NACHI

Spherical Roller Bearings

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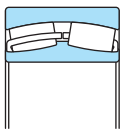
● Design and configurations

Spherical Roller Bearings are particularly suitable for applications where misalignment can arise from error in mounting or from shaft deflection. NACHI Spherical Roller Bearings are manufactured in a number of design and material configurations depending on the type of application and size of the bearing.
See Table 1 for the roller, the guide ring and cage design for NACHI Spherical Roller Bearings. They can sustain radial and axial loads.

Table 1. Design and configurations

Series \ Type	EX	EX1	E	E2	E	AEX	AX	A2X	AX
239					20, 26, 44~/1060		28~40		
230			20~36		38~/1000		20~36	38~48	
240		24~36			38~/600, /670, /800				24~36
231		20~34			36~/800		20~34	36~48	
241		22~32			36~/500				22~34
222	05~30		32	32	34~68	05~30		32	
232		18, 20~30	16, 17, 19		32~/600		20~30	32~40	
213		11~22	04~10, 24				06~22		
223	08~26				28~60	07~26		28, 30	
Cross section									
Roller	Symmetric			Symmetric		Nonsymmetric			Nonsymmetric
Center guide	Floating ring			Inner ring rib		Inner ring rib			Inner ring rib
Cage	Pressed steel			Machined high strength brass		Machined high strength brass			Pressed high strength brass

● Attention

(1) For high axial load applications, the axial load Fa must not exceed 0.6 of the radial load Fr. If the axial load exceeds 0.6 Fr, contact NACHI engineers for design assistance.

(2) For applications where oscillating loads (such as shaker screen applications) or high speed is involved, contact NACHI for design assistance.

(3) In very lightly loaded or no load conditions, sliding motion can occur which could damage the bearing.
To prevent this, bearings must be subjected to a load greater than 0.02 Cr (basic dynamic load rating).

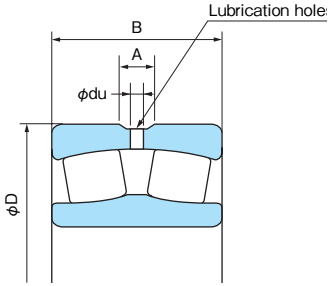
(4) The material coefficient number of the bearing is taken into consideration for the dynamic load rating.
* This only applies to spherical roller bearing.

● Lubrication Holes and Groove

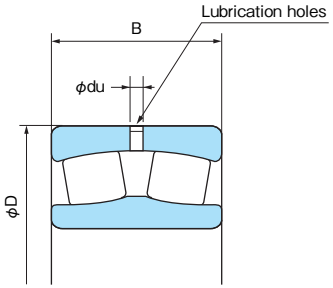
The outer ring of Spherical Roller Bearings are often made with lubrication holes and a groove for feeding lubricant. The outer ring may also be configured with oil holes only depending on fitting, mounting, or service conditions.
Table 2 shows the symbols for lubrication holes and grooves.
Hole diameter, groove width and hole count are according to the dimensions table.
Improved heat treatment technology allows for operation at 200˚C without change in dimensions.

Table 2. Lubrication holes and groove

Modification to outer ring	Suffix	Part No. Example
Lubrication holes and groove	W33	22330E W33
Lubrication holes	W20	22330E W20



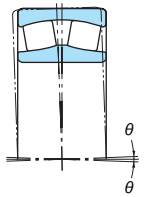
Lubrication holes and groove



Lubrication holes

● Misalignment

Maximum permissible misalignment angle is about 2° under general service conditions.
But its angle will vary with the series, service condition and surrounding structure.
As rotational speed increases, misaligned bearings will tend to generate more noise.
Due to noise constraints, the practical maximum misalignment in a bearing may be considerably less than the maximum permissible misalignment.



● Mounting bearings with tapered bore

Mounting bearings with a tapered bore requires some experience and technique. Bearings with tapered bore are always mounted with an interference fit on the shaft.
To measure the amount of interference fit on the shaft, the axial displacement of the inner ring or the reduction of radial internal clearance due to the interference fit can be used. Generally, the measurement of reduction in radial internal clearance is a more reliable method than measurement of the axial displacement of the inner ring.

Unit: mm

Nominal bore diameter d		Radial clearance reduction		Axial displacement (1) Taper 1 : 12		Axial displacement (1) Taper 1 : 30		Necessary minimum internal clearance after mounting (2) (for initial clearance range)		
Over	Incl.	Max	Min	Min	Max	Min	Max	Normal	C3	C4
24	30	0.015	0.020	0.3	0.35	—	—	0.015	0.020	0.035
30	40	0.020	0.025	0.35	0.4	—	—	0.015	0.025	0.040
40	50	0.025	0.030	0.34	0.45	—	—	0.020	0.030	0.050
50	65	0.030	0.040	0.45	0.6	—	—	0.025	0.035	0.055
65	80	0.040	0.050	0.6	0.75	—	—	0.025	0.040	0.070
80	100	0.045	0.060	0.7	0.9	1.7	2.2	0.035	0.050	0.080
100	120	0.050	0.070	0.75	1.1	1.9	2.7	0.050	0.065	0.100
120	140	0.065	0.090	1.1	1.4	2.7	3.5	0.055	0.080	0.110
140	160	0.075	0.100	1.2	1.6	3.0	4.0	0.055	0.090	0.130
160	180	0.080	0.110	1.3	1.7	3.2	4.2	0.060	0.100	0.150
180	200	0.090	0.130	1.4	2.0	3.5	5.0	0.070	0.100	0.160
200	225	0.100	0.140	1.6	2.2	4.0	5.5	0.080	0.120	0.180
225	250	0.110	0.150	1.7	2.4	4.2	6.0	0.090	0.130	0.200
250	280	0.120	0.170	1.9	2.7	4.7	6.7	0.100	0.140	0.220
280	315	0.130	0.190	2.0	3.0	5.0	7.5	0.110	0.150	0.240
315	355	0.150	0.210	2.4	3.3	6.0	8.2	0.120	0.170	0.260
355	400	0.170	0.230	2.6	3.6	6.5	9.0	0.130	0.190	0.290
400	450	0.200	0.260	3.1	4.0	7.7	10	0.130	0.200	0.310
450	500	0.210	0.280	3.3	4.4	8.2	11	0.160	0.230	0.350
500	560	0.240	0.320	3.7	5.0	9.2	12.5	0.170	0.250	0.360
560	630	0.260	0.350	4.0	5.4	10	13.5	0.200	0.290	0.410
630	710	0.300	0.400	4.6	6.2	11.5	15.5	0.210	0.310	0.450
710	800	0.340	0.450	5.3	7.0	13.3	17.5	0.230	0.350	0.510
800	900	0.370	0.500	5.7	7.8	14.3	19.5	0.270	0.390	0.570
900	1000	0.410	0.550	6.3	8.5	15.8	21	0.300	0.430	0.640
1000	1120	0.450	0.600	6.8	9.0	17	23	0.320	0.480	0.700
1120	1250	0.490	0.650	7.4	9.8	18.5	25	0.340	0.540	0.770

Notes: (1) The values are applied for mounting on solid shaft. In case of hollow shaft, larger axial displacement should be applied.
(2) In following cases, please make sure radial internal clearance after mounting. - Initial radial clearance is less than (bore diameter deviation) × 0.5 - Temperature difference exists between inner ring and outer ring under operation. Internal clearance after mounting must be over these values.