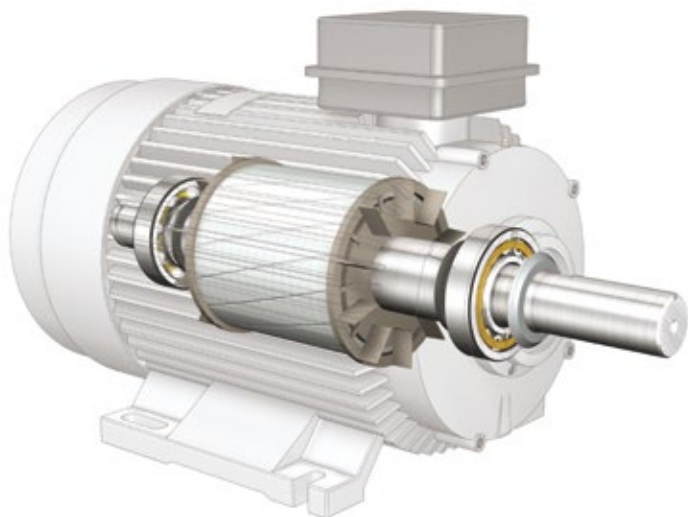


Bearing Handbook for Electric Motors



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Installation tips for reliable bearing operation

- 1 Handle with care.** Store bearings horizontally in a clean and dry place, free from vibration, in their original unopened package; periodically turn over sealed and shielded bearings to prevent grease from settling to one side. Leave bearings in their original packaging until immediately before mounting. Never place bearings on a dirty surface. Never hit, hammer or pound directly on a bearing or ring. If a bearing is dropped, it is best not to install it.
- 2 Inspect the shaft and housing.** Check for size and damage; remove nicks and burrs with emery paper, and wipe clean with a soft cloth. Replace or repair shafts and housings showing obvious signs of wear or damage. A shaft placed in a vise for mounting should be protected from vise jaws with a sheet of soft metal.
- 3 Avoid overheating.** During heat-mounting operations, always use a temperature controlled heating method. Never bring a flame in direct contact with the bearing and never heat beyond 230° F. Also, immediately hold a heat-mounted bearing in place against the shaft shoulder until it cools and locks in place. Otherwise, the bearing may creep away from the proper position.
- 4 Use a similar replacement bearing.** Replacement bearing should interchange to the bearings they replace. While replacing it may be a good time to upgrade your bearing to a higher quality bearing. Contact an SKF Authorized Distributor or SKF for interchange information.
- 5 Use the right tool for the job.** Induction heaters with demagnetization feature, oil injection kits, and hydraulic nuts are among the specialized tools available for mounting and dismounting bearings over 4 in. O.D. Their use lowers the possibility of damaging bearings and speeds up the process.
- 6 Pay attention to the bearing's press fit.** For bearings with an O.D. less than 4 inches, cold mounting with a press or appropriate mounting tool is acceptable. Mounting force should be applied to the ring with the interference fit, or both the inner ring and outer ring simultaneously to

avoid brinelling the raceways. Applying pressure to the ring with the loose fit only will brinell the raceways and may result in noise and potentially premature failure.

- 7 **Make sure** the contact between the bearing ring and a properly machined and dimensioned bearing seat should not require the use of bonding agents to prevent movement or turning.
- 8 **Don't wash new bearings.** Bearing manufacturers take great care to package and ship bearings that are dirt-free and ready for lubrication. There's usually no need to wash them or remove the protective slushing compound.
- 9 **Proper lubrication is critical.** Bearing manufacturers evaluate several factors before determining the type of lubricant required for specific bearings. Be sure to follow their recommendations if OEM specifications are not available. Temperature and contamination conditions will influence the frequency of lubrication changes.
- 10 **Rotate idle bearings.** Bearings installed in equipment that is subject to vibration while the shafts are stationary may incur false brinelling damage, which also occurs when equipment is not properly protected during storage and shipment. It can appear as bright, polished depressions on the inner and/or outer races, as well as on the rolling elements.
- 11 **Look for danger signs.** Keep alert for three sure signs of improper bearing operation: excessive noise and increases in vibration and temperature. Machine monitoring devices, like the SKF Pulse wireless sensor and app, predict machinery issues before operations are impacted.
- 12 **Find the cause of bearing failures.** Bearings are built to last, so frequent failures may point to an installation or lubrication problem. SKF bearing analysis experts can identify the cause of bearing failure and help you prevent it in the future.

Abbreviated nomenclature for deep groove ball bearings and cylindrical roller bearings

Deep groove ball bearings (DGBB)

Example: 6200-2Z/C3

Table 1

	Designation	Description
External design (seals, snap ring groove, etc.)	NR	Snap ring groove in the outer ring, with snap ring
	-RS1, -2RS1	Contact seal, on one or both sides
	-RSH, -2RSH	Contact seal, on one or both sides
	-Z, -2Z	Shield on one or both sides
Cage design	J*	For other bearings: pressed steel cage, ball centered
	M	Machined brass cage, ball centered
	MA	Machined brass cage, outer ring centered
	TN9	Glass fiber reinforced PA66 cage, ball centered
	JEM**	C3 clearance, Pressed steel cage, and GJN grease for bearings capped on both sides

Clearance designations for DGBB and CRB

Table 2

	Designation	Description
Clearance	C1	Radial internal clearance smaller than C2
	C2	Radial internal clearance smaller than Normal
	CN* or C0*	Normal radial internal clearance
	C3	Radial internal clearance greater than Normal
	C4	Radial internal clearance greater than C3

Cylindrical roller bearings (CRB)

Example: NU 310 ECM/C3

Table 3

	Designation	Description
Basic descriptions	NU	Two internal flanges on outer ring, flangeless inner ring
	N	Two internal flanges on internal ring, flangeless outer ring
	NJ	One flange on inner ring, two flanges on outer ring
Internal design	EC	Optimized internal design incorporating more and/or larger rollers and with modified roller end / flange contact
Cage design	J	Stamped steel cage, roller centered
	M	Machined brass cage, roller centered
	MA	Machined brass cage, outer ring centered
	ML	Machined brass cage, window-type, inner or outer ring centered (depending on bearing design)
	P	Glass fiber reinforced PA66 cage, roller centered

* Not marked on bearing or package.

** Marked on package but not marked on bearing.

For full nomenclature guide, please reference SKF bearings and mounted product guide (100-700) or the information on skf.com.

