SCHAEFFLER

Ball Bearings for the Food Industry

Foreword

Schaeffler products have proved themselves over many years even under critical and problematic application conditions.

In addition to the specific environmental influences, legal or religious requirements in the food and beverage industry also call for the use of special high-quality solutions. For this purpose, Schaeffler offers a range of deep groove ball bearings made from corrosion-resistant steel.

Furthermore, specific lubricants are used that meet the special requirements and approval regulations such as NSF H1. These lubricants are non-toxic and neutral in taste and odour, and are therefore suitable for applications where contact between food and lubricant cannot always be ruled out. If a longer operating life is also necessary, the steel rolling elements can be replaced with ceramic rolling elements.

All other bearing components are, of course, also designed to meet the standards of the food industry. The bearing designations are distinguished from the standard range by the suffix FD.

Figure 1
Areas of application

Deep groove ball bearings for the food industry

Deep groove ball bearings for the food industry

Single row deep groove ball bearings

FD design
Contact seals on both sides

S60..-2RSR-FD, S62..-2RSR-FD, S63..-2RSR-FD

0016GA33

Deep groove ball bearings for the food industry

Features

Deep groove ball bearings in FD design are designed for use in the food industry. They correspond in their structure to single row standard deep groove ball bearings but are specially optimised in relation to:

- suitable materials for the food industry
- significantly higher corrosion and media resistance.

Bearing design

Single row deep groove ball bearings are the most frequently used type of rolling bearing. They are produced in numerous sizes and designs and are particularly economical. Due to their low frictional torque, they are also suitable for high speeds.

Due to the raceway geometry, the use of balls as rolling elements and the design without a filling slot, deep groove ball bearings can support axial loads in both directions as well as radial loads, see page 9.

The angular adjustment facility of single row deep groove ball bearings is limited, so the bearing positions must be well aligned.

Operation even under difficult conditions is ensured by seals that are matched to the application and the use of food-grade grease.

Special characteristics

- bearing rings, cages and balls made from high-grade steel
- highly effective contact seal, type RSR
- lubrication with food-grade grease.

Design variant

Deep groove ball bearings in FD design for the food industry are available in the following variant:

- single row, contact seals on both sides.

Corrosion-resistant materials

The bearing rings, cages and rolling elements are made from high-grade steel.

As a result, they are resistant to moisture, contaminated water, salt spray mist and weak alkaline or weak acidic cleaning agents.

By agreement, deep groove ball bearings for the food industry are also available as hybrid bearings with ceramic rolling elements made from Si_3N_4.

Steels used

Bearing components	Designation		
	Short name ISO 683-17:2000	Material number EN 10088-3	In accordance with AISI
Bearing rings	X65Cr13	1.4037	420D
Rolling elements	X105CrMo17	1.4125	440C
Cage	X5CrNi18-10	1.4301	304

Deep groove ball bearings for the food industry

Media resistance

In the food industry in particular, the resistance of the material in relation to various cleaning agents is of increasing importance.

Resistance to media

Medium	Concentration	X65Cr13		X5CrNi18-10		X105CrMo17	
	%	+20 °C	+80 °C	+20 °C	+80 °C	+20 °C	+80 °C
Hydrochloric acid HCl	0,1	–	–	+	+	–	–
	1	–	–	(+)	–	–	–
	18	–	–	–	–	–	–
Hydrofluoric acid HF	1	–	–	–	–	–	–
	5	–[1]	–	–[1]	–	–[1]	–
Sulphuric acid H_2SO_4	1	–	–	+	–	–	–
	10	–	–	(+)	–	–	–
	96	(+)	–	+	(+)	–	–
Sulphurous acid H_2SO_3	1	–	–	+	+	–	–
Nitric acid HNO_3	5	–	–	+	+	–	–
	25	+	(+)	+	+	+	(+)
	65	+	(+)	+	+	+	(+)
Phosphoric acid H_3PO_4	1	+	+	+	+	+	+
	10	–	–	+	+	(+)	+
	85	+	–	+	+	+	–
Formic acid HCOOH	5	–	–	+	+	–	–
	25	–	–	+	+	–	–
Acetic acid CH_3COOH	5	(+)	–	+	+	+	–
	25	(+)	–	+	+	+	–
Citric acid	5	(+)	–	+	+	+	+
	25	(+)	–	+	+	–	–
Chloroacetic acid	5	(+)	–	+	+	(+)	–
Sodium chloride NaCl	10	(–)	(–)	+	+	(–)	(–)
Sea water	4	(–)	(–)	+	+	(–)	(–)
Distilled water	–	+	+	+	+	+	+
Ammonium hydroxide NH_4OH	1	+	+	+	+	+	+
	10	+	+	+	+	+	+
Potassium hydroxide solution KOH	0,1	+	+	+	+	+	+
	1	+	+	+	+	+	+
	10	+	+	+	+	+	+
Sodium hypochlorite solution	1	[2]	(–)	+[1]	+	[2]	(–)
Hydrogen peroxide H_2O_2	5	+	+	+	+	+	+

