



ELECTRIC MOTOR HANDBOOK

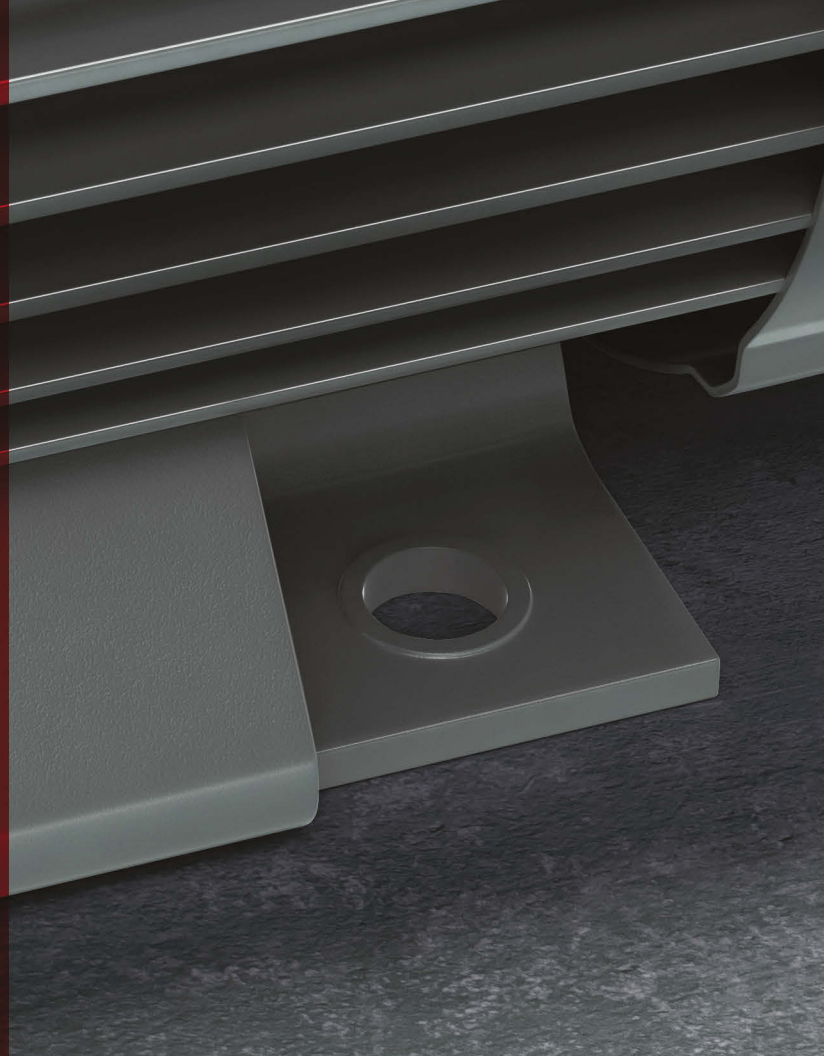
REFERENCE GUIDE TO BEARING SELECTION AND HANDLING

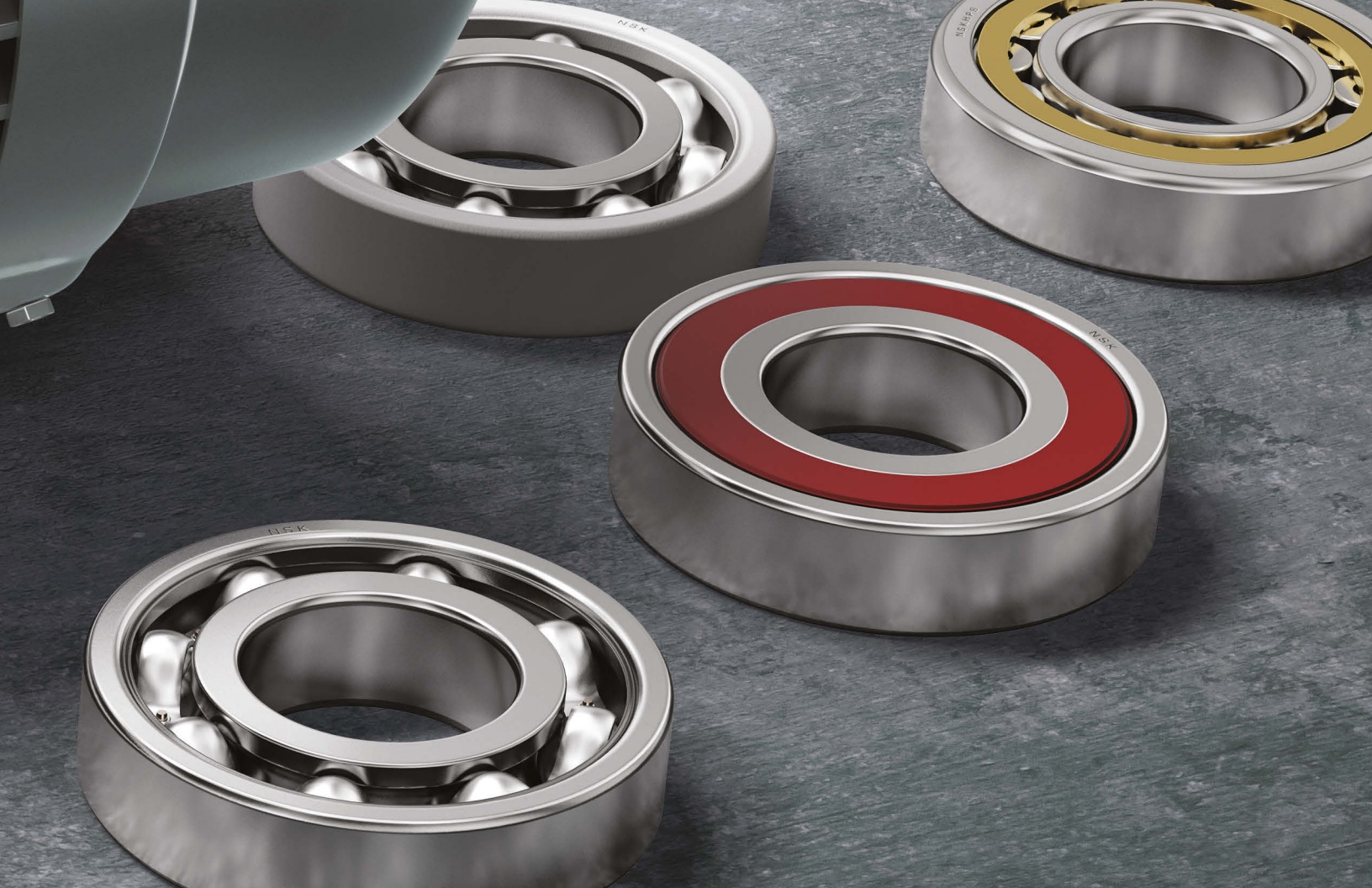
NSK TECHNICAL SERVICES

BEARINGS FOR ELECTRIC MOTORS

Optimized rolling contact for reduced noise, energy consumption and power loss. Advanced lubricant technologies and seal designs for durability. Special materials and coatings for insulation from current transmission.

With our extensive lineup of rolling bearings for industrial motors, NSK applies our core product development technologies and industry expertise to achieve total operating and energy efficiency with outstanding reliability.





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PRECAUTIONS FOR PROPER HANDLING OF ROLLER BEARINGS

Rolling bearings are high precision machine parts and must be handled accordingly. Even the highest quality bearings will not achieve their expected level of performance if they are mishandled. In fact, improper handling and incorrect mounting are the most common causes of premature failure. Consequently, it is clear that proper handling - as well as appropriate selection and use - are essential. Instructions for the proper handling of rolling bearings are summarized as follows:

- 1** Keep bearings, related components and the surrounding environment clean – entry of dust / dirt is detrimental to bearing performance
- 2** Confirm that the dimensions and finish of the bearings and all related components are correct for the desired use
- 3** Keep bearings free from harmful and corrosive substances, including moisture and foreign particles
- 4** Be sure to mount bearings in compliance with their designed purpose and specified operating conditions
- 5** Use proper tools and equipment in good working condition for mounting and dismounting; avoid relying on general-purpose tools
- 6** Exercise care to not damage or distort bearings in the course of mounting and dismounting; follow the appropriate methods outlined by NSK
- 7** Use the correct quantities of the appropriate lubricant and adhere to ongoing bearing lubrication requirements
- 8** Keep hands as clean as possible when handling bearings to prevent corrosion and contamination. Wearing clean gloves or disposable nitrile gloves, if possible, is recommended

Although sophisticated devices are not necessarily required for handling bearings, proper tools should be used depending on specific circumstances to facilitate work operations and ensure flawless performance. Obviously, engineers who engage in design and inspection must also be well versed in the proper handling and mounting methods in conformity with the intended use of the bearings. The goals of proper handling are to protect the bearings from any potential damage and ensure they serve their intended uses as effectively as possible.

BEARING STORAGE

To prevent rust, each bearing is treated and packed with an anticorrosive agent, but depending on the environment of the storage place, the effectiveness of the corrosion countermeasures varies greatly. Careful attention is necessary to select a suitable place to keep and stock replacement bearings.

