Z**
	35	27	400	1,1	**305707 2RS**	**305807 2RS**
	30	30,2	400	1,1	**306706 2Z**	**306806 2Z**
	30	30,2	400	1,1	**306706 2RS**	**306806 2RS**
90	35	34,9	400	1,5	**306707 2Z**	**306807 2Z**
	35	34,9	400	1,5	**306707 2RS**	**306807 2RS**
100	40	36,5	400	1,5	**306708 2Z**	**306808 2Z**
	40	36,5	400	1,5	**306708 2RS**	**306808 2RS**

Cam Rollers, Double Row



3057...2RS
3067...2RS



3058...2RS
3068...2RS

Abutment and fillet dimensions see on page 714

	Load ratings				**Max. permissible radial load**		**Mass**
	as bearing		**as cam roller**				
Speed rating	dyn. C_r	stat. C_{0r}	dyn. C_{LR}	stat. C_{0LR}	dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	
min^{-1}	kN				kN		kg
9000	24,5	15,8	21,1	14,5	27	29	0,34
6000	24,5	15,8	21,1	14,5	27	29	0,34
6000	29,6	21,2	27,6	18,6	34	49	0,49
4000	29,6	21,2	27,6	18,6	34	49	0,49
7900	32,5	21,6	27,5	19,5	34,5	39	0,5
5200	32,5	21,6	27,5	19,5	34,5	39	0,5
5300	39	28,5	35,1	24	31	44	0,65
3500	39	28,5	35,1	24	31	44	0,65
6200	45,5	31,5	36,5	26,5	43,5	53	0,67
4100	45,5	31,5	36,5	26,5	43,5	53	0,67
5100	56	39,5	44,5	33	39,5	66	0,95
3400	56	39,5	44,5	33	39,5	66	0,95
4700	69	49,5	56	42	70	84	1,2
4700	69	49,5	56	42	70	84	1,2


NUTR 45100 2Z

Support rollers

Standards, Boundary dimensions

Standard plans	DIN 616

General

Support Rollers are either needle roller or cylindrical roller bearings with an extra radially thick outer ring. Depending on their series, support rollers may be both separable and non - separable radial bearings.

Support Rollers usually run with their outer ring either directly on a guide track or against a machine surface that is for guidance. Due to their extra - thick outer rings, Suport rollers are able to accept high radial forces as well as shock loads.

Their ability to accomodate axial forces, however, depends on the particular design of the support roller.

Support roller are usually exposed to minor misalignments during operation. To minimize the negative effects of such misalignments, (e.g. high edge stresses), support rollers are more frequently used with sphered outer rings.

ART - support rollers with parallel (cylindrical) outer diameters are indicated by the suffix "**X**".

Design variants

In order to cover as many applications as possible, **ART Support rollers** are available in several different design variants as standard.

To provide simple re-lubrication, all suport roller have lubrication holes in their inner rings.

For the most common design are shown in the figures on the pages 725 and 727.

Support Rollers without axial guidance

The most simple design of support rollers is provided by the **STO** - type rollers.

For these rollers the outer ring, inner ring and the needle roller and cage assembly may be fitted separately. Since **STO** - type support rollers do not provide any axial guidance to their needle roller and cage assembly they adequately accept radial loads only.

The axial guidance of outer ring and needle roller and cage assembly must be provided by a suitable design of adjacent machine parts.

STO - Type suport rollers are frequently used without their inner rings, namely **RSTO** - rollers. The needle roler and cage assembly of **RSTO** - type support rollers run directly onto the shaft surface, which must be designed in an adequate manner, (e.g. hardened and ground).

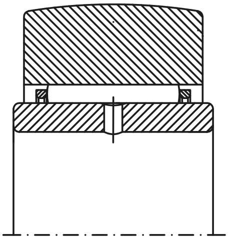
For detailed guide lines on the design of bearing raceways on shafts see chapter **"Bearing application"** on page 46.

STO and **RSTO** - type support rollers are the only support rollers that are satisfactory for operating with oil lubrication.

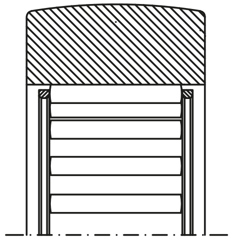
Unlike the **STO** - type support rollers, the outer ring, and the needle rollers and cage assembly of series **NA 22 ..2RS** build a unit, whilst the inner ring may be dealt with individually.

NA 22 ..2RS - type support rollers also accomodate radial loads only. They also require adequate axial guidance of their outer rings by adjacent parts.

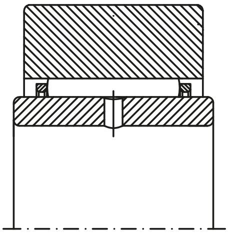
Due to the contact seals, which are integrated in their outer rings, **NA 22 ..2RS -** type support rollers provide the possibility for maintenance - free bearing arrangements.



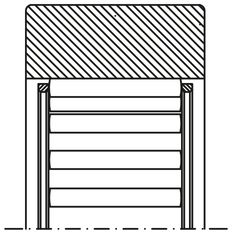
STO



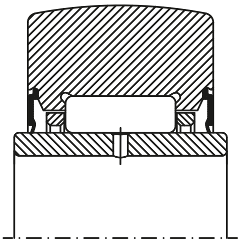
RSTO



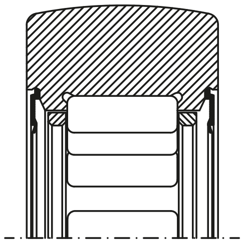
STO...X



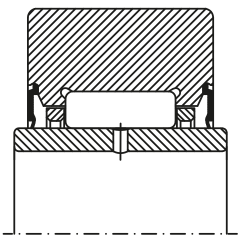
RSTO...X



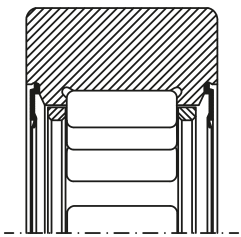
NA22...2RS



RNA22...2RS



NA22...2RS.X



RNA22...2RS.X

Sealed support rollers, without inner rings, are also produced, namely **RNA 22...2RS**.

For these types both the needle rollers and the rubbing seals run on the contacting shaft surface.

Support Rollers with axial guidance

These types of supporting rollers are also to accommodate additional thrust loads as they occur, due to aligning errors or if rollers run out of line.

That is why no extra external guiding surfaces are required.

Where high axial loads are anticipated effective axial support of side washers must be achieved by the adjacent machine components.

Support rollers, type STO..2Z

STO...2Z - type support rollers are designed similar to the **STO** - type but have two loose side plates to accept axial forces.

These types of support rollers are separable, this enables simple mounting of the rollers due to the separable parts.

Particular attention must be paid to the adequate axial camping of loose side washers during mounting.

The side plates of STO...2Z - type support rollers must not have any axial play when they are mounted.

Support rollers, type NATR

The side washers of NATR - type needle roller support rollers are pressed into the inner ring to ensure guidance of the outer ring and the needle roller and cage assembly.

Therefore, these roller types are non - separable. NATR - type needle roller support roller are optimum for applications where the rollers are exposed to high radial loads at high speeds.

The sealed support rollers, namely, **NATR.. PP**, which feature integrated rubbing seals on each side of the outer ring are very suitable for operating in harsh conditions (e.g. heavy dust, dirt and other contaminates).

Support rollers, type NATV

NATV-type rollers are identical to the **NATR**-type except they have no fitted cage (i.e. full complement type).

This enables an increased numbers of needle roller to be fitted in the available space (i.e. full circumferentially and radially). Therefore, significantly higher "basic" load ratings are achived.

NATV type full complement rollers are unsuitable for high speed applications due to the differing kinematic operating condition. Also they must be re-lubricated more frequently.

For applications of harsh operating conditions the sealed support roller, namely, **NATV...PP** is also available.

NUTR - type support rollers

The base internal design of **NUTR** - type support rollers is similar to that of double row cylindrical roller bearings.

Since the outer ring has tow shoulders these support rollers are able to accommodate greater thrust loads.

NUTR - type support rollers are non separable.

The separate loose ribs of these type are retained using either cupped washers pressfitted into the outer ring or with lamellar rings which sit in the formed circumferential grooves machined in the loose rib outer diameter.

Both methods also act as a gap seal.

Due to do their full complement design, **NUTR** - type support roller feature a maximum load rating but they must be more frequently re-lubrication.

For extra heavy duty applications, particularly where heavy shock loads occur **NUTR** - type support rollers are available with an extra - radialy thick walled outer ring (see sketch).

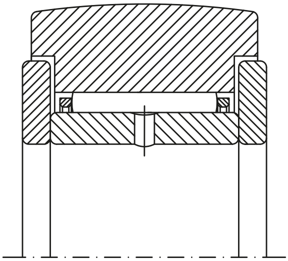
ART's extra heavy duty **NUTR** -type support rollers with increased outer ring wall thickness are identified by the fact that their nominal diameters are included in their designation.

Examples:

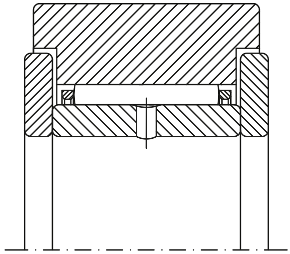
NUTR 1747

or

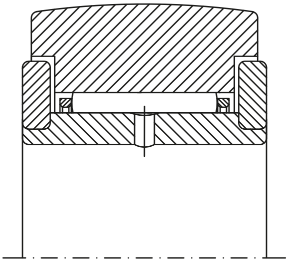
NUTR 50110.



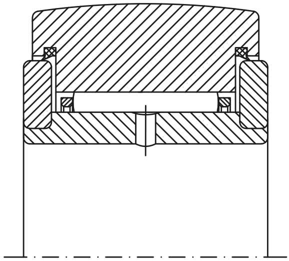
STO...2Z



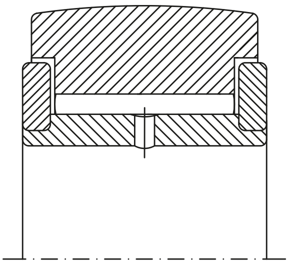
STO...2ZX



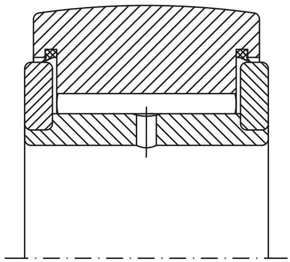
NATR



NATR...PP



NATV



NATV...PP

Tolerance values of ISO - tolerance fields F6 and h12 [µm]

Nominal dimension		>	**3**	**6**	**10**	**18**	**30**	**50**
	[mm]	≤	**6**	**10**	**18**	**30**	**50**	**80**
ISO - Tolerance field	**F6**	min	+10	+13	+16	+20	+25	+30
		max	+18	+22	+27	+33	+41	+49
ISO - Tolerance field	**h12**	min	-120	-150	-180	-210	-250	-300
		max	0	0	0	0	0	0

All **ART support rollers are produced with crowned outer ring diameter as standard** they are also available with parallel (cylindrical) outer diameters indicated by the suffix **"X",** see the relevant designs.

Material of seals

Several types of ART support rollers, such as series **NA22...2RS, NATR .. PP** und **NATV...PP** are also available in sealed versions.

These support rollers feature contacting seals made from wear - rezistant synthetic rubber compound (**NBR**) that provides an efficient and effective seal against the penetration of impurities or the escape of grease.

The synthetic rubber used for these contacting seals is satisfactory for operation temperatures of **-30°C** up to **+120°C**.

Grease filling

All **ART Support rollers** are already supplied fled with a high quality, lithium - soaped bearing grease as standard.

This lubricant is adequate for operating temperatures of **-30°C** up to ca. **+110°C**. Although support rollers under normal operating conditions usually run maintenance - free, they may require more frequent re - lubrication under certain unfavourable operating conditions such as heavy dust, high speeds, permanent operating temperatures of more than 70°C, and the presence of increased humidity etc.

Therefore a **ART support rollers** feature a lubrication hole in the inner ring to provide the possibility of re-lubricating the rollers, when necessary.

It must be considered where relubrication is necessary, with a satisfactory grease, the force of pressure to re-grease must be of a level not to cause permanent damage to either the seals or shields.

ART also produce roller with alternative grease fi according to customer's specidication upon order request.

Cages

ART support rollers, with cages fitted, have normally pressed steel cages as standard. Only small support rollers without axial guidance, series **STO** and **RSTO**, respectively, are fitted with solid polyamide cages (suffix **TN**), as standard.

Tolerances

ART support rollers are produced to normal tolerance class (**PN**) as standard, according to DIN - standard DIN 620.

The exceptions being the outer ring outer diameter tolerance of crowned outer rings and the width tolerance of supporting roller of series **STO ...2Z**, **NATR**, **NATV** and **NUTR**.

The tolerance for the outer ring diameter of support rollers with sphered outer ring is uniform at:

0 / -0,05 mm

The width tolerance of support rollers of series **STO ...2Z**, **NATR**, **NATV** and **NUTR** is lateral and lies in the ISO - tolerance field **h12**.

The tolerance for the **inside diameter of the needle roller complement**, (**F**), of **RSTO** and **RNA 22...2RS** - type support rollers that are used without inner rings, is lateral in the ISO - tolerance field **F6**.

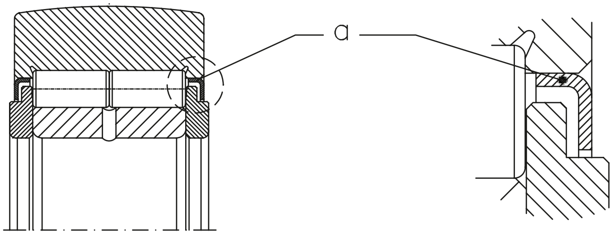
Values of ISO - tolerance field F6 and h12 are listed in the table below. For detailed values of tolerances to DIN 620 see chapter "**Bearing tolerances**" page 28.