\+ Resistant
(+) Moderately resistant
(–) Barely resistant
– Not resistant

[1] Not tested. Estimate generated from remaining test series.

[2] Not tested. No estimate possible.

In the case of direct exposure to spray water, prior consultation with Application Engineering is required.

Lubrication

Food-grade grease application

The high-quality grease used for lubrication is approved for food applications to category NSF H1. The grease is particularly suitable for use in the food industry and meets the quality requirements of FDA 21 CFR 178.3570 in full. Furthermore, the grease is Halal and Kosher-certified.

A lubricant of class NSF H1 is suitable for applications in which incidental contact between food and lubricant may occur and is unavoidable by technical measures. Such lubricants must be non-toxic and neutral in taste and odour.

The Halal and Kosher certification of the lubricant used confirms that the strict Halal and Kosher criteria are also met in relation to the processing and ingredients of the bearings. These dietary laws of the Muslim and Jewish population not only apply to the actual food and beverages, but also to the machines and environment during manufacture.

Lubrication of bearings

The bearings are greased using an aluminium complex soap grease with food applications approval to NSF H1, which is characterised by very good water and chemical resistance. The grease filling is measured so that it is sufficient for the entire life of the bearing. As a result, these bearings are generally maintenance-free.

Do not wash greased bearings out prior to mounting. If mounting is carried out using thermal tools, the bearings should not be heated to a temperature in excess of +80 °C, taking account of the grease filling and seal material. If higher heating temperatures are required, it must be ensured that the permissible upper temperature limits for grease and seals are not exceeded.

Schaeffler recommends the use of induction heating devices for heating purposes, see MH 1, Mounting Handbook.

Sealing

The bearings are sealed in a radial direction on both sides with contact seals made from NBR. These seals are of the type RSR and are elastomer lip seals with a sheet steel reinforcement (suffix 2RSR).

Seal type

Seal RSR	
	Single piece, sheet steel washer with vulcanised and radially preloaded seal lip made from NBR

As standard, bearings for the food industry are delivered with seals made from NBR.

Deep groove ball bearings for the food industry

Operating temperature

Deep groove ball bearings with RSR type seals can be used at operating temperatures of –30 °C to +100 °C, restricted by the grease.

Prefixes and suffixes

Prefixes and suffixes for the available designs, see table.

Available designs

Prefix	Suffix	Description	Design
S	–	High-grade steel	Standard
HC	–	Hybrid bearing with ceramic balls made from Si_3N_4	By agreement
–	2RSR	Contact seal on both sides (lip seal), seal material NBR	Standard
–	FD	Suitable for applications in the food industry	
–	C2	Radial internal clearance C2 (smaller than normal)	By agreement
–	C3	Radial internal clearance C3 (larger than normal)	
–	C4	Radial internal clearance C4 (larger than C3)	

Further information

- General information from Catalogue HR 1, Rolling Bearings, must be observed.
  Download at: https://www.schaeffler.de/std/1D65
- For additional information on corrosion resistance, see TPI 64, Corrosion-resistant products.
  Here, you will also find other corrosion-resistant bearings made from the high-performance steels Cronidur and Cronitect, which are available upon request.
  Download at: https://www.schaeffler.de/std/1F38
- For information on the correct storage, mounting, dismounting and maintenance of rolling bearings, see publication MH 1, Mounting Handbook.
  Download at: https://www.schaeffler.de/std/1D53

Design and safety guidelines

The information on the design of the bearing arrangement, lubrication, mounting and dismounting and on the operation of the bearings provided in the Technical Principles of Catalogue HR 1, must be observed as further information.