Aftermarket designation suffix “JEM” for deep groove ball bearings

SKF uses the suffix designation “JEM” for bearings that are used in electric motor applications. The “J” designates a pressed steel cage and “EM” designates electric motor quality as required by most electric motor customers. Several characteristics are included within this “EM” specification, such as:

- C3 radial internal clearance
- QE6 noise specification
- Capped bearings are filled with a high-quality polyurea-thickened grease Mobil Polyrex[®] EM designated by the SKF suffix “GJN”

The suffix designation “J” and “QE6” are not marked on the bearing since the pressed steel cage (J) and quiet running noise specification (QE6) are standard on all SKF Explorer deep groove ball bearings.

The “JEM” designation is used primarily for SKF’s aftermarket business and is only marked on the package. The bearing itself will not be marked with “JEM”. The designation marked on the bearing depends on whether it is open, has shields (2Z) or has contact seals (2RSH or 2RS1). The contact seal design depends on the bearing size:

Contact seal design	6000 series	6200 series	6300 series
RSH, 2RSH	6000 to 6005	6200 to 6205	6300 to 6304
RS1, 2RS1	6006 and up	6206 and up	6305 and up

An open bearing, bearing with one shield or bearing with one seal does not typically come filled with grease (but would be covered with a preservative). Here are some examples of the difference between the designation on the box and on the bearing:

Box designation	Bearing designation	Grease
6205 JEM	6205/C3	none
6308 ZJEM	6308-Z/C3	none
6203 2RSJEM	6203-2RSH/C3GJN	Mobil Polyrex® EM
6310 2RSJEM	6310-2RS1/C3GJN	Mobil Polyrex® EM

Speed limitations

Bearing type and size, internal design, load, lubrication and cooling conditions as well as cage design, accuracy and internal clearance all play a part in determining speed capability. The speed rating tables provide two speed ratings:

- The Reference Speed, which is based on thermal conditions
- The Limiting Speed, which is based on mechanical limits.

Both speed ratings are cautionary limits, rather than strict prohibiting limits, but approaching either of them signals that deeper analysis of the operating conditions is required. Typically, the limiting speed determines the maximum speed for capped bearings. For more information about speed limitations, please review information on skf.com or contact SKF Applications Engineering for advice.

Speed ratings

In the following tables, the basic bearing designation is used to represent a group of complete part designations. For specific tolerance classes and corresponding fits, see SKF Bearing Installation and Maintenance Guide (140-710).

Speed ratings (RPM)

Deep groove ball bearings

6200 & 6300 series

Basic bearing designation	double sealed limiting r/min	double shielded limiting r/min	open limiting r/min	reference speed r/min
6200	17,000	28,000	36,000	56,000
6201	15,000	26,000	32,000	50,000
6202	13,000	22,000	28,000	43,000
6203	12,000	19,000	24,000	38,000
6204	10,000	17,000	20,000	32,000
6205	8,500	14,000	18,000	28,000
6206	7,500	12,000	15,000	24,000
6207	6,300	10,000	13,000	20,000
6208	5,600	9,000	11,000	18,000
6209	5,000	8,500	11,000	17,000
6210	4,800	8,000	10,000	15,000
6211	4,300	7,000	9,000	14,000
6212	4,000	6,300	8,000	13,000
6213	3,600	6,000	7,500	12,000
6214	3,400	5,600	7,000	11,000
6215	3,200	5,300	6,700	10,000
6216	3,000	4,800	6,000	9,500
6217	2,800	4,500	5,600	9,000
6218	2,600	4,300	5,300	8,500
6219	2,400	4,000	5,000	8,000
6220	2,400	3,800	4,800	7,500
6221	-	3,600	4,500	7,000
6222	2,000	3,400	4,300	6,700
6224	1,900	3,200	4,000	6,300
6226	1,800	3,000	3,600	5,600
6228	-	-	3,400	5,300
6230	-	-	3,200	5,000
6232	-	-	3,000	4,500
6234	-	-	3,800*	4,300
6236	-	-	3,800*	4,000
6238	-	-	3,400*	3,800
6240	-	-	3,200*	3,600

Note: Low-friction seals (2RZ, 2RSL) and double shielded (2Z) bearings use same speed ratings. Single enclosure (Z, RSL, RZ) and open bearings use the same speed ratings.

*Brass cage variants.

Speed ratings (RPM)

Deep groove ball bearings

6200 & 6300 series

Basic bearing designation	double sealed limiting r/min	double shielded limiting r/min	open limiting r/min	reference speed r/min
6300	15,000	26,000	32,000	50,000
6301	14,000	22,000	28,000	45,000
6302	12,000	19,000	24,000	38,000
6303	11,000	17,000	22,000	34,000
6304	9,500	15,000	19,000	30,000
6305	7,500	13,000	16,000	24,000
6306	6,300	11,000	13,000	20,000
6307	6,000	9,500	12,000	19,000
6308	5,000	8,500	11,000	17,000
6309	4,500	7,500	9,500	15,000
6310	4,300	6,700	8,500	13,000
6311	3,800	6,300	8,000	12,000
6312	3,400	5,600	7,000	11,000
6313	3,200	5,300	6,700	10,000
6314	3,000	5,000	6,300	9,500
6315	2,800	4,500	5,600	9,000
6316	2,600	4,300	5,300	8,500
6317	2,400	4,000	5,000	8,000
6318	2,400	3,800	4,800	7,500
6319	2,200	3,600	4,500	7,000
6320	2,000	3,400	4,300	6,700
6321	–	3,200	4,000	6,300
6322	–	–	3,800	6,000
6324	1,700	2,800	3,400	5,600
6326	–	–	3,200	5,000
6328	–	–	4,300*	4,800
6330	–	–	4,000*	4,300
6332	–	–	3,800*	4,000
6334	–	–	3,400*	3,800
6336	–	–	3,200*	3,600
6338	–	–	3,000*	3,400

Note: Low-friction seals (2RZ, 2RSL) and double shielded (2Z) bearings use same speed ratings. Single enclosure (Z, RSL, RZ) and open bearings use the same speed ratings.

*Brass cage variants.

