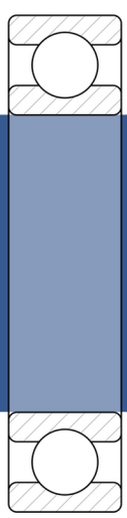
High-temp Deep Groove Ball Bearings

Technical details



Version: 6/2021

GSWC High-temp Deep Groove Ball Bearings

Depending on the used grease, perfect running performance for normal bearings is only guaranteed up to maximum of 150°C. GSWC High-temp Deep Groove Ball Bearings allow **temperatures up to 350°C at low speeds**.

Advantages:

- **Heat stabilization**
  for temperatures up to 250°C according to FAG standard S2
- **Increased radial clearance** (multiple of C5)
  compensation for temperature-induced deformations of the production goods (rails, transport units)
- **Riveted sheet steel cage**
  provides high stability at low friction
- **Manganese phosphate coating**
  (according to EN ISO 9717)
  ensures increased protection against corrosion, good adhesion of lubricants and better runability.

All HT1-, HT2- and HT2X-bearings are available open, with steel shield on one (ZR) or both sides (2ZR). HT3-bearings are always supplied with two steel shields (2ZR).

Available on request:

- Special lubrications
- Different sizes
- Different types of cages

Dimensioning

When choosing a high-temp deep groove ball bearing, the load and the temperature at the bearing location has to be taken into account. Further important parameters are the shaft diameter, which is determined by the required strength, and the type of mounting – shaft mounting (point load on outer ring) or hub mounting (circumferential load on outer ring).

Since the bearings rotate very slowly, dimensioning of the bearing is based on conditions concerning the static load. The static load C_0 is obtained by:

$$C_0 = f_{st} \cdot P_0 \quad [kN]$$

P_0: Equivalent static load of the bearing [kN].
With hub mounted wheel sets, the thrust load acting on the rim generates an additional radial load component.

f_{st}: Index of static stressing as a function of the operating temperature:

f_{st} =	1,5	bei / at	150°C
	1,6		200°C
	1,7		250°C
	2,0		300°C
	2,5		350°C

Calculation examples

Bearings are sought which are suitable for a fully loaded kiln truck (weight: 4000 kg, 4 wheels) at an operating temperature of 250°C. Between wheel and track a thrust load (Ka = 2,5 kN) can occur.

1) Turning inner ring (F_{rp})

$$F_{rp} = \frac{g}{4} = \frac{4000\ kg \cdot 9{,}81\ \frac{m}{s^2}}{4} = \frac{39{,}2\ kN}{4} = 9{,}8\ kN$$

$$F_a = K_a = 2{,}5\ kN$$

$$\frac{F_a}{F_{rp}} = \frac{2{,}5\ kN}{9{,}8\ kN} = 0{,}255$$

For $\frac{F_a}{F_{rp}} < 0{,}8$ applies: $P_0 = F_{rp}$

$$C_0 = f_{st} \cdot P_0 = 1{,}7 \cdot 9{,}8\ kN = 16{,}66\ kN$$

The suitable bearing is the one with the next higher load rating. For example, a 6208 (C_0 = 18 kN) with the matching lubricant (HT2, up to 280°C) would be appropriate.

2) Turning outer ring (F_{rc})

Wheel diameter	D = 300 mm
Distance of bearing centers	a = 75 mm
Distance between the line of action of the radial load and the center of bearing B:	$b = \frac{a}{2} = 37{,}5$ mm

Equivalent static load of the higher loaded bearing A:

$$F_{rc} = \frac{g}{4} \cdot \frac{b}{a} + K_a \cdot \frac{D}{2} \cdot \frac{1}{a}$$

$$F_{rc} = \frac{39{,}2\ \text{kN}}{4} \cdot 0{,}5 + 2{,}5\ \text{kN} \cdot 150\ \text{mm} \cdot \frac{1}{75\ \text{mm}}$$

$$F_{rc} = 4{,}9\ \text{kN} + 5\ \text{kN} = 9{,}9\ \text{kN}$$

For $F_a = K_a$ applies: $\frac{F_a}{F_{rc}} = \frac{2{,}5\ \text{kN}}{9{,}9\ \text{kN}} = 0{,}2525$

