

**Flanged housing units
for large electrical machinery**

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Rotor bearing arrangements in large electrical machinery with flanged housing units

There is nowadays an increasing requirement for high availability of industrial drive components. Schaeffler Group Industrial offers integrated rolling bearing solutions for manufacturers of large electrical machinery. Innovative products that were developed in-house in accordance with customer-specific perspectives and which offer cost-effective solutions.

For rotor bearing arrangements in large electrical machinery with end shields, FAG manufactures complete flanged housing units of series FERS, FERB, FKC and FKB.

- **Designs FERS, FERB**

Flanged housing units with integrated cylindrical roller bearings or a combination of one cylindrical roller bearing and one deep groove ball bearing. Special designs include flanged housing units fitted with angular contact or deep groove ball bearings.

- **Design FKC**

Flanged housing unit fitted with a radial spherical roller bearing

- **Design FKB**

Flanged housing unit fitted with one axial spherical roller bearing and one radial deep groove ball bearing

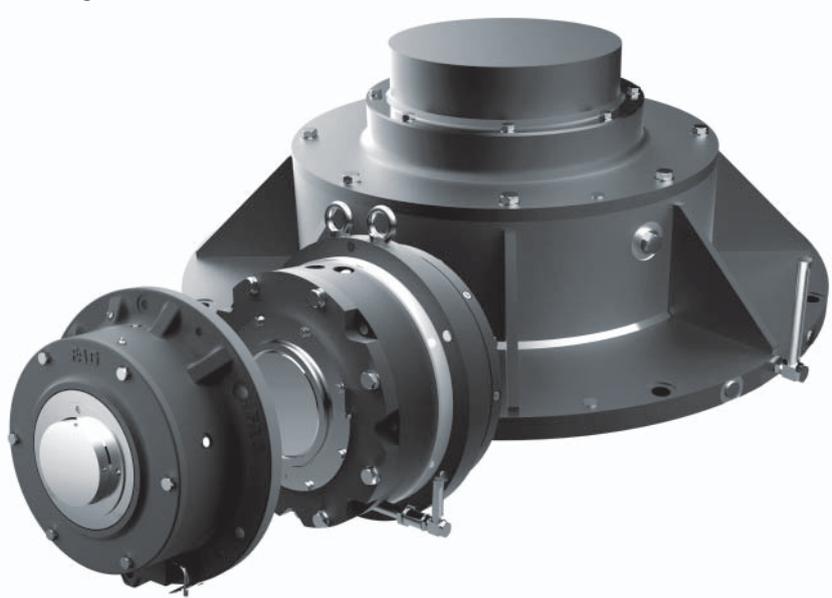
FAG flanged housing units offer a wide range of advantages in the design, production, assembly and maintenance of large electrical machinery. The design of the end shields is significantly simplified, resulting in considerable reductions in the construction work required on large motor housings. Thanks to their highly developed design, these bearing solutions are extremely easy to maintain.

The maximum possible flexibility in use is facilitated by, for example, a wide range of sealing variants corresponding to all IP codes. In addition, the lubrication concept can be individually matched to the specific application engineering requirements.

This provides our customers with the maximum freedom to shape their own developments. FAG guarantees the highest quality standards in order to fulfil the requirements of our customers. FAG flanged housing units are manufactured in Germany to the highest quality standards and to proven FAG precision.

A team of experienced engineers is available worldwide at any time to offer advice.

Figure 1: FAG flanged housing units



Flanged housing units FERB, FERS

The rotor bearing arrangement must be matched to the particular operating and ambient conditions in electrical machinery with end shields.

Depending on whether the rotor axis is arranged horizontally (type B) or vertically (type V), different bearing loads must be taken into consideration. The lubrication and sealing must be configured such that the bearings are neither undersupplied nor oversupplied with lubricant in any operating status. Due to the large mass of the housing, the aim must be to achieve simple mounting of the bearing arrangements. These conditions and requirements are fulfilled by the FAG flanged housing units (Figure 2).

Flanged housing units and accessories are made from spheroidal graphite cast iron GGG-50 or, in exceptional cases, from flake graphite cast iron (GG) or cast steel (GS).

The product range includes a narrow housing type (FERS) for one bearing and a wide housing type (FERB) for two bearings.

Both types are lubricated with grease; relubrication is possible (for lubricators, see page 22).

The grease valve prevents overlubrication of the bearings. Excess grease can be removed via a collector in the lower section of the housing by means of a slide.

Special designs with a container for collecting used grease are also in existence or are adapted to the appropriate customer requirements.

FERS and FERB housings are designed according to the modular concept, i. e. the labyrinth ring, cover, spacer ring, grease valve and the shaft nut for locating the bearings are matched to each other.

The shaft nut also forms a labyrinth ring.

It has a slot on one part of the circumference and is clamped to the shaft thread by means of a cap screw – it is thus secured against rotation.

The flanged housing units are normally mounted externally on the end shield. They are designed in such a way, however, that they can be flange mounted from the inside if necessary.

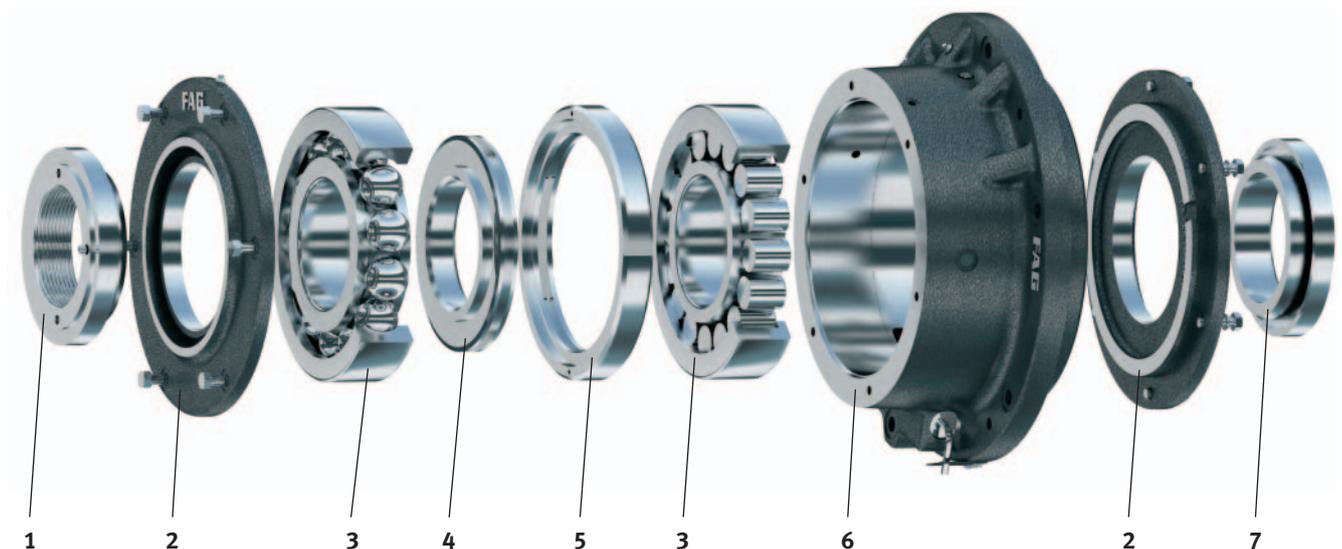
Apart from the correct arrangement of the bearings, it is only necessary to ensure that the labyrinth ring ring is located on the inside and the shaft nut is located on the outside.

