A versatile solution

Polymer ball bearings from SKF

Corrosion and chemical resistant
Lightweight and quiet running
No lubrication needed

Polymer ball bearings from SKF for unique application conditions

Polymer ball bearings consist of:
- Polymer rings
- Balls made of stainless steel, glass, polymer or other materials and
- A polymer cage.

Polymer ball bearings can be made from a variety of materials and material combinations. The materials selected depend on the application. Polymers have significantly different properties than steel. One of the most unique properties is that they are corrosion and chemical resistant.

The polymers used to make bearings have a low coefficient of friction and are highly resistant to wear and fatigue. These self-lubricating bearings can run dry and require no relubrication.

However, the loads and maximum speeds that a polymer bearing can accommodate are much lower than for conventional all-steel bearings.

The high specific strength – (strength to weight ratio) is a valuable property of polymer bearings especially in applications where weight is an important design consideration. High dimensional stability throughout the lifespan is achieved by the low creep tendency of the polymers used.

Features and benefits
- Corrosion resistant
- Chemical resistant
- Self lubricating (no lubricant required)
- Light weight (80% less than steel)
- Some have high temperature usage
- Low coefficient of friction
- Quiet running
- Good damping properties
- Electrical insulator
- Integrated functions for special bearings
- Low lifecycle costs



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Applications

Polymer ball bearings are typically used in applications where resistance to moisture or chemicals is essential. In these applications, steel can not be used – or only with certain restrictions – making polymer ball bearings the best solution from both a technical and an economic perspective.

Polymer ball bearings can run without lubrication. Therefore they can also be deployed where no lubricants can be used, e. g. for hygienic reasons.

The possible areas of use are as varied as the properties and advantages of polymer ball bearings. The following is a partial list of those industries and applications where polymer ball bearings are already in use today:

- Food and beverage
- Medical
- Heating and air conditioning
- Chemical and electro plating
- Film, photographic and pharmaceutical
- Textile
- Electro technology
- Consumer goods
- Office products
- Model and lightweight construction
- Measuring equipment
- Material handling and transportation
- Vacuum applications

Product range

Single row ball bearings

Polymer ball bearings from SKF are available in various dimension series for bore diameters ranging from 3 to 60 mm.

The standard range covers four material combinations listed in **table 1**.

Thrust ball bearings

Polymer thrust ball bearings from SKF are available with bore diameters ranging from 10 to 45 mm with a full complement design (without cage). The standard materials used for bearing rings are Polyoxymethylene (POM) and Polypropylene (PP). Two different materials per bearing are used for the ball set. Stainless steel or glass balls are arranged alternately with balls made of the same polymer as the rings.

Table 1

Standard material combinations

Combinations	Rings	Cage	Balls
1 and 2	Polyoxymethylene (POM)	Polyamide 6.6 (PA66)	Stainless steel **or** glass
3 and 4	Polypropylene (PP)	Polypropylene (PP)	Stainless steel **or** glass



Other polymer ball bearings and products

Other products are available in polymer on request:

- Single row ball bearings with inch dimensions
- Full complement single row ball bearings (without cage)
- Sealed single row ball bearings
- Double row ball bearings
- Track runner ball bearings
- Y bearings and Y bearing units
- Special size bearings
- Bearings made of other materials
- Bearing products with integrated functions

Special polymer ball bearings for particular applications can be produced economically, even in small quantities. A high level of integrated functions, e. g. gearing, is also possible. This can reduce the number of components and assembly costs. It also provides designers with options that are more efficient and appropriate for the application.

For additional information, contact the SKF application engineering service.

Table 2

Chemical resistance of available materials to common substances

	Standard materials					Alternate Materials										
Chemical group	POM	PP	PA6.6	1.4401	Glass	PE	PEEK	PET	PVDF	PPS	PI	Boro silicate glass	1.4034	Titanium	Si_3N_4	AL_2O_3
Hydrocarbons																
- aliphatic	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+
- aromatic	+	+	0	+	0	0	+	0	+	0	0	+	+	+	+	+
- halogenic	+	0	0	–	0	0	0	0	+	+	0	+	+	+	+	+
Acids																
- weak	0	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+
- strong	–	+	–	0	0	+	–	0	+	0	+	+	–	0	+	+
- oxdizing	–	–	–	0	+	0	–	–	0	–	–	+	–	+	+	+
- hydrofluoric acid	–	0	–	0	–	0	–	–	+	0	0	–	–	–	0	–
Alkaline																
- weak	+	+	0	0	+	+	+	0	+	+	+	+	+	0	0	+
- strong	+	+	0	0	0	+	+	–	–	0	0	0	0	0	–	+
Mineral lubricants	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Gasoline	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Alcohols	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Acetone	+	+	+	+	+	+	+	0	–	+	0	+	+	+	+	+

+ = good resistance: Can generally be used

0 = limited resistance: Bearing suitability should be tested under operating conditions

– = low resistance: Cannot be used

Application guidelines

The following section provides general guidelines for the material selection and use of polymer ball bearings.