Speed ratings (RPM)

Cylindrical roller bearings

NU, N, NJ 200 EC series

Basic bearing designation	reference speed r/min	limiting speed r/min J cage	M cage	ML cage	P cage
202	22,000	–	–	–	26,000
203	20,000	–	–	34,000	22,000
204	17,000	–	–	30,000	19,000
205	15,000	16,000	–	26,000	16,000
206	13,000	14,000	–	22,000	14,000
207	11,000	12,000	12,000	18000	12,000
208	9,500	1,1000	11,000	16000	11,000
209	9,000	9,500	9,500	15000	9,500
210	8,500	9,000	9,000	14000	9,000
211	7,500	8,000	8,000	13000	8,000
212	6,700	7,500	7,500	11,000	7,500
213	6,300	6,700	6,700	10,000	6,700
214	6,000	6,300	6,300	10,000	6,300
215	5,600	6,000	6,000	9,500	6,000
216	5,300	5,600	5,600	8,500	5,600
217	4,800	5,300	5,300	8,000	5300
218	4,500	5,000	5,000	7,500	5000
219	4,300	4,800	4,800	7,000	4800
220	4,000	4,500	4,500	6,700	4500
221	3,800	4,300	–	6,300	4300
222	3,600	4,000	4,000	6,000	4,000
224	3,400	3,600	3,600	5,600	3,600
226	3,200	3,400	3,400	5,300	3,400
228	2,800	3,200	3,200	4,800	–
230	2,600	2,800	2,800	4,500	–
232	2,400	–	2,600	4,000	–
234	2,200	–	2,400	3,800	–
236	2,200	–	2,400	3,600	–
238	2,000	–	2,200	3,400	–
240	1,900	–	2,200	3,200	–

Note: Cylindrical roller bearing limiting speeds depend on the cage type.

Speed ratings (RPM)

Cylindrical roller bearings
NU, N, NJ 300 EC series

Basic bearing designation	reference speed r/min	limiting speed r/min	M cage	ML cage	P cage
303	17,000	–	–	–	20,000
304	15,000	–	–	–	18,000
305	12,000	15,000	–	22,000	15,000
306	11,000	12,000	–	19,000	12,000
307	9,500	11,000	11,000	17,000	11,000
308	8,000	9,500	9,500	15,000	9,500
309	7,500	8,500	8,500	13,000	8,500
310	6,700	8,000	8,000	12,000	8,000
311	6,000	7,000	7,000	11,000	7,000
312	5,600	6,700	6,700	10,000	6,700
313	5,300	6,000	6,000	9,500	6,000
314	4,800	5,600	5,600	8,500	5,600
315	4,500	5,300	5,300	8,000	5,300
316	4,300	5,000	5,000	7,500	5,000
317	4,000	4,800	4,800	–	4,800
318	3,800	4,500	4,500	6,700	4,500
319	3,600	4,300	4,300	6,300	4,300
320	3,200	3,800	3,800	6,000	3,800
321	3,200	3,800	–	5,600	3,800
322	3,000	3,400	3,400	5,300	3,400
324	2,800	3,200	3,200	5,000	3,200
326	2,400	3,000	3,000	4,500	3,000
328	2,400	2,800	2,800	4,300	–
330	2,200	–	2,600	4,000	–
332	2,000	–	2,400	3,600	–
334	1,700	–	2,200	–	–
336	1,600	–	2,200	–	–
338	1,500	–	2,000	–	–
340	1,400	–	–	2,800	–

Note: Cylindrical roller bearing limiting speeds depend on the cage type.

Recommended shaft and housing diameters

Deep groove ball bearings

6200 series

Basic bearing desig.	brg. bore dia. (mm)	shaft dia. (in.)		ISO tolerance	brg. outside dia. (mm)	housing dia. (in.) (ISO tolerance H6)	
		max.	min.			max.	min.
6200	10	0.3939	0.3936	j5	30	1.1816	1.1811
6201	12	0.4726	0.4723	j5	32	1.2604	1.2598
6202	15	0.5908	0.5905	j5	35	1.3786	1.3780
6203	17	0.6695	0.6692	j5	40	1.5754	1.5748
6204	20	0.7878	0.7875	k5	47	1.8510	1.8504
6205	25	0.9847	0.9844	k5	52	2.0479	2.0472
6206	30	1.1815	1.1812	k5	62	2.4416	2.4409
6207	35	1.3785	1.3781	k5	72	2.8353	2.8346
6208	40	1.5753	1.5749	k5	80	3.1503	3.1496
6209	45	1.7722	1.7718	k5	85	3.3474	3.3465
6210	50	1.9690	1.9686	k5	90	3.5442	3.5433
6211	55	2.1660	2.1655	k5	100	3.9379	3.9370
6212	60	2.3628	2.3623	k5	110	4.3316	4.3307
6213	65	2.5597	2.5592	k5	120	4.7253	4.7244
6214	70	2.7565	2.7560	k5	125	4.9223	4.9213
6215	75	2.9534	2.9529	k5	130	5.1191	5.1181
6216	80	3.1502	3.1497	k5	140	5.5128	5.5118
6217	85	3.3472	3.3466	k5	150	5.9065	5.9055
6218	90	3.5440	3.5434	k5	160	6.3002	6.2992
6219	95	3.7409	3.7403	k5	170	6.6939	6.6929
6220	100	3.9377	3.9371	k5	180	7.0876	7.0866
6221	105	4.1350	4.1344	m5	190	7.4814	7.4803
6222	110	4.3318	4.3312	m5	200	7.8751	7.8740
6224	120	4.7255	4.7249	m5	215	8.4657	8.4646
6226	130	5.1194	5.1187	m5	230	9.0562	9.0551
6228	140	5.5131	5.5124	m5	250	9.8436	9.8425
6230	150	5.9071	5.9061	m6	270	10.6312	10.6299
6232	160	6.3008	6.2998	m6	290	11.4186	11.4173
6234	170	6.6945	6.6935	m6	310	12.2060	12.2047
6236	180	7.0882	7.0872	m6	320	12.5998	12.5984
6238	190	7.4821	7.4810	m6	340	13.3872	13.3858
6240	200	7.8758	7.8747	m6	360	14.1746	14.1732

Note: Diameters shown are based on normal loads, operating temperatures, and current industry fitting practices. See SKF Bearing Installation and Maintenance Guide (140-710) for specific tolerance classes and corresponding fits.