The grease feed lines are laid to the outside.

A precondition for fitting from the inside is that there is sufficient space in the motor housing for the flanged housing units and the grease removal slide is accessible.

Figure 2: Individual parts of the FAG flanged housing unit FERB

1 Shaft nut, 2 Cover, 3 Bearing, 4 Grease valve, 5 Spacer ring, 6 Housing, 7 Labyrinth ring



Locating/non-locating bearing design

Locating bearing arrangement

The wide FERB housings are normally fitted with a deep groove ball bearing and a cylindrical roller bearing; this arrangement forms the locating bearing design of the flanged housing unit (Figure 3).

Other bearing designs can be fitted if necessary. However, this should only be undertaken in consultation with the relevant Application Engineering department.

Non-locating bearing arrangement

The narrow housings FERS form, when fitted with the cylindrical roller bearing, the non-locating bearing design of the flanged housing unit (Figure 3).

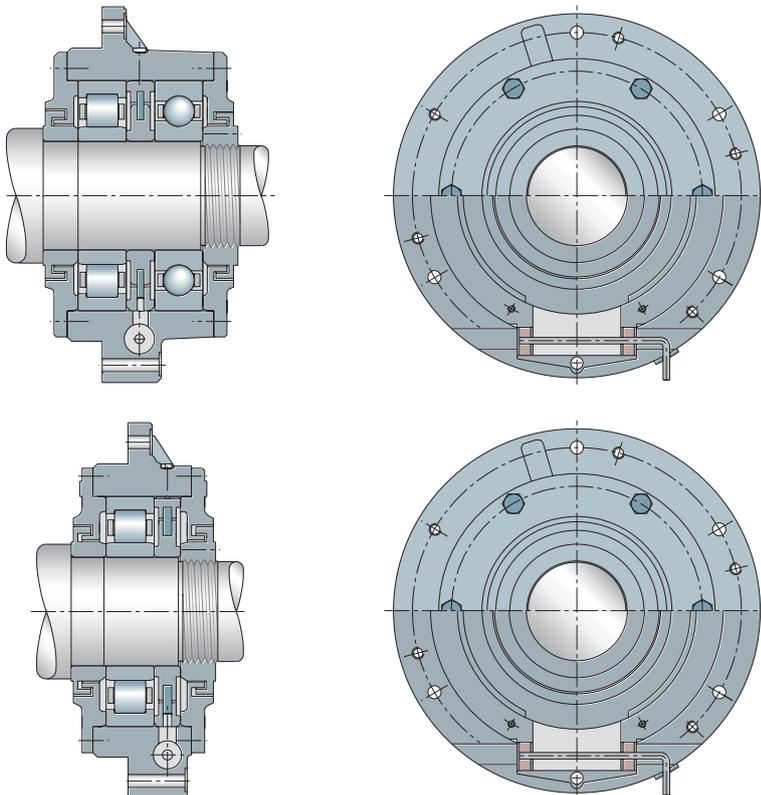
FAG flanged housing units for large electrical machinery are designed to be fitted with bearings of diameter series 0, 2 and 3.

Accordingly, there are three housing series each for the flanged housing units FERB and FERS:

Diameter series	Flanged housing Type	
	FERB	FERS
0	FERB0	FERS0
2	FERB2	FERS2
3	FERB3	FERS3

FAG flanged housing units FERS and FERB are available for shaft diameters $d = 100$ to 400 mm.

Figure 3: Flanged housing units



Flanged housing unit of type FERB as a locating bearing design, with one cylindrical roller bearing to support the radial force and one deep groove ball bearing to support the axial force.

Flanged housing unit of type FERS as a non-locating bearing design with one cylindrical roller bearing.

Fits · Designations

Fits

The bearings are located on the shaft with a tight fit. The tight fit for deep groove ball bearings and cylindrical roller bearings is achieved with a shaft tolerance of m5.

In the case of the angular contact ball bearings fitted in special housings (page 7), a shaft tolerance of k5 has proved effective.

Bearing fitted	Housing type	Tolerances Shaft	Tolerances Housing
Radial ball bearings for supporting axial load	FERB	m5	E8
Cylindrical roller bearings	FERB, FERS	m5	K6
Deep groove ball bearings as locating and non-locating bearings	FERS	m5	H6
Angular contact ball bearings, in matched pairs	FERB	k5	H6

In case of doubt, the Application Engineering resources of Schaeffler Group Industrial are available to offer advice.

Designation

For the normal designs, the basic designation of the flanged housing units is sufficient as an ordering designation.

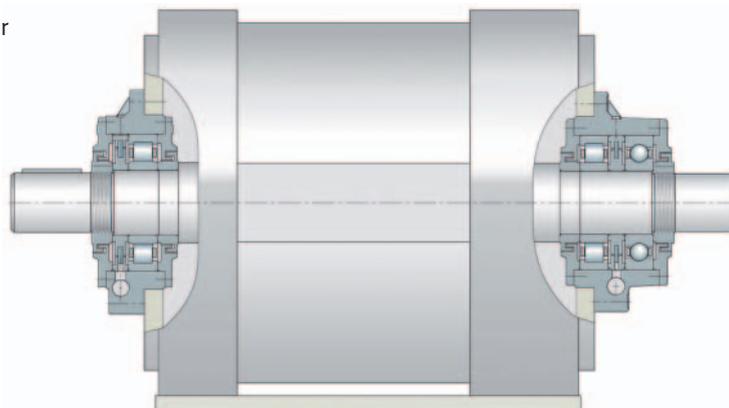
The locating bearing side contains a deep groove ball bearing and a cylindrical roller bearing, while the non-locating bearing has only one cylindrical roller bearing.

In these cases, the designation describes the:

- housing unit FERS or FERB
- diameter series of the bearings (series 0, 2, 3)
- bearing size (by means of the bore code) (see tables, page 9 to 12).

The rolling bearings must be ordered separately. Ordering examples are shown in Figure 4.

Figure 4: Horizontal motor



Ordering examples

1 flanged housing unit of non-locating bearing design

FAG FERS056

1 cylindrical roller bearing **FAG NU1056-M1-C3**

1 flanged housing unit of locating bearing design

FAG FERB056

1 cylindrical roller bearing **FAG NU1056-M1-C3**

1 deep groove ball bearing **FAG 6056-M-C3**

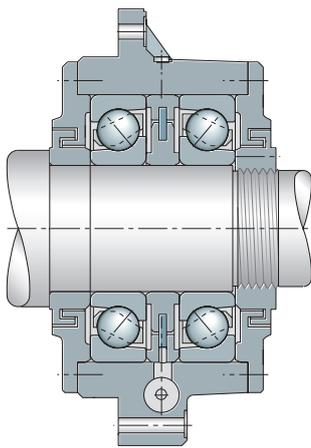
Special designs

If it is necessary due to the operating conditions, the FAG flanged housing units can be fitted with other bearing types, principally angular contact ball bearings and deep groove ball bearings.

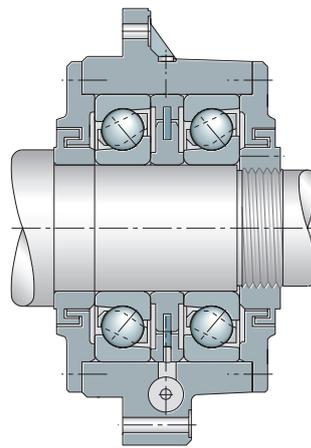
As examples, Figure 5 shows special designs of the flanged housing units FERB with angular contact ball

bearings in an X and tandem arrangement, as well as FAG flanged housing units FERS with deep groove ball bearings as a locating or non-locating bearing design. The main dimensions of the housings and the mounting dimensions of the bearings correspond to the normal flanged housing units.