Note: Materials and ball bearings are often subjected to influences that can not be recognised in laboratory tests (temperature, pressure, material tension, interaction with chemical substances, design features etc.). Because of the complexity of the effects of these factors, SKF recommends field testing a selected polymer ball bearing to confirm that it will perform satisfactorily within the application.

Resistance to chemicals

Most polymers have good chemical resistance. Depending on the medium, alternative polymers that go beyond the standard range may have to be used.

Polypropylene (PP) resists acids, alkalines, salts and salt solutions, alcohols, oils, greases, wax and many solvents. Exposure to aromatic compounds and halogenized hydrocarbons results in swelling. PP does not resist strong oxidizing media (e. g. nitric acid, chromates or halogens) and there is a risk of stress crack corrosion.

Polyoxymethylene (POM) resists weak acids, weak and strong alkaline and organic solvents as well as gasoline, benzene, oils and alcohols.

Polyamide 6.6 (PA66) resists almost all customary organic solvents and some weak acids and alkaline.

Table 2 lists the resistance of the available materials to common substances.

Service temperatures and thermal expansion

In addition to chemical resistance, operating temperature is a key criterion for selecting the appropriate bearing materials. **Diagram 1** provides a summary of operating temperatures for each available polymer.

Standard materials can accommodate temperatures up to about 100 °C (210 °F). The alternate materials listed can accommodate temperatures up to 250 °C (480 °F).

The thermal expansion combined with the operating temperature is also important as the values of the coefficient of thermal expansion of the various polymers can be up to 10 times greater than steel (→ **diagram 2**).

Thermal expansion affects the bearing internal clearance and must be considered when designing shaft and housing fits.

Load carrying capability

Static load carrying capability

The static load carrying capability is the upper load limit that a bearing can accommodate at a standstill without sustaining damage to the rolling elements or raceways. (→ **product tables**).

Dynamic load carrying capability

According to the current state of technology an analytical life calculation is not possible. The dynamic load carrying capability is an indicator for operational load in which the bearing fulfils its function in the majority of applications (→ **product tables**).

Dynamic load carrying capability depending on speed and operating temperature

The dynamic load carrying capability depends on the operating conditions. The effects of operating temperature and bearing speed on

Diagram 1

Operating temperature range [°C]

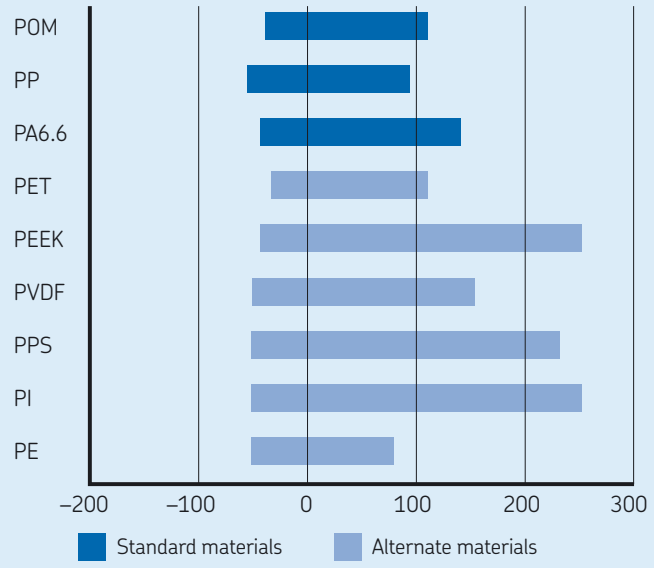


Diagram 2

Coefficient of thermal expansion [10^{-5} mm/mm K]