General recommended practices for optimal bearing storage include:

- › Keep the bearing stored in its original packaging
- › Lay the bearing on its side
- › The storage room should be temperature controlled with variation of no more than 5°F or 3°C
- › The storage room should be humidity controlled with a relative humidity of less than 60% at all times
- › The storage room should be free of external vibration
- › Bearings should be stored on a shelf with appropriate load capacity at least 12 inches from the floor

BEARING STORAGE DURATION

Storage duration is affected by the environment (temperature, humidity, vibration, etc.). The following storage times assume an appropriate environment and unopened packaging.

- › Ungreased, individually packaged bearings: up to 5 years
- › Ungreased, bulk packaged bearings: up to 3 years
- › Greased, individually packaged bearings: from 1 to 10 years depending on the grease type. Consult NSK for more details
- › Greased, bulk packaged bearings: up to 2 years depending on the grease type. Consult NSK for more details

SPEED RATINGS

DEFINITIONS

LIMITING SPEED - GREASE / OIL

When bearings are operating, the higher the speed, the higher the bearing temperature due to friction. The limiting speed is the empirically obtained value for the maximum speed at which bearings can be continuously operated without generating excessive heat or failing due to seizure. Consequently, the limiting speed of bearings varies depending on such factors as bearing type and size, cage form and material, load, lubricating method, and heat dissipating method including the design of the bearing's surroundings.

The limiting speed (grease) and limiting speed (oil) in this handbook are applicable to bearings of standard design and subjected to normal loads, i.e. $C/P \geq 12$ and $F_a/F_r \leq 0.2$ approximately. The limiting speed (oil) listed in the bearing tables is for conventional oil bath lubrication.

Some types of lubricants are not suitable for high speed, even though they may be markedly superior in other respects. When speeds are more than 70% of the listed limiting speed (grease) or limiting speed (oil), it is necessary to select a grease or oil which has good high-speed characteristics.

LIMITING SPEED - MECHANICAL

Limiting speed (mechanical) is the mechanical and kinematic limiting speed of bearings achievable under ideal conditions for lubrication, heat dissipation and temperature, such as with properly designed and controlled forced circulation oil lubrication for high-speed conditions. Mechanical limiting speed considers the sliding speed and contact forces between the various bearing elements, the centrifugal and gyratory forces, etc. The values in the tables are applicable to bearings of standard design and subjected to normal loads ($\sim C/P = 12$).

THERMAL REFERENCE SPEED

The thermal reference speed is the rotational speed at which equilibrium is reached between the heat generated by the bearing and the heat flow emitted through the shaft and housing under the reference conditions defined by ISO 15312. It is one among various criteria showing the suitability for operation at high speed.

The following reference conditions are defined by ISO 15312:

- › Outer-ring fixed, inner-ring rotating
- › Mean ambient temperature 20°C or 68°F
- › Mean bearing temperature at the outer ring 70°C or 158°F
- › Load on radial bearings 0.05 C0r
- › Normal bearing internal clearance
- › For oil bath lubrication:
 - › Lubricant ISO VG32
- › For grease lubrication:
 - › Lubricant ISO VG150
 - › Quantity: approximately 30% of the free space in the bearing

SPEED RATINGS

OVERVIEW



SPEEDS	OVERVIEW	LUBRICATION METHODS
Limiting Speed - Grease	Empirically obtained and comprehensive bearing limiting speed in grease lubrication	Grease lubrication
Limiting Speed - Oil	Empirically obtained and comprehensive bearing limiting speed in oil bath lubrication	Oil bath lubrication
Thermal Reference Speed	Rotational speed at which equilibrium is reached between the heat generated by the bearing and the heat flow emitted through the shaft and housing under the reference conditions defined by ISO 15312 - one among various criteria showing the suitability for operation at high speed	Oil bath or grease lubrication when subject to reference conditions outlined in ISO 15312
Limiting Speed - Mechanical	Mechanical and kinematic limiting speed achievable under ideal conditions for lubrication, heat dissipation and temperature	e.g. Properly designed and controlled forced-circulation oil lubrication

LIMITING SPEEDS (RPM)

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	GREASE LUBRICATION			OIL LUBRICATION	
	Open	ZZ/Z, VV/V	DDU/DU	Open	Z
6200	28 000	28 000	18 000	34 000	34 000
6201	26 000	26 000	17 000	32 000	32 000
6202	22 000	22 000	14 000	28 000	28 000
6203	20 000	20 000	12 000	24 000	24 000
6204	17 000	17 000	11 000	20 000	20 000
6205	15 000	15 000	9 000	18 000	18 000
6206	12 000	12 000	7 500	15 000	15 000
6207	11 000	11 000	6 300	13 000	13 000
6208	9 500	9 500	5 600	12 000	12 000
6209	9 000	9 000	5 300	11 000	11 000
6210	8 000	8 000	4 800	10 000	10 000
6211	7 500	7 500	4 300	9 000	9 000
6212	6 700	6 700	3 800	8 000	8 000
6213	6 300	6 300	3 600	7 500	7 500
6214	6 000	6 000	3 400	7 100	7 100
6215	5 600	5 600	3 200	6 700	6 700

BEARING NO.	GREASE LUBRICATION			OIL LUBRICATION	
	Open	ZZ/Z, VV/V	DDU/DU	Open	Z
6216	5 300	5 300	3 000	6 300	6 300
6217	4 800	4 800	2 800	6 000	6 000
6218	4 500	4 500	2 600	5 600	5 600
6219	4 300	4 300	2 600	5 000	5 000
6220	4 000	4 000	2 400	4 800	4 800
6221	3 800	3 800	2 200	4 500	4 500
6222	2 800	2 800	2 200	3 400	3 400
6224	2 600	2 600	2 000	3 200	3 200
6226	2 400	2 400	--	3 000	3 000
6228	2 200	2 200	1 700	2 800	2 800
6230	2 000	2 000	--	2 600	2 600
6232	1 900	1 900	--	2 400	2 400
6234	1 800	1 800	--	2 200	2 200
6236	1 700	1 700	--	2 000	2 000
6238	1 600	1 600	--	2 000	2 000
6240	1 500	1 500	--	1 800	1 800

LIMITING SPEEDS (RPM)

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	GREASE LUBRICATION			OIL LUBRICATION	
	Open	ZZ/Z, VV/V	DDU/DU	Open	Z
6300	26 000	26 000	17 000	30 000	30 000
6301	24 000	24 000	16 000	28 000	28 000
6302	19 000	19 000	13 000	24 000	24 000
6303	17 000	17 000	11 000	20 000	20 000
6304	16 000	16 000	10 000	19 000	19 000
6305	13 000	13 000	8 000	16 000	16 000
6306	11 000	11 000	6 700	13 000	13 000
6307	10 000	10 000	6 000	12 000	12 000
6308	9 000	9 000	5 300	11 000	11 000
6309	7 500	7 500	4 800	9 500	9 500
6310	7 100	7 100	4 300	8 500	8 500
6311	6 700	6 700	4 000	8 000	8 000
6312	6 000	6 000	3 600	7 100	7 100
6313	5 600	5 600	3 400	6 700	6 700
6314	5 300	5 300	3 200	6 300	6 300
6315	4 800	4 800	2 800	6 000	6 000

BEARING NO.	GREASE LUBRICATION			OIL LUBRICATION	
	Open	ZZ/Z, VV/V	DDU/DU	Open	Z
6316	4 500	4 500	2 800	5 600	5 600
6317	4 300	4 300	2 600	5 000	5 000
6318	4 000	4 000	2 400	4 800	4 800
6319	3 400	3 400	2 400	4 300	4 300
6320	2 800	2 800	2 200	3 400	3 400
6321	2 600	2 600	2 000	3 200	3 200
6322	2 400	2 400	--	3 000	3 000
6324	2 200	2 200	1 800	2 800	2 800
6326	2 200	2 200	--	2 600	2 600
6328	2 000	2 000	--	2 400	2 400
6330	1 800	1 800	--	2 200	2 200
6332	1 700	1 700	--	2 000	2 000
6334	1 600	1 600	--	2 000	2 000
6336	1 500	1 500	--	1 800	1 800
6338	1 400	1 400	--	1 700	1 700
6340	1 300	1 300	--	1 600	1 600

LIMITING SPEEDS (RPM)

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 200 SERIES

BEARING NO.	SPEED RATING		
	Mechanical	Grease	Thermal Reference
204	--	13 000	16 000
205	17 000	12 000	14 000
206	14 000	9 500	12 000
207	12 000	8 500	10 000
208	11 000	7 500	9 000
209	10 000	6 700	8 500
210	9 000	6 300	8 000
211	8 500	5 600	6 700
212	7 500	5 300	6 300
213	7 100	4 800	6 000
214	9 000	5 000	5 600
215	8 500	4 800	5 300
216	8 000	4 500	5 000
217	7 500	4 300	4 800
218	7 100	4 000	4 800
219	6 700	3 800	4 300

BEARING NO.	SPEED RATING		
	Mechanical	Grease	Thermal Reference
220	6 300	3 600	4 300
221	6 000	3 400	4 300
222	5 600	3 200	4 000
224	5 300	3 000	3 600
226	5 000	2 600	3 400
228	4 500	2 400	3 200
230	4 300	2 200	2 800
232	4 000	2 200	2 600
234	3 800	2 000	2 400
236	3 600	1 900	2 200
238	3 400	1 800	2 000
240	3 200	1 700	1 900