Internal Clearance

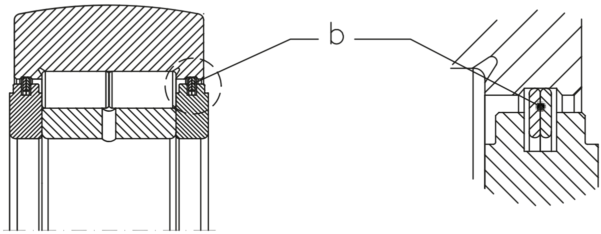
ART Support rollers are produced to normal internal clearance group (**CN**) as standard according to DIN 620.

Load carrying capability

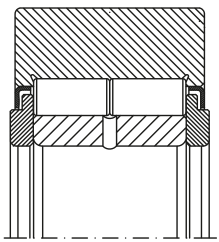
Unlike "normal" rolling element bearings, the outer ring of support rollers contact the adjacent parts with a very small contacting surface only.



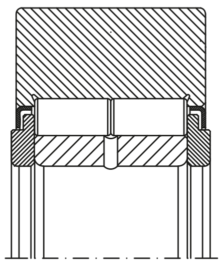
NUTR (a)



NUTR (b)



NUTR...X



NUTR...XXXX

This causes deformations of the outer ring. These are considered by the recommended maximum values for the permissible dynamic and static radial loads as given by the product tables.

Equivalent dynamic load

Where Support rollers must be calculated as rolling element bearings:

$$\mathbf{P = F_r}$$

But, **P** must be ≤ $\mathbf{F_r}$ **max**
(for $\mathbf{F_r}$ **max** see product tables)

Equivalent static bearing load

For Support rollers:

$$\mathbf{P_0 = F_r}$$

But, $\mathbf{P_0}$ must be ≤ $\mathbf{F_{0r}}$ **max**
(for $\mathbf{F_{0r}}$ **max** see product tables)

Design of adjacent machine components

For support rollers of the series **STO**, **RSTO**, **NA22..2RS** and **RNA22..2RS**, an effective axial guidance of the outer rings must be provided by satisfactory designed surrounding parts.
These guiding surfaces must have a clean and plain machined surface, minimum fine turned, without any burrs.
These guide surfaces which are machined should reach **50%**, or greater, of the outer ring radial wall section or the equivalent diameter.
Hardened guide surfaces, however, feature a higher wear - resistance and may therefore be smaller in diameter.

RSTO and **RNA22..2RS** - type support rollers that run directly on a shaft require an **axial play** of 0,2 mm minimum between the lateral guiding surfaces in mounted condition.
The diameter of the supposed shaft raceway should have a diameter tolerance according to **k5**.

The shaft or pin have to fulfil certain requirements in terms of hardness, dimensional and geometric accuracy.

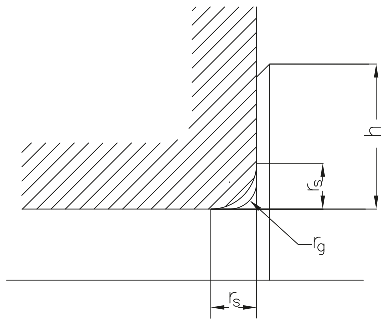
For detailed information on the design requirements see the chapter "**Bearing application**" on page 46.

For support roller which are exposed to high axial loads, effective lateral support of their side washers is necessary.

Since Support rollers usually have point loaded inner rings, their shaft may be rather loose (i.e. according to ISO - tolerance fields **g6**, **h6** or **j6**).

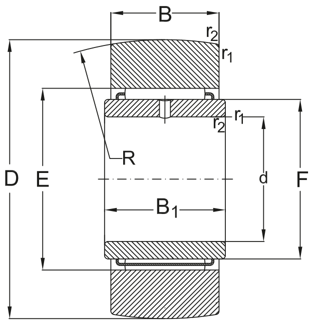
Abutment and Fillet dimensions for Support rollers

The bearing inner ring must contact adjacent surfaces with their side faces only. The fillet radius of inner ring corners must not touch the fillet radius of shaft shoulder.
Therefore, the largest fillet radius ($\mathbf{r_g}$) must be smaller than the minimum fillet dimension of the Support roller inner rings ($\mathbf{r_s}$) as listed in the product tables.

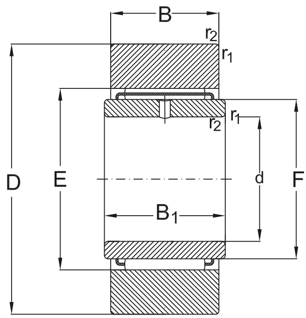


r_{smin}	r_{gmax}	h_{min}
0.6	0.6	2.1
1	1	2.8
1.1	1	3.5
1.5	1.5	4.5
2	2	5.5

Support Rollers without axial guidance



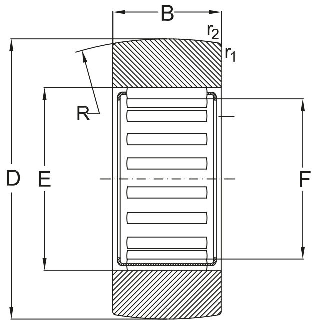
STO...

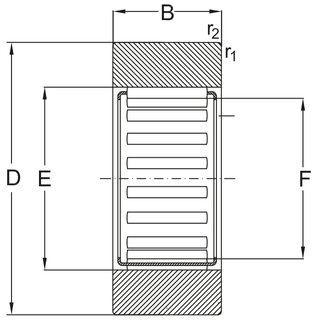


STO...X

Dimensions						Designation	
D	d	B	B_1	r_1, r_2 min.	R	with sphered outer ring	with cylindrical outer ring
mm							
16	-	7,8	-	0,3	500	**RSTO5 TN**	**RSTO5 XTN**
19	-	9,8	-	0,3	500	**RSTO6**	**RSTO6 X**
	6	9,8	10	0,3	500	**STO6**	**STO6 X**
24	-	9,8	-	0,3	500	**RSTO8**	**RSTO8 X**
	8	9,8	10	0,3	500	**STO8**	**STO8 X**
30	-	11,8	-	0,3	500	**RSTO10**	**RSTO10 X**
	10	11,8	12	0,3	500	**STO10**	**STO10 X**
32	-	11,8	-	0,3	500	**RSTO12**	**RSTO12 X**
	12	11,8	12	0,3	500	**STO12**	**STO12 X**
35	-	11,8	-	0,3	500	**RSTO15**	**RSTO15 X**
	15	11,8	12	0,3	500	**STO15**	**STO15 X**
40	-	15,8	-	0,3	500	**RSTO17**	**RSTO17 X**
	17	15,8	16	0,3	500	**STO17**	**STO17**
47	-	15,8	-	0,3	500	**RSTO20**	**RSTO20 X**
	20	15,8	16	0,3	500	**STO20**	**STO20 X**

Support Rollers without axial guidance

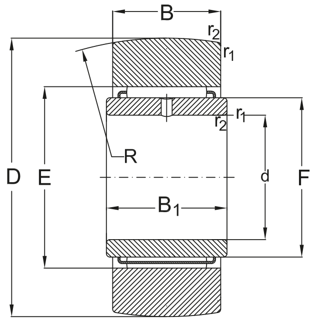




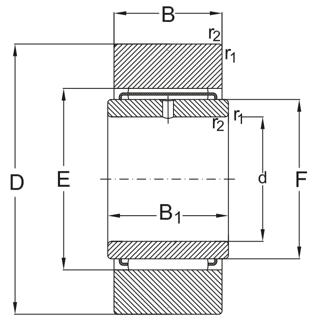
Recommended Abutment and fillet dimensions see on page 728

Dimensions		**Speed rating**	**Load ratings**				**max. permissible radial load**		**Mass**
			as bearing		**as support roller**				
F	E		dyn. C_r	stat. C_{0r}	dyn. C_{LR}	stat. C_{0LR}	dyn. $F_{r\ max}$	stat. $F_{0r\ max}$	
mm		min^{-1}	kN				kN		kg
7	10	24000	2,65	2,5	2,36	2,5	2,9	3	0,01
10	13	18000	5,2	6,55	4	4,5	3,9	5,6	0,01
10	13	18000	5,2	6,55	4	4,5	3,9	5,6	0,02
12	15	16000	5,6	7,65	4,5	5,4	6,4	7,5	0,02
12	15	16000	5,6	7,65	4,5	5,4	6,4	7,5	0,03
14	20	12000	10	10,8	8,15	8,8	7,35	10,6	0,04
14	20	12000	10	10,8	8,15	8,8	7,35	10,6	0,05
16	22	10000	10,6	12	8,3	9,8	7,35	10,8	0,05
16	22	10000	10,6	12	8,3	9,8	7,35	10,8	0,06
20	26	7000	12,5	15,6	8,65	10,6	6,55	11	0,05
20	26	7000	12,5	15,6	8,65	10,6	6,55	11	0,06
22	29	6300	18,3	23,6	13,2	17,6	10,8	18	0,09
22	29	6300	18,3	23,6	13,2	17,6	10,8	18	0,11
25	32	5300	19	26	14,3	15,6	15,6	22,4	0,13
25	32	5300	19	26	14,3	15,6	15,6	22,4	0,15

Support Rollers without axial guidance



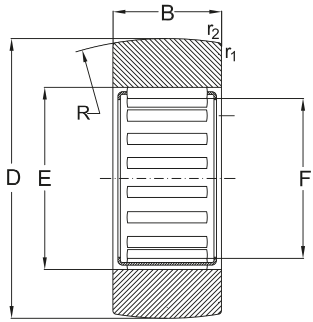
STO...



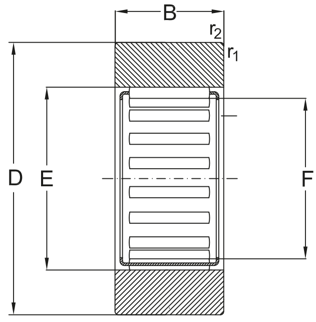
STO...X

Dimensions						Designation	
D	d	B	B_1	r_1, r_2 min.	R	with sphered outer ring	with cylindrical outer ring
mm							
52	-	15,8	-	0,3	500	**RSTO25**	**RSTO25 X**
	25	15,8	16	0,3	500	**STO25**	**STO25 X**
62	-	19,8	-	0,6	500	**RSTO30**	**RSTO30 X**
	30	19,8	20	0,6	500	**STO30**	**STO30 X**
72	-	19,8	-	0,6	500	**RSTO35**	**RSTO35 X**
	35	19,8	20	0,6	500	**STO35**	**STO35 X**
80	-	19,8	-	1	500	**RSTO40**	**RSTO40 X**
	40	19,8	20	1	500	**STO40**	**STO40 X**
85	-	19,8	-	1	500	**RSTO45**	**RSTO45 X**
	45	19,8	20	1	500	**STO45**	**STO45 X**
90	-	19,8	-	1	500	**RSTO50**	**RSTO50 X**
	50	19,8	20	1	500	**STO50**	**STO50 X**

Support Rollers without axial guidance



RSTO...



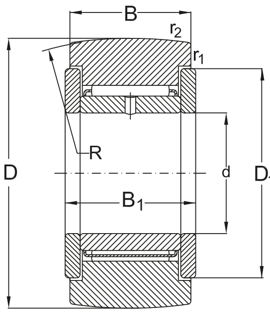
RSTO...X

Recommended Abutment and fillet dimensions see on page 728

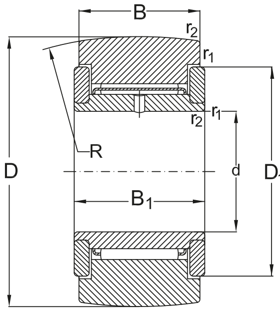
Dimensions		**Speed rating**	**Load ratings**				**max. permissible radial load**		**Mass**
			as bearing		**as support roller**				
			dyn.	stat.	dyn.	stat.	dyn.	stat.	
F	E		C_r	C_{0r}	C_{LR}	C_{0LR}	$F_{r\,max}$	$F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
30	37	4300	21,2	31,5	15	22,8	16	23,6	0,15
30	37	4300	21,2	31,5	15	22,8	16	23,6	0,18
38	46	3000	31,5	52	21,2	34,5	22	33,5	0,26
38	46	3000	31,5	52	21,2	34,5	22	33,5	0,31
42	50	2400	33,5	57	24	40,5	31,5	43	0,38
42	50	2400	33,5	57	24	40,5	31,5	43	0,44
50	58	1800	36,5	68	23,8	39,0	32,5	45	0,42
50	58	1800	36,5	68	23,8	39,0	32,5	45	0,53
55	63	1600	38	75	24,5	43,0	33,5	45,5	0,45
55	63	1600	38	75	24,5	43,0	33,5	45,5	0,58
60	68	1500	40	80	25	45,5	34,5	45,5	0,48
60	68	1500	40	80	25	45,5	34,5	45,5	0,62