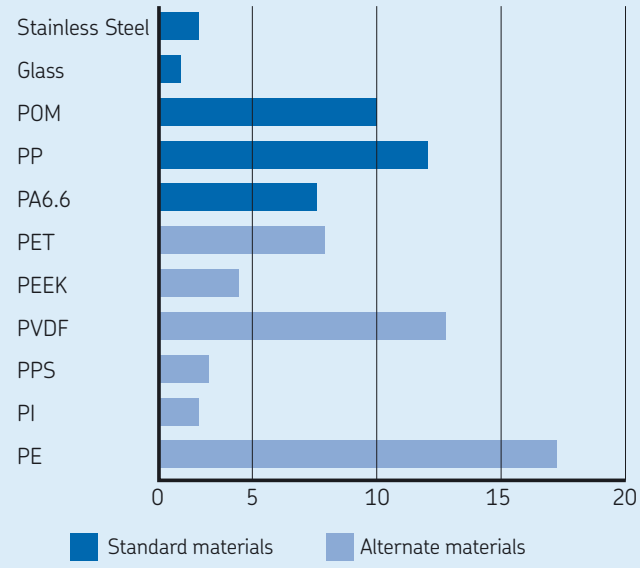
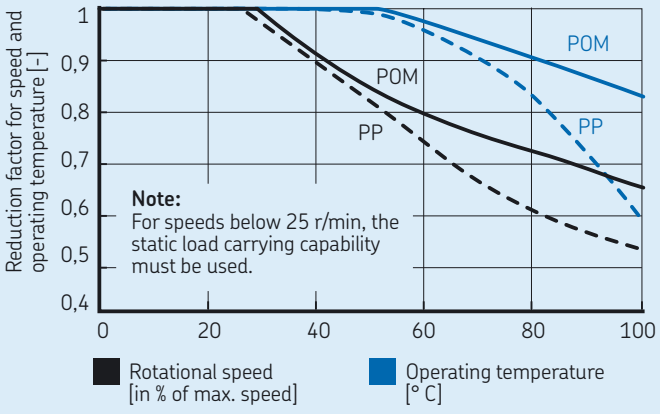


Diagram 3

Reduction of dynamic load carrying capability



the dynamic load capability can be estimated from **diagram 3**.

Example:
A 6301/HR11TN bearing with rings made of POM is to be used in an application that runs at 520 r/min with an operating temperature of 90 °C. From the product table this bearing is shown to have a dynamic load carrying capability of 310 N and a maximum speed of 1300 r/min.

According to **diagram 3** the reduction factor for an operating temperature of 90 °C is approximately 0,86.

Because 520 r/min is 40 % of the maximum speed, the reduction factor for the speed is about 0,9.Therefore the load should not exceed 0,86 × 0,9 × 310 N = 239 N.

Selection of fits

Shaft and housing fits can have a substantial influence on the operating clearance in the bearing and its operating characteristics. Therefore, SKF recommends an interference fit for one ring only with approximately 20 µm overlap (on the shaft or in the housing). The other ring should have a slight clearance fit.

Under no circumstances should there be an interference fit on both rings, as insufficient operating clearance will cause the bearing to fail prematurely.

These are only guidelines to calculate a fit. Thermal expansion of the bearing and its components in operation must be taken into consideration

For additional information, contact the SKF application engineering service.

Bearing data – general

Dimensions

The boundary dimensions of polymer radial ball bearings conform to ISO 15:1998; except for chamfer dimensions. The boundary dimensions of polymer thrust ball bearings, with exception of the chamfer dimensions, conform to ISO 104:2002.

Tolerances

In general, the tolerances for polymer ball bearings are greater than for comparably sized all-steel bearings (→ **table 3**). When applied properly and used in the appropriate application, the greater tolerances have not had an adverse effect on bearing service life. For additional information contact the SKF application engineering service.

Radial internal clearance

Radial internal clearance for standard SKF polymer ball bearings depends on the bore diameter and is summarised in **table 4**.

Materials

Polyacetal (POM) and polypropylene (PP) rings are used for the standard range of polymer bearings. The cages are made of polyamide 6.6 (PA66) or PP. The balls are made of glass or stainless steel 1.4401 as per AISI 316. Balls in the standard range of thrust bearings are made of the same material as the rings and are arranged alternately with stainless steel or glass.

It is possible to meet the requirements for most applications with these materials.

Other materials are available on request (→ **designations on page 9**).