LIMITING SPEEDS (RPM)

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 300 SERIES



BEARING NO.	SPEED RATING		
	Mechanical	Grease	Thermal Reference
304	--	12 000	13 000
305	15 000	10 000	11 000
306	13 000	8 500	9 500
307	11 000	7 500	8 500
308	10 000	6 700	7 500
309	9 000	6 000	7 100
310	8 000	5 000	6 700
311	7 500	4 500	6 000
312	9 500	4 800	5 600
313	8 500	4 300	5 300
314	8 000	4 000	4 800
315	7 500	3 800	4 500
316	7 100	3 600	4 300
317	6 700	3 400	4 000
318	6 300	3 200	4 000
319	6 000	3 000	3 800

BEARING NO.	SPEED RATING		
	Mechanical	Grease	Thermal Reference
320	5 600	2 800	3 600
321	5 300	2 600	3 400
322	5 000	2 600	3 200
324	4 800	2 200	2 800
326	4 300	2 200	2 600
328	4 000	2 000	2 400
330	3 800	1 800	2 200
332	3 600	1 700	1 900
334	3 400	1 600	1 800
336	2 800	1 500	1 700
338	2 600	1 400	1 600
340	2 600	1 300	1 500

RECOMMENDED SHAFT AND HOUSING FITS, INCH

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
6200	10	30	j5	0.3939	0.3936	H6	1.1816	1.1811
6201	12	32	j5	0.4726	0.4723	H6	1.2604	1.2598
6202	15	35	j5	0.5908	0.5905	H6	1.3786	1.3780
6203	17	40	j5	0.6695	0.6692	H6	1.5754	1.5748
6204	20	47	k5	0.7878	0.7875	H6	1.8510	1.8504
6205	25	52	k5	0.9847	0.9844	H6	2.0479	2.0472
6206	30	62	k5	1.1815	1.1812	H6	2.4416	2.4409
6207	35	72	k5	1.3785	1.3781	H6	2.8353	2.8346
6208	40	80	k5	1.5753	1.5749	H6	3.1503	3.1496
6209	45	85	k5	1.7722	1.7718	H6	3.3474	3.3465
6210	50	90	k5	1.9690	1.9686	H6	3.5442	3.5433
6211	55	100	k5	2.1660	2.1655	H6	3.9379	3.9370
6212	60	110	k5	2.3628	2.3623	H6	4.3316	4.3307
6213	65	120	k5	2.5597	2.5592	H6	4.7253	4.7244
6214	70	125	k5	2.7565	2.7560	H6	4.9223	4.9213
6215	75	130	k5	2.9534	2.9529	H6	5.1191	5.1181

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_r).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
6216	80	140	k5	3.1502	3.1497	H6	5.5128	5.5118
6217	85	150	k5	3.3472	3.3466	H6	5.9065	5.9055
6218	90	160	k5	3.5440	3.5434	H6	6.3002	6.2992
6219	95	170	k5	3.7409	3.7403	H6	6.6939	6.6929
6220	100	180	k5	3.9377	3.9371	H6	7.0876	7.0866
6221	105	190	m5	4.1350	4.1344	H6	7.4814	7.4803
6222	110	200	m5	4.3318	4.3312	H6	7.8751	7.8740
6224	120	215	m5	4.7255	4.7249	H6	8.4657	8.4646
6226	130	230	m5	5.1194	5.1187	H6	9.0562	9.0551
6228	140	250	m5	5.5131	5.5124	H6	9.8436	9.8425
6230	150	270	m6	5.9071	5.9061	H6	10.6312	10.6299
6232	160	290	m6	6.3008	6.2998	H6	11.4186	11.4173
6234	170	310	m6	6.6945	6.6935	H6	12.2060	12.2047
6236	180	320	m6	7.0882	7.0872	H6	12.5998	12.5984
6238	190	340	m6	7.4821	7.4810	H6	13.3872	13.3858
6240	200	360	m6	7.8758	7.8747	H6	14.1746	14.1732

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, INCH

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
6300	10	35	j5	0.3939	0.3936	H6	1.3786	1.3780
6301	12	37	j5	0.4726	0.4723	H6	1.4573	1.4567
6302	15	42	j5	0.5908	0.5905	H6	1.6541	1.6535
6303	17	47	j5	0.6695	0.6692	H6	1.8510	1.8504
6304	20	52	k5	0.7878	0.7875	H6	2.0479	2.0472
6305	25	62	k5	0.9847	0.9844	H6	2.4416	2.4409
6306	30	72	k5	1.1815	1.1812	H6	2.8353	2.8346
6307	35	80	k5	1.3785	1.3781	H6	3.1503	3.1496
6308	40	90	k5	1.5753	1.5749	H6	3.5442	3.5433
6309	45	100	k5	1.7722	1.7718	H6	3.9379	3.9370
6310	50	110	k5	1.9690	1.9686	H6	4.3316	4.3307
6311	55	120	k5	2.1660	2.1655	H6	4.7253	4.7244
6312	60	130	k5	2.3628	2.3623	H6	5.1191	5.1181
6313	65	140	k5	2.5597	2.5592	H6	5.5128	5.5118
6314	70	150	k5	2.7565	2.7560	H6	5.9065	5.9055
6315	75	160	k5	2.9534	2.9529	H6	6.3002	6.2992

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_r).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
6316	80	170	k5	3.1502	3.1497	H6	6.6939	6.6929
6317	85	180	k5	3.3472	3.3466	H6	7.0876	7.0866
6318	90	190	k5	3.5440	3.5434	H6	7.4814	7.4803
6319	95	200	k5	3.7409	3.7403	H6	7.8751	7.8740
6320	100	215	k5	3.9377	3.9371	H6	8.4657	8.4646
6321	105	225	m5	4.1350	4.1344	H6	8.8594	8.8583
6322	110	240	m5	4.3318	4.3312	H6	9.4499	9.4488
6324	120	260	m5	4.7255	4.7249	H6	10.2375	10.2362
6326	130	280	m5	5.1194	5.1187	H6	11.0249	11.0236
6328	140	300	m5	5.5131	5.5124	H6	11.8123	11.8110
6330	150	320	m6	5.9071	5.9061	H6	12.5998	12.5984
6332	160	340	m6	6.3008	6.2998	H6	13.3872	13.3858
6334	170	360	m6	6.6945	6.6935	H6	14.1746	14.1732
6336	180	380	m6	7.0882	7.0872	H6	14.9620	14.9606
6338	190	400	m6	7.4821	7.4810	H6	15.7494	15.7480
6340	200	420	m6	7.8758	7.8747	H6	16.5370	16.5354

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, INCH

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 200 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
204	20	47	k5	0.7878	0.7875	H6	1.8510	1.8504
205	25	52	k5	0.9847	0.9844	H6	2.0479	2.0472
206	30	62	k5	1.1815	1.1812	H6	2.4416	2.4409
207	35	72	k5	1.3785	1.3781	H6	2.8353	2.8346
208	40	80	m5	1.5756	1.5752	H6	3.1503	3.1496
209	45	85	m5	1.7725	1.7721	H6	3.3474	3.3465
210	50	90	m5	1.9693	1.9689	H6	3.5442	3.5433
211	55	100	m5	2.1663	2.1658	H6	3.9379	3.9370
212	60	110	m5	2.3631	2.3626	H6	4.3316	4.3307
213	65	120	m5	2.5600	2.5595	H6	4.7253	4.7244
214	70	125	m5	2.7568	2.7563	H6	4.9223	4.9213
215	75	130	m5	2.9537	2.9532	H6	5.1191	5.1181
216	80	140	m5	3.1505	3.1500	H6	5.5128	5.5118
217	85	150	m5	3.3476	3.3470	H6	5.9065	5.9055

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_d).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
218	90	160	m5	3.5444	3.5438	H6	6.3002	6.2992
219	95	170	m5	3.7413	3.7407	H6	6.6939	6.6929
220	100	180	m5	3.9381	3.9375	H6	7.0876	7.0866
221	105	190	m6	4.1353	4.1344	H6	7.4814	7.4803
222	110	200	m6	4.3321	4.3312	H6	7.8751	7.8740
224	120	215	m6	4.7258	4.7249	H6	8.4657	8.4646
226	130	230	m6	5.1197	5.1187	H6	9.0562	9.0551
228	140	250	m6	5.5134	5.5124	H6	9.8436	9.8425
230	150	270	n6	5.9075	5.9066	H6	10.6312	10.6299
232	160	290	n6	6.3012	6.3003	H6	11.4186	11.4173
234	170	310	n6	6.6949	6.6940	H6	12.2060	12.2047
236	180	320	n6	7.0886	7.0877	H6	12.5998	12.5984
238	190	340	n6	7.4827	7.4815	H6	13.3872	13.3858
240	200	360	p6	7.8771	7.8760	H6	14.1746	14.1732