ART BEARINGS

Support Rollers with axial guidance



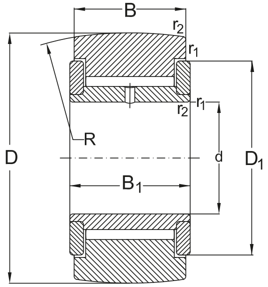
STO...2Z



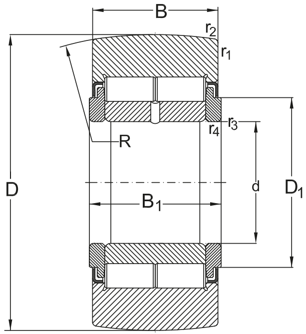
NATR

Dimensions							**Designation**	
D	d	B	B_1	r_1, r_2 min.	r_3, r_4 min.	R	with sphered outer ring	with cylindrical outer ring
mm								
16	5	11	12	0,1	-	500	**NATR5**	**NATR5 X**
	5	11	12	0,1	-	500	**NATV5**	**NATV5 X**
19	6	11	12	0,1	-	500	**NATR6**	**NATR6 X**
	6	11	12	0,1	-	500	**NATV6**	**NATV6 X**
	6	13,8	14	0,3	-	500	**STO6 2Z**	**STO6 2ZX**
24	8	14	15	0,3	-	500	**NATR8**	**NATR8 X**
	8	14	15	0,3	-	500	**NATV8**	**NATV8 X**
	8	13,8	14	0,3	-	500	**STO8 2Z**	**STO8 2ZX**
30	10	14	15	0,6	-	500	**NATR10**	**NATR10 X**
	10	14	15	0,6	-	500	**NATV10**	**NATV10 X**
	10	15,8	16	0,3	-	500	**STO10 2Z**	**STO10 2ZX**
32	12	14	15	0,6	-	500	**NATR12**	**NATR12 X**
	12	14	15	0,6	-	500	**NATV12**	**NATV12 X**
	12	15,8	16	0,3	-	500	**STO12 2Z**	**STO12 2ZX**
35	15	18	19	0,6	-	500	**NATR15**	**NATR15 X**
	15	18	19	0,6	-	500	**NATV15**	**NATV15 X**

Support Rollers with axial guidance



NATV

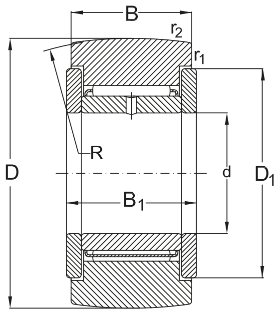


NUTR

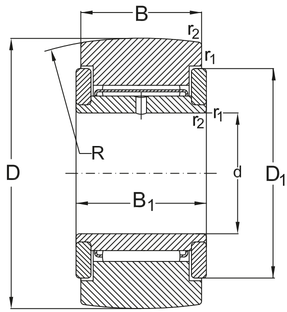
Recommended Abutment and fillet dimensions *see on page 728*

Dimensions		**Speed rating**	**Load ratings** **as bearing**		**as support roller**		**max. permissible radial load**		**Mass**
D	D_1		dyn. C_r	stat. C_{0r}	dyn. C_{LR}	stat. C_{0LR}	dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
16	12	22000	3,7	3,9	3,1	3,2	2,9	4,1	0,02
	12	11000	6	8,8	4,7	6,5	4	5,7	0,02
19	14	20000	4,15	4,75	3,25	3,8	3,45	5,5	0,02
	14	10000	6,9	11	5,3	8	5,1	7,4	0,02
	15	18000	5,1	6,55	4	5,1	4,2	5,85	0,03
24	19	17000	6,6	7,8	5,3	6,1	4,8	7,35	0,04
	19	8500	9,7	16	7,4	11,4	7,4	10,4	0,04
	18	16000	5,6	7,65	4,65	6,4	7,1	7,5	0,04
30	23	15000	7,8	9,65	6,4	8	7,1	11,2	0,06
	23	7500	11,4	19,3	8,9	14,6	11	15,6	0,07
	23	12000	10	10,8	8,3	8,8	8,15	11	0,07
32	25	14000	8,4	10,8	6,6	8,5	7,1	10	0,07
	25	7000	12,3	22	9,3	15,3	10,6	15	0,07
	25	10000	10,6	12	8,3	9,3	8	11,2	0,08
35	27	13000	12,3	19,3	9,5	13,7	11,4	16,3	0,10
	27	6700	17,2	35,5	12,3	23,2	14,6	20,8	0,11

Support Rollers with axial guidance



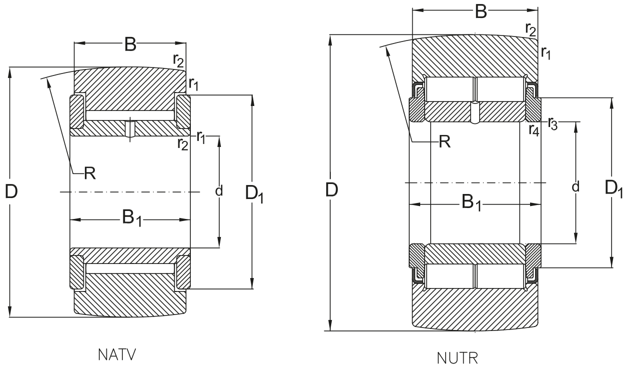
STO...2Z



NATR

Dimensions							Designation	
D	d	B	B_1	r_1, r_2 min.	r_3, r_4 min.	R	with sphered outer ring	with cylindrical outer ring
mm								
35	15	18	19	0,6	0,3	500	**NUTR15**	**NUTR15 X**
	15	15,8	16	0,3	-	500	**STO15 2Z**	**STO15 2ZX**
40	17	20	21	1	-	500	**NATR17**	**NATR17 X**
	17	20	21	1	-	500	**NATV17**	**NATV17 X**
	17	20	21	1	0,3	500	**NUTR17**	**NUTR17 X**
	17	19,8	20	0,3	-	500	**STO17 2Z**	**STO17 2ZX**
42	15	18	19	0,6	0,3	500	**NUTR1542**	**NUTR1542 X**
47	20	24	25	1	-	500	**NATR20**	**NATR20 X**
	20	24	25	1	-	500	**NATV20**	**NATV20 X**
	17	20	21	1	0,3	500	**NUTR1747**	**NUTR1747 X**
	20	24	25	1	0,3	500	**NUTR20**	**NUTR20 X**
	20	19,8	20	0,3	-	500	**STO20 2Z**	**STO20 2ZX**
52	25	24	25	1	-	500	**NATR25**	**NATR25 X**
	25	24	25	1	-	500	**NATV25**	**NATV25 X**
	20	24	25	1	0,3	500	**NUTR2052**	**NUTR2052 X**
	25	24	25	1	0,3	500	**NUTR25**	**NUTR25 X**

Support Rollers with axial guidance

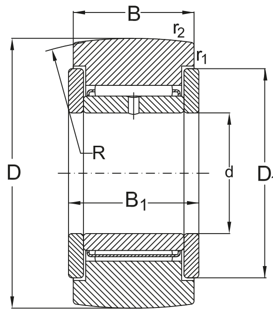


Recommended Abutment and fillet dimensions see on page 728

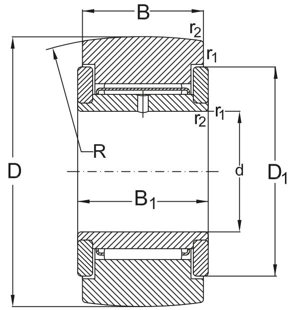
Dimensions		Speed rating	Load ratings				max. permissible radial load		Mass
			as bearing		as support roller				
D	D_1		dyn. C_r	stat. C_{0r}	dyn. C_{LR}	stat. C_{0LR}	dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
35	20	5600	24,2	28,5	16,8	17,6	8,7	12,2	0,10
	30	7000	12,3	15,6	8,8	10,6	7,8	6,95	0,09
40	32	10000	13,4	20,4	10,5	14,6	12,5	18	0,14
	32	5600	19,4	40	14,2	26,5	17	24,5	0,15
	22	5300	26	32	19	20	14	22,2	0,15
	33	6300	18,3	23,6	13,2	16,6	11,4	18,6	0,15
42	20	5600	24,2	28,5	20,1	17,6	21,6	31	0,16
47	37	9500	18,7	32,5	14,7	24,5	23,6	33,5	0,25
	37	5300	26	60	19,4	41,5	30,5	43	0,26
	22	5300	26	32	22	27	30	43	0,22
	27	4500	39	49	28,6	33,5	17	25	0,25
	37	5300	19	26	14,6	19,6	16,6	22,8	0,2
52	42	8000	20,5	38	14,7	25,5	21,6	31	0,28
	42	4300	28,6	72	19,8	44	28,5	40,5	0,29
	27	4500	39	49	30	39	30	42,5	0,32
	31	3800	44,6	61	29,7	36	18	25,5	0,28

ART BEARINGS

Support Rollers with axial guidance



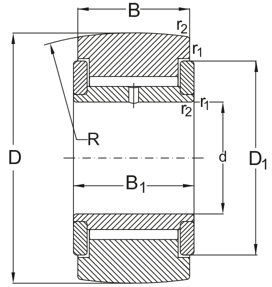
STO...2Z



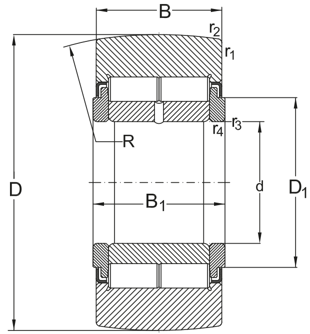
NATR

Dimensions							Designation	
D	d	B	B_1	r_1, r_2 min.	r_3, r_4 min.	R	with sphered outer ring	with cylindrical outer ring
mm								
52	25	19,8	20	0,3	-	500	**STO25 2Z**	**STO25 2ZX**
62	30	28	29	1	-	500	**NATR30**	**NATR30 X**
	30	28	29	1	-	500	**NATV30**	**NATV30 X**
	25	24	25	1	0,3	500	**NUTR 2562**	**NUTR2562 X**
	30	28	29	1	0,3	500	**NUTR 30**	**NUTR30 X**
	30	24,8	25	0,6	-	500	**STO30 2Z**	**STO30 2ZX**
72	35	28	29	1,1	-	500	**NATR35**	**NATR35 X**
	35	28	29	1,1	-	500	**NATV35**	**NATV35 X**
	30	28	29	1	0,3	500	**NUTR3072**	**NUTR3072 X**
	35	28	29	1,1	0,3	500	**NUTR35**	**NUTR35 X**
	35	24,8	25	0,6	-	500	**STO35 2Z**	**STO35 2ZX**
80	40	30	32	1,1	-	500	**NATR40**	**NATR40 X**
	40	30	32	1,1	-	500	**NATV40**	**NATV40 X**
	35	28	29	1,1	0,6	500	**NUTR3580**	**NUTR3580 X**
	40	30	32	1,1	0,6	500	**NUTR40**	**NUTR40 X**
	40	25,8	26	0,6	-	500	**STO40 2Z**	**STO40 2ZX**

Support Rollers with axial guidance



NATV



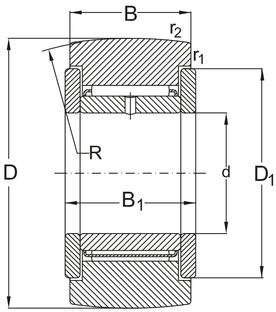
NUTR

Recommended Abutment and fillet dimensions see on page 728

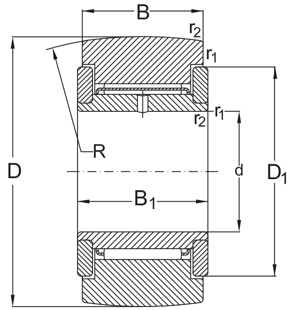
Dimensions		**Speed rating**	**Load ratings**				**max. permissible radial load**		**Mass**
			as bearing		**as support roller**				
			dyn.	stat.	dyn.	stat.	dyn.	stat.	
D	D_1		C_r	C_{0r}	C_{LR}	C_{0LR}	$F_{r\,max}$	$F_{0r\,max}$	
mm		min $^{-1}$	kN				kN		kg
52	42	4300	21,2	31,5	15,3	21,6	17	24	0,2
62	51	7000	33	60	22,9	37,5	26,5	38	0,47
	51	3600	44,6	108	29,2	62	34,5	49	0,48
	31	3800	44,6	61	35,8	48	44	63	0,45
	38	3200	60	78	41,3	47,5	24	34,5	0,47
	52	3000	31,4	52	21,2	32	22,8	35,5	0,42
72	58	6000	35,8	69,5	24,6	43	33,5	48	0,64
	58	3000	49,5	129	31,9	72	43	62	0,65
	38	3200	60	78	46,5	61	52	76,5	0,71
	40	2800	65,5	91,5	44	57	33,5	47,5	0,63
	56	2400	31,9	54	22,8	36,5	34	41,5	0,56
80	66	5300	46,8	95	31,9	57	41,5	58,5	0,80
	66	2600	60,5	160	39,1	88	51	73,5	0,89
	44	2800	65,5	91,5	49	68	57	81,5	0,86
	51	2400	91,3	134	57,2	72	32	45,5	0,82
	64	1800	36,5	68	24,5	42,5	35,5	45,5	0,70

ART BEARINGS

Support Rollers with axial guidance



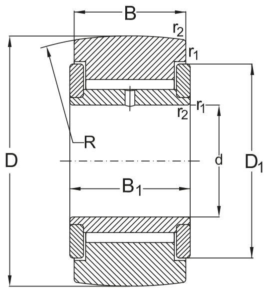
STO...2Z



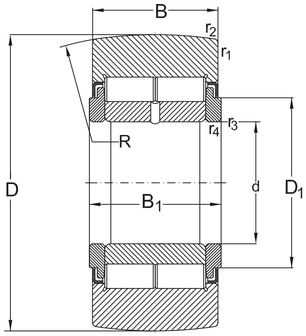
NATR

Dimensions							**Designation**	
D	d	B	B_1	r_1, r_2 min.	r_3, r_4 min.	R	with sphered outer ring	with cylindrical outer ring
mm								
85	45	30	32	1,1	-	500	**NATR45**	**NATR45 X**
	45	30	32	1,1	0,6	500	**NUTR45**	**NUTR45 X**
	45	25.8	26	0,6	-	500	**STO45 2Z**	**STO45 2ZX**
90	50	30	32	1,1	-	500	**NATR50**	**NATR50 X**
	50	30	32	1,1	-	500	**NATV50**	**NATV50 X**
	40	30	32	1,1	0,6	500	**NUTR4090**	**NUTR4090 X**
	50	30	32	1,1	0,6	500	**NUTR50**	**NUTR50 X**
100	45	30	32	1,1	0,6	500	**NUTR45100**	**NUTR45100 X**
110	50	30	32	1,1	0,6	500	**NUTR50110**	**NUTR50110 X**