Table 4

Bearing internal clearance tolerance

Bore d		**Radial internal clearance**	
over	incl.	min	max
mm	mm	µm	µm
	9	60	140
9	17	70	150
17	20	80	160
20	25	80	170
30	35	90	180
35	45	100	200
45	60	110	210

Table 3

Tolerances

Radial and thrust ball bearings								**Radial bearings**				**Thrust bearings**			
Inner ring				**Outer ring**				**Width**				**Height**			
d		Tolerance		D		Tolerance		B		Tolerance		H		Tolerance	
over	incl.	high	low	over	incl.	high	low	over	incl.	high	low	over	incl.	high	low
mm	mm	µm	µm	mm	mm	µm	µm	mm	mm	µm	µm	mm	mm	µm	µm
	3	30	-30		30	40	-40	4	25	0	-100	9	21	200	-200
3	17	30	-30	30	47	50	-50								
17	50	40	-40	47	80	60	-60								
50	60	50	-50	80	95	80	-80								

Designations

The designations for SKF polymer ball bearings are based on the SKF designation system. The bearing component materials are described clearly using suffixes. The designation system is shown in **table 5**.

The complete bearing designation is shown on the package but polymer ball bearings do not have the designation inscribed on either the inner or outer ring.

Table 5

Polymer ball bearings designation system

Examples				
	6302/HR11TN	6302	/HR	11TN
	16005/HR22Q2	16005	/HR	22Q2
	51204 V/HR11Q1	51204	V /HR	11Q1

Basic designation

type, basic design, standard boundary dimensions -> as for steel ball bearings

Suffixes for variants

V	full complement bearing (without cage)
HR	polymer ball bearing

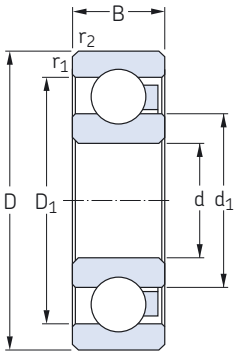
Suffixes for materials

Figure 1	Outer ring
Figure 2	Inner ring
Figure 3	Balls
Figure 4	Cage or 2nd ball material (full complement thrust ball bearings)

Material codes

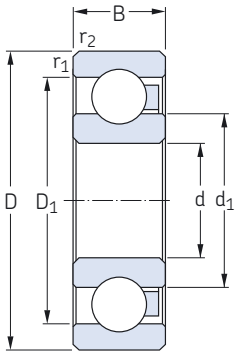
1	POM	Q	Glass
2	PP	R	Boro silicate glass
3	Polyethylene (PE)	S	Stainless steel 1.4034
6	Polyetheretherketone (PEEK)	T	Stainless steel 1.4401
B	Polyethylenterephthalate (PET)	W	Titanium
K	Polyvinylidenfluoride (PVDF)	X	Ceramic Si_3N_4
L	Polyphenylensulfide (PPS)	Z	Ceramic AL_2O_3
M	Polyimide (PI)		
N	Polyamide 66 (PA66)		