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, INCH

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 300 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
304	20	52	k5	0.7878	0.7875	H6	2.0479	2.0472
305	25	62	k5	0.9847	0.9844	H6	2.4416	2.4409
306	30	72	k5	1.1815	1.1812	H6	2.8353	2.8346
307	35	80	k5	1.3785	1.3781	H6	3.1503	3.1496
308	40	90	m5	1.5756	1.5752	H6	3.5442	3.5433
309	45	100	m5	1.7725	1.7721	H6	3.9379	3.9370
310	50	110	m5	1.9693	1.9689	H6	4.3316	4.3307
311	55	120	m5	2.1663	2.1658	H6	4.7253	4.7244
312	60	130	m5	2.3631	2.3626	H6	5.1191	5.1181
313	65	140	m5	2.5600	2.5595	H6	5.5128	5.5118
314	70	150	m5	2.7568	2.7563	H6	5.9065	5.9055
315	75	160	m5	2.9537	2.9532	H6	6.3002	6.2992
316	80	170	m5	3.1505	3.1500	H6	6.6939	6.6929
317	85	180	m5	3.3476	3.3470	H6	7.0876	7.0866

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_r).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, inch		ISO	housing diameter, inch	
	mm	mm		max	min		max	min
318	90	190	m5	3.5444	3.5438	H6	7.4814	7.4803
319	95	200	m5	3.7413	3.7407	H6	7.8751	7.8740
320	100	215	m5	3.9381	3.9375	H6	8.4657	8.4646
321	105	225	m6	4.1353	4.1344	H6	8.8594	8.8583
322	110	240	m6	4.3321	4.3312	H6	9.4499	9.4488
324	120	260	m6	4.7258	4.7249	H6	10.2375	10.2362
326	130	280	m6	5.1197	5.1187	H6	11.0249	11.0236
328	140	300	m6	5.5134	5.5124	H6	11.8123	11.8110
330	150	320	n6	5.9075	5.9066	H6	12.5998	12.5984
332	160	340	n6	6.3012	6.3003	H6	13.3872	13.3858
334	170	360	n6	6.6949	6.6940	H6	14.1746	14.1732
336	180	380	n6	7.0886	7.0877	H6	14.9620	14.9606
338	190	400	n6	7.4827	7.4815	H6	15.7494	15.7480
340	200	420	p6	7.8771	7.8760	H6	16.5370	16.5354

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, METRIC

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
6200	10	30	j5	10.004	9.998	H6	30.013	30.000
6201	12	32	j5	12.005	11.997	H6	32.016	32.000
6202	15	35	j5	15.005	14.997	H6	35.016	35.000
6203	17	40	j5	17.005	16.997	H6	40.016	40.000
6204	20	47	k5	20.011	20.002	H6	47.016	47.000
6205	25	52	k5	25.011	25.002	H6	52.019	52.000
6206	30	62	k5	30.011	30.002	H6	62.019	62.000
6207	35	72	k5	35.013	35.002	H6	72.019	72.000
6208	40	80	k5	40.013	40.002	H6	80.019	80.000
6209	45	85	k5	45.013	45.002	H6	85.022	85.000
6210	50	90	k5	50.013	50.002	H6	90.022	90.000
6211	55	100	k5	55.015	55.002	H6	100.022	100.000
6212	60	110	k5	60.015	60.002	H6	110.022	110.000
6213	65	120	k5	65.015	65.002	H6	120.022	120.000
6214	70	125	k5	70.015	70.002	H6	125.025	125.000
6215	75	130	k5	75.015	75.002	H6	130.025	130.000

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_r).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
6216	80	140	k5	80.015	80.002	H6	140.025	140.000
6217	85	150	k5	85.018	85.003	H6	150.025	150.000
6218	90	160	k5	90.018	90.003	H6	160.025	160.000
6219	95	170	k5	95.018	95.003	H6	170.025	170.000
6220	100	180	k5	100.018	100.003	H6	180.025	180.000
6221	105	190	m5	105.028	105.013	H6	190.029	190.000
6222	110	200	m5	110.028	110.013	H6	200.029	200.000
6224	120	215	m5	120.028	120.013	H6	215.029	215.000
6226	130	230	m5	130.033	130.015	H6	230.029	230.000
6228	140	250	m5	140.033	140.015	H6	250.029	250.000
6230	150	270	m6	150.040	150.015	H6	270.032	270.000
6232	160	290	m6	160.040	160.015	H6	290.032	290.000
6234	170	310	m6	170.040	170.015	H6	310.032	310.000
6236	180	320	m6	180.040	180.015	H6	320.036	320.000
6238	190	340	m6	190.046	190.017	H6	340.036	340.000
6240	200	360	m6	200.046	200.017	H6	360.036	360.000

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, METRIC

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
6300	10	35	j5	10.004	9.998	H6	35.016	35.000
6301	12	37	j5	12.005	11.997	H6	37.016	37.000
6302	15	42	j5	15.005	14.997	H6	42.016	42.000
6303	17	47	j5	17.005	16.997	H6	47.016	47.000
6304	20	52	k5	20.011	20.002	H6	52.019	52.000
6305	25	62	k5	25.011	25.002	H6	62.019	62.000
6306	30	72	k5	30.011	30.002	H6	72.019	72.000
6307	35	80	k5	35.013	35.002	H6	80.019	80.000
6308	40	90	k5	40.013	40.002	H6	90.022	90.000
6309	45	100	k5	45.013	45.002	H6	100.022	100.000
6310	50	110	k5	50.013	50.002	H6	110.022	110.000
6311	55	120	k5	55.015	55.002	H6	120.022	120.000
6312	60	130	k5	60.015	60.002	H6	130.025	130.000
6313	65	140	k5	65.015	65.002	H6	140.025	140.000
6314	70	150	k5	70.015	70.002	H6	150.025	150.000
6315	75	160	k5	75.015	75.002	H6	160.025	160.000

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_r).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
6316	80	170	k5	80.015	80.002	H6	170.025	170.000
6317	85	180	k5	85.018	85.003	H6	180.025	180.000
6318	90	190	k5	90.018	90.003	H6	190.029	190.000
6319	95	200	k5	95.018	95.003	H6	200.029	200.000
6320	100	215	k5	100.018	100.003	H6	215.029	215.000
6321	105	225	m5	105.028	105.013	H6	225.029	225.000
6322	110	240	m5	110.028	110.013	H6	240.029	240.000
6324	120	260	m5	120.028	120.013	H6	260.032	260.000
6326	130	280	m5	130.033	130.015	H6	280.032	280.000
6328	140	300	m5	140.033	140.015	H6	300.032	300.000
6330	150	320	m6	150.040	150.015	H6	320.036	320.000
6332	160	340	m6	160.040	160.015	H6	340.036	340.000
6334	170	360	m6	170.040	170.015	H6	360.036	360.000
6336	180	380	m6	180.040	180.015	H6	380.036	380.000
6338	190	400	m6	190.046	190.017	H6	400.036	400.000
6340	200	420	m6	200.046	200.017	H6	420.040	420.000

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, METRIC

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 200 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
204	20	47	k5	20.011	20.002	H6	47.016	47.000
205	25	52	k5	25.011	25.002	H6	52.019	52.000
206	30	62	k5	30.011	30.002	H6	62.019	62.000
207	35	72	k5	35.013	35.002	H6	72.019	72.000
208	40	80	m5	40.020	40.009	H6	80.019	80.000
209	45	85	m5	45.020	45.009	H6	85.022	85.000
210	50	90	m5	50.020	50.009	H6	90.022	90.000
211	55	100	m5	55.024	55.011	H6	100.022	100.000
212	60	110	m5	60.024	60.011	H6	110.022	110.000
213	65	120	m5	65.024	65.011	H6	120.022	120.000
214	70	125	m5	70.024	70.011	H6	125.025	125.000
215	75	130	m5	75.024	75.011	H6	130.025	130.000
216	80	140	m5	80.024	80.011	H6	140.025	140.000
217	85	150	m5	85.028	85.013	H6	150.025	150.000

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_r).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
218	90	160	m5	90.028	90.013	H6	160.025	160.000
219	95	170	m5	95.028	95.013	H6	170.025	170.000
220	100	180	m5	100.028	100.013	H6	180.025	180.000
221	105	190	m6	105.035	105.013	H6	190.029	190.000
222	110	200	m6	110.035	110.013	H6	200.029	200.000
224	120	215	m6	120.035	120.013	H6	215.029	215.000
226	130	230	m6	130.040	130.015	H6	230.029	230.000
228	140	250	m6	140.040	140.015	H6	250.029	250.000
230	150	270	n6	150.052	150.027	H6	270.032	270.000
232	160	290	n6	160.052	160.027	H6	290.032	290.000
234	170	310	n6	170.052	170.027	H6	310.032	310.000
236	180	320	n6	180.052	180.027	H6	320.036	320.000
238	190	340	n6	190.060	190.031	H6	340.036	340.000
240	200	360	p6	200.079	200.050	H6	360.036	360.000

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

RECOMMENDED SHAFT AND HOUSING FITS, METRIC

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 300 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
304	20	52	k5	20.011	20.002	H6	52.019	52.000
305	25	62	k5	25.011	25.002	H6	62.019	62.000
306	30	72	k5	30.011	30.002	H6	72.019	72.000
307	35	80	k5	35.013	35.002	H6	80.019	80.000
308	40	90	m5	40.020	40.009	H6	90.022	90.000
309	45	100	m5	45.020	45.009	H6	100.022	100.000
310	50	110	m5	50.020	50.009	H6	110.022	110.000
311	55	120	m5	55.024	55.011	H6	120.022	120.000
312	60	130	m5	60.024	60.011	H6	130.025	130.000
313	65	140	m5	65.024	65.011	H6	140.025	140.000
314	70	150	m5	70.024	70.011	H6	150.025	150.000
315	75	160	m5	75.024	75.011	H6	160.025	160.000
316	80	170	m5	80.024	80.011	H6	170.025	170.000
317	85	180	m5	85.028	85.013	H6	180.025	180.000

Shaft fits are for solid steel shafts. Maximize shaft diameter within tolerance for loads near 13% of the dynamic load rating (C_d).