Recommended shaft and housing diameters

Deep groove ball bearings

6300 series

Basic bearing desig.	brg. bore dia. (mm)	shaft dia. (in.)		ISO tolerance	brg. outside dia. (mm)	housing dia. (in.) (ISO tolerance H6)	
		max.	min.			max.	min.
6300	10	0.3939	0.3936	j5	35	1.3786	1.3780
6301	12	0.4726	0.4723	j5	37	1.4573	1.4567
6302	15	0.5908	0.5905	j5	42	1.6541	1.6535
6303	17	0.6695	0.6692	j5	47	1.8510	1.8504
6304	20	0.7878	0.7875	k5	52	2.0479	2.0472
6305	25	0.9847	0.9844	k5	62	2.4416	2.4409
6306	30	1.1815	1.1812	k5	72	2.8353	2.8346
6307	35	1.3785	1.3781	k5	80	3.1503	3.1496
6308	40	1.5753	1.5749	k5	90	3.5442	3.5433
6309	45	1.7722	1.7718	k5	100	3.9379	3.9370
6310	50	1.9690	1.9686	k5	110	4.3316	4.3307
6311	55	2.1660	2.1655	k5	120	4.7253	4.7244
6312	60	2.3628	2.3623	k5	130	5.1191	5.1181
6313	65	2.5597	2.5592	k5	140	5.5128	5.5118
6314	70	2.7565	2.7560	k5	150	5.9065	5.9055
6315	75	2.9534	2.9529	k5	160	6.3002	6.2992
6316	80	3.1502	3.1497	k5	170	6.6939	6.6929
6317	85	3.3472	3.3466	k5	180	7.0876	7.0866
6318	90	3.5440	3.5434	k5	190	7.4814	7.4803
6319	95	3.7409	3.7403	k5	200	7.8751	7.8740
6320	100	3.9377	3.9371	k5	215	8.4657	8.4646
6321	105	4.1350	4.1344	m5	225	8.8594	8.8583
6322	110	4.3318	4.3312	m5	240	9.4499	9.4488
6324	120	4.7255	4.7249	m5	260	10.2375	10.2362
6326	130	5.1194	5.1187	m5	280	11.0249	11.0236
6328	140	5.5131	5.5124	m5	300	11.8123	11.8110
6330	150	5.9071	5.9061	m6	320	12.5998	12.5984
6332	160	6.3008	6.2998	m6	340	13.3872	13.3858
6334	170	6.6945	6.6935	m6	360	14.1746	14.1732
6336	180	7.0882	7.0872	m6	380	14.9620	14.9606
6338	190	7.4821	7.4810	m6	400	15.7494	15.7480
6340	200	7.8758	7.8747	m6	420	16.5370	16.5354

Note: Diameters shown are based on normal loads, operating temperatures, and current industry fitting practices. See SKF Bearing Installation and Maintenance Guide (140-710) for specific tolerance classes and corresponding fits.

Recommended shaft and housing diameters

Cylindrical roller bearings

NU, N, NJ 200 EC series

Basic bearing desig.	brg. bore dia. (mm)	shaft dia. (in.)		ISO tolerance	brg. outside dia. (mm)	housing dia. (in.) (ISO tolerance H6)	
		max.	min.			max.	min.
202	15	0.5911	0.5906	k6	35	1.3786	1.3780
203	17	0.6698	0.6693	k6	40	1.5754	1.5748
204	20	0.7880	0.7875	k6	47	1.8510	1.8504
205	25	0.9849	0.9844	k6	52	2.0479	2.0472
206	30	1.1817	1.1812	k6	62	2.4416	2.4409
207	35	1.3788	1.3784	m5	72	2.8353	2.8346
208	40	1.5756	1.5752	m5	80	3.1503	3.1496
209	45	1.7725	1.7721	m5	85	3.3474	3.3465
210	50	1.9693	1.9689	m5	90	3.5442	3.5433
211	55	2.1667	2.1662	n5	100	3.9379	3.9370
212	60	2.3635	2.3630	n5	110	4.3316	4.3307
213	65	2.5604	2.5599	n5	120	4.7253	4.7244
214	70	2.7574	2.7567	n6	125	4.9223	4.9213
215	75	2.9543	2.9536	n6	130	5.1191	5.1181
216	80	3.1511	3.1504	n6	140	5.5128	5.5118
217	85	3.3483	3.3474	n6	150	5.9065	5.9055
218	90	3.5451	3.5442	n6	160	6.3002	6.2992
219	95	3.7420	3.7411	n6	170	6.6939	6.6929
220	100	3.9388	3.9379	n6	180	7.0876	7.0866
221	105	4.1362	4.1354	p6	190	7.4814	7.4803
222	110	4.3330	4.3322	p6	200	7.8751	7.8740
224	120	4.7267	4.7259	p6	215	8.4657	8.4646
226	130	5.1208	5.1198	p6	230	9.0562	9.0551
228	140	5.5145	5.5135	p6	250	9.8436	9.8425
230	150	5.9082	5.9072	p6	270	10.6312	10.6299
232	160	6.3019	6.3009	p6	290	11.4186	11.4173
234	170	6.6956	6.6946	p6	310	12.2060	12.2047
236	180	7.0893	7.0883	p6	320	12.5998	12.5984
238	190	7.4834	7.4823	p6	340	13.3872	13.3858
240	200	7.8771	7.8760	p6	360	14.1746	14.1732

Note: Diameters shown are based on normal loads, operating temperatures, and current industry fitting practices. See SKF Bearing Installation and Maintenance Guide (140-710) for specific tolerance classes and corresponding fits.

Recommended shaft and housing diameters

Cylindrical roller bearings

NU, N, NJ 300 EC series

Basic bearing desig.	brg. bore dia. (mm)	shaft dia. (in.)		ISO tolerance	brg. outside dia. (mm)	housing dia. (in.) (ISO tolerance H6)	
		max.	min.			max.	min.
303	17	0.6698	0.6693	k6	47	1.8510	1.8504
304	20	0.7880	0.7875	k6	52	2.0479	2.0472
305	25	0.9849	0.9844	k6	62	2.4416	2.4409
306	30	1.1817	1.1812	k6	72	2.8353	2.8346
307	35	1.3788	1.3784	m5	80	3.1503	3.1496
308	40	1.5756	1.5752	m5	90	3.5442	3.5433
309	45	1.7725	1.7721	m5	100	3.9379	3.9370
310	50	1.9693	1.9689	m5	110	4.3316	4.3307
311	55	2.1667	2.1662	n5	120	4.7253	4.7244
312	60	2.3635	2.3630	n5	130	5.1191	5.1181
313	65	2.5604	2.5599	n5	140	5.5128	5.5118
314	70	2.7574	2.7567	n6	150	5.9065	5.9055
315	75	2.9543	2.9536	n6	160	6.3002	6.2992
316	80	3.1511	3.1504	n6	170	6.6939	6.6929
317	85	3.3483	3.3474	n6	180	7.0876	7.0866
318	90	3.5451	3.5442	n6	190	7.4814	7.4803
319	95	3.7420	3.7411	n6	200	7.8751	7.8740
320	100	3.9388	3.9379	n6	215	8.4657	8.4646
321	105	4.1362	4.1354	p6	225	8.8594	8.8583
322	110	4.3330	4.3322	p6	240	9.4499	9.4488
324	120	4.7267	4.7259	p6	260	10.2375	10.2362
326	130	5.1208	5.1198	p6	280	11.0249	11.0236
328	140	5.5145	5.5135	p6	300	11.8123	11.8110
330	150	5.9082	5.9072	p6	320	12.5998	12.5984
332	160	6.3019	6.3009	p6	340	13.3872	13.3858
334	170	6.6956	6.6946	p6	360	14.1746	14.1732
336	180	7.0893	7.0883	p6	380	14.9620	14.9606
338	190	7.4834	7.4823	p6	400	15.7494	15.7480
340	200	7.8771	7.8760	p6	420	16.5370	16.5354

Note: Diameters shown are based on normal loads, operating temperatures, and current industry fitting practices. See SKF Bearing Installation and Maintenance Guide (140-710) for specific tolerance classes and corresponding fits.