Support Rollers with axial guidance



NATV



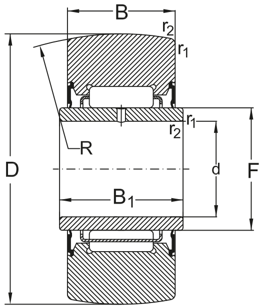
NUTR

Recommended Abutment and fillet dimensions see on page 728

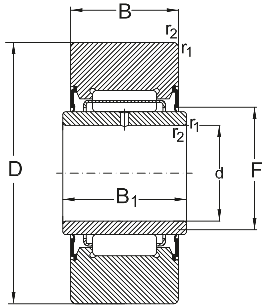
Dimensions		Speed rating	Load ratings				max. permissible radial load		Mass
			as bearing		as support roller				
			dyn.	stat.	dyn.	stat.	dyn.	stat.	
D	D_1		C_r	C_{0r}	C_{LR}	C_{0LR}	$F_{r\,max}$	$F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
85	72	5000	48,4	102	31,4	57	40	57	0,91
	55	2000	98,8	146	58,3	75	32,5	46,5	0,88
	69	1600	38	75	24,5	43	36,5	47,5	0,77
90	76	4500	50,1	108	30,8	58,5	40	57	0,96
	76	2000	67,1	193	39,1	93	50	72	1,00
	51	2400	91,3	134	68,2	91,5	63	90	1,16
	60	1900	101	160	58,3	78	32,5	47,5	0,95
100	55	2000	96,8	146	73,6	104	80	114	1,43
110	60	1900	101	160	78,1	116	98	140	1,73

BEARINGS

Sealed Support Rollers without axial guidance



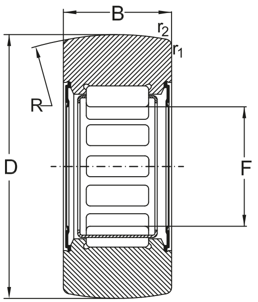
NA22...2RS



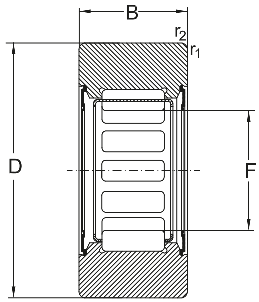
NA22...2RS.X

Dimensions							**Designation**	
D	d	B	B_1	r_1, r_2 min.	r_3, r_4 min.	R	with sphered outer ring	with cylindrical outer ring
mm								
19	-	-	11,8	0,3	-	500	**RNA22/6 2RS**	**RNA22/6 2RSX**
	6	12	11,8	0,3	0,3	500	**NA22/6 2RS**	**NA22/6 2RSX**
24	-	-	11,8	0,3	-	500	**RNA22/8 2RS**	**RNA22/8 2RSX**
	8	12	11,8	0,3	0,3	500	**NA22/8 2RS**	**NA22/8 2RSX**
30	-	-	13,8	0,6	-	500	**RNA2200 2RS**	**RNA2200 2RSX**
	10	14	13,8	0,6	0,3	500	**NA2200 2RS**	**NA2200 2RSX**
32	-	-	13,8	0,6	-	500	**RNA2201 2RS**	**RNA2201 2RSX**
	12	14	13,8	0,6	0,3	500	**NA2201 2RS**	**NA2201 2RSX**
35	-	-	13,8	0,6	-	500	**RNA2202 2RS**	**RNA2202 2RSX**
	15	14	13,8	0,6	0,3	500	**NA2202 2RS**	**NA2202 2RSX**
40	-	-	15,8	1	-	500	**RNA2203 2RS**	**RNA2203 2RSX**
	17	16	15,8	1	0,3	500	**NA2203 2RS**	**NA2203 2RSX**
47	-	-	17,8	1	-	500	**RNA2204 2RS**	**RNA2204 2RSX**
	20	18	17,8	1	0,3	500	**NA2204 2RS**	**NA2204 2RSX**

Sealed Support Rollers without axial guidance



RNA22...2RS

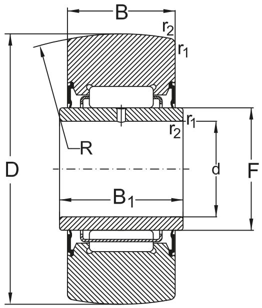


RNA22...2RS.X

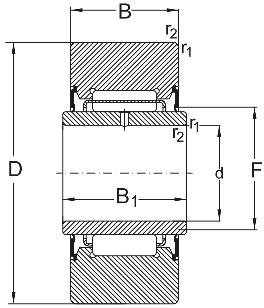
Recommended Abutment and fillet dimensions *see on page 728*

Dimensions		Speed rating	Load ratings				max. permissible radial load		Mass
			as bearing		as support roller				
D	F		dyn. C_r	stat. C_{0r}	dyn. C_{LR}	stat. C_{0LR}	dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
19	10	16000	4,5	4,1	3,5	3	1,9	2,8	0,01
	10	16000	4,5	4,1	3,5	3	1,9	2,8	0,02
24	12	14000	5,4	5,2	4,5	4,4	5	7,1	0,03
	12	14000	5,4	5,2	4,5	4,4	5	7,1	0,03
30	14	13000	7,4	8,2	6,4	7,2	12	17	0,05
	14	13000	7,4	8,2	6,4	7,2	12	17	0,06
32	16	12000	8,1	9,1	6,9	8,2	11,6	16,6	0,06
	16	12000	8,1	9,1	6,9	8,2	11,6	16,6	0,07
35	20	9500	9,1	12	7,2	9	9,6	13,7	0,06
	20	9500	9,1	12	7,2	9	9,6	13,7	0,07
40	22	9000	11,3	16,3	9,4	12,9	16	22,8	0,09
	22	9000	11,3	16,3	9,4	12,9	16	22,8	0,11
47	25	7500	19,4	22,4	15,4	17,3	17,6	25,5	0,15
	25	7500	19,4	22,4	15,4	17,3	17,6	25,5	0,18

Sealed Support Rollers without axial guidance



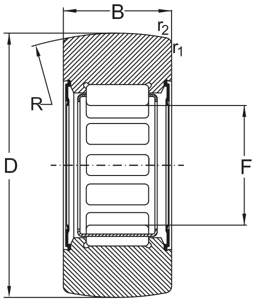
NA22...2RS



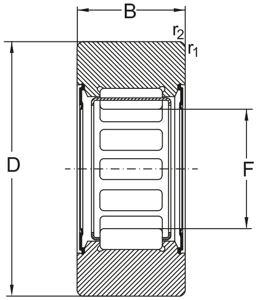
NA22...2RS.X

Dimensions							Designation	
D	d	B	B_1	r_1, r_2 min.	r_3, r_4 min.	R	with sphered outer ring	with cylindrical outer ring
mm								
52	-	-	17,8	1	-	500	**RNA2205 2RS**	**RNA2205 2RSX**
	25	18	17,8	1	0,3	500	**NA2205 2RS**	**NA2205 2RSX**
62	-	-	19,8	1	-	500	**RNA2206 2RS**	**RNA2206 2RSX**
	30	20	19,8	1	0,3	500	**NA2206 2RS**	**NA2206 2RSX**
72	-	-	22,7	1,1	-	500	**RNA2207 2RS**	**RNA2207 2RSX**
	35	23	22,7	1,1	0,6	500	**NA2207 2RS**	**NA2207 2RSX**
80	-	-	22,7	1,1	-	500	**RNA2208 2RS**	**RNA2208 2RSX**
	40	23	22,7	1,1	0,6	500	**NA2208 2RS**	**NA2208 2RSX**
85	-	-	22,7	1,1	-	500	**RNA2209 2RS**	**RNA2209 2RSX**
	45	23	22,7	1,1	0,6	500	**NA2209 2RS**	**NA2209 2RSX**
90	-	-	22,7	1,1	-	500	**RNA2210 2RS**	**RNA2210 2RSX**
	50	23	22,7	1,1	0,6	500	**NA2210 2RS**	**NA2210 2RSX**

Sealed Support Rollers without axial guidance



RNA22...2RS

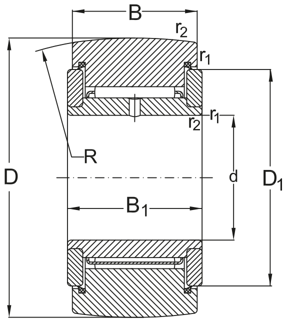


RNA22...2RS.X

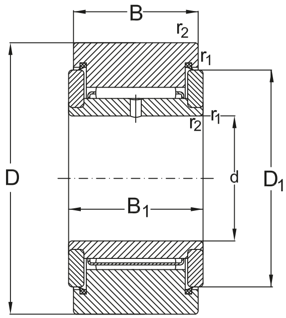
Recommended Abutment and fillet dimensions *see on page 728*

Dimensions		Speed rating	Load ratings				max. permissible radial load		Mass
			as bearing		as support roller				
			dyn.	stat.	dyn.	stat.	dyn.	stat.	
D	F		C_r	C_{0r}	C_{LR}	C_{0LR}	$F_{r\,max}$	$F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
52	30	6300	21,6	27,5	16,1	19	17,4	24,6	0,17
	30	6300	21,6	27,5	16,1	19	17,4	24,6	0,20
62	35	5600	22,4	32	17,6	24,5	28,5	40,5	0,29
	35	5600	22,4	32	17,6	24,5	28,5	40,5	0,32
72	42	4800	28,5	46,5	22	34	39	56	0,42
	42	4800	28,5	46,5	22	34	39	56	0,49
80	48	4000	36,9	58,5	27	39	37,5	53	0,515
	48	4000	36,9	58,5	27	39	37,5	53	0,615
85	52	3800	39	63	27,5	41,5	39	56	0,565
	52	3800	39	63	27,5	41,5	39	56	0,661
90	58	3400	40	71	27	41,5	36,5	52	0,59
	58	3400	40	71	27	41,5	36,5	52	0,712

Sealed Support Rollers with axial guidance



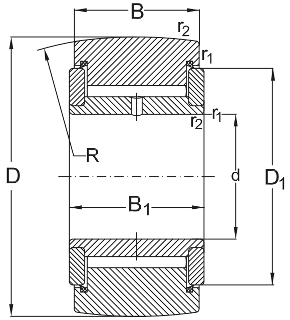
NATR...PP



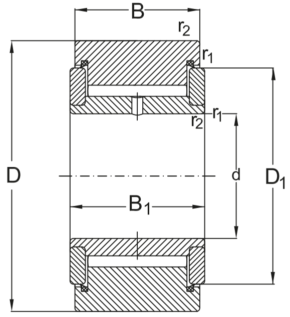
NATR...PPX

Dimensions						Designation	
D	d	B	B_1	r_1, r_2 min.	R	with sphered outer ring	with cylindrical outer ring
mm							
16	5	11	12	0,1	500	**NATR5 PP**	**NATR5 PPX**
	5	11	12	0,1	500	**NATV5 PP**	**NATV5 PPX**
19	6	11	12	0,1	500	**NATR6 PP**	**NATR6 PPX**
	6	11	12	0,1	500	**NATV6 PP**	**NATV6 PPX**
24	8	14	15	0,3	500	**NATR8 PP**	**NATR8 PPX**
	8	14	15	0,3	500	**NATV8 PP**	**NATV8 PPX**
30	10	14	15	0,6	500	**NATR10 PP**	**NATR10 PPX**
	10	14	15	0,6	500	**NATV10 PP**	**NATV10 PPX**
32	12	14	15	0,6	500	**NATR12 PP**	**NATR12 PPX**
	12	14	15	0,6	500	**NATV12 PP**	**NATV12 PPX**
35	15	18	19	0,6	500	**NATR15 PP**	**NATR15 PPX**
	15	18	19	0,6	500	**NATV15 PP**	**NATV15 PPX**
40	17	20	21	1	500	**NATR17 PP**	**NATR17 PPX**
	17	20	21	1	500	**NATV17 PP**	**NATV17 PPX**
47	20	24	25	1	500	**NATR20 PP**	**NATR20 PPX**
	20	24	25	1	500	**NATV20 PP**	**NATV20 PPX**

Sealed Support Rollers with axial guidance



NATV...PP

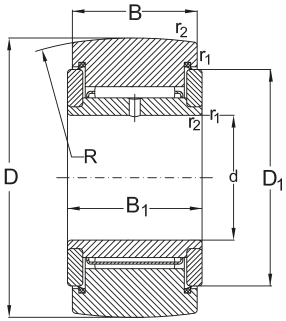


NATV...PPX

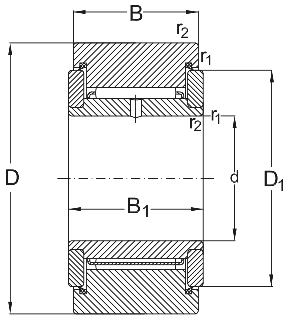
Recommended Abutment and fillet dimensions *see on page 728*