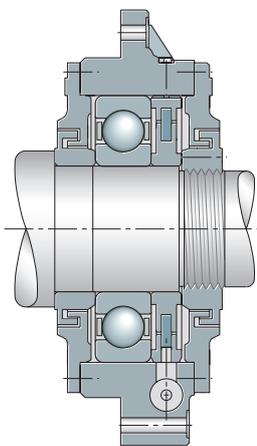
Figure 5: Special designs of FAG flanged housing units with angular contact or deep groove ball bearings



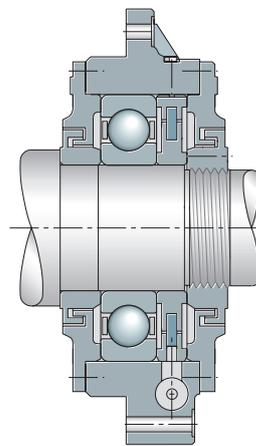
Flanged housing unit of type FERB (special design) as locating bearing design with two angular contact ball bearings in X arrangement to support the radial force and the alternating axial force.



Flanged housing unit of type FERB (special design) as locating bearing design with two angular contact ball bearings in tandem arrangement to support the radial force and the high, unilateral axial force.



Flanged housing unit of type FERS (special design) as non-locating bearing design with one deep groove ball bearing; optionally with spring adjustment.



Flanged housing unit of type FERS (special design) as locating bearing design with one deep groove ball bearing to support the radial force and the axial guidance forces.

Special designs

The ordering designation for special designs of flanged housing units comprises a Z-100 000 range number and an additional basic housing designation. This ensures that the bearing seats in the housings are correctly machined.

The bearings and housings must be ordered individually. Ordering examples are shown in Figure 6.

If the shaft seats for the cylindrical roller bearings and deep groove ball bearings are machined to tolerance class m5 as recommended, the bearings must be ordered with an increased internal clearance to C3 or C4 depending on the operating conditions.

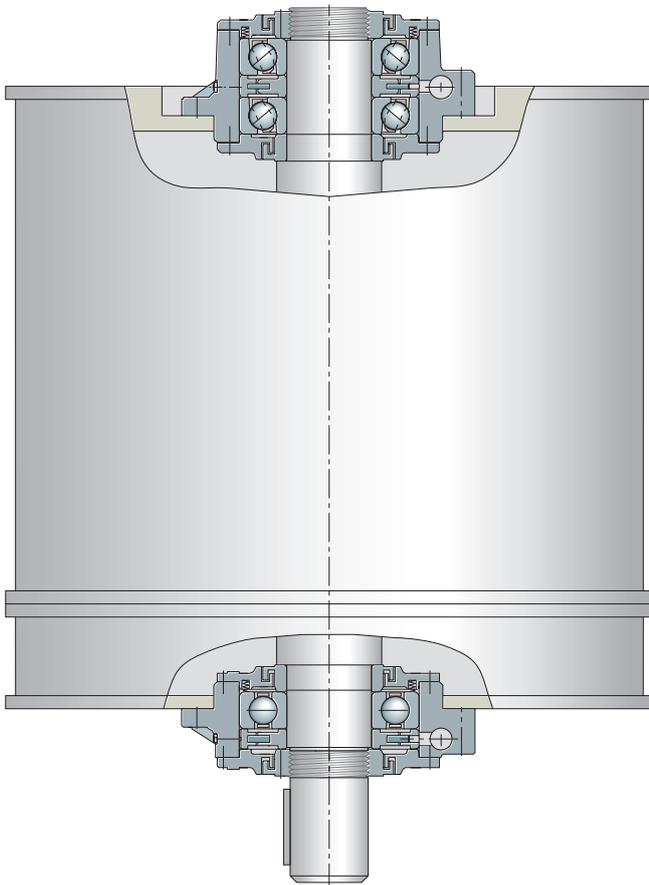
If the shaft is machined to tolerance k5, angular contact ball bearings of UA design have a small axial internal clearance when fitted in matched pairs in an X arrangement.

For electrical machinery with higher protection levels, Schaeffler Group Industrial supplies flanged housing units in special designs. These are sealed, instead of labyrinth rings, with V rings or rotary shaft seals.

For oil lubrication, the special housing FKC is available (see page 16 onwards), or special designs of FERB/FERS may be produced by agreement.

For increased operational security, the flanged housing units can be supplied as a current-insulated variant. An insulating layer is applied to the housing flange.

Figure 6: Vertical motor



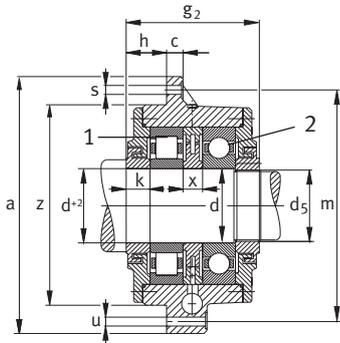
Ordering examples (special design)

- 1 flanged housing unit of locating bearing design **FAG Z-1...FERB340**
- 2 angular contact ball bearings in tandem arrangement
FAG 7340-B-MP-UA

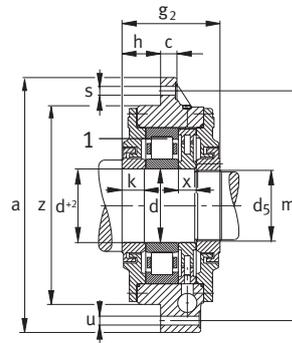
- 1 flanged housing unit of non-locating bearing design **FAG Z-1...FERS056**
- 1 deep groove ball bearing with spring adjustment **FAG 6056-M-C3**