Shoulder dimensions for shafts and housings

Deep groove ball bearings

6200 series

Basic bearing desig.	d mm	shaft shoulder		D mm	housing shoulder		shaft & housing corner max. in
		d _a min. in	d _a max. in		D _a max. in	D _a min in	
6200	10	0.5591	0.5906	30	1.0157	0.9757	0.0236
6201	12	0.6378	0.6496	32	1.0945	1.0545	0.0236
6202	15	0.7559	0.7638	35	1.2136	1.1736	0.0236
6203	17	0.8346	0.8661	40	1.4094	1.3694	0.0236
6204	20	1.0079	1.0236	47	1.6299	1.5899	0.0394
6205	25	1.2047	1.2402	52	1.8268	1.7868	0.0394
6206	30	1.4016	1.4216	62	2.2205	2.1805	0.0394
6207	35	1.6535	1.6735	72	2.5591	2.5191	0.0394
6208	40	1.8504	1.8704	80	2.8740	2.8340	0.0394
6209	45	2.0470	2.0670	85	3.0709	3.0309	0.0394
6210	50	2.2441	2.2641	90	3.2677	3.2277	0.0394
6211	55	2.5197	2.5397	100	3.5827	3.5427	0.0591
6212	60	2.7165	2.7365	110	3.9764	3.9364	0.0591
6213	65	2.9134	2.9334	120	4.3701	4.3301	0.0591
6214	70	3.1102	3.1302	125	4.5669	4.5269	0.0591
6215	75	3.0710	3.0910	130	4.7638	4.7238	0.0591
6216	80	3.5827	3.6027	140	5.0787	5.0387	0.0787
6217	85	3.7795	3.7995	150	5.4724	5.4324	0.0787
6218	90	3.9764	4.1339	160	5.8661	5.8261	0.0787
6219	95	4.2126	4.3701	170	6.2205	6.1805	0.0787
6220	100	4.4094	4.6063	180	6.6142	6.5342	0.0787
6221	105	4.6063	4.8819	190	7.0079	6.9279	0.0787
6222	110	4.8031	4.8431	200	7.4016	7.3216	0.0787
6224	120	5.1969	5.2369	215	7.9921	7.9121	0.0787
6226	130	5.6693	5.7093	230	8.5039	8.4239	0.0984
6228	140	6.0630	6.1030	250	9.2913	9.2113	0.0984
6230	150	6.4567	6.4967	270	10.0787	9.9987	0.0984
6232	160	6.8504	6.8904	290	10.8661	10.7861	0.0984
6234	170	7.3622	7.4022	310	11.5354	11.4554	0.1181
6236	180	7.7559	7.7959	320	11.9291	11.8491	0.1181
6238	190	8.1496	8.1896	340	12.7165	12.6365	0.1181
6240	200	8.5433	8.5833	360	13.5039	13.4239	0.1181

Shoulder dimensions for shafts and housings

Deep groove ball bearings

6300 series

Basic bearing desig.	d mm	shaft shoulder		D mm	housing shoulder		shaft & housing corner max. in
		d _a min. in	d _a max. in		D _a max. in	D _a min in	
6300	10	0.5591	0.6102	35	1.2126	1.1726	0.0236
6301	12	0.6929	0.7129	37	1.2362	1.1962	0.0394
6302	15	0.8110	0.8268	42	1.4331	1.3931	0.0394
6303	17	0.8898	0.9252	47	1.6299	1.5899	0.0394
6304	20	1.0630	1.0830	52	1.7717	1.7317	0.0394
6305	25	1.2598	1.2798	62	2.1654	2.1254	0.0394
6306	30	1.4567	1.4767	72	2.5591	2.5191	0.0394
6307	35	1.7323	1.7523	80	2.7953	2.7553	0.0591
6308	40	1.9291	1.9491	90	3.1890	3.1490	0.0591
6309	45	2.1260	2.1460	100	3.5827	3.5427	0.0591
6310	50	2.3228	2.3428	110	3.9764	3.9364	0.0787
6311	55	2.5984	2.6184	120	4.2913	4.2513	0.0787
6312	60	2.8346	2.8546	130	4.6457	4.6057	0.0787
6313	65	3.0315	3.0515	140	5.0394	4.9994	0.0787
6314	70	3.2283	3.2483	150	5.4331	5.3931	0.0787
6315	75	3.4252	3.4452	160	5.8268	5.7868	0.0787
6316	80	3.6220	3.6420	170	6.2205	6.1805	0.0787
6317	85	3.8976	3.9176	180	6.5354	6.4554	0.0984
6318	90	4.0945	4.1145	190	6.9291	6.8491	0.0984
6319	95	4.2913	4.7244	200	7.3228	7.2428	0.0984
6320	100	4.4882	4.5282	215	7.9134	7.8334	0.0984
6321	105	4.6850	4.7250	225	8.3071	8.2271	0.0984
6322	110	4.8819	4.9219	240	8.8976	8.8176	0.0984
6324	120	5.2756	5.3156	260	9.6850	9.6050	0.0984
6326	130	5.7874	5.8274	280	10.3543	10.2743	0.1181
6328	140	6.1811	6.2211	300	11.1417	11.0617	0.1181
6330	150	6.5748	6.6148	320	11.9291	11.8491	0.1181
6332	160	6.9685	7.0085	340	12.7165	12.6365	0.1181
6334	170	7.3622	7.4022	360	13.5039	13.4239	0.1181
6336	180	7.7559	7.7959	380	14.2913	14.2113	0.1181
6338	190	8.2677	8.3077	400	14.9606	14.8806	0.1575

Fight against

INSOCOAT bearings protect your machines from electrical erosion, ensuring an increased reliability and machine uptime

Stray electric currents can be drastic for your machinery: they can cause damage over time, resulting in costly maintenance and loss of valuable uptime.