BEARING NO.	BEARING DIMENSIONS		SHAFT TOLERANCE			HOUSING BORE TOLERANCE		
	bore	OD	ISO	shaft diameter, mm		ISO	housing diameter, mm	
	mm	mm		max	min		max	min
318	90	190	m5	90.028	90.013	H6	190.029	190.000
319	95	200	m5	95.028	95.013	H6	200.029	200.000
320	100	215	m5	100.028	100.013	H6	215.029	215.000
321	105	225	m6	105.035	105.013	H6	225.029	225.000
322	110	240	m6	110.035	110.013	H6	240.029	240.000
324	120	260	m6	120.035	120.013	H6	260.032	260.000
326	130	280	m6	130.040	130.015	H6	280.032	280.000
328	140	300	m6	140.040	140.015	H6	300.032	300.000
330	150	320	n6	150.052	150.027	H6	320.036	320.000
332	160	340	n6	160.052	160.027	H6	340.036	340.000
334	170	360	n6	170.052	170.027	H6	360.036	360.000
336	180	380	n6	180.052	180.027	H6	380.036	380.000
338	190	400	n6	190.060	190.031	H6	400.036	400.000
340	200	420	p6	200.079	200.050	H6	420.040	420.000

Housing fits are for cast iron and steel bearing housing. For light alloys, interference should be tighter than those in this table.

SHOULDER DIMENSIONS FOR SHAFTS AND HOUSINGS, INCH

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d_a , inch		D_a , inch	r_a , inch
	mm	mm	min	max	max	max
6200	10	30	0.5512	0.6299	1.0236	0.0236
6201	12	32	0.6299	0.6693	1.1024	0.0236
6202	15	35	0.7480	0.8071	1.2205	0.0236
6203	17	40	0.8268	0.9252	1.4173	0.0236
6204	20	47	0.9843	1.0433	1.6535	0.0394
6205	25	52	1.1811	1.2598	1.8504	0.0394
6206	30	62	1.3780	1.5157	2.2441	0.0394
6207	35	72	1.6339	1.7520	2.5787	0.0394
6208	40	80	1.8307	1.9882	2.8937	0.0394
6209	45	85	2.0276	2.1850	3.0906	0.0394
6210	50	90	2.2244	2.3622	3.2874	0.0394
6211	55	100	2.4803	2.6181	3.6220	0.0591
6212	60	110	2.6772	2.9331	4.0157	0.0591
6213	65	120	2.8740	3.1496	4.4094	0.0591
6214	70	125	3.0709	3.3071	4.6063	0.0591
6215	75	130	3.2677	3.5433	4.8031	0.0591

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d_a , inch		D_a , inch	r_a , inch
	mm	mm	min	max	max	max
6216	80	140	3.5039	3.7598	5.1575	0.0787
6217	85	150	3.7008	4.0157	5.5512	0.0787
6218	90	160	3.8976	4.2323	5.9449	0.0787
6219	95	170	4.1732	4.4882	6.2598	0.0787
6220	100	180	4.3701	4.7835	6.6535	0.0787
6221	105	190	4.5669	5.0197	7.0472	0.0787
6222	110	200	4.7638	5.2756	7.4409	0.0787
6224	120	215	5.1575	5.7480	8.0315	0.0787
6226	130	230	5.6299	6.1811	8.5433	0.0984
6228	140	250	6.0236	6.7520	9.3307	0.0984
6230	150	270	6.4173	7.3228	10.1181	0.0984
6232	160	290	6.8110	7.9528	10.9055	0.0984
6234	170	310	7.3228	8.4646	11.5748	0.1181
6236	180	320	7.7165	8.7795	11.9685	0.1181
6238	190	340	8.1102	9.2913	12.7559	0.1181
6240	200	360	8.5039	9.9213	13.5433	0.1181

SHOULDER DIMENSIONS FOR SHAFTS AND HOUSINGS, INCH

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d _a , inch		D _a , inch	r _a , inch
	mm	mm	min	max	max	max
6300	10	35	0.5512	0.6496	1.2205	0.0236
6301	12	37	0.6693	0.7087	1.2598	0.0394
6302	15	42	0.7874	0.8858	1.4567	0.0394
6303	17	47	0.8661	1.0039	1.6535	0.0394
6304	20	52	1.0433	1.1024	1.7717	0.0394
6305	25	62	1.2402	1.4370	2.1654	0.0394
6306	30	72	1.4370	1.6732	2.5787	0.0394
6307	35	80	1.6929	1.8504	2.8346	0.0591
6308	40	90	1.8898	2.0866	3.2283	0.0591
6309	45	100	2.0866	2.4213	3.6220	0.0591
6310	50	110	2.3228	2.6772	3.9764	0.0787
6311	55	120	2.5197	2.8543	4.3701	0.0787
6312	60	130	2.7953	3.1102	4.6850	0.0787
6313	65	140	2.9921	3.3661	5.0787	0.0787
6314	70	150	3.1890	3.6220	5.4724	0.0787
6315	75	160	3.3858	3.8780	5.8661	0.0787

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d_a , inch		D_a , inch	r_a , inch
	mm	mm	min	max	max	max
6316	80	170	3.5827	4.1142	6.2598	0.0787
6317	85	180	3.8583	4.3504	6.5748	0.0984
6318	90	190	4.0551	4.6063	6.9685	0.0984
6319	95	200	4.2520	4.8622	7.3622	0.0984
6320	100	215	4.4488	5.2362	7.9528	0.0984
6321	105	225	4.6457	5.4331	8.3465	0.0984
6322	110	240	4.8425	5.7874	8.9370	0.0984
6324	120	260	5.2362	6.3386	9.7244	0.0984
6326	130	280	5.7480	6.8898	10.3937	0.1181
6328	140	300	6.1417	7.3622	11.1811	0.1181
6330	150	320	6.5354	7.9921	11.9685	0.1181
6332	160	340	6.9291	8.4843	12.7559	0.1181
6334	170	360	7.3228	--	13.5433	0.1181
6336	180	380	7.7165	--	14.3307	0.1181
6338	190	400	8.2677	--	14.9606	0.1575
6340	200	420	8.6614	--	15.7480	0.1575

SHOULDER DIMENSIONS FOR SHAFTS AND HOUSINGS, METRIC

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d_a , mm		D_a , mm	r_a , mm
	mm	mm	min	max	max	max
6200	10	30	14.0	16.0	26.0	0.6
6201	12	32	16.0	17.0	28.0	0.6
6202	15	35	19.0	20.5	31.0	0.6
6203	17	40	21.0	23.5	36.0	0.6
6204	20	47	25.0	26.5	42.0	1.0
6205	25	52	30.0	32.0	47.0	1.0
6206	30	62	35.0	38.5	57.0	1.0
6207	35	72	41.5	44.5	65.5	1.0
6208	40	80	46.5	50.5	73.5	1.0
6209	45	85	51.5	55.5	78.5	1.0
6210	50	90	56.5	60.0	83.5	1.0
6211	55	100	63.0	66.5	92.0	1.5
6212	60	110	68.0	74.5	102.0	1.5
6213	65	120	73.0	80.0	112.0	1.5
6214	70	125	78.0	84.0	117.0	1.5
6215	75	130	83.0	90.0	122.0	1.5

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d_a , mm		D_a , mm	r_a , mm
	mm	mm	min	max	max	max
6216	80	140	89.0	95.5	131.0	2.0
6217	85	150	94.0	102.0	141.0	2.0
6218	90	160	99.0	107.5	151.0	2.0
6219	95	170	106.0	114.0	159.0	2.0
6220	100	180	111.0	121.5	169.0	2.0
6221	105	190	116.0	127.5	179.0	2.0
6222	110	200	121.0	134.0	189.0	2.0
6224	120	215	131.0	146.0	204.0	2.0
6226	130	230	143.0	157.0	217.0	2.5
6228	140	250	153.0	171.5	237.0	2.5
6230	150	270	163.0	186.0	257.0	2.5
6232	160	290	173.0	202.0	277.0	2.5
6234	170	310	186.0	215.0	294.0	3.0
6236	180	320	196.0	223.0	304.0	3.0
6238	190	340	206.0	236.0	324.0	3.0
6240	200	360	216.0	252.0	344.0	3.0

SHOULDER DIMENSIONS FOR SHAFTS AND HOUSINGS, METRIC

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d _a , mm		D _a , mm	r _a , mm
	mm	mm	min	max	max	max
6300	10	35	14.0	16.5	31.0	0.6
6301	12	37	17.0	18.0	32.0	1.0
6302	15	42	20.0	22.5	37.0	1.0
6303	17	47	22.0	25.5	42.0	1.0
6304	20	52	26.5	28.0	45.0	1.0
6305	25	62	31.5	36.5	55.0	1.0
6306	30	72	36.5	42.5	65.5	1.0
6307	35	80	43.0	47.0	72.0	1.5
6308	40	90	48.0	53.0	82.0	1.5
6309	45	100	53.0	61.5	92.0	1.5
6310	50	110	59.0	68.0	101.0	2.0
6311	55	120	64.0	72.5	111.0	2.0
6312	60	130	71.0	79.0	119.0	2.0
6313	65	140	76.0	85.5	129.0	2.0
6314	70	150	81.0	92.0	139.0	2.0
6315	75	160	86.0	98.5	149.0	2.0