Single row ball bearings
d **3 – 15** mm



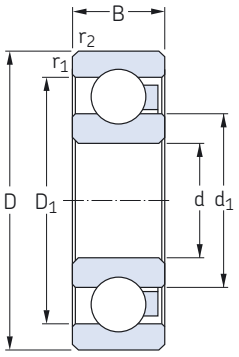
Boundary dimensions			Load carrying capability		Speed rating	Dimensions			Mass	Designations	
d	D	B	static[1]	dynamic[2]	max[3]	d_1	D_1	$r_{1,2}$ min x45°	max		
mm			N		r/min	mm			kg		
3	10	4	30	45	4500	5,6	7,9	0,2	0,4	**623/HR11TN**	**623/HR11QN**
	10	4	30	45	3960	5,6	7,9	0,2	0,3	**623/HR22T2**	**623/HR22Q2**
4	13	5	40	60	3600	6,6	9,8	0,3	1	**624/HR11TN**	**624/HR11QN**
	13	5	40	60	3170	6,6	9,8	0,3	0,8	**624/HR22T2**	**624/HR22Q2**
5	16	5	45	65	3050	7,5	12,5	0,4	1,5	**625/HR11TN**	**625/HR11QN**
	16	5	45	65	2680	7,5	12,5	0,4	1,4	**625/HR22T2**	**625/HR22Q2**
6	19	6	50	70	2600	9	15,4	0,4	3	**626/HR11TN**	**626/HR11QN**
	19	6	50	70	2290	9	15,4	0,4	3	**626/HR22T2**	**626/HR22Q2**
7	19	6	50	70	2600	10,8	15,9	0,4	3	**607/HR11TN**	**607/HR11QN**
	19	6	50	70	2290	10,8	15,9	0,4	1,8	**607/HR22T2**	**607/HR22Q2**
	22	7	55	80	2200	11,5	17,9	0,4	4	**627/HR11TN**	**627/HR11QN**
	22	7	55	80	1900	11,5	17,9	0,4	4	**627/HR22T2**	**627/HR22Q2**
8	22	7	55	80	2200	11,5	17,9	0,4	4	**608/HR11TN**	**608/HR11QN**
	22	7	55	80	1930	11,5	17,9	0,4	3	**608/HR22T2**	**608/HR22Q2**
9	24	7	60	90	2050	13,4	19,9	0,4	8	**609/HR11TN**	**609/HR11QN**
	24	7	60	90	1800	13,4	19,9	0,4	6	**609/HR22T2**	**609/HR22Q2**
	26	8	70	100	1900	13,7	21,3	0,4	7	**629/HR11TN**	**629/HR11QN**
	26	8	70	100	1670	13,7	21,3	0,4	6	**629/HR22T2**	**629/HR22Q2**
10	26	8	90	130	1900	15,1	21,4	0,4	7	**6000/HR11TN**	**6000/HR11QN**
	26	8	90	130	1670	15,1	21,4	0,4	6	**6000/HR22T2**	**6000/HR22Q2**
	28	8	90	130	1900	15,1	20,9	0,4	8	**16100/HR11TN**	**16100/HR11QN**
	28	8	90	130	1670	15,1	20,9	0,4	6	**16100/HR22T2**	**16100/HR22Q2**
	30	9	110	160	1650	17	23	0,9	9	**6200/HR11TN**	**6200/HR11QN**
	30	9	110	160	1450	17	23	0,9	8	**6200/HR22T2**	**6200/HR22Q2**
	35	11	190	280	1400	18	26,9	0,9	18	**6300/HR11TN**	**6300/HR11QN**
	35	11	190	280	1230	18	26,9	0,9	15	**6300/HR22T2**	**6300/HR22Q2**
12	28	8	110	160	1750	17,1	22,9	0,4	8	**6001/HR11TN**	**6001/HR11QN**
	28	8	110	160	1540	17,1	22,9	0,4	6	**6001/HR22T2**	**6001/HR22Q2**
	32	10	150	220	1550	18,2	25,7	0,9	12	**6201/HR11TN**	**6201/HR11QN**
	32	10	150	220	1360	18,2	25,7	0,9	10	**6201/HR22T2**	**6201/HR22Q2**
	37	12	210	310	1300	19,5	29,5	0,9	22	**6301/HR11TN**	**6301/HR11QN**
	37	12	210	310	1140	19,5	29,5	0,9	19	**6301/HR22T2**	**6301/HR22Q2**
15	32	8	130	190	1500	19,8	25,9	0,4	9	**16002/HR11TN**	**16002/HR11QN**
	32	8	130	190	1320	19,8	25,9	0,4	7	**16002/HR22T2**	**16002/HR22Q2**
	32	9	140	200	1500	20,6	26,4	0,4	10	**6002/HR11TN**	**6002/HR11QN**
	32	9	140	200	1320	20,6	26,4	0,4	8	**6002/HR22T2**	**6002/HR22Q2**
	35	11	170	250	1400	21,5	29	0,9	15	**6202/HR11TN**	**6202/HR11QN**
	35	11	170	250	1230	21,5	29	0,9	12	**6202/HR22T2**	**6202/HR22Q2**
	42	13	260	370	1200	23,7	33,7	0,9	28	**6302/HR11TN**	**6302/HR11QN**
	42	13	260	370	1060	23,7	33,7	0,9	23	**6302/HR22T2**	**6302/HR22Q2**

[1] Above 50 °C consider reduction according to **diagram 3**
[2] Above 50 °C and/or above 20% of max speed rating consider reduction according to **diagram 3**
[3] Consider load carrying capability reduction according to **diagram 3**