Further information

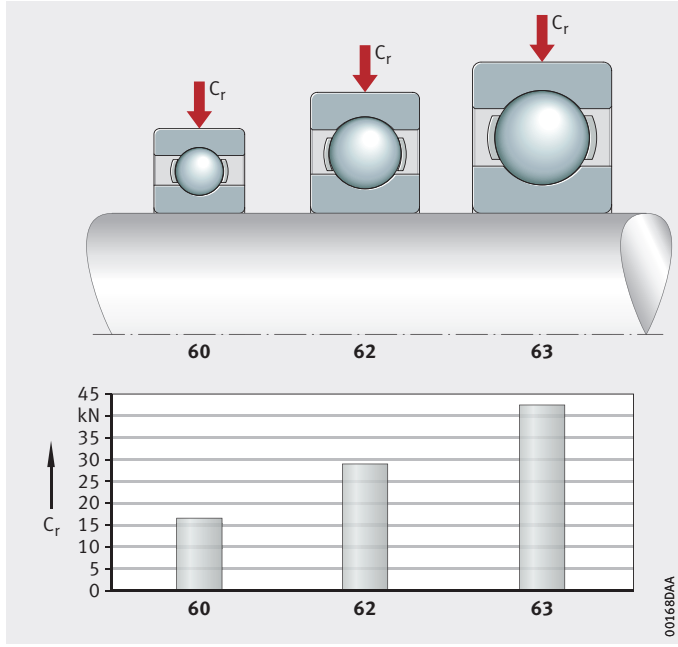
- Technical Principles, Catalogue HR 1, Rolling Bearings. Download at: https://www.schaeffler.de/std/1D65

Load carrying capacity

Radial load carrying capacity

The balls are in contact with the raceways at one point only. Under purely radial load, the contact points between the rolling elements and raceways lie at the centre of the raceway. As a result, the connection between the contact points passes through the radial plane, i.e. the optimum load direction is a purely radial load.

The load carrying capacity is dependent on the bearing series and the size of the ball set in the deep groove ball bearings. As a result, the deep groove ball bearing series 60 with a smaller bearing cross-section cannot support loads as high as those of the standard series 62 with the same dimensions (relative to the bore diameter d) with a larger ball set. The heavy bearing series 63 with the largest ball set is suitable for even higher loads when used for the same bore diameter, *Figure 1*.



C_r = basic dynamic load rating

Figure 1
Single row deep groove ball bearings, comparison of cross-section and load carrying capacity for bearings with d = 40 mm

Deep groove ball bearings for the food industry

Axial load carrying capacity

Due to the deep raceway grooves in the bearing rings and the narrow osculation between the raceway grooves and the balls, the bearings can support axial loads in both directions. The axial load carrying capacity is dependent, for example, on the bearing size, the internal construction and the operating clearance. If the axial load is too high, however, this can increase the running noise and considerably reduce the operating life of the bearings.

If there is any uncertainty regarding the axial load carrying capacity of the bearings, please consult Schaeffler.

Compensation of angular misalignments

Single row deep groove ball bearings are only suitable for compensating static angular misalignments to a very limited extent. As a result, the bearing positions must be well aligned. Misalignments shorten the operating life, as they place an additional strain on the bearing. In order to keep these loads at a low level, only small adjustment angles are permissible for deep groove ball bearings as a function of the load, see table.

Permissible adjustment angles

Series	Adjustment angle for			
	low loads		high loads	
	from	to	from	to
62, 63	5′	10′	8′	16′
60	2′	6′	5′	10′

Speeds

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

If the specified speed limits must be exceeded due to the application, please contact Schaeffler Application Engineering.

Dimensioning

Equivalent dynamic bearing load

The basic rating life equation $L = (C_r/P)^p$ used in the dimensioning of bearings under dynamic load assumes a load of constant magnitude and direction. In radial bearings, this is a purely radial load F_r. If this condition is met, the bearing load F_r is used in the rating life equation for P ($P = F_r$).

If this condition is not met, a constant radial force must first be determined for the rating life calculation that (in relation to the rating life) represents an equivalent load. This force is known as the equivalent dynamic bearing load P.