BEARING NO.	BEARING DIMENSIONS		SHAFT SHOULDER		HOUSING SHOULDER	CHAMFER
	bore	OD	d_a , mm		D_a , mm	r_a , mm
	mm	mm	min	max	max	max
6316	80	170	91.0	104.5	159.0	2.0
6317	85	180	98.0	110.5	167.0	2.5
6318	90	190	103.0	117.0	177.0	2.5
6319	95	200	108.0	123.5	187.0	2.5
6320	100	215	113.0	133.0	202.0	2.5
6321	105	225	118.0	138.0	212.0	2.5
6322	110	240	123.0	147.0	227.0	2.5
6324	120	260	133.0	161.0	247.0	2.5
6326	130	280	146.0	175.0	264.0	3.0
6328	140	300	156.0	187.0	284.0	3.0
6330	150	320	166.0	203.0	304.0	3.0
6332	160	340	176.0	215.5	324.0	3.0
6334	170	360	186.0	--	344.0	3.0
6336	180	380	196.0	--	364.0	3.0
6338	190	400	210.0	--	380.0	4.0
6340	200	420	220.0	--	400.0	4.0

MINIMUM RADIAL LOAD REQUIREMENTS

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 200 SERIES

BEARING NO.	MINIMUM LOAD REQUIREMENTS / SPEED					
	900 rpm		1800 rpm		3600 rpm	
	lbs	N	lbs	N	lbs	N
204T	16	72	21	96	28	127
205W	21	94	28	125	37	166
206W	29	131	39	175	52	232
207W	39	175	52	233	69	309
208W	49	218	64	289	86	385
209W	57	254	75	337	100	448
210W	65	292	87	388	115	515
211W	79	354	105	471	140	625
212W	94	422	126	561	167	745
213W	111	496	148	659	196	875
214W	123	548	163	728	217	967
215W	135	603	180	801	238	1 060
216M	154	689	205	916	274	1 220
217M	175	781	233	1 040	310	1 380

T = Polyamide Cage, W = Steel Cage, M = Brass Cage

BEARING NO.	MINIMUM LOAD REQUIREMENTS / SPEED					
	900 rpm		1800 rpm		3600 rpm	
	lbs	N	lbs	N	lbs	N
218M	197	879	263	1 170	348	1 550
219M	220	981	292	1 300	388	1 730
220M	245	1 090	325	1 450	431	1 920
221M	269	1 200	359	1 600	476	2 120
222M	296	1 320	395	1 760	523	2 330
224M	343	1 530	458	2 040	> limiting speeds	
226M	395	1 760	523	2 330		
228M	464	2 066	617	2 746		
230M	533	2 371	708	3 150		
232M	605	2 693	804	3 579		
234M	707	3 146	939	4 180		
236M	765	3 403	1 016	4 521		
238M	849	3 779	1 128	5 021		
240M	947	4 215	1 259	5 601		

T = Polyamide Cage, W = Steel Cage, M = Brass Cage

MINIMUM RADIAL LOAD REQUIREMENTS

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 300 SERIES

BEARING NO.	MINIMUM LOAD REQUIREMENTS / SPEED					
	900 rpm		1800 rpm		3600 rpm	
	lbs	N	lbs	N	lbs	N
304T	21	98	29	130	38	172
305W	31	139	41	184	55	245
306W	41	186	55	248	73	329
307W	52	233	69	310	92	412
308W	65	293	87	389	116	517
309W	80	359	107	477	142	633
310W	96	431	128	572	171	761
311W	114	509	151	676	202	899
312M	133	593	177	788	236	1 050
313M	153	683	204	908	272	1 210
314M	175	779	233	1 040	310	1 380
315M	198	881	263	1 170	348	1 550
316M	222	988	294	1 310	391	1 740
317M	247	1 100	328	1 460	436	1 940

T = Polyamide Cage, W = Steel Cage, M = Brass Cage

BEARING NO.	MINIMUM LOAD REQUIREMENTS / SPEED					
	900 rpm		1800 rpm		3600 rpm	
	lbs	N	lbs	N	lbs	N
318M	274	1 220	364	1 620	483	2 150
319M	301	1 340	402	1 790	532	2 370
320M	341	1 520	454	2 020	> limiting speeds	
321M	373	1 660	494	2 200		
322M	415	1 850	550	2 450		
324M	483	2 150	642	2 860		
326M	512	2 280	681	3 030		
328M	662	2 948	880	3 917		
330M	756	3 364	1 004	4 469		
332M	859	3 825	1 142	5 082		
334M	945	4 207	1 256	5 590		
336M	1 024	4 557	1 361	6 054		
338M	1 106	4 921	> limiting speeds			
340M	1 198	5 329				

T = Polyamide Cage, W = Steel Cage, M = Brass Cage

GREASE RELUBRICATION GUIDELINES

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
6200	0.05	1.350	> 20 000	> 20 000	> 20 000
6201	0.06	1.600	> 20 000	> 20 000	17 980
6202	0.07	1.925	> 20 000	> 20 000	15 046
6203	0.08	2.400	> 20 000	> 20 000	12 540
6204	0.12	3.290	> 20 000	> 20 000	11 846
6205	0.14	3.900	> 20 000	> 20 000	9 724
6206	0.17	4.960	> 20 000	18 390	8 201
6207	0.22	6.120	> 20 000	16 181	7 033
6208	0.25	7.200	> 20 000	14 431	6 100
6209	0.28	8.075	> 20 000	13 012	5 336
6210	0.32	9.000	> 20 000	11 820	4 690

The replenishment intervals apply for the condition of high quality lithium soap-mineral oil grease at 70°C or 158°F bearing operating temperature. If the bearing temperature exceeds 70°C or 158°F, the replenishment time interval must be reduced by half for every 15°C or 59°F temperature rise of the bearings.

In the case of ball bearings especially, the replenishment time interval can be extended depending on the grease type. A high quality lithium soap-synthetic oil grease may extend the replenishment interval about two times of those shown above.

Other factors that impact the replenishment interval are vertical orientation, presence of moisture, magnitude of bearing load, and contamination. It is advisable to consult NSK if these factors are present.

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
6211	0.37	10.500	> 20 000	10 805	4 135
6212	0.43	12.100	> 20 000	9 921	3 649
6213	0.49	13.800	> 20 000	9 151	3 222
6214	0.53	15.000	19 730	8 470	2 840
6215	0.57	16.250	18 592	7 862	2 497
6216	0.64	18.200	17 568	7 313	2 185
6217	0.74	21.000	16 645	6 815	1 900
6218	0.85	24.000	15 804	6 360	1 637
6219	0.96	27.200	15 035	5 941	1 394
6220	1.08	30.600	14 328	5 555	1 169

GREASE RELUBRICATION GUIDELINES

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
6300	0.07	1.925	> 20 000	> 20 000	> 20 000
6301	0.08	2.220	> 20 000	> 20 000	17 967
6302	0.10	2.730	> 20 000	> 20 000	15 057
6303	0.12	3.290	> 20 000	> 20 000	13 577
6304	0.14	3.900	> 20 000	> 20 000	11 843
6305	0.19	5.270	> 20 000	> 20 000	9 729
6306	0.24	6.840	> 20 000	18 390	8 201
6307	0.30	8.400	> 20 000	16 181	7 033
6308	0.37	10.350	> 20 000	14 431	6 100
6309	0.44	12.500	> 20 000	13 005	5 334
6310	0.52	14.850	> 20 000	11 814	4 687

The replenishment intervals apply for the condition of high quality lithium soap-mineral oil grease at 70°C or 158°F bearing operating temperature. If the bearing temperature exceeds 70°C or 158°F, the replenishment time interval must be reduced by half for every 15°C or 59°F temperature rise of the bearings.

In the case of ball bearings especially, the replenishment time interval can be extended depending on the grease type. A high quality lithium soap-synthetic oil grease may extend the replenishment interval about two times of those shown above.

Other factors that impact the replenishment interval are vertical orientation, presence of moisture, magnitude of bearing load, and contamination. It is advisable to consult NSK if these factors are present.

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
6311	0.61	17.400	> 20 000	10 805	4 135
6312	0.71	20.150	> 20 000	9 922	3 649
6313	0.81	23.100	> 20 000	9 153	3 222
6314	0.93	26.250	19 733	8 471	2 841
6315	1.04	29.600	18 593	7 862	2 497
6316	1.17	33.150	17 571	7 314	2 185
6317	1.30	36.900	16 646	6 815	1 900
6318	1.44	40.850	15 813	6 363	1 638
6319	1.59	45.000	15 036	5 942	-
6320	1.78	50.525	14 329	5 555	-

GREASE RELUBRICATION GUIDELINES

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 200 SERIES

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
204	0.12	3.290	> 20 000	12 694	5 924
205	0.14	3.900	> 20 000	10 660	4 867
206	0.17	4.960	19 384	9 195	4 101
207	0.22	6.120	17 239	8 091	3 517
208	0.25	7.200	15 546	7 215	3 050
209	0.28	8.075	14 182	6 506	2 668
210	0.32	9.000	13 033	5 907	2 344
211	0.37	10.500	12 066	5 400	2 066
212	0.43	12.100	11 233	4 961	1 824

The replenishment intervals apply for the condition of high quality lithium soap-mineral oil grease at 70°C or 158°F bearing operating temperature. If the bearing temperature exceeds 70°C or 158°F, the replenishment time interval must be reduced by half for every 15°C or 59°F temperature rise of the bearings.