Flanged housing units

With grease valve



Type FERB
1 Cylindrical roller bearing
2 Deep groove ball bearing



Type FERS
1 Cylindrical roller bearing

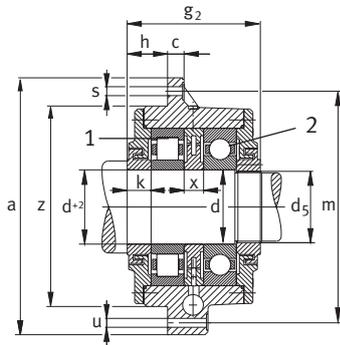
Flanged housing units with grease valve

Designation*)		Mass m ≈kg	Dimensions												
Housing	Bearing 1		Bearing 2	d	d ₅	a	c	g ₂	h	k	m	u	s	x	z
FERS020	NU1020-M1-C3	8	100	M95x2	220	10	76	30	17	200	9	M8	18	180	
FERS220	NU220-E-TVP2-C3	20	100	M95x2	280	18	104	40	25	255	11	M10	20	220	
FERS320	NU320-E-TVP2-C3	47	100	M95x2	355	25	147	60	35	320	14	M12	30	275	
FERB020	NU1020-M1-C3	6020-C3	10	100	M95x2	220	10	100	30	17	200	9	M8	18	180
FERB220	NU220-E-TVP2-C3	6220-C3	23	100	M95x2	280	18	138	40	25	255	11	M10	20	220
FERB320	NU320-E-TVP2-C3	6320-C3	55	100	M95x2	355	25	194	60	35	320	14	M12	30	275
FERS022	NU1022-M1-C3	12	110	M105x2	250	12	88	35	20	225	9	M8	20	200	
FERS222	NU222-E-TVP2-C3	30	110	M105x2	320	20	123	50	30	290	11	M10	25	250	
FERS322	NU322-E-TVP2-C3	57	110	M105x2	390	25	150	60	35	350	14	M12	30	300	
FERB022	NU1022-M1-C3	6022-C3	14	110	M105x2	250	12	116	35	20	225	9	M8	20	200
FERB222	NU222-E-TVP2-C3	6222-C3	35	110	M105x2	320	20	161	50	30	290	11	M10	25	250
FERB322	NU322-E-TVP2-C3	6322-C3	67	110	M105x2	390	25	200	60	35	350	14	M12	30	300
FERS024	NU1024-M1-C3	15	120	M115x2	265	12	97	40	25	245	11	M10	20	215	
FERS224	NU224-E-TVP2-C3	34	120	M115x2	335	20	125	50	30	305	14	M12	25	265	
FERS324	NU324-E-TVP2-C3	76	120	M115x2	420	25	165	70	40	380	18	M16	30	330	
FERB024	NU1024-M1-C3	6024-C3	17	120	M115x2	265	12	125	40	25	245	11	M10	20	215
FERB224	NU224-E-TVP2-C3	6224-C3	40	120	M115x2	335	20	165	50	30	305	14	M12	25	265
FERB324	NU324-E-TVP2-C3	6324-C3	90	120	M115x2	420	25	220	70	40	380	18	M16	30	330
FERS026	NU1026-M1-C3	22	130	M125x2	300	15	108	40	25	275	11	M10	25	240	
FERS226	NU226-E-TVP2-C3	38	130	M125x2	350	20	125	50	30	320	14	M12	25	280	
FERS326	NU326-E-TVP2-C3	90	130	M125x2	450	25	173	70	40	405	18	M16	35	350	
FERB026	NU1026-M1-C3	6026-C3	25	130	M125x2	300	15	141	40	25	275	11	M10	25	240
FERB226	NU226-E-TVP2-C3	6226-C3	44	130	M125x2	350	20	165	50	30	320	14	M12	25	280
FERB326	NU326-E-TVP2-C3	6326-M-C3	105	130	M125x2	450	25	231	70	40	405	18	M16	35	350
FERS028	NU1028-M1-C3	24	140	M135x2	310	15	112	45	27	285	11	M10	25	250	
FERS028	NU228-E-TVP2-C3	53	140	M135x2	390	25	142	55	35	355	14	M12	30	310	
FERS028	NU328-E-TVP2-C3	114	140	M135x2	490	30	187	75	45	440	18	M16	35	380	
FERB028	NU1028-M1-C3	6028-C3	27	140	M135x2	310	15	145	45	27	285	11	M10	25	250
FERB228	NU228-E-TVP2-C3	6228-C3	60	140	M135x2	390	25	184	55	35	355	14	M12	30	310
FERB328	NU328-E-TVP2-C3	6328-M-C3	133	140	M135x2	490	30	249	75	45	440	18	M16	35	380

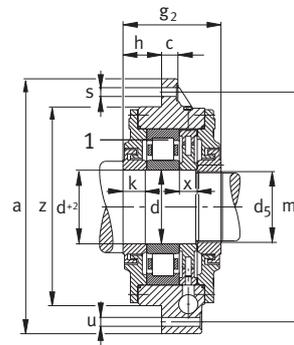
*) Ordering examples for flanged housing unit on page 6 and 8.

Flanged housing units

With grease valve



Type FERB
1 Cylindrical roller bearing
2 Deep groove ball bearing



Type FERS
1 Cylindrical roller bearing

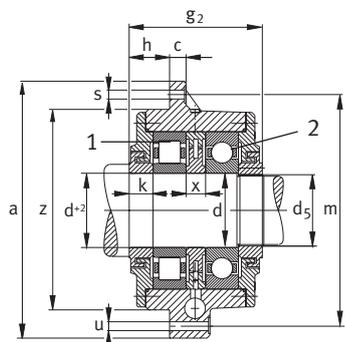
Flanged housing units with grease valve

Designation*)			Mass m ≈kg	Dimensions		a	c	g ₂	h	k	m	u	s	x	z
Housing	Bearing 1	Bearing 2		d	d ₅										
			Housing mm												
FERS030	NU1030-M1-C3		28	150	M145x2	325	15	120	50	30	300	11	M10	25	265
FERS230	NU230-E-M1-C3		61	150	M145x2	420	25	145	55	35	380	18	M16	30	330
FERS330	NU330-E-M1-C3		134	150	M145x2	510	30	200	85	50	460	18	M16	35	400
FERB030	NU1030-M1-C3	6030-C3	32	150	M145x2	325	15	155	50	30	300	11	M10	25	265
FERB230	NU230-E-M1-C3	6230-C3	70	150	M145x2	420	25	190	55	35	380	18	M16	30	330
FERB330	NU330-E-M1-C3	6330-M-C3	156	150	M145x2	510	30	265	85	50	460	18	M16	35	400
FERS032	NU1032-M1-C3		32	160	M155x3	350	20	123	50	30	320	14	M12	25	280
FERS232	NU232-E-M1-C3		77	160	M155x3	440	25	163	65	40	400	18	M16	35	350
FERS332	NU332-E-M1-C3		150	160	M155x3	540	30	203	85	50	490	22	M20	35	420
FERB032	NU1032-M1-C3	6032-M-C3	36	160	M155x3	350	20	161	50	30	320	14	M12	25	280
FERB232	NU232-E-M1-C3	6232-M-C3	88	160	M155x3	440	25	211	65	40	400	18	M16	35	350
FERB332	NU332-E-M1-C3	6332-M-C3	175	160	M155x3	540	30	271	85	50	490	22	M20	35	420
FERS034	NU1034-M1-C3		42	170	M165x3	380	20	127	50	30	345	14	M12	25	310
FERS234	NU234-E-M1-C3		100	170	M165x3	480	25	177	70	45	440	18	M16	35	380
FERS334	NU334-E-M1-C3		182	170	M165x3	560	30	226	94	57	510	22	M20	40	440
FERB034	NU1034-M1-C3	6034-C3	50	170	M165x3	380	20	169	50	30	345	14	M12	25	310
FERB234	NU234-E-M1-C3	6234-M-C3	113	170	M165x3	480	25	229	70	45	440	18	M16	35	380
FERB334	NU334-E-M1-C3	6334-M-C3	210	170	M165x3	560	30	298	94	57	510	22	M20	40	440
FERS036	NU1036-M1-C3		55	180	M175x3	400	20	146	60	35	365	14	M12	30	330
FERS236	NU236-E-M1-C3		104	180	M175x3	490	25	177	70	45	450	18	M16	35	390
FERS336	NU336-E-M1-C3		218	180	M175x3	610	35	225	95	55	555	22	M20	40	480
FERB036	NU1036-M1-C3	6036-M-C3	63	180	M175x3	400	20	192	60	35	365	14	M12	30	330
FERB236	NU236-E-M1-C3	6236-M-C3	117	180	M175x3	490	25	229	70	45	450	18	M16	35	390
FERB336	NU336-E-M1-C3	6336-M-C3	255	180	M175x3	610	35	300	95	55	555	22	M20	40	480
FERS038	NU1038-M1-C3		62	190	M185x3	440	25	146	60	35	400	18	M16	30	350
FERS238	NU238-E-M1-C3		127	190	M185x3	540	30	185	70	45	490	18	M16	40	420
FERS338	NU338-E-M1-C3		240	190	M185x3	630	35	228	95	55	575	22	M20	40	500
FERB038	NU1038-M1-C3	6038-M-C3	71	190	M185x3	440	25	192	60	35	400	18	M16	30	350
FERB238	NU238-E-M1-C3	6238-M-C3	144	190	M185x3	540	30	240	70	45	490	18	M16	40	420
FERB338	NU338-E-M1-C3	6338-M-C3	280	190	M185x3	630	35	306	95	55	575	22	M20	40	500