Dimensions		**Speed rating**	**Load ratings** **as bearing**		**as support roller**		**max. permissible radial load**		**Mass**
D	F		dyn. C_r	stat. C_{0r}	dyn. C_{LR}	stat. C_{0LR}	dyn. $F_{r\,max}$	stat. $F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
16	12	20000	3,7	3,9	3,1	3,2	2,9	4,2	0,01
	12	11000	6	8,8	4,7	6,5	4	5,7	0,02
19	14	17000	4,15	4,8	3,25	3,8	3,45	5,5	0,02
	14	10000	6,9	11	5,3	8	5,1	7,3	0,02
24	19	15000	6,6	7,8	5,3	6,1	5,2	7,65	0,04
	19	8500	9,6	16	7,4	11,4	7,3	10,4	0,04
30	23	13000	7,8	9,65	6,4	8	7,1	11,2	0,07
	23	7500	11,4	19,3	8,9	14,6	11	15,6	0,07
32	25	11000	8,4	10,8	6,6	8,5	7,1	10	0,07
	25	7000	12,3	22	9,3	15,3	10,6	15	0,07
35	27	10000	12,3	19,3	9,5	13,7	11,4	16,3	0,10
	27	6700	17,2	35,5	12,3	23,2	14,6	20,8	0,11
40	32	9000	13,4	20,4	10,5	14,6	12,5	18	0,14
	32	5600	19,4	40	14,2	26,5	17	24,5	0,15
47	37	8000	18,7	32,5	14,7	24,5	23,6	33,5	0,25
	37	5300	26	60	19,4	41,5	30,5	43	0,26

Sealed Support Rollers with axial guidance



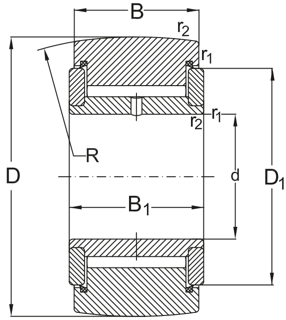
NATR...PP



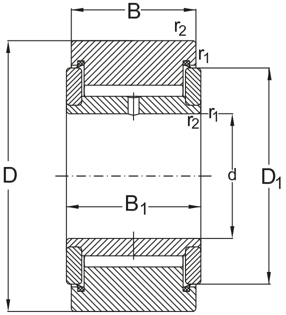
NATR...PPX

Dimensions						Designation	
D	d	B	B_1	r_1, r_2 min.	R	with sphered outer ring	with cylindrical outer ring
mm							
52	25	24	25	1	500	**NATR25 PP**	**NATR25 PPX**
	25	24	25	1	500	**NATV25 PP**	**NATV25 PPX**
62	30	28	29	1	500	**NATR30 PP**	**NATR 30 PPX**
	30	28	29	1	500	**NATV30 PP**	**NATV30 PPX**
72	35	28	29	1,1	500	**NATR35 PP**	**NATR35 PPX**
	35	28	29	1,1	500	**NATV35 PP**	**NATV35 PPX**
80	40	30	32	1,1	500	**NATR40 PP**	**NATR40 PPX**
	40	30	32	1,1	500	**NATV40 PP**	**NATV40 PPX**
85	45	30	32	1,1	500	**NATR45 PP**	**NATR45 PPX**
90	50	30	32	1,1	500	**NATR50 PP**	**NATR50 PPX**
	50	30	32	1,1	500	**NATV50 PP**	**NATV50 PPX**

Sealed Support Rollers with axial guidance



NATV...PP



NATV...PPX

Recommended Abutment and fillet dimensions *see on page 728*

Dimensions		Speed rating	Load ratings				max. permissible radial load		Mass
			as bearing		as support roller				
			dyn.	stat.	dyn.	stat.	dyn.	stat.	
D	F		C_r	C_{0r}	C_{LR}	C_{0LR}	$F_{r\,max}$	$F_{0r\,max}$	
mm		min^{-1}	kN				kN		kg
52	42	6700	20,5	38	14,7	25,5	21,6	31	0,28
	42	4300	28,6	72	19,8	44	28,5	40,5	0,29
62	51	5300	33	60	22,9	37,5	26,5	38	0,47
	51	3600	44,6	108	29,2	62	34,5	49	0,48
72	58	4500	38,5	69,5	24,6	43	33,5	48	0,64
	58	3000	49,5	129	31,9	72	43	62	0,65
80	66	4000	46,8	95	31,9	57	41,5	58,5	0,80
	66	2600	60,5	160	39,1	88	51	73,5	0,89
85	72	3600	48,4	102	31,4	57	40	57	0,91
90	76	3400	50,1	108	30,8	58,5	40	57	0,96
	76	2000	67,1	193	39,1	93	50	72	1,00

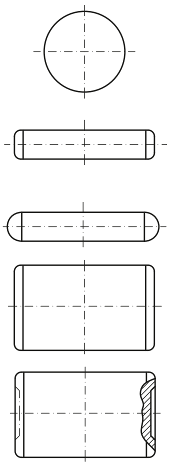
Rolling Elements

General

Rolling Elements are simple geometric bodies that are produced to very high precision standard by the rolling bearing industry.
Rolling elements are made from hardened bearing steel. They have fine ground or even superfinished surfaces as standard.

Rolling elements such as Balls, Cylindrical Rollers and Needle Rolers are used in a wide variety of Rolling Bearings for a whole spectrum of applications and industries.
Additional to the use in rolling bearings, individual rolling elements are frecquently used separately or loose for other requirements or applications, such as Valve Balls, Gauge Rollers, Cycles wheels etc.

The more popular sizes are normally available and supplied loose from stock.



Balls

Standard, Boundary dimensions
Balls of through - hardening
rolling bearing steel DIN 5401 / Part 1
ISO 3290

Hardness

Balls made from through - hardened rolling bearing steel according to DIN 17 230 generally, have the following hardness values and ranges as stated in the table below.

Ball diameter DW [mm]		Hardness [HRC]	
>	≤	>	≤
-	12,7	62	67
12,7	50,8	60	66
50,8	70	59	65
70	120	57	63
120	-	55	61

Ball grades, Tolerances

ART balls from rolling bearing steel are supplied according to the following tolerances.
The balls are clasified and graded according to their diameters, each grade is sorted into individual ball gauges, each gauge is separately packaged.
Each package is clearly identified with ball diameter, grade and gauge. Where there are no specific grade and gauge requirements readily available standard ball diameters will be despatched.

Symbols

D_W	nominal ball diameter
D_{Ws}	Single diameter of a ball. Distance between two parallel planes that contact the surface of the ball.
D_{Wm}	Mean ball diameter. Arithmetical mean of largest and smallest (measured) single ball diameter.
Lot	A defined quantity of balls that have been manufactured under uniform conditions and have therefore similar characteristics.
D_{WmL}	Mean ball diameter of a ball lot Arithmetical mean of largest and smallest mean ball diameter (D_{Wm}) within a lot.
V_{DWs}	Variation of ball diameter. Difference between largest and smallest measured single diameter of one ball, (D_{Ws})
V_{DWL}	Variation of ball diameters within a lot. Difference between largest and smallest mean ball diameter, (D_{Wm}) within a lot.
tDW	Deviation from spherical form as defined by DIN ISO 1011.
Gauge	The amount by which the lot mean diameter, (D_{WmL}), differs from the nominal ball diameter, (D_W). This amount being one of a defined series. Each ball gauge is a whole multiple of ball gauge interval (**I**).
I	Ball gauge interval; Amount in which the permissible deviation of ball diameter is divided.
R_a	Surface finish roughness, according to DIN 4768
Grade	Defined combination of quality features such as dimensional and geometrical accuracy, surface roughness, shape and gauge intervals of a specific ball.

ART BEARINGS

Tolerance Values for hardened balls from rolling bearing steel according to ISO 3290

Ball Grade	ΦD_w >	ΦD_w ≤	V_{Dws} max	t_{Dw} max	R_a max	V_{DwL} max	Gauge interval I	Gauge mean values (deviation range)		
	mm		µm				µm			
G3	-	12,7	0,08	0,08	0,012	0,13	0,5	-5 ... -0,5	0	+0,5 ... +5
G5	-	12,7	0,13	0,13	0,020	0,25	1	-5 ... -1	0	+1 ... +5
G10	-	25,4	0,25	0,25	0,025	0,5	1	-9 ... -1	0	+1 ... +9
G16	-	25,4	0,4	0,4	0,032	0,8	2	-10 ... -2	0	+2 ... +10
G20	-	25,4	0,5	0,5	0,040	1	2	-10 ... -2	0	+2 ... +10
G28	25,4	50,8	0,7	0,7	0,050	1,4	2	-12 ... -2	0	+2 ... +12
G40	-	101,6	1	1	0,080	2	4	-16 ... -4	0	+4 ... +16
G100	101,6	152,4	2,5	2,5	0,125	5	5	-20 ... -5	0	+5 ... +20
	152,4	175	2,5	2,5	0,125	5	10	-40 ... -10	0	+10 ... +40
G200	175	250	5	5	0,200	10	15	-60 ... -15	0	+15 ... +60
G500	-	25,4	13	13	0,200	-	50	-50	0	+50
	25,4	50,8	19	19	0,200	-	75	-75	0	+75
	50,8	76,2	25	25	0,200	-	100	-100	0	+100
	76,2	101,6	32	32	0,200	-	125	-125	0	+125
	101,6	127	38	38	0,200	-	150	-150	0	+150
	127	152,4	44	44	0,400	-	175	-175	0	+175
G600	all		-	-	-	-	400	-	0	-
G700	all		-	-	-	-	2000	-	0	-

Designation

Balls are classified according to their diameters, each grade and gauge is separately packed and despatched.

ART balls made from chromium rolling bearing steel are designated following the system as shown below:

RB 12,7 G10 P4

where:

RB	Symbols for balls made from chromium rolling bearing steel
12,7	Nominal ball diameter $\mathbf{D_w}$ [mm]
G10	Grade **G10**
P4	Gauge **P4** (the mean deviation of this specific lot equals +4 µm

To avoid possible misinterpretations by poor visible printings etc. the **mean deviation** is stated according to the following system:

P	**Plus** e.g. **P4** = mean deviation + **4** µm
N	0
M	**Minus** e.g. **M3**=mean deviation - **3** µm

Therefore, the mean diameter deviation of a ball from a specific lot is

12,704 mm ± 0,5 µm

For a ball with the designation **RB 5,556 G3 M2**, the mean diameter deviation would be:

5,554 ± 0,25 µm

Balls from other materials

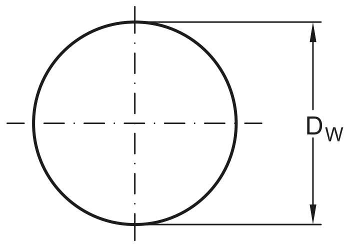
Aditional to the balls produced from chromium bearing steel, **ART** also produce balls suitable for different purposes from alternative materials.

Examples are balls of:

mild steel, unhardened
stainless steel
bronze
brass, etc.

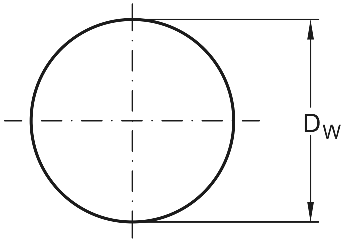
ART will provide detailed information on request.

Steel Balls



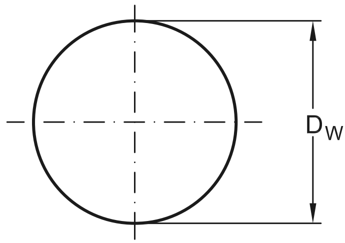
Ball diameter, D_W		Designation	Mass per 100 balls
mm	inch		kg
0,4	-	**RB 0,4**	0,0001
0,5	-	**RB 0,5**	0,0001
1	-	**RB 1**	0,0004
1,5	-	**RB 1,5**	0,0014
1,588	**1/16**	**RB 1,588**	0,0016
2	-	**RB 2**	0,0033
2,381	**3/32**	**RB 2,381**	0,0055
2,5	-	**RB 2,5**	0,0064
3	-	**RB 3**	0,0111
3,175	**1/8**	**RB 3,175**	0,0132
3,5	-	**RB 3,5**	0,0177
3,969	**5/32**	**RB 3,969**	0,0257
4	-	**RB 4**	0,0263
4,5	-	**RB 4,5**	0,0374
4,762	**3/16**	**RB 4,762**	0,0446
5	-	**RB 5**	0,0514
5,5	-	**RB 5,5**	0,0679
5,556	**7/32**	**RB 5,556**	0,702
6	-	**RB 6**	0,0882
6,350	**1/4**	**RB 6,350**	0,103
6,5	-	**RB 6,5**	0,113
7	-	**RB 7**	0,141
7,144	**9/32**	**RB 7,144**	0,150
7,5	-	**RB 7,5**	0,174
7,938	**5/16**	**RB 7,938**	0,106

Steel Balls



Ball diameter, D_W		Designation	Mass per 100 balls
mm	inch		kg
8	**-**	**RB 8**	0,210
8,5	**-**	**RB 8,5**	0,220
8,731	**11/32**	**RB 8,731**	0,266
9	**-**	**RB 9**	0,330
9,525	**3/8**	**RB 9,525**	0,355
10	**-**	**RB 10**	0,411
10,319	**13/32**	**RB 10,319**	0,443
10,5	**-**	**RB 10,5**	0,476
11	**-**	**RB 11**	0,547
11,112	**7/16**	**RB 11,112**	0,564
11,5	**-**	**RB 11,5**	0,625
11,906	**15/32**	**RB 11,906**	0,693
12	**-**	**RB 12**	0,710
12,5	**-**	**RB 12,5**	0,803
12,700	**1/2**	**RB 12,700**	0,842
13	**-**	**RB 13**	0,903
13,494	**17/32**	**RB 13,494**	1,01
14	**-**	**RB 14**	1,13
14,288	**9/16**	**RB 14,288**	1,20
15	**-**	**RB 15**	1,39
15,081	**19/32**	**RB 15,081**	1,41
15,875	**5/8**	**RB 15,875**	1,65
16	**-**	**RB 16**	1,68
16,5	**-**	**RB 16,5**	1,85
16,669	**21/32**	**RB 16,669**	1,91