In the case of ball bearings especially, the replenishment time interval can be extended depending on the grease type. A high quality lithium soap-synthetic oil grease may extend the replenishment interval about two times of those shown above.

Other factors that impact the replenishment interval are vertical orientation, presence of moisture, magnitude of bearing load, and contamination. It is advisable to consult NSK if these factors are present.

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
213	0.49	13.800	10 507	4 576	1 611
214	0.53	15.000	9 866	4 236	1 420
215	0.57	16.250	9 297	3 931	1 249
216	0.64	18.200	8 790	3 659	1 093
217	0.74	21.000	8 323	3 408	950
218	0.85	24.000	7 903	3 180	819
219	0.96	27.200	7 518	2 971	697
220	1.08	30.600	7 164	2 778	584

GREASE RELUBRICATION GUIDELINES

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 300 SERIES

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
304	0.14	3.900	> 20 000	12 688	5 921
305	0.19	5.270	> 20 000	10 654	4 865
306	0.24	6.840	19 395	9 200	4 103
307	0.30	8.400	17 237	8 090	3 516
308	0.37	10.350	15 547	7 216	3 050
309	0.44	12.500	14 174	6 502	2 667
310	0.52	14.850	13 033	5 907	2 344
311	0.61	17.400	12 066	5 400	2 066
312	0.71	20.150	11 233	4 961	1 824

The replenishment intervals apply for the condition of high quality lithium soap-mineral oil grease at 70°C or 158°F bearing operating temperature. If the bearing temperature exceeds 70°C or 158°F, the replenishment time interval must be reduced by half for every 15°C or 59°F temperature rise of the bearings.

In the case of ball bearings especially, the replenishment time interval can be extended depending on the grease type. A high quality lithium soap-synthetic oil grease may extend the replenishment interval about two times of those shown above.

Other factors that impact the replenishment interval are vertical orientation, presence of moisture, magnitude of bearing load, and contamination. It is advisable to consult NSK if these factors are present.

BEARING NO.	GREASE AMOUNT		OPERATING HOUR INTERVALS		
	oz	grams	900 rpm	1800 rpm	3600 rpm
313	0.81	23.100	10 507	4 576	1 611
314	0.93	26.250	9 867	4 236	1 420
315	1.04	29.600	9 297	3 931	1 249
316	1.17	33.150	8 785	3 657	1 093
317	1.30	36.900	8 322	3 407	-
318	1.44	40.850	7 902	3 180	-
319	1.59	45.000	7 518	2 971	-
320	1.78	50.525	7 165	2 778	-

NSK BEARING FREQUENCY ANALYSIS DATA

DEEP GROOVE BALL BEARINGS, 6200 SERIES

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
6200	1	0.082	0.051	0.068	0.006
6201	1	0.074	0.043	0.057	0.006
6202	1	0.082	0.051	0.068	0.006
6203	1	0.082	0.051	0.068	0.006
6204	1	0.082	0.051	0.066	0.006
6205	1	0.090	0.060	0.078	0.007
6206	1	0.090	0.060	0.078	0.007
6207	1	0.091	0.059	0.077	0.007
6208	1	0.090	0.060	0.081	0.007
6209	1	0.099	0.068	0.088	0.007
6210	1	0.098	0.068	0.089	0.007
6211	1	0.099	0.068	0.087	0.007
6212	1	0.099	0.068	0.088	0.007
6213	1	0.098	0.068	0.089	0.007
6214	1	0.098	0.068	0.090	0.007
6215	1	0.107	0.076	0.096	0.007

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
6216	1	0.098	0.069	0.093	0.007
6217	1	0.098	0.069	0.092	0.007
6218	1	0.098	0.069	0.091	0.007
6219	1	0.098	0.068	0.090	0.007
6220	1	0.098	0.068	0.089	0.007
6221	1	0.099	0.068	0.088	0.007
6222	1	0.099	0.068	0.087	0.007
6224	1	0.098	0.068	0.090	0.007
6226	1	0.098	0.069	0.092	0.007
6228	1	0.097	0.070	0.100	0.007
6230	1	0.106	0.078	0.108	0.007
6232	1	0.114	0.086	0.116	0.007
6234	1	0.115	0.085	0.112	0.007
6236	1	0.106	0.078	0.107	0.007
6238	1	0.106	0.077	0.104	0.007
6240	1	0.115	0.085	0.111	0.007

NSK BEARING FREQUENCY ANALYSIS DATA

DEEP GROOVE BALL BEARINGS, 6300 SERIES

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
6300	1	0.066	0.034	0.047	0.006
6301	1	0.066	0.034	0.046	0.006
6302	1	0.074	0.043	0.057	0.006
6303	1	0.074	0.043	0.059	0.006
6304	1	0.074	0.043	0.059	0.006
6305	1	0.082	0.051	0.068	0.006
6306	1	0.082	0.051	0.069	0.006
6307	1	0.082	0.051	0.068	0.006
6308	1	0.082	0.051	0.068	0.006
6309	1	0.082	0.051	0.067	0.006
6310	1	0.082	0.051	0.068	0.006
6311	1	0.082	0.051	0.067	0.006
6312	1	0.082	0.051	0.067	0.006
6313	1	0.082	0.051	0.068	0.006
6314	1	0.082	0.051	0.068	0.006
6315	1	0.082	0.051	0.069	0.006

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
6316	1	0.082	0.051	0.069	0.006
6317	1	0.082	0.051	0.069	0.006
6318	1	0.082	0.052	0.070	0.006
6319	1	0.082	0.052	0.070	0.006
6320	1	0.082	0.051	0.069	0.006
6321	1	0.082	0.051	0.068	0.006
6322	1	0.082	0.051	0.068	0.006
6324	1	0.081	0.052	0.073	0.007
6326	1	0.081	0.052	0.073	0.007
6328	1	0.081	0.052	0.073	0.007
6330	1	0.090	0.060	0.079	0.007
6332	1	0.080	0.053	0.079	0.007
6334	1	0.081	0.052	0.074	0.007
6336	1	0.090	0.060	0.078	0.007
6338	1	0.090	0.060	0.083	0.007
6340	1	0.080	0.053	0.078	0.007

NSK BEARING FREQUENCY ANALYSIS DATA

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 200 SERIES

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
204W	1	0.100	0.067	0.083	0.007
205W	1	0.117	0.083	0.096	0.007
206W	1	0.116	0.084	0.100	0.007
207W	1	0.117	0.083	0.095	0.007
208W	1	0.126	0.090	0.097	0.007
209W	1	0.135	0.099	0.106	0.007
210W	1	0.143	0.107	0.115	0.007
211W	1	0.143	0.107	0.115	0.007
212W	1	0.143	0.108	0.116	0.007
213W	1	0.152	0.115	0.116	0.007
214W	1	0.151	0.116	0.123	0.007
215W	1	0.152	0.115	0.120	0.007
216W	1	0.152	0.115	0.120	0.007
217W	1	0.151	0.115	0.120	0.007

W = Steel Cage, M = Brass Cage

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
218W	1	0.153	0.114	0.113	0.007
219W	1	0.143	0.107	0.114	0.007
220W	1	0.152	0.114	0.114	0.007
221M	1	0.152	0.114	0.115	0.007
222W	1	0.144	0.107	0.110	0.007
224W	1	0.143	0.107	0.114	0.007
226W	1	0.151	0.116	0.123	0.007
228W	1	0.151	0.116	0.123	0.007
230W	1	0.151	0.116	0.123	0.007
232M	1	0.170	0.130	0.123	0.007
234M	1	0.170	0.130	0.123	0.007
236M	1	0.179	0.138	0.128	0.007
238M	1	0.179	0.138	0.128	0.007
240M	1	0.179	0.138	0.128	0.007

