

INSOCOAT bearings

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INSOCOAT bearings

Rolling bearings in electric motors, generators or associated equipment are at risk from the passage of electric current, which can damage the surfaces of rolling elements and raceways in the bearing and degrade the grease rapidly. The risk of damage, so called electric erosion, increases greatly if a frequency converter controls the electrical machinery, which is becoming increasingly common. An additional risk for high frequency bearing currents occurs in the application due to the inherent stray capacitances within the electrical machinery.

To protect the bearings against electric current passage, SKF has developed INSOCOAT bearings – electrically insulated rolling bearings (→ **fig. 1**). An INSOCOAT bearing is a very economical solution compared with other insulation methods to protect the bearing. By integrating the electrical insulation function into the bearing, SKF has been able to increase reliability and machine uptime by virtually eliminating electric erosion problems.

INSOCOAT bearings have a nominal 100 µm thick layer of aluminium oxide on the exterior surfaces of the outer or inner ring, that can withstand voltages up to 1 000 V DC. The SKF plasma spray coating technique provides an extremely coherent coating of uniform thickness, which is further treated to make it insensitive to moisture and humidity.

INSOCOAT bearings are robust and should be handled in the same way as normal non-insulated bearings.

Fig. 1



INSOCOAT bearing designs

INSOCOAT bearings are available from stock as

- single row deep groove ball bearings
- single row cylindrical roller bearings

in the most frequently used sizes and variants. The performance data as well as the dimensional and running accuracy of the INSOCOAT bearings are identical to those of standard non-insulated bearings.

The SKF standard range includes bearings either with coated outer ring or coated inner ring of open design. Deep groove ball bearings with Z shields or with RS1 contact seals can also be supplied by SKF. Before deciding upon design and ordering, please consult the SKF application engineering service.

INSOCOAT bearings with coated outer ring

Bearings with electrically insulating coating on the external surfaces of the outer ring are the most common INSOCOAT bearings. They are identified by the suffix VL0241.

For applications where smaller bearings are needed than listed in the product table on **page 916**, SKF recommends the use of hybrid deep groove ball bearings (→ **page 897**).

INSOCOAT bearings with coated inner ring

Bearings with electrically insulating coating on the external surfaces of the inner ring (→ **fig. 2**) provide enhanced protection against electric erosion due to the increased impedance because of the smaller coated surface area. They are identified by the suffix VL2071.

Other INSOCOAT bearings

If the standard range of INSOCOAT deep groove ball bearings and cylindrical roller bearings is inadequate please contact the SKF application engineering service for information about the complete manufacturing programme of INSOCOAT bearings. Other types and sizes of INSOCOAT bearings that are not listed in the standard range and INSOCOAT bearings with an aluminium-oxide layer up to 300 µm thickness on the bearing outer ring are available on request.



Bearing data – general

Dimensions

The boundary dimensions of INSOCOAT deep groove ball bearings as well as cylindrical roller bearings are in accordance with ISO 15:1998.

Tolerances

The INSOCOAT bearings are produced to Normal tolerances. Some deep groove ball bearings are also available with higher accuracy to tolerance class P5. The values of the tolerances conform to ISO 492:2002 and are shown in **tables 3 and 5** on **pages 125 and 127**.

The aluminium-oxide layer applied either to the external surfaces of the outer ring or the inner ring does not influence the accuracy.

Internal clearance

INSOCOAT deep groove ball bearings and cylindrical roller bearings are manufactured as standard with radial internal clearance shown within the bearing designation. The availability of bearings with clearance other than standard should be checked before ordering.

The clearance limits can be found for

- the deep groove ball bearings in **table 4** on **page 297**
- the cylindrical roller bearings in **table 1** on **page 513**.

The values are valid before mounting under zero measuring load.

Cages

Depending on the bearing type and size, INSOCOAT bearings are fitted as standard with one of the following cages

- an injection moulded window-type cage of glass fibre reinforced polyamide 6,6, ball centred, designation suffix P
- a riveted cage of pressed steel, ball centred, no designation suffix
- a two-piece machined brass cage, rolling element centred, designation suffix M.

For more detailed information on these cages please refer to the sections “Deep groove ball

bearings”, starting on **page 287**, and “Cylindrical roller bearings”, starting on **page 503**.

Minimum load

In order to provide satisfactory operation, INSOCOAT rolling bearings, like the non-insulated standard bearings, must always be subjected to a given minimum load. The recommendations for calculating the requisite minimum loads are identical to those of the standard non-insulated bearings and can be found for

- deep groove ball bearings on **page 298**
- cylindrical roller bearings on **page 517**.