For $\frac{F_a}{F_{rc}} = 0{,}26 < 0{,}8$ applies: $P_0 = F_{rc}$

$$C_0 = f_{st} \cdot P_0 = 1{,}7 \cdot 9{,}9\ \text{kN} = 16{,}83\ \text{kN}$$

The suitable bearing is the one with the next higher load rating.
For example, a 6208 (C_0 = 18 kN) with the matching lubricant (HT2, up to 280°C) would be appropriate.

Maintenance

Ball bearings **filled with HT1** have to be relubricated frequently.

An investigation is required when the bearing is not running smoothly anymore or dust or water may have intruded into the bearing. If a relubrication is desired, we recommend to perform this after 12 to 18 months. In some circumstances new bearings can be the more economical solution.

The second (third) relubrication should be done after 70% (50%) of the period of the first.
For example when the first relubrication was done after 12 months, the second should be done after 20 months and the third after 26 months.
For reasons of efficiency, at least after the third relubrication, new bearings should be installed.

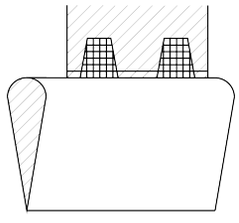
Other high-temp lubricants (HT2, HT2X and HT3) run maintenance-free for up to 6 years.
A relubrication for those bearings is not necessary in most of the cases.

Fits and Seals

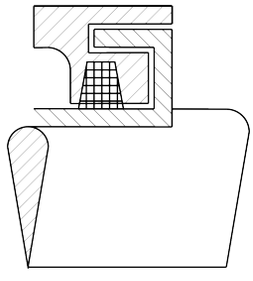
Since high-temp deep groove ball bearings should be easy to install and remove, the following fits have proved effective in practice:

	Shaft	Housing
Turning inner ring:	g6	J7
Turning outer ring:	k6	F7

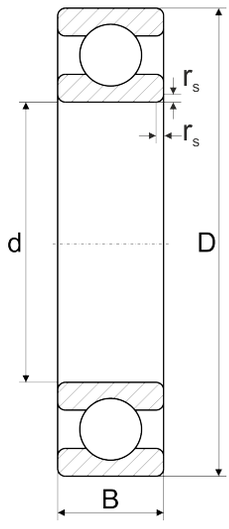
Typically, the sealing between housing and shaft is accomplished by one or two graphite impregnated glass fiber packings.



In very dusty environments, the use of an additional labyrinth seal is recommended. Rubbing contact seals (Nilos rings) directly at the bearings are also suitable.



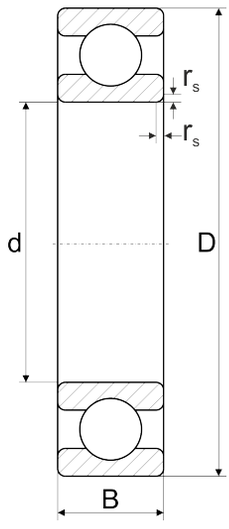
60xx



Code	Dimensions				Load Ratings	Max. Speed	Weight
GSWC	d	D	B	r_s min	C_0		
	[mm]	[mm]	[mm]	[mm]	[kN]	[min^{-1}]	≈ [kg]
6000	10	26	8	0,3	1,96	250	0,019
6001	12	28	8	0,3	2,36	220	0,020
6002	15	32	9	0,3	2,85	190	0,031
6003	17	35	10	0,3	3,25	170	0,038
6004	20	42	12	0,6	5,00	150	0,068
6005	25	47	12	0,6	5,85	130	0,080
6006	30	55	13	1,0	8,00	120	0,122
6007	35	62	14	1,0	10,4	100	0,157
6008	40	68	15	1,0	11,8	90	0,194
6009	45	75	16	1,0	14,3	80	0,247
6010	50	80	16	1,0	15,6	80	0,272
6011	55	90	18	1,1	21,2	70	0,397
6012	60	95	18	1,1	23,2	60	0,404
6013	65	100	18	1,1	25,0	50	0,411
6014	70	110	20	1,1	31,0	50	0,594
6015	75	115	20	1,1	33,5	50	0,639
6016	80	125	22	1,1	40,0	50	0,844
6017	85	130	22	1,1	43,0	50	0,880
6018	90	140	24	1,5	50,0	50	1,010
6019	95	145	24	1,5	54,0	50	1,070
6020	100	150	24	1,5	54,0	50	1,140

Remark: The weight applies for the bearing only without lubricant and shields.