W = Steel Cage, M = Brass Cage

NSK BEARING FREQUENCY ANALYSIS DATA

CYLINDRICAL ROLLER BEARINGS, N/NJ/NU 300 SERIES

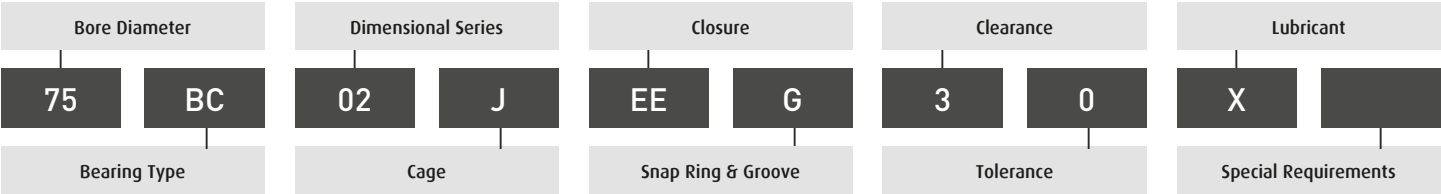
BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
304W	1	0.091	0.059	0.072	0.007
305W	1	0.100	0.066	0.078	0.007
306W	1	0.109	0.074	0.083	0.007
307W	1	0.119	0.081	0.083	0.007
308W	1	0.118	0.082	0.088	0.007
309W	1	0.109	0.074	0.083	0.007
310W	1	0.119	0.081	0.086	0.007
311W	1	0.119	0.081	0.083	0.007
312W	1	0.119	0.081	0.085	0.007
313W	1	0.119	0.081	0.087	0.007
314W	1	0.128	0.089	0.089	0.007
315W	1	0.119	0.081	0.086	0.007
316W	1	0.127	0.089	0.092	0.007
317W	1	0.118	0.082	0.089	0.007

W = Steel Cage, M = Brass Cage

BEARING NO.	INNER RING SPEED	BALL PASS FREQUENCY		BALL DEFECT FREQUENCY	CAGE TRAIN FREQUENCY
		INNER RING	OUTER RING		
	rpm	Hz	Hz	Hz	Hz
318W	1	0.128	0.089	0.090	0.007
319W	1	0.127	0.089	0.092	0.007
320W	1	0.128	0.089	0.091	0.007
321M	1	0.128	0.089	0.089	0.007
322W	1	0.118	0.082	0.088	0.007
324W	1	0.119	0.081	0.085	0.007
326W	1	0.119	0.081	0.087	0.007
328W	1	0.118	0.082	0.089	0.007
330W	1	0.118	0.082	0.090	0.007
332M	1	0.146	0.104	0.096	0.007
334M	1	0.146	0.104	0.095	0.007
336M	1	0.146	0.104	0.094	0.007
338M	1	0.146	0.104	0.096	0.007
340M	1	0.145	0.105	0.101	0.007

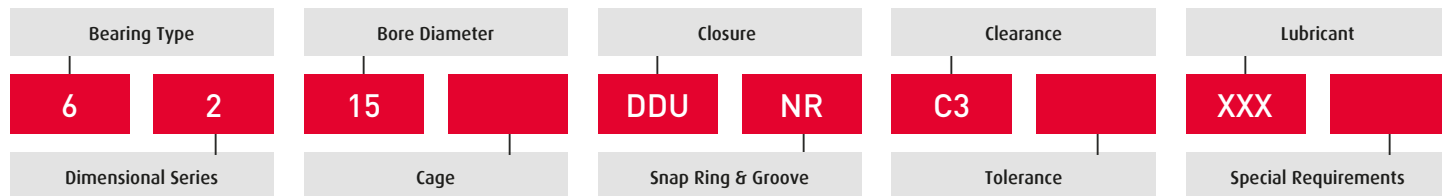
W = Steel Cage, M = Brass Cage

NOMENCLATURE - ABMA TO NSK



ATTRIBUTE	ABMA	NSK	DESCRIPTION
Bore Diameter	75	XX15	ABMA / 5 equals NSK except: 10 mm = 00, 12 mm = 01, 15 mm = 02, 17 mm = 03
Bearing Type	BC	6XXX	single row deep groove ball bearing
	RU	NUXXX	cylindrical roller bearing, no inner ring ribs
	RN	NXXX	cylindrical roller bearing, no outer ring ribs
	RJ	NJXXX	cylindrical roller bearing, one inner ring rib
Dimensional Series (OD, width)	00	X0XX	extra light series
	02	X2XX	light series
	03	X3XX	medium series
	04	X4XX	heavy series

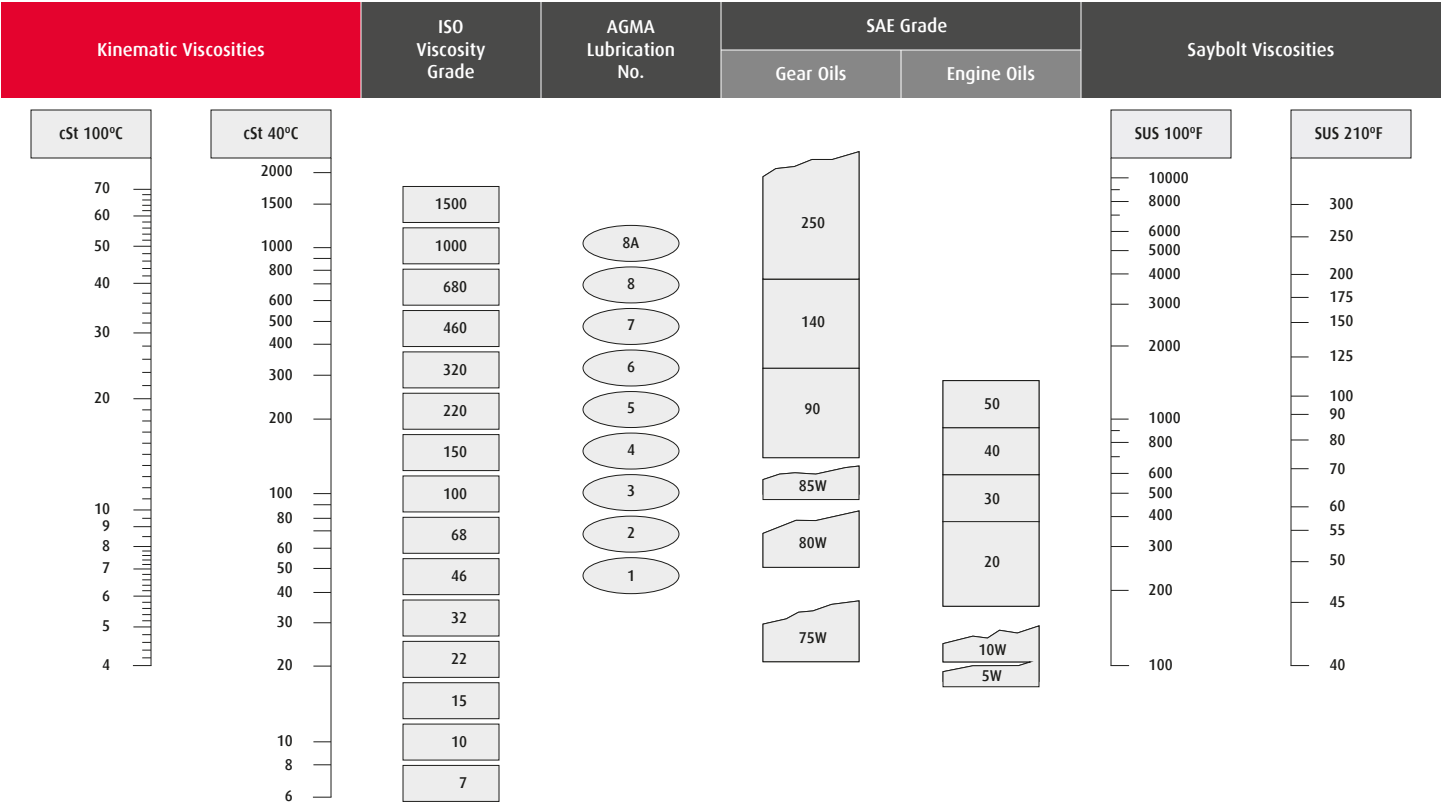
ATTRIBUTE	ABMA	NSK	DESCRIPTION
Cage Type	J	blank	pressed steel, deep groove ball bearing
		W	pressed steel, cylindrical roller bearing
	Y, K	Y	pressed brass cage
	M	M	machined brass cage
Closures	X	-	place holder
	P, PP	Z, ZZ	non-contact shield
	E, EE	DU, DDU	contact seal
	H, HH	V, VV	non-contact / labyrinth type seal



ATTRIBUTE	ABMA	NSK	DESCRIPTION
Snap Ring Groove	N	N	snap ring groove only
	G	NR	snap ring groove with snap ring
Internal Clearance	0	blank	normal internal clearance
	1	C1	internal clearance less than C2
	2	C2	internal clearance less than normal
	3	C3	internal clearance greater than normal
	4	C4	internal clearance greater than C3
	5	C5	internal clearance greater than C4

ATTRIBUTE	ABMA	NSK	DESCRIPTION
Tolerance	0	blank	ABEC 1, DIN P0
	6	P6	ABEC 3, ISO and DIN P6
	5	P5	ABEC 5, ISO and DIN P5
	4	P4	ABEC 7, ISO and DIN P4
	2	P2	ABEC 9, ISO and DIN P2
Lubricant	X	-	any slush or grease
	A	XXX	specific preservative or lubricant
Special Requirements	X27	X26	heat stabilization to 150°C
	X28	X28	heat stabilization to 200°C

COMPARATIVE VISCOSITY CLASSIFICATIONS



Note:

Viscosity can only be related horizontally.

Viscosities based on 95 VI single-grade oils.

ISO and AGMA viscosities are specified at 40°C. SAE 5W, 10W, 75W, 80W and 85W viscosities are specified at low temperature. Equivalent viscosities at 100°F and 210°F are shown.

SAE 90-250 (gear oils) and SAE 20-50 (engine oils) are specified at 210°F / 99°C.



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