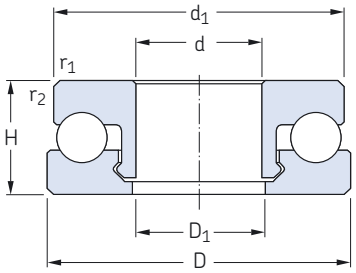
Boundary dimensions			Load carrying capability		Speed rating	Dimensions			Mass	Designations	
d	D	B	static[1]	dynamic[2]	max[3]	d_1	D_1	$r_{1,2}$ min x45°	max		
mm			N		r/min	mm			kg		
17	35	8	160	240	1400	22,2	29,8	0,4	10	**16003/HR11TN**	**16003/HR11QN**
	35	8	160	240	1230	22,2	29,8	0,4	8	**16003/HR22T2**	**16003/HR22Q2**
	35	10	170	260	1400	23,1	28,9	0,4	12	**6003/HR11TN**	**6003/HR11QN**
	35	10	170	260	1230	23,1	28,9	0,4	9	**6003/HR22T2**	**6003/HR22Q2**
	40	12	220	320	1250	24,2	32,7	0,9	20	**6203/HR11TN**	**6203/HR11QN**
	40	12	220	320	1100	24,2	32,7	0,9	16	**6203/HR22T2**	**6203/HR22Q2**
	47	14	260	370	1050	26,5	37,4	0,9	38	**6303/HR11TN**	**6303/HR11QN**
	47	14	260	370	920	26,5	37,4	0,9	32	**6303/HR22T2**	**6303/HR22Q2**
20	42	8	190	290	1150	26,5	34,5	0,4	14	**16004/HR11TN**	**16004/HR11QN**
	42	8	190	290	1010	26,5	34,5	0,4	11	**16004/HR22T2**	**16004/HR22Q2**
	42	12	200	300	1150	27,2	34,8	0,9	21	**6004/HR11TN**	**6004/HR11QN**
	42	12	200	300	1010	27,2	34,8	0,9	17	**6004/HR22T2**	**6004/HR22Q2**
	47	14	270	420	1050	28,5	38,5	0,9	34	**6204/HR11TN**	**6204/HR11QN**
	47	14	270	420	920	28,5	38,5	0,9	28	**6204/HR22T2**	**6204/HR22Q2**
	52	15	350	500	950	30,3	41,6	0,9	49	**6304/HR11TN**	**6304/HR11QN**
	52	15	350	500	840	30,3	41,6	0,9	41	**6304/HR22T2**	**6304/HR22Q2**
25	47	8	210	310	1050	32,3	40,9	0,4	20	**16005/HR11TN**	**16005/HR11QN**
	47	8	210	310	920	32,3	40,9	0,4	17	**16005/HR22T2**	**16005/HR22Q2**
	47	12	240	360	1050	32,2	39,8	0,9	24	**6005/HR11TN**	**6005/HR11QN**
	47	12	240	360	920	32,2	39,8	0,9	20	**6005/HR22T2**	**6005/HR22Q2**
	52	15	320	480	950	34	44	0,9	40	**6205/HR11TN**	**6205/HR11QN**
	52	15	320	480	840	34	44	0,9	33	**6205/HR22T2**	**6205/HR22Q2**
	62	17	400	600	725	37	50	0,9	77	**6305/HR11TN**	**6305/HR11QN**
	62	17	400	600	640	37	50	0,9	64	**6305/HR22T2**	**6305/HR22Q2**
30	55	9	240	370	900	37,7	47,3	0,4	27	**16006/HR11TN**	**16006/HR11QN**
	55	9	240	370	790	37,7	47,3	0,4	22	**16006/HR22T2**	**16006/HR22Q2**
	55	13	280	420	900	38,2	46,8	0,9	36	**6006/HR11TN**	**6006/HR11QN**
	55	13	280	420	790	38,2	46,8	0,9	29	**6006/HR22T2**	**6006/HR22Q2**
	62	16	360	550	800	40,3	51,6	0,9	64	**6206/HR11TN**	**6206/HR11QN**
	62	16	360	550	700	40,3	51,6	0,9	53	**6206/HR22T2**	**6206/HR22Q2**
	72	19	460	700	675	44,7	59,2	1,4	114	**6306/HR11TN**	**6306/HR11QN**
	72	19	460	700	590	44,7	59,2	1,4	96	**6306/HR22T2**	**6306/HR22Q2**
35	62	9	240	370	800	43,7	53,3	0,4	33	**16007/HR11TN**	**16007/HR11QN**
	62	9	240	370	700	43,7	53,3	0,4	27	**16007/HR22T2**	**16007/HR22Q2**
	62	14	320	480	800	43,7	53,3	0,9	48	**6007/HR11TN**	**6007/HR11QN**
	62	14	320	480	700	43,7	53,3	0,9	39	**6007/HR22T2**	**6007/HR22Q2**
	72	17	410	620	700	47	60	0,9	95	**6207/HR11TN**	**6207/HR11QN**
	72	17	410	620	620	47	60	0,9	80	**6207/HR22T2**	**6207/HR22Q2**
	80	21	490	750	600	49,55	65,35	1,4	154	**6307/HR11TN**	**6307/HR11QN**
	80	21	490	750	530	49,55	65,35	1,4	130	**6307/HR22T2**	**6307/HR22Q2**