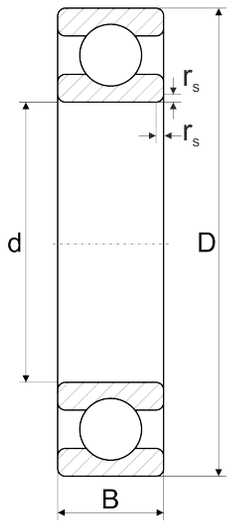
62xx



Code	Dimensions				Load Ratings	Max. Speed	Weight
GSWC	d	D	B	r_s min	C_0		
	[mm]	[mm]	[mm]	[mm]	[kN]	[min^{-1}]	≈ [kg]
6200	10	30	9	0,6	2,60	230	0,031
6201	12	32	10	0,6	3,10	200	0,037
6202	15	35	11	0,6	3,75	180	0,043
6203	17	40	12	0,6	4,75	160	0,065
6204	20	47	14	1,0	6,55	140	0,105
6205	25	52	15	1,0	7,80	130	0,128
6206	30	62	16	1,0	11,2	110	0,195
6207	35	72	17	1,1	15,3	90	0,291
6208	40	80	18	1,1	18,0	80	0,371
6209	45	85	19	1,1	20,4	80	0,429
6210	50	90	20	1,1	24,0	70	0,466
6211	55	100	21	1,5	29,0	60	0,616
6212	60	110	22	1,5	36,0	50	0,789
6213	65	120	23	1,5	41,5	50	0,980
6214	70	125	24	1,5	44,0	50	1,060
6215	75	130	25	1,5	49,0	50	1,170
6216	80	140	26	2,0	53,0	50	1,390
6217	85	150	28	2,0	64,0	50	1,780
6218	90	160	30	2,0	72,0	50	2,140
6219	95	170	32	2,1	81,5	50	2,610
6220	100	180	34	2,1	93,0	50	3,130

Remark: The weight applies for the bearing only without lubricant and shields.

63xx



Code	Dimensions				Load Ratings	Max. Speed	Weight
GSWC	d	D	B	r_s min	C_0		
	[mm]	[mm]	[mm]	[mm]	[kN]	[min^{-1}]	≈ [kg]
6300	10	35	11	0,6	3,45	200	0,055
6301	12	37	12	1,0	4,15	190	0,062
6302	15	42	13	1,0	5,40	170	0,088
6303	17	47	14	1,0	6,55	150	0,114
6304	20	52	15	1,1	7,80	140	0,151
6305	25	62	17	1,1	11,4	120	0,234
6306	30	72	19	1,1	16,3	100	0,355
6307	35	80	21	1,5	19,0	90	0,471
6308	40	90	23	1,5	25,0	80	0,640
6309	45	100	25	1,5	32,0	70	0,847
6310	50	110	27	2,0	38,0	60	1,100
6311	55	120	29	2,0	47,5	60	1,390
6312	60	130	31	2,1	52,0	50	1,750
6313	65	140	33	2,1	60,0	50	2,070
6314	70	150	35	2,1	68,0	50	2,510
6315	75	160	37	2,1	76,5	50	3,010
6316	80	170	39	2,1	86,5	50	3,580
6317	85	180	41	3,0	96,5	50	4,220
6318	90	190	43	3,0	102,0	50	4,900
6319	95	200	45	3,0	112,0	50	5,660
6320	100	215	47	3,0	134,0	50	6,990

Remark: The weight applies for the bearing only without lubricant and shields.