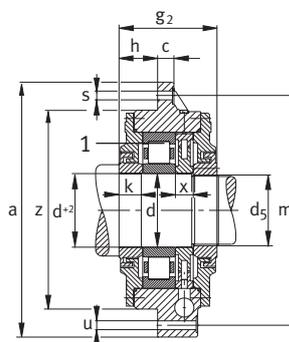
*) Ordering examples for flanged housing unit on page 6 and 8.

Flanged housing units

With grease valve



Type FERB
1 Cylindrical roller bearing
2 Deep groove ball bearing



Type FERS
1 Cylindrical roller bearing

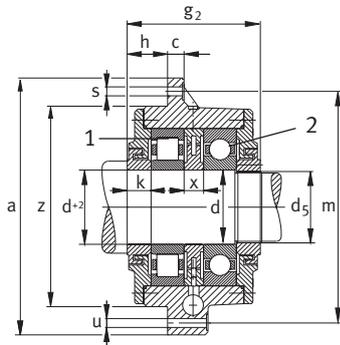
Flanged housing units with grease valve

Designation*)		Mass m ≈kg	Dimensions		a	c	g ₂	h	k	m	u	s	x	z	
Housing	Bearing 1		Bearing 2	d											d ₅
FERS040	NU1040-M1-C3	74	200	M195x3	460	25	156	60	35	420	18	M16	35	370	
FERS240	NU240-E-M1-C3	158	200	M195x3	580	30	198	80	50	525	22	M20	40	450	
FERS340	NU340-E-M1-C3	260	200	M195x3	660	35	230	100	55	600	26	M24	40	520	
FERB040	NU1040-M1-C3	6040-M-C3	91	200	M195x3	460	25	207	60	35	420	18	M16	35	370
FERB240	NU240-E-M1-C3	6240-M-C3	178	200	M195x3	580	30	256	80	50	525	22	M20	40	450
FERB340	NU340-E-M1-C3	6340-M-C3	306	200	M195x3	660	35	310	100	55	600	26	M24	40	520
FERS044	NU1044-M1-C3	106	220	Tr215x4	510	25	181	75	45	465	18	M16	35	410	
FERS244	NU244-E-M1-C3	193	220	Tr215x4	620	30	205	80	50	560	22	M20	40	490	
FERS344	NU344-E-M1-C3	378	220	Tr215x4	740	40	268	110	65	665	26	M24	50	580	
FERB044	NU1044-M1-C3	6044-M-C3	122	220	Tr215x4	510	25	237	75	45	465	18	M16	35	410
FERB244	NU244-E-M1-C3	6244-M-C3	222	220	Tr215x4	620	30	270	80	50	560	22	M20	40	490
FERB344	NU344-E-M1-C3	6344-M-C3	440	220	Tr215x4	740	40	356	110	65	665	26	M24	50	580
FERS048	NU1048-M1-C3	116	240	Tr235x4	530	25	186	75	45	485	18	M16	40	430	
FERS248	NU248-E-M1-C3	272	240	Tr235x4	680	35	237	95	60	620	22	M20	45	540	
FERS348	NU348-E-M1-C3	457	240	Tr235x4	800	40	275	115	65	720	26	M24	50	630	
FERB048	NU1048-M1-C3	6048-M-C3	132	240	Tr235x4	530	25	242	75	45	485	18	M16	40	430
FERB248	NU248-E-M1-C3	6248-M-C3	310	240	Tr235x4	680	35	309	95	60	620	22	M20	45	540
FERB348	NU348-E-M1-C3	6348-M-C3	538	240	Tr235x4	800	40	370	115	65	720	26	M24	50	630
FERS052	NU1052-M1-C3	170	260	Tr255x4	590	30	214	85	54,5	540	18	M16	40	480	
FERS252	NU252-E-M1-C3	337	260	Tr255x4	730	35	245	100	60	670	22	M20	45	590	
FERS352	NU352-E-M1-C3	594	260	Tr255x4	860	40	307	125	75	780	26	M24	55	680	
FERB052	NU1052-M1-C3	6052-M-C3	195	260	Tr255x4	590	30	279	85	54,5	540	18	M16	40	480
FERB252	NU252-E-M1-C3	6252-M-C3	390	260	Tr255x4	730	35	325	100	60	670	22	M20	45	590
FERB352	NU352-E-M1-C3	6352-M-C3	692	260	Tr255x4	860	40	409	125	75	780	26	M24	55	680
FERS056	NU1056-M1-C3	180	280	Tr275x4	630	30	214	85	54,5	570	18	M16	40	500	
FERS256	NU256-E-M1-C3	374	280	Tr275x4	750	35	260	105	65	690	22	M20	50	610	
FERS356	NU356-E-M1-C3	697	280	Tr275x4	910	45	313	130	75	830	26	M24	55	730	
FERB056	NU1056-M1-C3	6056-M-C3	205	280	Tr275x4	630	30	279	85	54,5	570	18	M16	40	500
FERB256	NU256-E-M1-C3	6256-M-C3	428	280	Tr275x4	750	35	340	105	65	690	22	M20	50	610
FERB356	NU356-E-M1-C3	6356-M-C3	820	280	Tr275x4	910	45	421	130	75	830	26	M24	55	730
FERS060	NU1060-M1-C3	238	300	Tr295x4	680	35	229	90	55	620	22	M20	45	550	
FERS260	NU260-E-M1-C3	415	300	Tr295x4	820	40	281	115	73	750	26	M24	50	670	
FERS360	NU360-E-M1-C3	828	300	Tr295x4	960	45	336	140	83,5	870	33	M30	60	770	

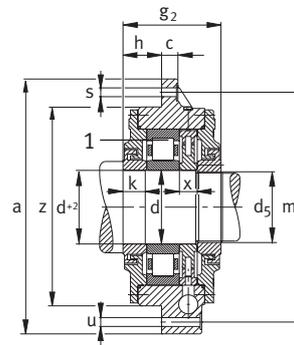
*) Ordering examples for flanged housing unit on page 6 and 8.