Single row ball bearings
d **40 – 60** mm



Boundary dimensions			Load carrying capability		Speed rating	Dimensions			Mass	Designations	
d	D	B	static[1]	dynamic[2]	max[3]	d_1	D_1	$r_{1,2}$ min x45°	max		
mm			N		r/min	mm			kg		
40	68	9	300	450	750	49,4	58,6	0,4	38	**16008/HR11TN**	**16008/HR11QN**
	68	9	300	450	660	49,4	58,6	0,4	31	**16008/HR22T2**	**16008/HR22Q2**
	68	15	350	520	750	49,2	58,8	0,9	57	**6008/HR11TN**	**6008/HR11QN**
	68	15	350	520	660	49,2	58,8	0,9	46	**6008/HR22T2**	**6008/HR22Q2**
	80	18	440	660	625	53	67	0,9	132	**6208/HR11TN**	**6208/HR11QN**
	80	18	440	660	550	53	67	0,9	113	**6208/HR22T2**	**6208/HR22Q2**
	90	23	520	800	575	56,1	73,75	1,9	208	**6308/HR11TN**	**6308/HR11QN**
	90	23	520	800	510	56,1	73,75	1,9	175	**6308/HR22T2**	**6308/HR22Q2**
45	75	10	330	500	650	55	65	0,9	49	**16009/HR11TN**	**16009/HR11QN**
	75	10	330	500	570	55	65	0,9	40	**16009/HR22T2**	**16009/HR22Q2**
	75	16	380	560	650	54,7	65,3	0,9	75	**6009/HR11TN**	**6009/HR11QN**
	75	16	380	560	570	54,7	65,3	0,9	62	**6009/HR22T2**	**6009/HR22Q2**
	85	19	470	720	580	57,5	72,35	1,9	138	**6209/HR11TN**	**6209/HR11QN**
	85	19	470	720	510	57,5	72,35	1,9	118	**6209/HR22T2**	**6209/HR22Q2**
	100	25	540	900	500	62,18	82,65	1,9	297	**6309/HR11TN**	**6309/HR11QN**
	100	25	540	900	440	62,18	82,65	1,9	255	**6309/HR22T2**	**6309/HR22Q2**
50	80	16	390	580	600	60	70	0,9	82	**6010/HR11TN**	**6010/HR11QN**
	80	16	390	580	530	60	70	0,9	67	**6010/HR22T2**	**6010/HR22Q2**
	90	20	540	770	550	62,5	77,35	1,9	154	**6210/HR11TN**	**6210/HR11QN**
	90	20	540	770	480	62,5	77,35	1,9	131	**6210/HR22T2**	**6210/HR22Q2**
55	90	18	400	600	550	66,3	78,7	0,9	121	**6011/HR11TN**	**6011/HR11QN**
	90	18	400	600	480	66,3	78,7	0,9	100	**6011/HR22T2**	**6011/HR22Q2**
	100	21	600	800	500	69,06	85,8	2,4	207	**6211/HR11TN**	**6211/HR11QN**
	100	21	600	800	440	69,06	85,8	2,4	178	**6211/HR22T2**	**6211/HR22Q2**
60	95	18	420	640	500	70,2	84,5	1,9	127	**6012/HR11TN**	**6012/HR11QN**
	95	18	420	640	440	70,2	84,5	1,9	105	**6012/HR22T2**	**6012/HR22Q2**

[1] Above 50 °C consider reduction according to **diagram 3**
[2] Above 50 °C and/or above 20% of max speed rating consider reduction according to **diagram 3**
[3] At max speed consider dynamic load rating reduction according to **diagram 3**