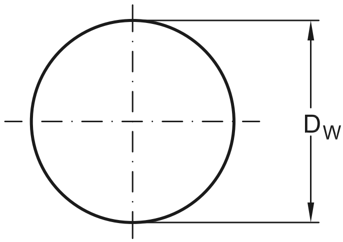
Steel Balls



Ball diameter, D_W		Designation	Mass per 100 balls
mm	inch		kg
17	**-**	**RB 17**	2,02
17,462	**11/16**	**RB 17,462**	2,19
18	**-**	**RB 18**	2,40
18,256	**23/32**	**RB 18,256**	2,50
19	**-**	**RB 19**	2,82
19,050	**3/4**	**RB 19,050**	2,84
19,844	**25/32**	**RB 19,844**	3,24
20	**-**	**RB 20**	3,29
20,5	**-**	**RB 20,5**	3,54
20,638	**13/16**	**RB 20,638**	3,62
21	**-**	**RB 21**	3,81
22	**-**	**RB 22**	4,38
22,225	**7/8**	**RB 22,225**	4,52
22,5	**-**	**RB 22,5**	4,68
23	**-**	**RB 23**	5,00
23,812	**15/16**	**RB 23,812**	5,55
24	**-**	**RB 24**	5,68
25	**-**	**RB 25**	6,42
25,400	**1**	**RB 25,400**	6,74
26	**-**	**RB 26**	7,23
26,988	**1 1/16**	**RB 26,988**	8,08
28	**-**	**RB 28**	9,02
28,575	**1 1/8**	**RB 28,575**	9,55
30	**-**	**RB 30**	11,1
30,162	**1 3/16**	**RB 30,162**	11,3

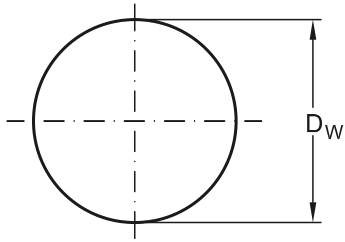
ART BEARINGS

Steel Balls



Ball diameter, D_W		Designation	Mass per 100 balls
mm	inch		kg
31,750	**1 1/4**	**RB 31,750**	13,2
32	**-**	**RB 32**	13,5
33	**-**	**RB 33**	14,8
33,338	**1 5/16**	**RB 33,338**	15,2
34	**-**	**RB 34**	16,2
34,925	**1 3/8**	**RB 34,925**	17,5
35	**-**	**RB 35**	17,7
36	**-**	**RB 36**	19,2
36,512	**1 7/16**	**RB 36,512**	20,0
38	**-**	**RB 38**	22,5
38,100	**1 1/2**	**RB 38,100**	22,7
39,688	**1 9/16**	**RB 39,688**	25,7
40	**-**	**RB 40**	26,3
41,275	**1 5/8**	**RB 41,275**	29,0
42,862	**1 11/16**	**RB 42,862**	32,4
44,450	**1 3/4**	**RB 44,450**	36,1
45	**-**	**RB 45**	37,4
46,038	**1 13/16**	**RB 46,038**	40,3
47,625	**1 7/8**	**RB 47,625**	44,6
49,212	**1 15/16**	**RB 49,212**	49,0
50	**-**	**RB 50**	51,4
50,800	**2**	**RB 50,800**	53,9
53,975	**2 1/8**	**RB 53,975**	64,6
55	**-**	**RB 55**	67,9
57,15	**2 1/4**	**RB 57,15**	76,7

Steel Balls



Ball diameter, D_W		Designation	Mass per 100 balls
mm	inch		kg
60	**-**	**RB 60**	88,2
60,325	**2 3/8**	**RB 60,325**	90,2
63,500	**2 1/2**	**RB 63,500**	103
65	**-**	**RB 65**	113
66,675	**2 5/8**	**RB 66,675**	122
69,850	**2 3/4**	**RB 69,850**	140
70	**-**	**RB 70**	141
73,025	**2 7/8**	**RB 73,025**	160
75	**-**	**RB 75**	174
76,200	**3**	**RB 76,200**	182
80	**-**	**RB 80**	210
82,550	**3 1/4**	**RB 82,550**	231
85	**-**	**RB 85**	252
88,900	**3 1/2**	**RB 88,900**	289
90	**-**	**RB 90**	300
95	**-**	**RB 95**	352
95,250	**3 3/4**	**RB 95,250**	355
100	**-**	**RB 100**	411
110	**-**	**RB 110**	547
120	**-**	**RB 120**	710
127	**5**	**RB 127**	842
150	**-**	**RB 150**	1390
200	**-**	**RB 200**	3290
250	**-**	**RB 250**	6420

ART BEARINGS

Cylindrical Rollers

Standards, Boundary dimensions

Cylindrical rollers of Through-hardering Rolling bearings steel DIN 5402/part 1

Hardness

ART cylindrical rollers made from through - hardened rolling bearing steel according to DIN 17 230 have a surface hardness of **58** up to **65 HRC**.

Design features

ART cylindrical rollers are produced using the latest technology, with the modified surface profile (i.e. semi-crowned) as standard (see sketch below).

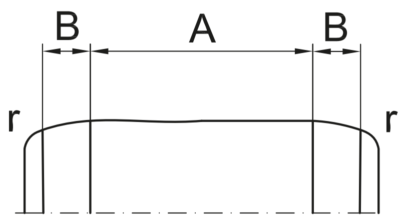
This modified profile features a cylindrical centre diameter (**A**) that blends into a slightly curved area (**B**) which blends into the roller radii (**r**) and end face.

This feature reduces considerably the negative effect of edge loading and, therefore, additional stresses.

For manufacturing reasons, small cylindrical rollers may have shallow dimples in their end faces.

Such dimples have a depth of approximately 0,5 mm, tthe diameter is approximately half the nominal roller diameter (**D_W**).

In cases where such dimpled cylinfrical rollers are unsuitable for application reasons, it must be clearly stated on the order.

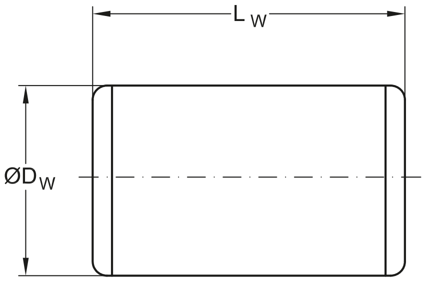


Tolerances for ART Cylindrical Rollers

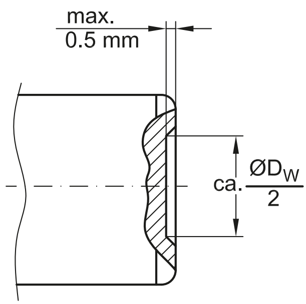
Values of dimensional and geometrical accuracy of **ART** cylindrical rollers

Roller diameter Nominal ΦD_w >	≤	Tolerances min.	max.	Gauge interval I	Gauge mean values (deviation range)			Roundness tolerance to DIN ISO 1101
mm		µm		µm	µm			µm
-	**26**	-17	+11	2	-8 ... -1	0	+1 ... +6	1
26	**40**	-19,5	+10,5	3	-9 ... -1,5	0	+1,5 ... +6	1,2

Roller lenght Nominal L_w >	≤	Tolerances min.	max.	Gauge interval I	Gauge mean values (deviation range)	Tolerance of end face runout to DIN ISO 1101
mm		µm		µm	µm	µm
-	**48**	-20	+10	6	-18 / -12 / -6 / 0 / +6	6
48	**-**	-45	+15	10	-30 / -20 / -10 / 0 / +10	10



a



b

Grades, Tolerances

ART cylindrical rollers are classified in grades according to their nominal diameters and lenghts. Each grade is sorted into gauge ranges, each gauge is separately package.

Each package is clearly identified with the mean gauge interval of both, cylindrical roller diameter and roller length.

Where there are no specific Grade or gauge requirements specified the standard available cylindrical roller stock size will be despatched.

Designation

Cylindrical Rollers are classified according to their nominal diameters and lenghts, each individual grade and gauge is separately packed and despatched.

ART Cylindrical Rollers made from chromium rolling bearing steel are designated following the system as shown below:

RC 6,5X9 P2/M6

where:

RC	Symbol for cylindrical rollers from chromium rolling bearing steel
6,5	Nominal roller diameter, $\mathbf{D_w}$ [mm]
9	Nominal roller length, $\mathbf{L_w}$ [mm]
P2	Diameter gauge **P2** (the mean deviation of roller diameter of this specific lot equals + 2 µm)
M6	Lenght gauge **M6** (the mean deviation of roller lenght of this specific lot is - 6 µm)

To avoid possible misinterpretations by poor visible printings etc., the **mean deviation** is stated acording to the following system:

P	**Plus** e.g. **P2** = mean deviation + 2 µm
N	**0**
M	**Minus** e.g. **M6** = mean deviation - 6 µm

Therefore, the **mean diameter deviation** of a cylindrical roller from this specific lot is

6,502 mm ±1 µm.

The **mean roller length deviation** of a cylindrical roller from a specific lot is

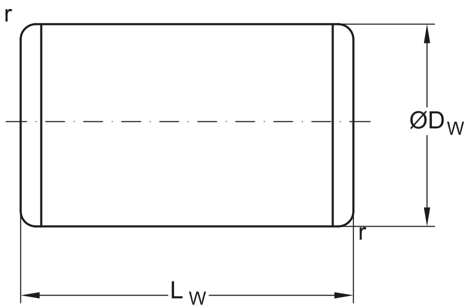
8,994 mm ±3 µm.

Cylindrical Rollers to other Tolerances

ART also produces cylindrical rollers with reduced tolerances to customer order requirements.

ART will provide detailed information on request.

Cylindrical Rollers

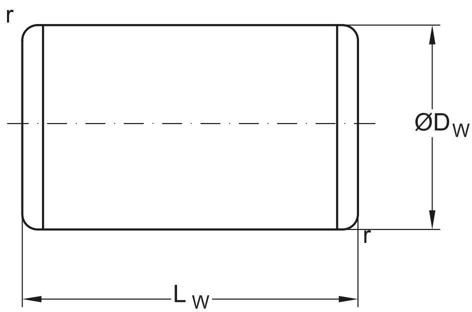


Dimensions				Designation	Mass per 100 rollers
D_W	L_W	r_{min}	r_{max}		
		mm			kg
3	5	0,2	0,4	**RC 3 X 5**	0,027
3,5	5	0,2	0,4	**RC 3,5 X 5**	0,037
	8	0,2	0,4	**RC 3,5 X 8**	0,060
4	4	0,2	0,4	**RC 4 X 4**	0,038
	6	0,2	0,4	**RC 4 X 6**	0,058
	8	0,2	0,4	**RC 4 X 8**	0,078
4,5	6	0,2	0,6	**RC 4,5 X 6**	0,073
5	5	0,2	0,6	**RC 5 X 5**	0,075
	6	0,2	0,6	**RC 5 X 6**	0,091
	7	0,2	0,6	**RC 5 X 7**	0,106
	8	0,2	0,6	**RC 5 X 8**	0,121
	10	0,2	0,6	**RC 5 X 10**	0,152
5,5	5,5	0,2	0,6	**RC 5,5 X 5,5**	0,100
	8	0,2	0,6	**RC 5,5 X 8**	0,146
6	6	0,2	0,6	**RC 6 X 6**	0,130
	8	0,2	0,6	**RC 6 X 8**	0,178
	12	0,2	0,6	**RC 6 X 12**	0,261
6,5	6,5	0,2	0,6	**RC 6,5 X 6,5**	0,166
	9	0,2	0,6	**RC 6,5 X 9**	0,230

Cylindrical Rollers

Dimensions				Designation	Mass per 100 rollers
D_W	L_W	r_{min}	r_{max}		
		mm			kg
7	7	0,2	0,6	**RC 7 X 7**	0,206
	10	0,2	0,6	**RC 7 X 10**	0,30
	14	0,2	0,6	**RC 7 X 14**	0,42
7,5	7,5	0,2	0,6	**RC 7,5 X 7,5**	0,25
	11	0,2	0,6	**RC 7,5 X 11**	0,37
8	8	0,2	0,6	**RC 8 X 8**	0,31
	12	0,2	0,6	**RC 8 X 12**	0,47
9	9	0,3	0,7	**RC 9 X 9**	0,44
	14	0,3	0,7	**RC 9 X 14**	0,68
10	10	0,3	0,7	**RC 10 X 10**	0,60
	14	0,3	0,7	**RC 10 X 14**	0,85
11	11	0,3	0,7	**RC 11 X 11**	0,81
	15	0,3	0,7	**RC 11 X 15**	1,10
12	12	0,3	0,7	**RC 12 X 12**	1,04
	18	0,3	0,7	**RC 12 X 18**	1,57
13	13	0,4	0,8	**RC 13 X 13**	1,33
	20	0,4	0,8	**RC 13 X 20**	2,04
14	14	0,4	0,8	**RC 14 X 14**	1,66
	20	0,4	0,8	**RC 14 X 20**	2,38

Cylindrical Rollers



Dimensions				Designation	Mass per 100 rollers
D_W	L_W	r_{min}	r_{max}		
		mm			kg
15	15	0,4	0,8	**RC 15 X 15**	2,04
	22	0,4	0,8	**RC 15 X 22**	3,00
16	16	0,4	0,8	**RC 16 X 16**	2,48
	24	0,4	0,8	**RC 16 X 24**	3,73
17	17	0,4	1	**RC 17 X 17**	2,97
	24	0,4	1	**RC 17 X 24**	4,20
18	18	0,4	1	**RC 18 X 18**	3,57
	26	0,4	1	**RC 18 X 26**	5,10
19	19	0,4	1	**RC 19 X 19**	4,16
	28	0,4	1	**RC 19 X 28**	6,10
20	20	0,4	1	**RC 20 X 20**	4,85
	30	0,4	1	**RC 20 X 30**	7,30
21	21	0,5	1,1	**RC 21 X 21**	5,60
	30	0,5	1,1	**RC 21 X 30**	8,0
22	22	0,5	1,1	**RC 22 X 22**	6,4
	34	0,5	1,1	**RC 22 X 34**	10,0
23	23	0,5	1,1	**RC 23 X 23**	7,4
	34	0,5	1,1	**RC 23 X 34**	11,2
24	24	0,5	1,1	**RC 24 X 24**	8,4

Cylindrical Rollers

Dimensions				Designation	Mass per 100 rollers
D_W	L_W	r_{min}	r_{max}		
		mm			kg
24	36	0,5	1,1	**RC 24 X 36**	12,6
25	25	0,5	1,1	**RC 25 X 25**	9,5
	36	0,5	1,1	**RC 25 X 36**	13,7
26	26	0,5	1,1	**RC 26 X 26**	10,7
	40	0,5	1,1	**RC 26 X 40**	16,4
28	28	0,6	1,4	**RC 28 X 28**	13,3
	44	0,6	1,4	**RC 28 X 44**	21,0
30	30	0,6	1,4	**RC 30 X 30**	16,3
	48	0,6	1,4	**RC 30 X 48**	26,2
32	32	0,6	1,4	**RC 32 X 32**	19,9
	52	0,6	1,4	**RC 32 X 52**	32,4
34	34	0,6	1,4	**RC 34 X 34**	23,9
	55	0,6	1,4	**RC 34 X 55**	38,7
36	36	0,7	1,7	**RC 36 X 36**	28,3
	58	0,7	1,7	**RC 36 X 58**	45,7
38	38	0,7	1,7	**RC 38 X 38**	33,3
	62	0,7	1,7	**RC 38 X 62**	55,0
40	40	0,7	1,7	**RC 40 X 40**	38,9
	65	0,7	1,7	**RC 40 X 65**	63,0

Needle Rollers

Standards, Bondary dimensions

Needle rollers of through-hardened rolling bearing steel DIN 5402 / part 3

Hardness

ART - needle rollers made from through - hardened rolling bearing steel according to DIN 17 230 generally, have a hardness value range of **58** to **65 HRC**.