The calculation of P is dependent on the load ratio F_a/F_r and the calculation factor e:

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

$$\frac{F_a}{F_r} > e \quad \Rightarrow \quad P = X \cdot F_r + Y \cdot F_a$$

P N
Equivalent dynamic bearing load
F_r N
Radial load
F_a N
Axial load
e, X, Y –
Factors, see table Factors e, X and Y.

The specified values are valid for normal operating clearance, see table Factors e, X and Y. If the operating clearance differs significantly, the use of BEARINX is recommended for calculation of the rating life. If the calculation values lie between the stated values (such as 0,4), then read off the table values for 0,3 and 0,5 and determine the intermediate values using linear interpolation.

For normal operating clearance, please observe the fit recommendations in Catalogue HR 1, Rolling Bearings.

Factors e, X and Y

$\frac{f_0 \cdot F_a}{C_{0r}}$	Factor (for normal operating clearance)		
	e	X	Y
0,3	0,22	0,56	2
0,5	0,24	0,56	1,8
0,9	0,28	0,56	1,58
1,6	0,32	0,56	1,4
3	0,36	0,56	1,2
6	0,43	0,56	1

f_0 –
Factor, see dimension table
F_a N
Axial load
C_{0r} N
Basic static load rating, see dimension table.

Deep groove ball bearings for the food industry

Equivalent static bearing load

The calculation of P_0 for deep groove ball bearings under static load is dependent on the load ratio F_{0a}/F_{0r} and the factor 0,8:

$$\frac{F_{0a}}{F_{0r}} \leqq 0{,}8 \quad \Rightarrow \quad P_0 = F_{0r}$$

$$\frac{F_{0a}}{F_{0r}} > 0{,}8 \quad \Rightarrow \quad P_0 = 0{,}6 \cdot F_{0r} + 0{,}5 \cdot F_{0a}$$

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

Static load safety factor

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

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

S_0 –
Static load safety factor
C_0 N
Basic static load rating, see dimension table
P_0 N
Equivalent static bearing load.

Minimum radial load

In order that no slippage occurs between the contact partners, the bearings must be constantly subjected to a sufficiently high load. Based on experience, a minimum radial load of the order of $P > C_{0r}/100$ is thus necessary. In most cases, however, the radial load is higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than stated, please consult Schaeffler.

Design of bearing arrangements

In order to allow full utilisation of the load carrying capacity of the bearings and thus also achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements, see tables, page 14.

Radial location of bearings – fit recommendations

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts. Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts and the mounting and dismounting options must be taken into consideration in the selection of fits.

If shock type loads occur, tight fits (transition fit or interference fit) are required to prevent the rings from coming loose at any point.

Further information

The following information provided in Technical Principles, Catalogue HR 1, Rolling Bearings, must be taken into consideration in the design of bearing arrangements:

- conditions of rotation
- tolerance classes for cylindrical shaft seats (radial bearings)
- shaft fits
- tolerance classes for bearing seats in housings (radial bearings)
- housing fits.

Axial location of bearings – location methods

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, housing covers, nuts, spacer rings and retaining rings etc., are fundamentally suitable.

Deep groove ball bearings for the food industry

Dimensional, geometrical and running accuracy of the bearing seats

The accuracy of the cylindrical bearing seat on the shaft and in the housing should correspond to the accuracy of the bearing used. For deep groove ball bearings with the tolerance class Normal, the shaft seat should correspond to a minimum of standard tolerance grade IT6 and the housing seat to a minimum of IT7. Guide values for the geometrical and positional tolerances of bearing seating surfaces and corresponding numerical values for IT grades, see tables.

Further information

- For tolerances t_1 to t_3, see Catalogue HR 1, Rolling Bearings, Technical Principles.

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

Bearing tolerance class		Bearing seating surface	Standard tolerance grades to ISO 286-1 (IT grades)			
To ISO 492	To DIN 620		Diameter tolerance	Roundness tolerance t_1	Parallelism tolerance t_2	Total axial run-out tolerance of abutment shoulder t_3
Normal	PN (P0)	Shaft	IT6 (IT5)	Circumferential load IT4/2	Circumferential load IT4/2	IT4
				Point load IT5/2	Point load IT5/2	
		Housing	IT7 (IT6)	Circumferential load IT5/2	Circumferential load IT5/2	IT5
				Point load IT6/2	Point load IT6/2	

Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm					
	over 6	10	18	30	50	80
	incl. 10	18	30	50	80	120
	Values in µm					
IT3	2,5	3	4	4	5	6
IT4	4	5	6	7	8	10
IT5	6	8	9	11	13	15
IT6	9	11	13	16	19	22
IT7	15	18	21	25	30	35

Roughness of cylindrical bearing seating surfaces

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces, see table.

Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2
80	500	1,6	1,6	0,8	0,4

Mounting dimensions for the contact surfaces of bearing rings

The mounting dimensions of the shaft and housing shoulders, and spacer rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. However, they must also reliably prevent rotating parts of the bearing from grazing stationary parts. Proven mounting dimensions for the radii and diameters of the abutment shoulders are given in the product tables.
These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

Mounting and dismounting

Deep groove ball bearings are not separable. In the mounting of non-separable bearings, the mounting forces must always be applied to the bearing ring with a tight fit.

The mounting and dismounting options for deep groove ball bearings by thermal, hydraulic or mechanical methods, must also be taken into consideration in the design of the bearing position.

Mounting Handbook

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

Further information

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position.

This book is available from Schaeffler on request:

- MH 1, Mounting Handbook.
  Download at: https://www.schaeffler.de/std/1D53

Deep groove ball bearings for the food industry

Accuracy

Dimensions, tolerances

The main dimensions of single row deep groove ball bearings correspond to DIN 625-1:2011. Nominal dimensions of single row deep groove ball bearings, see dimension table.

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. For overview and limiting values, see Catalogue HR 1, Rolling Bearings.
Nominal dimension of chamfer dimension, see dimension table.

Tolerances

The tolerances for the dimensional and running accuracy of deep groove ball bearings correspond to tolerance class Normal in accordance with ISO 492:2014.

Internal clearance

Deep groove ball bearings of basic design are manufactured as standard with the radial internal clearance CN (normal), see table. CN is not stated in the designation.

The bearings are also available by agreement with the smaller internal clearance C2 and with the larger internal clearance C3 and C4.

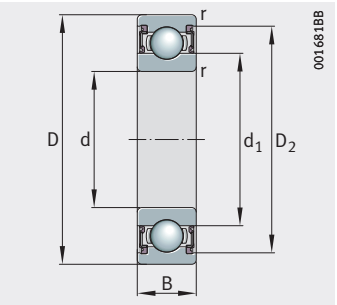
The values for radial internal clearance correspond to DIN 620-4:2004 (ISO 5753-1:2009). These are valid for bearings which are free from load and measurement forces (without elastic deformation).

Radial internal clearance of deep groove ball bearings

Nominal bore diameter		Radial internal clearance							
d		C2 (Group 2)		CN (Group N)		C3 (Group 3)		C4 (Group 4)	
mm		µm		µm		µm		µm	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
6	10	0	7	2	13	8	23	14	29
10	18	0	9	3	18	11	25	18	33
18	24	0	10	5	20	13	28	20	36
24	30	1	11	5	20	13	28	23	41
30	40	1	11	6	20	15	33	28	46
40	50	1	11	6	23	18	36	30	51

Single row deep groove ball bearings

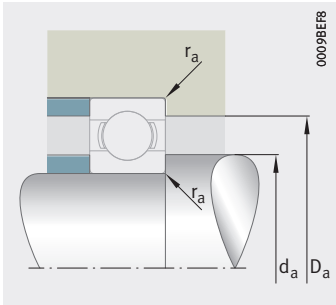
FD design
Contact seals on both sides



With seals 2RSR
(schematic representation)