Flanged housing units

With grease valve



Type FERB
1 Cylindrical roller bearing
2 Deep groove ball bearing



Type FERS
1 Cylindrical roller bearing

Flanged housing units with grease valve

Designation*)		Mass m ≈kg	Dimensions		a	c	g ₂	h	k	m	u	s	x	z	
Housing	Bearing 1		Bearing 2	d											d ₅
		Housing mm													
FERS064	NU1064-M1-C3	250	320	Tr315x5	700	35	229	90	55	640	22	M20	45	570	
FERS264	NU264-EX-M1-C3	567	320	Tr315x5	860	40	288	120	73	790	26	M24	50	710	
FERS364	NU364-E-M1-C3	1 040	320	Tr315x5	1 060	50	352	145	90	960	33	M30	60	840	
FERB064	NU1064-M1-C3	6064-M-C3	289	320	Tr315x5	700	35	303	90	55	640	22	M20	45	570
FERB264	NU264-E-M1-C3	6264-M-C3	654	320	Tr315x5	860	40	380	120	73	790	26	M24	50	710
FERB364	NU364-E-M1-C3	6364-M-C3	1 120	320	Tr315x5	1 060	50	464	145	90	960	33	M30	60	840
FERS068	NU1068-M1-C3	300	340	Tr335x5	780	40	252	100	60	710	22	M20	50	620	
FERS268	NU268-E-M1-C3	663	340	Tr335x5	920	40	293	120	73	845	26	M24	55	760	
FERS368	NU368-E-M1-C3	1 236	340	Tr335x5	1 120	55	373	155	95	1 020	33	M30	65	890	
FERB068	NU1068-M1-C3	6068-M-C3	350	340	Tr335x5	780	40	334	100	60	710	22	M20	50	620
FERB268	NU268-E-M1-C3	6268-M-C3	762	340	Tr335x5	920	40	385	120	73	845	26	M24	55	760
FERB368	NU368-E-M1-C3	6368-M-C3	1 424	340	Tr335x5	1 120	55	491	155	95	1 020	33	M30	65	890
FERS072	NU1072-M1-C3	345	360	Tr355x5	800	40	252	100	60	730	22	M20	50	640	
FERS272	NU272-E-M1-C3	775	360	Tr355x5	970	45	310	130	80	890	26	M24	55	800	
FERS372	NU372-E-M1-C3	1 440	360	Tr355x5	1 180	60	390	165	100	1 070	39	M36	65	940	
FERB072	NU1072-M1-C3	6072-M-C3	400	360	Tr355x5	800	40	334	100	60	730	22	M20	50	640
FERB272	NU272-E-M1-C3	6272-M-C3	886	360	Tr355x5	970	45	405	130	80	890	26	M24	55	800
FERB372	NU372-E-M1-C3	6372-M-C3	1 664	360	Tr355x5	1 180	60	515	165	100	1 070	39	M36	65	940
FERS076	NU1076-M1-C3	360	380	Tr375x5	820	40	252	100	60	750	22	M20	50	660	
FERS276	NU276-E-M1-C3	827	380	Tr375x5	1000	45	310	130	80	920	29	M24	55	830	
FERS376	NU376-E-M1-C3	1 553	380	Tr375x5	1 230	65	398	165	100	1 120	39	M36	70	970	
FERB076	NU1076-M1-C3	6076-M-C3	417	380	Tr375x5	820	40	334	100	60	750	22	M20	50	660
FERB276	NU276-E-M1-C3	6276-M-C3	945	380	Tr375x5	1 000	45	405	130	80	920	26	M24	55	830
FERB376	NU376-E-M1-C3	6376-M-C3	1 795	380	Tr375x5	1 230	65	526	165	100	1 120	39	M36	70	970
FERS080	NU1080-M1-C3	455	400	Tr395x5	880	40	270	105	65	810	22	M20	50	710	
FERS280	NU280-M1-C3	972	400	Tr395x5	1 060	50	323	135	80	980	26	M24	60	880	
FERS380	NU380-M1-C3	1 815	400	Tr395x5	1 300	70	421	175	105	1 190	39	M36	75	1 020	
FERB080	NU1080-M1-C3	6080-M-C3	530	400	Tr395x5	880	40	360	105	65	810	22	M20	50	710
FERB280	NU280-M1-C3	6280-M-C3	1 122	400	Tr395x5	1 060	50	426	135	80	980	26	M24	60	880
FERB380	NU380-M1-C3	6380-M-C3	2 102	400	Tr395x5	1 300	70	557	175	105	1 190	39	M36	75	1 020

*) Ordering examples for flanged housing unit on page 6 and 8.

Fitting example for FERB/FERS

Drive unit for a wind tunnel blower

Technical data

- AC motor
- Nom. power rating 2 300 kW at 270 min⁻¹
- Impeller diameter 8 m
- Max. axial thrust 97 kN at 300 min⁻¹
- Weight of shaft and impeller 176 kN

The impeller is located on the extended motor shaft.

Bearing arrangement

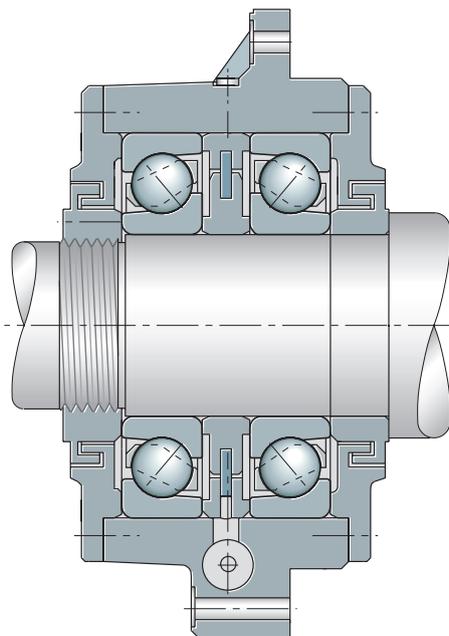
The locating bearing side is fitted with a flanged housing unit FERB356 in a special design. This contains two angular contact ball bearings 7356-B-MP-UA in an X arrangement. This bearing arrangement can support not only the high axial thrust but also radial load components.

The non-locating bearing arrangement of the motor contains the flanged housing unit FERS280 with a cylindrical roller bearing NU280-M-C3. This bearing only transmits radial forces. They comprise the weight of the rotor, the magnetic attraction, the unbalance occurring and the additional radial forces arising from the drive system.

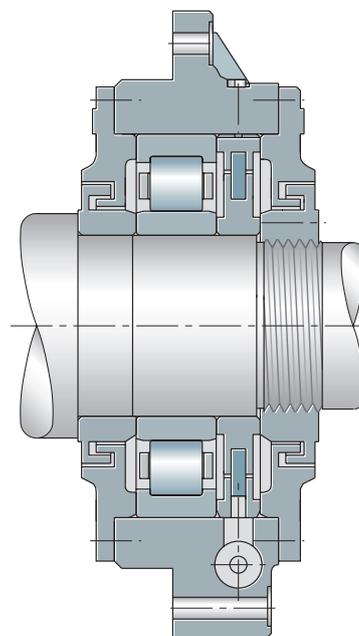
Both bearing positions are lubricated using a lithium soap grease.

The housings are fitted with grease valves in order to prevent overlubrication when they are relubricated.