Boundary dimensions			Load carrying capability		Speed rating	Dimensions			Mass	Designations	
d	D	H	static[1]	dynamic[2]	max[3]	D_1	d_1	$r_{1,2}$ min x45°	max		
mm			N		r/min	mm			kg		
10	24	9	200	250	600	11	23	0,4	5,2	**51100 V/HR11T1**	**51100 V/HR11Q1**
	24	9	175	220	550	11	23	0,4	4	**51100 V/HR22T2**	**51100 V/HR22Q2**
	26	11	210	260	600	11	25	0,4	7,9	**51200 V/HR11T1**	**51200 V/HR11Q1**
	26	11	185	230	550	11	25	0,4	6	**51200 V/HR22T2**	**51200 V/HR22Q2**
12	26	9	320	400	540	13	25	0,4	5,6	**51101 V/HR11T1**	**51101 V/HR11Q1**
	26	9	280	350	500	13	25	0,4	4,3	**51101 V/HR22T2**	**51101 V/HR22Q2**
	28	11	330	410	540	13	27	0,4	9,5	**51201 V/HR11T1**	**51201 V/HR11Q1**
	28	11	290	360	500	13	27	0,4	6,7	**51201 V/HR22T2**	**51201 V/HR22Q2**
15	28	9	500	625	500	16	27	0,4	6,1	**51102 V/HR11T1**	**51102 V/HR11Q1**
	28	9	440	550	460	16	27	0,4	4,7	**51102 V/HR22T2**	**51102 V/HR22Q2**
	32	12	520	650	500	16	31	0,4	11,7	**51202 V/HR11T1**	**51202 V/HR11Q1**
	32	12	460	570	460	16	31	0,4	8,8	**51202 V/HR22T2**	**51202 V/HR22Q2**
17	30	9	570	710	480	18	29	0,4	6,8	**51103 V/HR11T1**	**51103 V/HR11Q1**
	30	9	500	625	440	18	29	0,4	5,4	**51103 V/HR22T2**	**51103 V/HR22Q2**
	35	12	600	750	480	18	34	0,4	14,9	**51203 V/HR11T1**	**51203 V/HR11Q1**
	35	12	530	660	440	18	34	0,4	11,8	**51203 V/HR22T2**	**51203 V/HR22Q2**
20	35	10	650	810	460	21	34	0,4	10,3	**51104 V/HR11T1**	**51104 V/HR11Q1**
	35	10	570	710	420	21	34	0,4	8,1	**51104 V/HR22T2**	**51104 V/HR22Q2**
	40	14	690	860	460	21	39	0,4	20,5	**51204 V/HR11T1**	**51204 V/HR11Q1**
	40	14	600	750	420	21	39	0,4	15,8	**51204 V/HR22T2**	**51204 V/HR22Q2**
25	42	11	710	880	410	26	41	0,4	14,6	**51105 V/HR11T1**	**51105 V/HR11Q1**
	42	11	625	770	375	26	41	0,4	7,9	**51105 V/HR22T2**	**51105 V/HR22Q2**
	47	15	750	930	400	26	46	0,4	28,7	**51205 V/HR11T1**	**51205 V/HR11Q1**
	47	15	660	815	370	26	46	0,4	21,8	**51205 V/HR22T2**	**51205 V/HR22Q2**
	52	18	820	1025	380	26	51	0,4	46,2	**51305 V/HR11T1**	**51305 V/HR11Q1**
	52	18	720	900	350	26	51	0,4	35,7	**51305 V/HR22T2**	**51305 V/HR22Q2**
30	47	11	760	950	400	31	46	0,9	17,3	**51106 V/HR11T1**	**51106 V/HR11Q1**
	47	11	670	835	370	31	46	0,9	13,2	**51106 V/HR22T2**	**51106 V/HR22Q2**
	52	16	820	1025	375	31	51	0,9	34	**51206 V/HR11T1**	**51206 V/HR11Q1**
	52	16	720	900	345	31	51	0,9	25,7	**51206 V/HR22T2**	**51206 V/HR22Q2**
	60	21	860	1070	360	31	59	0,9	62,8	**51306 V/HR11T1**	**51306 V/HR11Q1**
	60	21	755	940	330	31	59	0,9	47,1	**51306 V/HR22T2**	**51306 V/HR22Q2**
35	52	12	810	1010	390	36	51	0,9	20,8	**51107 V/HR11T1**	**51107 V/HR11Q1**
	52	12	710	885	360	36	51	0,9	15,7	**51107 V/HR22T2**	**51107 V/HR22Q2**
	62	18	870	1090	365	36	61	0,9	56,9	**51207 V/HR11T1**	**51207 V/HR11Q1**
	62	18	765	960	335	36	61	0,9	43,3	**51207 V/HR22T2**	**51207 V/HR22Q2**
40	60	13	890	1110	375	41	59	0,9	29,6	**51108 V/HR11T1**	**51108 V/HR11Q1**
	60	13	780	975	345	41	59	0,9	22,5	**51108 V/HR22T2**	**51108 V/HR22Q2**
45	65	14	950	1185	360	46	64	0,9	38,8	**51109 V/HR11T1**	**51109 V/HR11Q1**
	65	14	835	1040	330	46	64	0,9	27,6	**51109 V/HR22T2**	**51109 V/HR22Q2**

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