With its latest generation of insulated bearings, SKF has raised the performance standard:

- Providing robust and effective protection in challenging conditions
- Combining bearings and insulation in one high performance solution
- Is the perfect match for industrial electric motors and generators



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Minimum radial load requirements

Cylindrical roller bearings

NU, N, NJ 200 EC series

Basic bearing designation	Minimum radial load required @		
	900 rpm lb	1800 rpm lb	3600 rpm lb
202	13	14	15
203	17	18	19
204	24	25	26
205	32	33	35
206	45	47	51
207	62	65	71
208	78	83	92
209	92	97	109
210	107	114	128
211	132	141	161
212	160	173	199
213	190	207	240
214	212	231	270
215	236	259	304
216	273	301	356
217	315	350	420
218	359	401	485
219	405	455	554
220	457	516	635
221	510	580	719
222	568	649	811
224	668	769	969
226	779	902	1,148*
228	935	1,100	1,429*
230	1,099	1,305	1,716*
232	1,281	1,537	2,049*
234	1,484	1,802	2,437*
236	1,610	1,955	2,645*
238	1,848	2,274	–
240	2,088	2,589	–

Note: Minimum radial loads are necessary for satisfactory rolling bearing operation. This is particularly true for roller bearings running at high speeds, where inertia forces and friction from the lubricant may cause damaging sliding –rather than rolling–movements between the rollers and raceways. * ML cage only

Minimum radial load requirements

Cylindrical roller bearings

NU, N, NJ 300 EC series

Basic bearing designation	Minimum radial load required @		
	900 rpm lb	1800 rpm lb	3600 rpm lb
303	22	23	24
304	28	29	31
305	41	43	46
306	56	59	65
307	72	76	84
308	92	99	112
309	115	124	141
310	142	153	176
311	171	186	217
312	203	222	261
313	237	261	309
314	276	307	368
315	317	354	429
316	361	405	493
317	409	462	569
318	460	522	648
319	514	587	734
320	597	691	879
321	655	758	964
322	744	868	1,116*
324	887	1,044	1,357*
326	1,063	1,276	1,701*
328	1,225	1,469	1,959*
330	1,423	1,727	2,337*
332	1,644	2,024	2,783*
334	1,923	2,424	–
336	2,182	2,776	–
338	2,466	3,170	–
340	2,778	3,611	–

Note: Minimum radial loads are necessary for satisfactory rolling bearing operation. This is particularly true for roller bearings running at high speeds, where inertia forces and friction from the lubricant may cause damaging sliding –rather than rolling–movements between the rollers and raceways. * ML cage only

Grease relube recommendation

Deep groove ball bearings

6200 series

Basic bearing designation	Quantity oz	Interval @ 900 rpm hr	1800 rpm hr	3600 rpm hr
6200	0.04	27,100	24,500	20,000
6201	0.07	26,800	24,000	19,200
6202	0.07	26,400	23,200	18,000
6203	0.07	26,000	22,500	16,900
6204	0.11	25,300	21,400	15,200
6205	0.14	24,600	20,200	13,600
6206	0.18	23,800	18,800	11,800
6207	0.21	22,900	17,500	10,200
6208	0.25	22,100	16,300	8,910
6209	0.28	21,600	15,500	8,050
6210	0.32	21,100	14,800	7,280
6211	0.35	20,300	13,700	6,250
6212	0.42	19,500	12,700	5,370
6213	0.49	18,800	11,700	4,590
6214	0.53	18,300	11,200	4,170
6215	0.56	17,900	10,600	3,770
6216	0.63	17,100	9,690	3,130
6217	0.74	16,500	9,090	2,760
6218	0.85	15,900	8,450	2,380
6219	0.95	15,300	7,850	2,060
6220	1.09	14,800	7,280	

Note: The relubrication intervals shown are based on a good quality lithium based grease at a maximum temperature of 160° F, and a $c/p=15$. Reduce the interval by half for each 27° F above 160° F, or for vertical applications. (High temperature greases, like polyurea, can operate for longer periods of time than those listed above.) Lubricate more often in applications where there is a risk of heavy solid and chemical contamination. Consult manufacturer or SKF Application Engineering for details.

LGHP 2 ball and roller bearing grease

LGHP 2 is a polyurea-based grease designed for use in electric motors. LGHP 2 meets strict SKF noise requirements. Each batch is blended and selected for consistency and adherence to quietness standards. The grease is also recommended for applications where long life is required.

With LGHP 2, users can often avoid compatibility problems when relubricating bearings. LGHP 2 is compatible with common polyurea and lithium thickened greases, as well as Mobil Polyrex® EM grease.

Grease relube recommendation

Deep groove ball bearings

6300 series

Basic bearing designation	Quantity oz	Interval @ 900 rpm hr	1800 rpm hr	3600 rpm hr
6300	0.07	26,800	24,000	19,100
6301	0.07	26,500	23,400	18,300
6302	0.11	25,900	22,400	16,800
6303	0.11	25,500	21,700	15,700
6304	0.14	25,000	20,800	14,500
6305	0.18	24,100	19,300	12,400
6306	0.25	23,100	17,700	10,500
6307	0.28	22,400	16,800	9,370
6308	0.35	21,600	15,500	8,050
6309	0.42	20,800	14,400	6,920
6310	0.53	20,000	13,400	5,950
6311	0.60	19,300	12,400	5,110
6312	0.71	18,600	11,500	4,390
6313	0.81	17,900	10,600	3,770
6314	0.92	17,200	9,860	3,240
6315	1.06	16,600	9,140	2,780
6316	1.16	15,900	8,470	2,390
6317	1.31	15,300	7,850	2,060
6318	1.45	14,800	7,280	–
6319	1.59	14,200	6,750	–
6320	1.80	13,500	6,100	–

Note: The relubrication intervals shown are based on a good quality lithium based grease at a maximum temperature of 160° F, and a $c/p=15$. Reduce the interval by half for each 27° F above 160° F, or for vertical applications. (High temperature greases, like polyurea, can operate for longer periods of time than those listed above.) Lubricate more often in applications where there is a risk of heavy solid and chemical contamination. Consult manufacturer or SKF Application Engineering for details.