Figure 7: Rotor shaft bearing arrangement



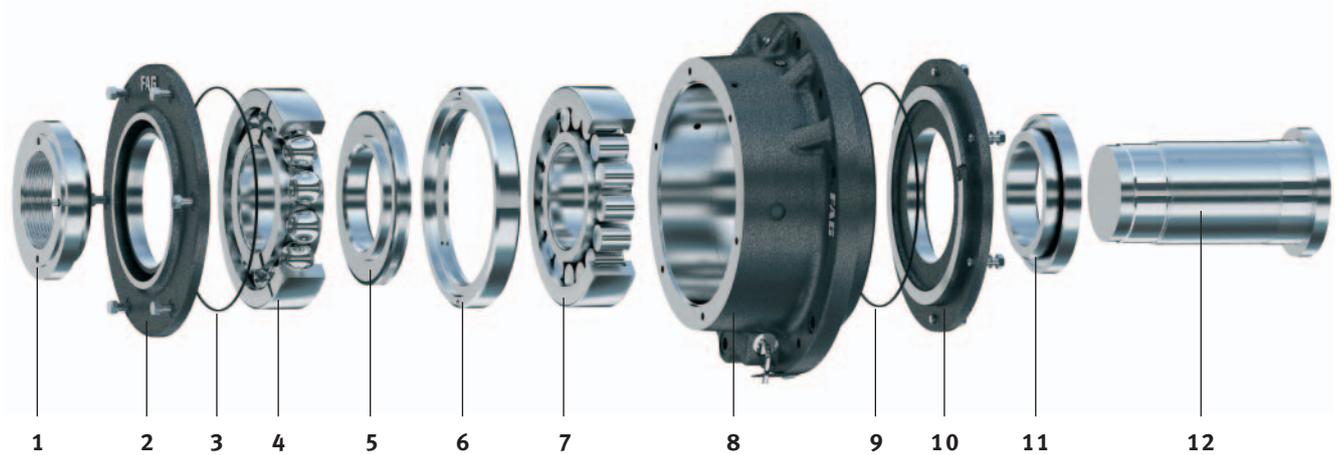
Flanged housing unit
FAG FERB 356.1...
(special design)



Flanged housing unit
FAG FERS280

Fitting manual for FERB/FERS

Figure 8: FERB flanged housing unit with one cylindrical roller bearing and one deep groove ball bearing



- 1 Shaft nut
- 2 Labyrinth cover
- 3 Toroidal ring
- 4 Deep groove ball bearing
- 5 Grease valve
- 6 Spacer ring
- 7 Cylindrical roller bearing
- 8 Housing body
- 9 Toroidal ring
- 10 Labyrinth cover
- 11 Labyrinth ring
- 12 Rotor shaft

Measures to be taken prior to assembly

- The assembly area should be clean and dry.
- All parts – housing body, cover, spacer ring and labyrinth rings – must be carefully cleaned, paying particular attention to machining or moulding sand residues.
- The seating points on the shaft for rolling bearings, labyrinth rings and grease valves must be checked for dimensional accuracy and compliance with the specified tolerances. The edges must be deburred.
- The rolling bearings should only be removed from their packaging immediately before assembly. It must be checked whether the rolling bearing designation matches the designation on the packaging. The rolling bearings in their original packaging are treated with an anti-corrosion oil that does not normally need to be washed out.

Fitting manual for FERB/FERS

Mounting of rolling bearings in FERB housings

1. Pull the rotor (12) out of the stator as far as possible and ensure that the rotor is securely supported.
2. In order to prevent fretting corrosion, rub the shaft seats with mounting paste ARCANOL-MOUNTINGPASTE or an equivalent agent and ensure that the previously shiny metal surface is now matt.
3. Locate the inner labyrinth ring (11) and grease the labyrinth passage.
4. Work the toroidal ring (9) onto the cover flange of the housing body (8).
5. Grease the labyrinth passage with the inner labyrinth cover (10). Push the prepared labyrinth cover (10) into place such that it is initially supported by the labyrinth ring (11).
6. Heat the inner ring of the cylindrical roller bearing (7) using an appropriate heating device and press it on until it is force-locked on the locating surface. Grease the outer ring and the rolling element set of the cylindrical roller bearing (7) and press it onto the inner ring using a circular motion.
7. Push on the grease valve (5) and place the spacer ring (6) over this. The slot in the spacer ring (6) must face upwards.
8. Heat the deep groove ball bearing (4) using an appropriate induction heating device, push it onto the shaft and press into place with force locking until the bearing has cooled and is firmly seated on the shaft.
9. Tighten the fixing screw in the housing body (8) until the cylindrical stud of the screw is flush with the housing bore.
10. Heat the housing body (8) to approx. 70°C and fit it over the mounted bearings. It must be ensured that the retaining screw in the housing and the slot in the spacer ring are in the same plane.
11. After sliding into place, the retaining screw must be completely tightened.
12. Insert the toroidal ring (3) into the slot of the labyrinth cover (2). Grease the labyrinth passage of the labyrinth cover (2) and screw mount the labyrinth cover (2) to the housing body (8).
13. Screw down the shaft nut (1) and secure using a cap screw.
14. Ensure that both labyrinth covers (2) and (10) are screwed firmly into place.
15. Screw mount the housing flange to the end shield.

Mounting of rolling bearings in FERS housings

Mounting is carried out in line with the mounting of FERB flanged housing units.

For further information, please contact the Application Engineering resources of Schaeffler Group Industrial.

Flanged housing units FKC

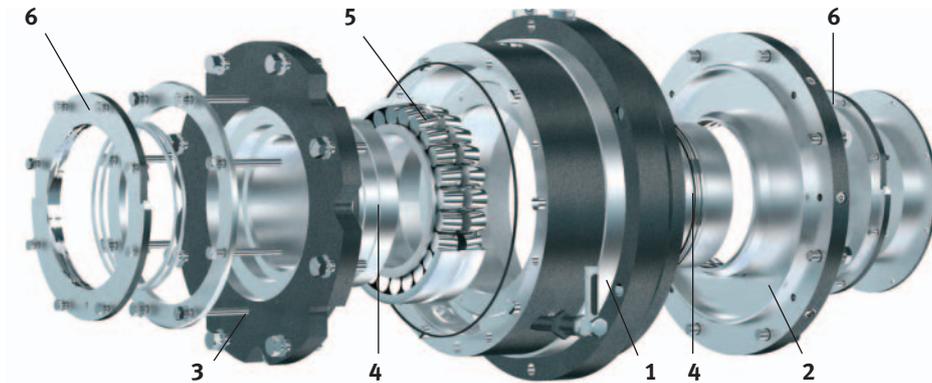
Large electrical machinery of type B supported by rolling bearings is often fitted with spherical roller bearings. These give reliable resistance to the high loads occurring. Flanged housing units FKC designed for oil lubrication have been specially developed for such applications. These housing designs comprise a housing body that is also available in current-insulated

form where necessary, two labyrinth covers, two labyrinth rings and two sealing washers that are used to support an additional sealing cover.

FKC flanged housing units with spherical roller bearings are particularly suitable for applications with high loads, moderate speeds and where, due to the bearing size, only oil lubrication can be considered.

Figure 9: Individual parts of an FAG flanged housing unit FKC

1 Housing, 2 Labyrinth cover, 3 Labyrinth cover, 4 Labyrinth ring, 5 Spherical roller bearing, 6 Sealing sleeve



In order to give better sealing of the housing, an air barrier seal is used in addition to the sealing washers. The fitting of additional sealing washers to the sealing sleeve further improves the IP protection against external influences.

The flanged housing units FKC are available in a locating or non-locating design. The spherical roller bearing must be ordered separately.

An oil level indicator can be screw mounted to both sides to monitor the oil level. The oil level at any point in operation can thus be monitored. The flanged housings also have additional connectors for thermocouples, air feed and shock impulse measurement. At customer request, the design can be modified to include further connectors.

FKC flanged housings with spherical roller bearings of the latest generation in diameter series 3

Shaft mm	Housing FAG	Bearing FAG
180	FKC3036	23036-E1A-M-C3
200	FKC3040	23040-E1A-M-C3
220	FKC3044	23044-MB-C3
260	FKC3052	23052-MB-C3
280	FKC3056	23056-B-MB-C3
300	FKC3060	23060-MB-C3
340	FKC3068	23068-MB-C3
380	FKC3076	23076-B-MB-C3
420	FKC3084	23084-B-MB-C3

When ordering, it must always be stated whether a locating or non-locating variant is required.