Design features

ART Needler Rollers are produced using the latest technology.

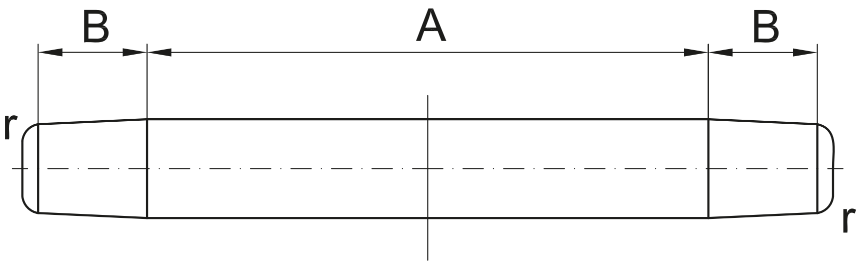
One detail of outstanding importance to needle rollers is the modified profile that is established as a standard for all **ART needle rollers**, see sletch below.

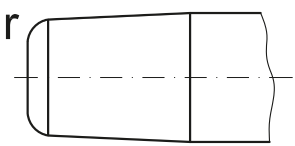
The modified profile features a cylindrical section in the centre (**A**) that blends into a slightly curved area (**B**) which blends into the roller radii (**r**) and end face.

This feature reduces considerably the potentially negative effect of edge loading and, therefore, additional stresses.

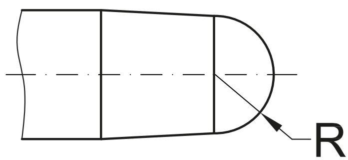
Needle rollers are available in two different designs as standard (see sketch below).

Needle rollers of type "**B**" have spherical end faces, whilst needle rollers of the "**BF**" - design are produced with flat ends.





BF



B

Grades, tolerances

ART Needle rollers are classified and graded according to their diameters into tharee **Grades** (**G2, G3** and **G5**).

Furthermore, the needle diameters of every grade are subdivided in **gauges**.

The tolerance ranges of each gauge are different depending on the grade.

Each package is clearly identified with the nominal needle roller diameter, grade, individual gauge range and length.

Each gauge is packed and despached separately.

Where there is no specific grade and/or gauge requirements G2-Needle rollers from available stock sizes will be despatched.

The **lenght tolerances** of needle rollers correspond uniformly to ISO tolerance field **h13**.

Values of dimensional and geometrical accuracy of ART Needle Rollers

Grade	**Tolerances** min.	max.	**Gauge internal** I	**Gauges** (limit values)	**Roundness tolerance**
mm	µm		µm	µm	µm
G2	-10	0	2	0 / -2, -1 / -3, -2 / -4, -3 / -5, -4 / -6 -5 / -7, -6 / -8, -7 / -9, -8 / -10	1
G3	-10	0	3	0 / -3, -1,5 / / -4,5, -3 / -6, -4,5 / -7,5, -6 / -9, -7 / -10	1,2
G5	-10	0	5	0 / -5, -3 / -8, -5 / -10	2,5

The lenght tolerance of needle rollers correspond uniformly to ISO tolerance field h13.

Designation

The ART designation system for needle rollers made from chromium rolling bearing steel follows the system as shown bellow:

RN 2X13,8 BF M2/M4 G2

where:

RN Symbols for needle rollers from chromium rolling bearing steel

2 Nominal diameter of needle roller **D_w** [mm]

13,8 Nominal lenght of needle roller, **L_W** [mm]

BF Needle rollers with flat ends

M2/M4 Diameter gauge **M2/M4** (the physical roller diameter size of this specific lot lies between 1,998 to 1,996 mm)

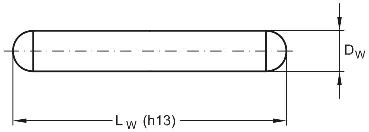
G2 Grade of needle rollers

To avoid possible misinterpretation by poor visible printings, etc., the **diameter** gauges are stated acording the following system:

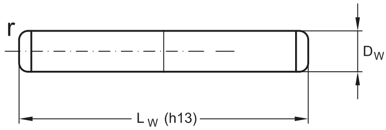
N **0**

M **Minus**
e.g. **M2/M4** = -2 / -4 µm

Needle Rollers



B



BF

Dimensions				Designation		Mass per 100 needles
D_W	L_W	r_{min}	r_{max}	"Sphered end" type	"Flat end" type	
		mm				kg
1,5	5,8	0,1	0,4	**RN 1,5 X 5,8 B**	**RN 1,5 X 5,8 BF**	0,008
	7,8	0,1	0,4	**RN 1,5 X 7,8 B**	**RN 1,5 X 7,8 BF**	0,011
	9,8	0,1	0,4	**RN 1,5 X 9,8 B**	**RN 1,5 X 9,8 BF**	0,013
	11,8	0,1	0,4	**RN 1,5 X 11,8 B**	**RN 1,5 X 11,8 BF**	0,016
	13,8	0,1	0,4	**RN 1,5 X 13,8 B**	**RN 1,5 X 13,8 BF**	0,020
2	7,8	0,1	0,4	**RN 2 X 7,8 B**	**RN 2 X 7,8 BF**	0,02
	9,8	0,1	0,4	**RN 2 X 9,8 B**	**RN 2 X 9,8 BF**	0,02
	11,8	0,1	0,4	**RN 2 X 11,8 B**	**RN 2 X 11,8 BF**	0,03
	13,8	0,1	0,4	**RN 2 X 13,8 B**	**RN 2 X 13,8 BF**	0,03
	15,8	0,1	0,4	**RN 2 X 15,8 B**	**RN 2 X 15,8 BF**	0,04
	17,8	0,1	0,4	**RN 2 X 17,8 B**	**RN 2 X 17,8 BF**	0,04
	19,8	0,1	0,4	**RN 2 X 19,8 B**	**RN 2 X 19,8 BF**	0,05
	21,8	0,1	0,4	**RN 2 X 21,8 B**	**RN 2 X 21,8 BF**	0,05
2,5	7,8	0,1	0,4	**RN 2,5 X 7,8 B**	**RN 2,5 X 7,8 BF**	0,03
	9,8	0,1	0,4	**RN 2,5 X 9,8 B**	**RN 2,5 X 9,8 BF**	0,04
	11,8	0,1	0,4	**RN 2,5 X 11,8 B**	**RN 2,5 X 11,8 BF**	0,05
	13,8	0,1	0,4	**RN 2,5 X 13,8 B**	**RN 2,5 X 13,8 BF**	0,05

Needle Rollers

Dimensions				Designation		Mass per 100 needles
D_W	L_W	r_{min}	r_{max}	"Sphered end" type	"Flat end" type	
		mm				kg
	15,8	0,1	0,4	**RN 2,5 X 15,8 B**	**RN 2,5 X 15,8 BF**	0,06
	17,8	0,1	0,4	**RN 2,5 X 17,8 B**	**RN 2,5 X 17,8 BF**	0,07
2,5	19,8	0,1	0,4	**RN 2,5 X 19,8 B**	**RN 2,5 X 19,8 BF**	0,08
	21,8	0,1	0,4	**RN 2,5 X 21,8 B**	**RN 2,5 X 21,8 BF**	0,08
	23,8	0,1	0,4	**RN 2,5 X 23,8 B**	**RN 2,5 X 23,8 BF**	0,09
3	9,8	0,1	0,4	**RN 3 X 9,8 B**	**RN 3 X 9,8 BF**	0,05
	11,8	0,1	0,4	**RN 3 X 11,8 B**	**RN 3 X 11,8 BF**	0,07
	13,8	0,1	0,4	**RN 3 X 13,8 B**	**RN 3 X 13,8 BF**	0,08
	15,8	0,1	0,4	**RN 3 X 15,8 B**	**RN 3 X 15,8 BF**	0,09
	17,8	0,1	0,4	**RN 3 X 17,8 B**	**RN 3 X 17,8 BF**	0,10
	19,8	0,1	0,4	**RN 3 X 19,8 B**	**RN 3 X 19,8 BF**	0,11
	23,8	0,1	0,4	**RN 3 X 23,8 B**	**RN 3 X 23,8 BF**	0,13
	27,8	0,1	0,6	**RN 3 X 27,8 B**	**RN 3 X 27,8 BF**	0,15
3,5	29,8	0,1	0,6	**RN 3,5 X 29,8 B**	**RN 3,5 X 29,8 BF**	0,23
	34,8	0,1	0,6	**RN 3,5 X 34,8 B**	**RN 3,5 X 34,8 BF**	0,27
4	39,8	0,1	0,6	**RN 4 X 39,8 B**	**RN 4 X 39,8 BF**	0,40
5	49,8	0,1	0,6	**RN 5 X 49,8 B**	**RN 5 X 49,8 BF**	0,75

Adapter and Withdrawal Sleeves

General

Adapter and Withdrawal Sleeves are devices using to mount and secure rolling element bearings with tapered bores onto cylindrical shaft seats.
This enables the mounting or dismounting of rolling element bearings in a simple and effective way to for a variety of applications.

Since, adapter and withdrawal sleeves are able to adapt to shaft diameter variations within certain limits, larger than normal **shaft diameter tolerances** are accomodated.
The **geometrical accuracy**, however, must be more closely defined, as the forms errors of the shaft affect the running accuracy of the total bearing arrangement in a direct way.

Furthermore, using adapter or withdrawal sleeves allows bearing seats with lower surface qualities, (e.g. turned surfaces) to be acceptable. For applications where no accurate shaft guidance of bearings is required, bright drawn round bar stock may also be used.

Generally the following tolerances may be used for guidance:

Expected running accuracy	Diameter tolerance	Form accuracy
Normal	h7, h8, h9	$\frac{IT5}{2}$
Low	h10, h11	$\frac{IT7}{2}$

Adapter sleeves

Standards, boundary, dimensions

Adapter Sleeves DIN 5415

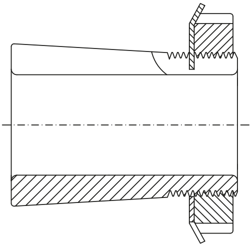
General

Adapter sleeves (see sketch below) are slotted steel sleeves that have a tapered outer diameter, taper 1:12 on one side and a thread on the opposite side.
Small adapter sleeves may have phosphated surfaces, normally they are only oil preserved.

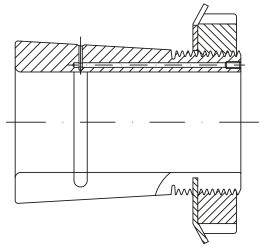
ART adapter sleeves are supplied complete with lock nut and locking washer as standard. Beside the standard design (see figure **a**), there are also larger adapter sleeves available with oil bores and oil distribution ducs, (prefix **OH**) as required for applying the oil injection method as shown in figure **b**.