Grease relube recommendation

Cylindrical roller bearings

NU, N, NJ 200 EC series

Basic bearing designation	Quantity oz	Interval @ 900 rpm hr	1800 rpm hr	3600 rpm hr
202	0.07	24,900	20,600	14,100
203	0.07	24,100	19,400	12,600
204	0.11	23,200	17,900	10,700
205	0.14	22,400	16,700	9,300
206	0.18	21,200	14,900	7,400
207	0.21	19,900	13,200	5,870
208	0.25	19,000	12,100	4,900
209	0.28	18,300	11,200	4,200
210	0.32	17,600	10,400	3,600
211	0.39	16,700	9,300	2,900
212	0.42	15,700	8,300	2,300
213	0.49	14,900	7,400	1,800
214	0.53	14,300	6,800	1,600
215	0.56	13,800	6,300	1,300
216	0.63	13,000	5,700	1,100
217	0.74	12,300	5,000	800
218	0.85	11,600	4,500	700
219	0.95	11,000	4,000	–
220	1.09	10,400	3,600	–

Note: The relubrication intervals shown are based on a good quality lithium based grease at a maximum temperature of 160° F, and a $c/p=15$. Reduce the interval by half for each 27° F above 160° F, or for vertical applications. (High temperature greases, can operate for longer periods of time than those listed above.) Lubricate more often in applications where there is a risk of heavy solid and chemical contamination. Consult manufacturer or SKF Application Engineering for details.

Grease relube recommendation

Cylindrical roller bearings

NU, N, NJ 300 EC series

Basic bearing designation	Quantity oz	Interval @ 900 rpm hr	1800 rpm hr	3600 rpm hr
303	0.11	23,500	18,500	11,400
304	0.14	22,800	17,400	10,100
305	0.18	21,600	15,500	8,000
306	0.25	20,400	13,800	6,400
307	0.28	19,400	12,500	5,200
308	0.35	18,300	11,200	4,200
309	0.46	17,300	10,000	3,300
310	0.53	16,400	8,900	2,600
311	0.6	15,400	8,000	2,100
312	0.71	14,600	7,100	1,700
313	0.81	13,800	6,300	1,300
314	0.92	13,000	5,700	1,100
315	1.06	12,300	5,000	800
316	1.16	11,600	4,500	700
317	1.31	11,000	4,000	–
318	1.45	10,400	3,600	–
319	1.59	9,800	3,200	–
320	1.80	9,100	2,700	–

Note: The relubrication intervals shown are based on a good quality lithium based grease at a maximum temperature of 160° F, and a $c/p=15$. Reduce the interval by half for each 27° F above 160° F, or for vertical applications. (High temperature greases, can operate for longer periods of time than those listed above.) Lubricate more often in applications where there is a risk of heavy solid and chemical contamination. Consult manufacturer or SKF Application Engineering for details.

SKF vibration data @ 1 rpm inner ring rotation

Deep groove ball bearings

6200 series

Basic bearing designation	inner ring defect freq. (Hz)	outer ring defect freq. (Hz)	cage train freq. (Hz)	ball defect freq. (Hz)
6200	0.083	0.051	0.006	0.066
6201	0.074	0.042	0.006	0.057
6202	0.083	0.051	0.006	0.066
6203	0.082	0.051	0.006	0.066
6204	0.082	0.051	0.006	0.066
6205	0.090	0.060	0.007	0.079
6206	0.091	0.059	0.007	0.077
6207	0.091	0.059	0.007	0.077
6208	0.090	0.060	0.007	0.078
6209	0.099	0.068	0.007	0.085
6210	0.098	0.068	0.007	0.089
6211	0.099	0.068	0.007	0.087
6212	0.099	0.068	0.007	0.086
6213	0.107	0.076	0.007	0.095
6214	0.107	0.076	0.007	0.095
6215	0.107	0.076	0.007	0.095
6216	0.116	0.084	0.007	0.104
6217	0.107	0.076	0.007	0.096
6218	0.107	0.076	0.007	0.095
6219	0.098	0.068	0.007	0.090
6220	0.098	0.068	0.007	0.089
6221	0.099	0.068	0.007	0.088
6222	0.099	0.068	0.007	0.087
6224	0.089	0.061	0.007	0.090
6226	0.088	0.062	0.007	0.092
6228	0.097	0.070	0.007	0.100
6230	0.106	0.078	0.007	0.108
6232	0.114	0.086	0.007	0.116

SKF vibration data @ 1 rpm inner ring rotation

Deep groove ball bearings

6300 series

Basic bearing designation	inner ring defect freq. (Hz)	outer ring defect freq. (Hz)	cage train freq. (Hz)	ball defect freq. (Hz)
6300	0.066	0.034	0.006	0.046
6301	0.066	0.034	0.006	0.046
6302	0.074	0.042	0.006	0.056
6303	0.074	0.042	0.006	0.057
6304	0.074	0.043	0.006	0.059
6305	0.074	0.043	0.006	0.059
6306	0.082	0.051	0.006	0.067
6307	0.082	0.051	0.006	0.067
6308	0.082	0.051	0.006	0.068
6309	0.083	0.051	0.006	0.065
6310	0.083	0.051	0.006	0.066
6311	0.082	0.051	0.006	0.067
6312	0.082	0.051	0.006	0.067
6313	0.082	0.051	0.006	0.067
6314	0.082	0.051	0.006	0.068
6315	0.082	0.051	0.006	0.069
6316	0.082	0.051	0.006	0.069
6317	0.082	0.051	0.006	0.069
6318	0.082	0.052	0.006	0.070
6319	0.082	0.052	0.006	0.070
6320	0.082	0.051	0.006	0.068
6321	0.082	0.051	0.006	0.068
6322	0.082	0.051	0.006	0.067
6324	0.081	0.052	0.007	0.073
6326	0.081	0.052	0.007	0.073
6328	0.081	0.052	0.007	0.073
6330	0.090	0.060	0.007	0.079

SKF vibration data @ 1 rpm inner ring rotation

Cylindrical roller bearings

NU, N, NJ 200 EC series

Basic bearing designation	inner ring defect freq. (Hz)	outer ring defect freq. (Hz)	cage train freq. (Hz)	ball defect freq. (Hz)
202	0.112	0.071	0.006	0.071
203	0.112	0.071	0.006	0.070
204	0.112	0.071	0.006	0.072
205	0.129	0.088	0.007	0.083
206	0.129	0.087	0.007	0.083
207	0.138	0.095	0.007	0.087
208	0.138	0.095	0.007	0.089
209	0.146	0.104	0.007	0.096
210	0.154	0.113	0.007	0.104
211	0.163	0.120	0.007	0.106
212	0.155	0.112	0.007	0.100
213	0.155	0.112	0.007	0.101
214	0.163	0.120	0.007	0.107
215	0.172	0.128	0.007	0.113
216	0.172	0.128	0.007	0.114
217	0.163	0.120	0.007	0.107
218	0.163	0.120	0.007	0.108
219	0.164	0.119	0.007	0.103
220	0.164	0.120	0.007	0.104
221	0.155	0.112	0.007	0.101
222	0.163	0.120	0.007	0.106
224	0.163	0.120	0.007	0.106
226	0.164	0.120	0.007	0.105
228	0.181	0.136	0.007	0.115
230	0.181	0.136	0.007	0.115
232	0.181	0.136	0.007	0.116