Axial load carrying capacity

The axial load carrying capacity of INSOCOAT bearings is identical to that of the standard non-insulated bearings. Recommendations can be found for

- deep groove ball bearings on **page 299**
- cylindrical roller bearings on **page 518**.

Equivalent bearing loads

Recommendations for calculating the equivalent dynamic and static bearing loads of INSOCOAT bearings are identical to those of the corresponding standard bearings. They can be found for

- deep groove ball bearings on **page 299**
- cylindrical roller bearings on **page 519**.

Electrical properties

The INSOCOAT layer provides effective protection against AC and DC currents. The minimum ohmic resistance is 50 MΩ at 1 000 V DC. Tests at SKF have shown that electrical breakdown of the insulating layer occurs above 3 000 V DC.

Design of associated components

For insulation reasons it is recommended that for

- bearings with coated outer ring, type VL0241, the housing shoulder or spacer sleeve should not have a smaller diameter than the abutment dimension $D_{a\ min}$ (→ **fig. 3a**) listed in the product tables
- bearings with coated inner ring, type VL2071, the shaft shoulder or spacer sleeve should not have a larger diameter than the abutment dimension $d_{a\ max}$ (→ **fig. 3b**) listed in the product tables.

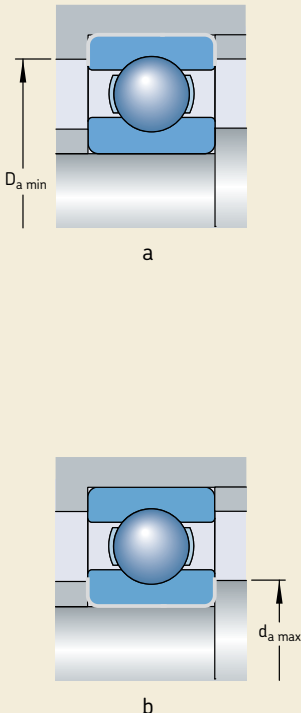
Mounting and maintenance

During mounting INSOCOAT bearings should be handled in the same way as standard bearings. Proper lubrication is important to utilize fully the service life of INSOCOAT bearings. The best method is frequent regreasing.

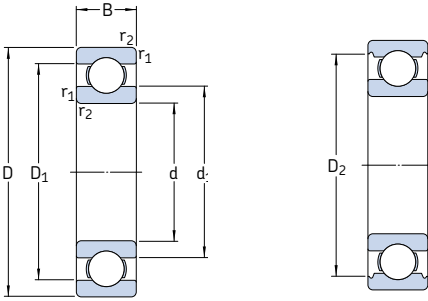
Additional information

For additional information concerning INSOCOAT bearings, please contact the SKF application engineering service.

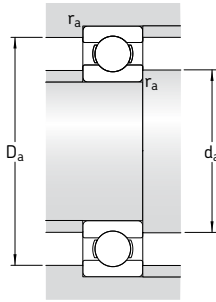
Fig. 3



INSOCOAT deep groove ball bearings
d 70 – 150 mm

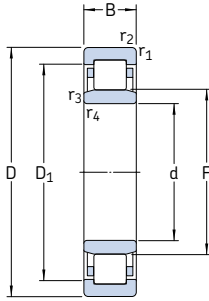


Principal dimensions			Basic load ratings		Fatigue load limit P_u	Speed ratings		Mass	Designation
d	D	B	dynamic C	static C_0		Reference speed	Limiting speed		
mm			kN		kN	r/min		kg	–
70	150	35	111	68	2,75	9 500	6 300	2,50	6314/C3VL0241
75	130 160	25 37	68,9 119	49 76,5	2,04 3	10 000 9 000	6 700 5 600	1,20 3,05	6215/C3VL0241 6315/C3VL0241
80	140 170	26 39	72,8 130	55 86,5	2,2 3,25	9 500 8 500	6 000 5 300	1,40 3,55	6216/C3VL0241 6316/C3VL0241
85	150 180	28 41	87,1 140	64 96,5	2,5 3,55	9 000 8 000	5 600 5 000	1,75 4,10	6217/C3VL0241 6317/C3VL0241
90	160 190	30 43	101 151	73,5 108	2,8 3,8	8 500 7 500	5 300 4 800	2,40 4,90	6218/C3VL0241 6318/C3VL0241
95	170 200	32 45	114 159	81,5 118	3 4,15	8 000 7 000	5 000 4 500	2,50 5,65	6219/C3VL0241 6319/C3VL0241
100	180 215	34 47	127 174	93 140	3,35 4,75	7 500 6 700	4 800 4 300	3,15 7,00	6220/C3VL0241 6320/C3VL0241
110	200 240	38 50	151 203	118 180	4 5,7	6 700 6 000	4 300 3 800	4,25 9,65	6222/C3VL0241 6322/C3VL0241
120	215 260	40 55	146 208	118 186	3,9 5,7	6 300 5 600	4 000 3 400	5,20 12,5	6224/C3VL0241 6324/C3VL2071
130	230 280	40 58	156 229	132 216	4,15 6,3	5 600 5 000	3 600 3 200	5,75 15,2	6226/C3VL2071 6326/C3VL2071
140	300	62	251	245	7,1	4 800	3 000	18,5	6328/C3VL2071
150	270 320	45 65	174 276	166 285	4,9 7,8	5 000 4 300	3 200 2 800	9,80 23,0	6230/C3VL2071 6330/C3VL2071