On smooth straight shafts, (e.g. on a drawn round stock), adapter sleeves allow a simple positioning of bearings in any position, (see figure **c**).
In applications where bearings with adapter sleeves are mounted on straight shafts without axial support, (see figure **c**), their ability to accept axial forces is limited by the friction between the adapter sleeve and the shaft.

in the case of higher axial forces, the bearing needs to be secured additionaly by **supporting rings** (see figure **d**).
When designing such supporting rings, however, the abutment dimensions recommended by the product tables must be considered.



a



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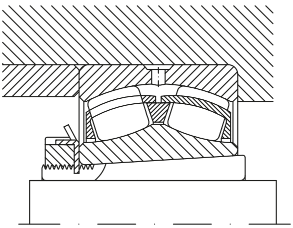

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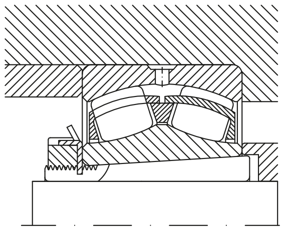
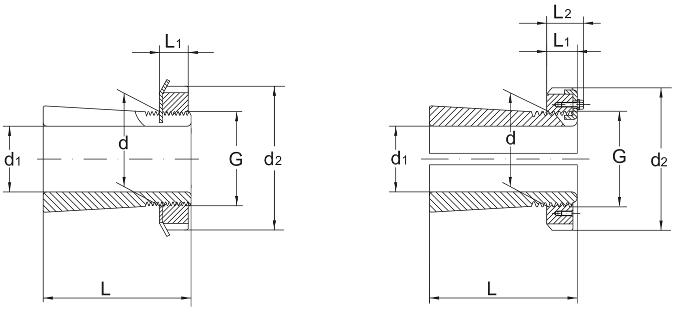


d

ART
BEARINGS

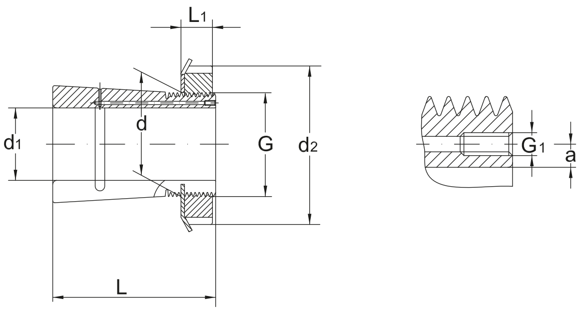
ART BEARINGS

Adapter Sleeves



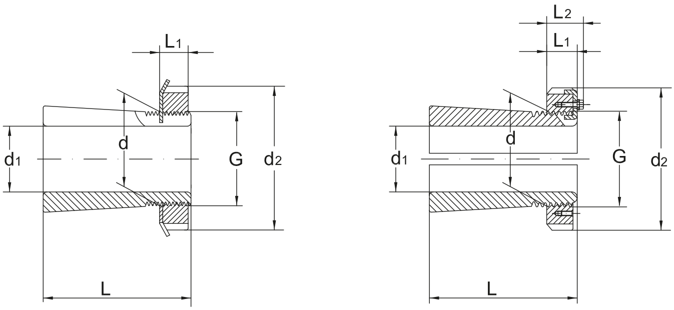
Shaft Φ d_1	Dimension d	d_2	L	Designation adapter sleeve, complete	Mass
mm	mm				kg
17	20	32	24	**H204**	0,04
		32	28	**H304**	0,04
		32	31	**H2304**	0,05
20	25	38	26	**H205**	0,06
		38	29	**H305**	0,07
		38	35	**H2305**	0,09
25	30	45	27	**H206**	0,09
		45	31	**H306**	0,10
		45	38	**H2306**	0,11
30	35	52	29	**H207**	0,12
		52	35	**H307**	0,14
		52	43	**H2307**	0,15
35	40	58	31	**H208**	0,16
		58	36	**H308**	0,18
		58	46	**H2308**	0,22
40	45	65	33	**H209**	0,21
		65	39	**H309**	0,23
		65	50	**H2309**	0,27
45	50	70	35	**H210**	0,24
		70	42	**H310**	0,27
		70	55	**H2310**	0,34
50	55	75	37	**H211**	0,28
		75	45	**H311**	0,32
		75	59	**H2311**	0,39

Adapter Sleeves



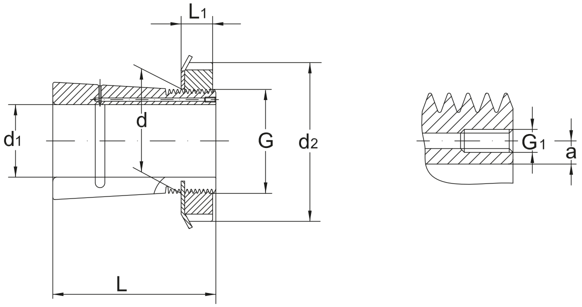
Shaft Φ	Thread	Dimensions				Lock nut	Locking Device
d_1	G	L_1	L_2	G_1	a		
mm							
17	M 20 X 1	7	-	-	-	MK4	MB4
	M 20 X 1	7	-	-	-	MK4	MB4
	M 20 X 1	7	-	-	-	MK4	MB4
20	M 25 X 1,5	8	-	-	-	MK5	MB5
	M 25 X 1,5	8	-	-	-	MK5	MB5
	M 25 X 1,5	8	-	-	-	MK5	MB5
25	M 30 X 1,5	8	-	-	-	MK6	MB6
	M 30 X 1,5	8	-	-	-	MK6	MB6
	M 30 X 1,5	8	-	-	-	MK6	MB6
30	M 35 X 1,5	9	-	-	-	MK7	MB7
	M 35 X 1,5	9	-	-	-	MK7	MB7
	M 35 X 1,5	9	-	-	-	MK7	MB7
35	M 40 X 1,5	10	-	-	-	MK8	MB8
	M 40 X 1,5	10	-	-	-	MK8	MB8
	M 40 X 1,5	10	-	-	-	MK8	MB8
40	M 45 X 1,5	11	-	-	-	MK9	MB9
	M 45 X 1,5	11	-	-	-	MK9	MB9
	M 45 X 1,5	11	-	-	-	MK9	MB9
45	M 50 X 1,5	12	-	-	-	MK10	MB10
	M 50 X 1,5	12	-	-	-	MK10	MB10
	M 50 X 1,5	12	-	-	-	MK10	MB10
50	M 55 X 2	12,5	-	-	-	MK11	MB11
	M 55 X 2	12,5	-	-	-	MK11	MB11
	M 55 X 2	12,5	-	-	-	MK11	MB11

Adapter Sleeves



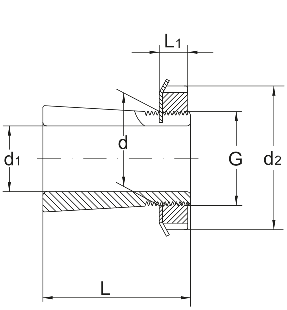
Shaft Φ d_1	Dimension d	d_2	L	Designation adapter sleeve, complete	Mass
mm	mm				kg
55	60	80	38	**H212**	0,31
		80	47	**H312**	0,35
		80	62	**H2312**	0,45
60	65	85	40	**H213**	0,36
	65	85	50	**H313**	0,42
	65	85	65	**H2313**	0,52
	70	92	52	**H314**	0,68
	70	92	68	**H2314**	0,88
65	75	98	43	**H215**	0,66
		98	55	**H315**	0,78
		98	73	**H2315**	1,1
70	80	105	46	**H216**	0,81
		105	59	**H316**	0,95
		105	78	**H2316**	1,2
75	85	110	50	**H217**	0,94
		110	63	**H317**	1,1
		110	82	**H2317**	1,35
80	90	120	52	**H218**	1,1
		120	65	**H318**	1,3
		120	86	**H2318**	1,6
85	95	125	55	**H219**	1,25
		125	68	**H319**	1,4
		125	90	**H2319**	1,8
90	100	130	58	**H220**	1,4

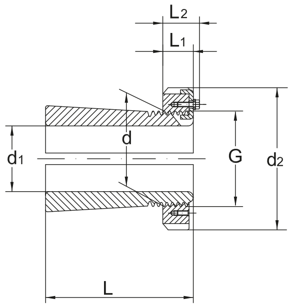
Adapter Sleeves



Shaft Φ	Thread	Dimensions				Lock nut	Locking Device
d_1	G	L_1	L_2	G_1	a		
mm							
55	M 60 X 2	13	-	-	-	KM12	MB 12
	M 60 X 2	13	-	-	-	KM12	MB12
	M 60 X 2	13	-	-	-	KM12	MB12
60	M 65 X 2	14	-	-	-	KM13	MB13
	M 65 X 2	14	-	-	-	KM13	MB13
	M 65 X 2	14	-	-	-	KM13	MB13
	M 70 X 2	14	-	-	-	KM14	MB14
	M 70 X 2	14	-	-	-	KM14	MB14
65	M 75 X 2	15	-	-	-	KM15	MB15
	M 75 X 2	15	-	-	-	KM15	MB15
	M 75 X 2	15	-	-	-	KM15	MB15
70	M 80 X 2	17	-	-	-	KM16	MB16
	M 80 X 2	17	-	-	-	KM16	MB16
	M 80 X 2	17	-	-	-	KM16	MB16
75	M 85 X 2	18	-	-	-	KM17	MB17
	M 85 X 2	18	-	-	-	KM17	MB17
	M 85 X 2	18	-	-	-	KM17	MB17
80	M 90 X 2	18	-	-	-	KM18	MB18
	M 90 X 2	18	-	-	-	KM18	MB18
	M 90 X 2	18	-	-	-	KM18	MB18
85	M 95 X 2	19	-	-	-	KM19	MB19
	M 95 X 2	19	-	-	-	KM19	MB19
	M 95 X 2	19	-	-	-	KM19	MB19
90	M 100 X 2	20	-	-	-	KM20	MB20

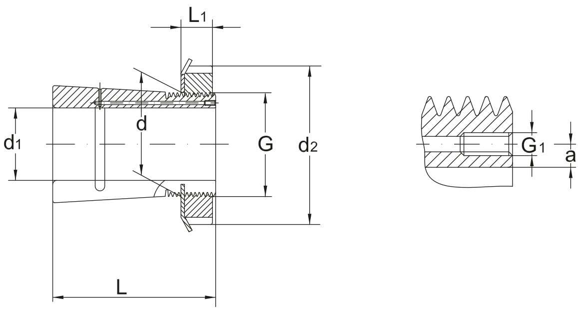
Adapter Sleeves





Shaft Φ d_1	Dimension d	d_2	L	Designation adapter sleeve, complete	Mass
mm	mm				kg
90	100	130	71	**H320**	1,6
		130	97	**H2320**	2
	105	130	76	**H3120**	1,8
95		140	60	**H221**	1,6
		140	74	**H321**	1,85
100	110	145	63	**H222**	1,8
		145	77	**H322**	2,05
		145	105	**H2322**	2,75
		145	81	**H3122**	2,1
110	120	155	112	**H2324**	3
		145	72	**H3024**	1,8
		155	88	**H3124**	2,5
115	130	165	121	**H2326**	4,45
		155	80	**H3026**	2,8
		165	92	**H3126**	3,45
125	140	180	131	**H2328**	5,4
		165	82	**H3028**	3,05
		180	97	**H3128**	4,1
135	150	195	139	**H2330**	6,4
		180	87	**H3030**	3,75
		195	111	**H3130**	5,25
140	160	210	147	**H2332**	8,8
		210	147	**OH2332 H**	8,8
		190	93	**H3032**	5,1

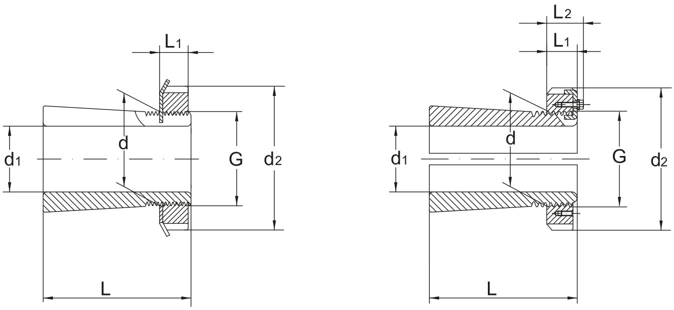
Adapter Sleeves



Shaft Φ	Thread	Dimensions				Lock nut	Locking Device
d_1	G	L_1	L_2	G_1	a		
mm							
90	M 100 X 2	20	-	-	-	KM20	MB20
	M 100 X 2	20	-	-	-	KM20	MB20
	M 100 X 2	20	-	-	-	KM20	MB20
95	M 105 X 2	20	-	-	-	KM21	MB21
	M 105 X 2	20	-	-	-	KM21	MB21
100	M 110 X 2	21	-	-	-	KM22	MB22
	M 110 X 2	21	-	-	-	KM22	MB22
	M 110 X 2	21	-	-	-	KM22	MB22
	M 110 X 2	31	-	-	-	KM22	MB22
110	M 120 X 2	22	-	-	-	KM24	MB24
	M 120 X 2	22	-	-	-	KML24	MBL24
	M 120 X 2	22	-	-	-	KM24	MB24
115	M 130 X 2	23	-	-	-	KM26	MB26
	M 130 X 2	23	-	-	-	KML26	MBL26
	M 130 X 2	23	-	-	-	KM26	MB26
125	M 140 X 2	24	-	-	-	KM28	MB28
	M 140 X 2	24	-	-	-	KML28	MBL28
	M 140 X 2	24	-	-	-	KM28	MB28
135	M 150 X 2	26	-	-	-	KM30	MB30
	M 150 X 2	26	-	-	-	KML30	MBL30
	M 150 X 2	26	-	-	-	KM30	MB30
140	M 160 X 3	28	-	-	-	KM32	MB32
	M 160 X 3	28	-	M 6	4,2	KM32	MB32
	M 160 X 3	27,5	-	-	-	KML32	MBL32

ART BEARINGS

Adapter Sleeves



Shaft Φ d_1	Dimension d	d_2	L	Designation adapter sleeve, complete	Mass
mm	mm				kg
140	160	190	93	**OH3032 H**	5,1
		210	119	**H3132**	7,25
		210	119	**OH3132 H**	7,25
150	170	220	154	**H2334**	9,9
		220	154	**OH2334 H**	9,9
		200	101	**H3034**	5,8
		200	101	**OH3034 H**	5,8
		220	101	**H3134**	8,1
		220	122	**OH3134 H**	8,1
160	180	230	161	**H2336**	11
		230	161	**OH2336 H**	11
		210	109	**H3036**	6,7
		210	109	**OH3036 H**	6,7
		230	131	**H3136**	9,15
		230	131	**OH3136 H**	9,15
170	190	240	169	**H2338**	12
		240	169	**OH2338 H**	12
		220	112	**H3038**	7,25
		220	112	**OH3038 H**	7,25
		240	141	**H3138**	10,5
		240	141	**OH3138 H**	10,5
180	200	250	176	**H2340**	13,5
		250	176	**OH2340 H**	13,5
		240	120	**H3040**	8,9

ART BEARINGS

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