SKF vibration data @ 1 rpm inner ring rotation

Cylindrical roller bearings

NU, N, NJ 300 EC series

Basic bearing designation	inner ring defect freq. (Hz)	outer ring defect freq. (Hz)	cage train freq. (Hz)	ball defect freq. (Hz)
303	0.104	0.063	0.006	0.063
304	0.104	0.063	0.006	0.063
305	0.112	0.071	0.006	0.070
306	0.121	0.079	0.007	0.074
307	0.121	0.079	0.007	0.077
308	0.121	0.079	0.007	0.075
309	0.130	0.086	0.007	0.078
310	0.130	0.087	0.007	0.081
311	0.130	0.086	0.007	0.079
312	0.130	0.087	0.007	0.081
313	0.130	0.096	0.007	0.079
314	0.130	0.087	0.007	0.081
315	0.130	0.086	0.007	0.079
316	0.130	0.087	0.007	0.081
317	0.139	0.094	0.007	0.083
318	0.130	0.087	0.007	0.081
319	0.139	0.095	0.007	0.086
320	0.130	0.087	0.007	0.080
321	0.130	0.096	0.007	0.078
322	0.139	0.094	0.007	0.084
324	0.130	0.087	0.007	0.081
326	0.139	0.094	0.007	0.083
328	0.139	0.095	0.007	0.085
330	0.139	0.095	0.007	0.085
332	0.139	0.094	0.007	0.084
232	0.181	0.136	0.007	0.116

ABMA → SKF

Product number comparison

90	BC	03	J	PP	N	3	0	X	
1	2	3	4	5	6	7	8	9	10

6	3	18	2Z	N			C3		GJN
2	3	1	5	6	4	8	7	10	9

Symbols

ABMA	SKF	Description
<i>1. Bore diameter</i>		
90	XX18	ABMA/5 = SKF exc. 17 = XX03 15 = XX02 12 = XX01 10 = XX00
<i>2. Bearing type</i>		
BC	6XXX	Conrad DGBB
BL	XXX	maximum capacity DGBB
BT	7XXX B	angular contact (40°)
RU	NU XXX EC	cylindrical roller
RN	N XXX EC	cylindrical roller
RJ	NJ XXX EC	cylindrical roller
<i>3. Dimension series</i>		
00	X0XX	extra light
02	X2XX	light
03	X3XX	medium
04	X4XX	heavy
<i>4. Cage type</i>		
X	–	any type
J	J	pressed steel
Y, K	Y	pressed brass
M	M	machined brass
<i>5. Seals/shields or duplex mounting</i>		
X	–	character separator
P	Z	(PP ' 2Z, two shields)
E	RS,RS1,RSH	(EE ' 2RS, two seals)
RR	DB	duplex back-to-back
UU	DF	duplex face-to-face
TT	DT	duplex tandem

ABMA → SKF

Product number comparison

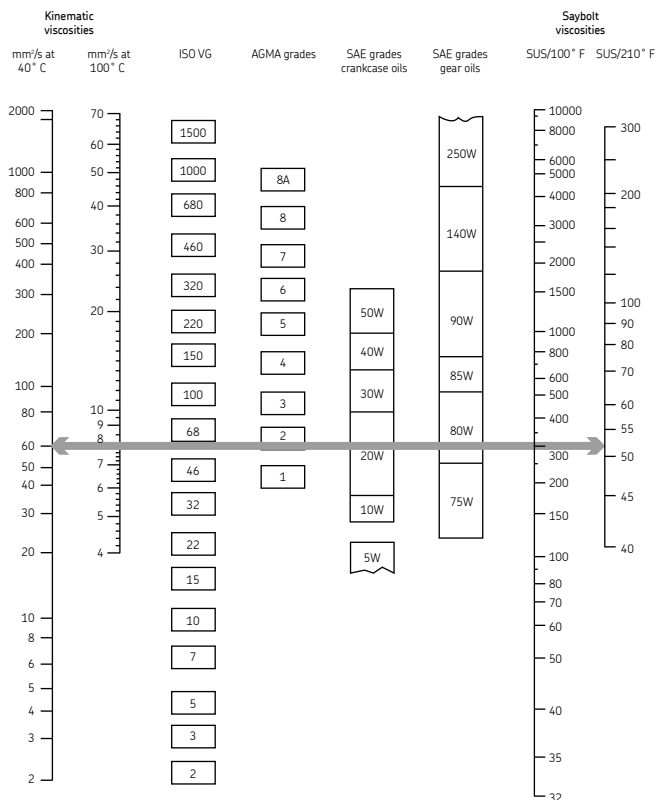
90	BC	03	J	PP	N	3	0	X		
1	2	3	4	5	6	7	8	9	10	

6	3	18	2Z	N				C3		GJN
2	3	1	5	6	4	8	7	10	9	

Symbols

ABMA	SKF	Description
<i>6. Snap ring and groove</i>		
N	N	groove without snap ring
A	NB	groove without ring on same side as seal/shield
G	NR	groove with snap ring
C	NBR	groove without snap ring on same side as seal/shield
<i>7. Radial clearance/preload</i>		
0	–	normal clearance
1	C1	tighter than C2
2	C2	tighter than normal
3	C3	looser than normal
4	C4	looser than C3
5	C5	looser than C4
<i>8. Tolerance class</i>		
0	–	normal, ABEC1, ISO P7
6	P6	ABEC 3, ISO P6
5	P5	ABEC 5, ISO P5
4	P4	ABEC 7, ISO P4
2	P9A	ABEC 9
<i>9. Lubricant</i>		
X	–	any slush or grease
A	–	refer to manufacturer
<i>10. Special features</i>		
X26	–	(consult SKF Engineering)
X27	S0	heat stabilized to 150° C
X28	S1	heat stabilized to 200° C

Comparative Viscosity Classifications



Viscosities based on 95 VI single-grade oils.
 ISO grades are specified at 40° C.
 AGMA grades are specified at 100° F.
 SAE 75W, 80W, 85W, and 5 and 10W
 specified at low temperature (below -17° F = 0° C).
 Equivalent viscosities for 100° F and 210° F are shown.
 SAE 90 to 250 and 20 to 50 specified at 210° F (100° C).

Comparison of various viscosity classification methods

NOTE: ISO mineral lubricants are recommended over SAE and AGMA lubricants for centrifugal pump applications.

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