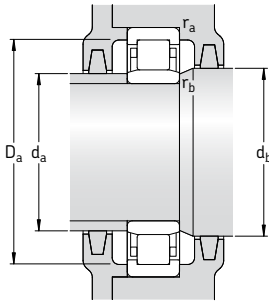


Dimensions					Abutment and fillet dimensions					Calculation factors	
d	d ₁	D ₁	D ₂	r _{1,2} min	d _a min	d _a max	D _a min	D _a max	r _a max	k _r	f ₀
mm					mm					-	
70	95	126	132	2,1	82	-	136	138	2	0,03	13
75	92 101	114 134	118 141	1,5 2,1	84 87	- -	121 146	121 148	1,5 2	0,025 0,03	15 13
80	101 108	127 143	122 149	2 2,1	91 92	- -	128 154	129 158	2 2	0,025 0,03	15 13
85	106 115	130 152	134 158	2 3	96 99	- -	139 163	139 166	2 2,5	0,025 0,03	15 13
90	112 121	139 160	145 166	2 3	101 104	- -	149 171	149 176	2 2,5	0,025 0,03	15 13
95	118 127	146 169	151 174	2,1 3	107 109	- -	156 179	158 186	2 2,5	0,025 0,03	14 13
100	125 135	155 181	160 186	2,1 3	112 114	- -	165 191	168 201	2 2,5	0,025 0,03	14 13
110	138 149	173 201	179 207	2,1 3	122 124	- -	184 213	188 226	2 2,5	0,025 0,03	14 13
120	151 164	184 216	189 -	2,1 3	132 134	- 158	194 -	203 246	2 2,5	0,025 0,03	14 14
130	160 177	199 233	205 -	3 4	144 147	154 171	- -	216 263	2,5 3	0,025 0,03	15 14
140	190	250	-	4	157	185	-	283	3	0,03	14
150	190 206	229 265	- -	3 4	164 167	185 200	- -	256 303	2,5 3	0,025 0,03	15 14

INSOCOAT cylindrical roller bearings
d 75 – 120 mm



Principal dimensions			Basic load ratings		Fatigue load limit P_u	Speed ratings		Mass	Designation
d	D	B	dynamic C	static C_0		Reference speed	Limiting speed		
mm			kN		kN	r/min		kg	–
75	160	37	280	265	33,5	4 500	5 300	3,30	NU 315 ECP/VL0241
85	180	41	340	335	41,5	4 000	4 800	5,25	NU 317 ECM/C3VL0241
95	200	45	390	390	46,5	3 600	4 300	7,25	NU 319 ECM/C3VL0241
110	240	50	530	540	61	3 000	3 400	12,0	NU 322 ECM/C3VL0241
120	260	55	610	620	69,5	2 800	3 200	15,2	NU 324 ECM/C3VL0241



Dimensions						Abutment and fillet dimensions							Calculation factor
d	D ₁	F	r _{1,2} min	r _{3,4} min	s ¹⁾	d _a min	d _a max	d _b min	D _a min	D _a max	r _a max	r _b max	k _r
mm						mm							-
75	136	95	2,1	2,1	1,8	87	92	97	141	148	2	2	0,15
85	153	108	3	3	2,3	99	105	111	158	166	2,5	2,5	0,15
95	170	121,5	3	3	2,9	109	118	124	175	186	2,5	2,5	0,15
110	201	143	3	3	3	124	139	146	207	226	2,5	2,5	0,15
120	219	154	3	3	3,7	134	150	157	225	246	2,5	2,5	0,15

¹⁾ Permissible axial displacement from the normal position of one bearing ring in relation to the other