Dimension table · Dimensions in mm

Designation	Mass	Dimensions					
	m	d	D	B	r	d_1	D_2
	≈ kg				min.	≈	≈
S6000-2RSR-FD	0,02	**10**	26	8	0,3	14,5	22,38
S6200-2RSR-FD	0,032	**10**	30	9	0,6	17,6	25,28
S6300-2RSR-FD	0,058	**10**	35	11	0,6	17,7	29,3
S6001-2RSR-FD	0,022	**12**	28	8	0,3	17	25,15
S6201-2RSR-FD	0,036	**12**	32	10	0,6	18,5	27,95
S6301-2RSR-FD	0,065	**12**	37	12	1	19,3	31,92
S6002-2RSR-FD	0,03	**15**	32	9	0,3	20,5	29,05
S6202-2RSR-FD	0,045	**15**	35	11	0,6	21,7	31,4
S6302-2RSR-FD	0,081	**15**	42	13	1	24,5	36,8
S6003-2RSR-FD	0,039	**17**	35	10	0,3	23,5	31,85
S6203-2RSR-FD	0,065	**17**	40	12	0,6	24,9	35,8
S6303-2RSR-FD	0,114	**17**	47	14	1	27,5	41,1
S6004-2RSR-FD	0,069	**20**	42	12	0,6	27,6	38,75
S6204-2RSR-FD	0,109	**20**	47	14	1	29,5	40,92
S6304-2RSR-FD	0,144	**20**	52	15	1,1	30	45,4
S6005-2RSR-FD	0,077	**25**	47	12	0,6	31,7	42,73
S6205-2RSR-FD	0,13	**25**	52	15	1	34	45,72
S6305-2RSR-FD	0,245	**25**	62	17	1,1	38,1	53,22
S6006-2RSR-FD	0,1	**30**	55	13	1	38	49,95
S6206-2RSR-FD	0,211	**30**	62	16	1	40,7	55,13
S6306-2RSR-FD	0,32	**30**	72	19	1,1	44,9	62,35
S6007-2RSR-FD	0,155	**35**	62	14	1	44	57,05
S6207-2RSR-FD	0,303	**35**	72	17	1,1	47,6	64,83
S6307-2RSR-FD	0,483	**35**	80	21	1,5	50,4	71,58
S6008-2RSR-FD	0,188	**40**	68	15	1	49,2	62,5
S6208-2RSR-FD	0,384	**40**	80	18	1,1	52,93	70,78
S6009-2RSR-FD	0,244	**45**	75	16	1	54,5	69
S6209-2RSR-FD	0,441	**45**	85	19	1,1	57,2	76,35
S6010-2RSR-FD	0,271	**50**	80	16	1	60	74,55
S6210-2RSR-FD	0,457	**50**	90	20	1,1	62,8	82,15



Mounting dimensions

Mounting dimensions			Basic load ratings		Fatigue limit load	Limiting speed	Factor
d_a	D_a	r_a	dyn. C_r	stat. C_{0r}	C_{ur}	n_G	f_0
min.	max.	max.	N	N	N	min^{-1}	
12	24	0,3	3 890	1 570	99	11 000	9,9
14,2	25,8	0,6	4 350	1 910	100	9 700	10,5
14,2	30,8	0,6	6 880	2 750	204	8 900	9
14	26	0,3	4 350	1 910	121	9 700	10,5
16,2	27,8	0,6	5 780	2 440	127	9 100	9,8
17,6	31,4	1	8 250	3 350	265	8 300	8,9
17	30	0,3	4 750	2 270	123	8 600	11,1
19,2	30,8	0,6	6 490	2 980	154	8 000	10,5
20,6	36,4	1	9 720	4 350	345	7 000	9,9
19	33	0,3	5 100	2 610	135	7 700	11,5
21,2	35,8	0,6	8 130	3 830	199	7 100	10,5
22,6	41,4	1	11 600	5 290	275	6 300	9,9
23,2	38,8	0,6	7 980	4 050	216	6 600	11,2
25,6	41,4	1	10 900	5 320	275	6 000	10,6
27	45	1	13 500	6 270	600	5 900	9,9
28,2	43,8	0,6	8 550	4 680	246	5 800	11,6
30,6	46,4	1	11 900	6 300	330	5 400	11,1
32	55	1	17 500	9 000	770	4 700	10,6
34,6	50,4	1	11 200	6 620	350	4 900	11,8
35,6	56,4	1	16 500	9 070	480	4 500	11,1
37	65	1	22 700	12 000	1 030	4 100	10,6
39,6	57,4	1	13 600	8 240	580	4 300	11,9
42	65	1	21 800	12 300	970	3 900	11,1
44	71	1,5	28 300	15 400	1 340	3 600	10,6
44,6	63,4	1	14 300	9 240	620	3 900	12,2
47	73	1	24 700	14 300	1 120	3 500	11,2
49,6	70,4	1	17 800	12 100	690	3 500	12,2
52	78	1	27 800	16 400	1 200	3 200	11,3
54,6	75,4	1	18 500	13 300	740	3 200	12,5
57	83	1	29 800	18 600	1 300	3 000	11,5

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