If bearing designs other than those stated in the table are required, this must be agreed with the Application Engineering services of Schaeffler KG. These are available to offer advice on all matters.

A fitting and user manual can also be requested via the appropriate Application Engineering department.

Fitting example for FKC

Drive unit for a coiler motor

Technical data

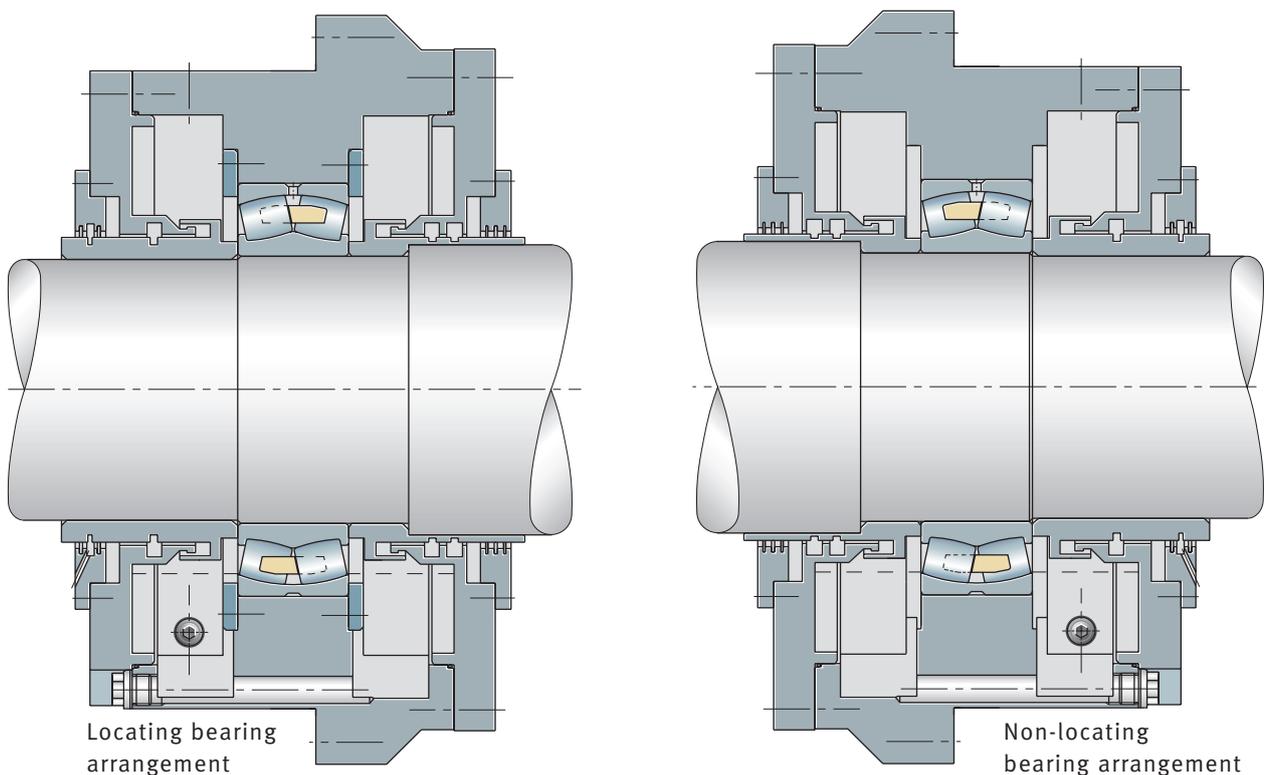
- Three-phase AC synchronous motor, speed control by frequency using inverter
- Motor rating: 2 300 kW for continuous operation
- Speed: 600 to 1 500 min⁻¹
- Rotor mass: 5,2 tonnes
- Loads: Drive via gearbox, axial forces of 10 kN

Bearing arrangement

Both the locating and non-locating bearing side are fitted with an FKC flanged housing unit with a new generation spherical roller bearing 23040-E1A-M-C3. This ensures the locating and non-locating function in the housing accordingly. The bearings are mainly subjected to load by the heavy weight of the rotor and the axial force. Both bearings are lubricated using oil. The oil level is monitored during operation by means of oil level indicators.

For protection against any current passage, both FKC flanged housing units are (optionally) provided with a current-insulating layer. The sealing function on the inside is increased further by an air barrier.

Figure 10: Rotor bearing arrangement of a coiler motor with flanged housing unit FKC



Flanged housing units FKB

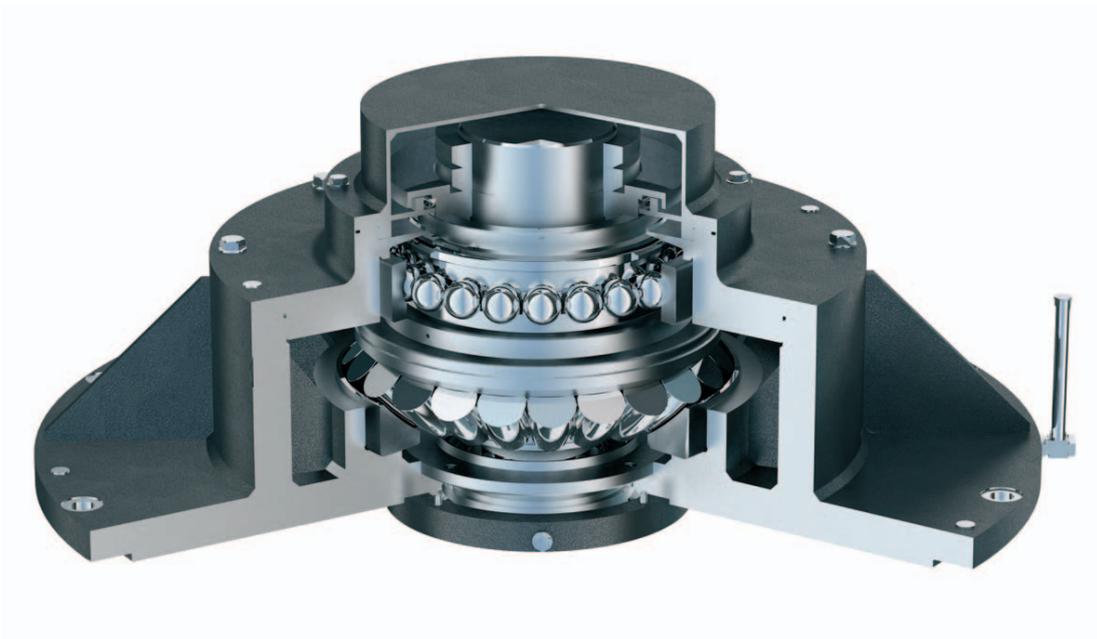
The flanged housing units FKB were specially developed for use in vertical motors and for the support of high axial forces.

Figure 11 shows a schematic of the FKB housing design. The housing generally comprises a housing body, covers, intermediate rings, collector plate, flinger plate and an oil injection ring.

The flanged housing is designed for sump type lubrication.

The associated bearings must be ordered separately. Recirculating oil lubrication with lubricant cooling is also conceivable. The peripheral equipment required here must be designed by the customer himself.

Figure 11: Flanged housing unit FKB with oil sump lubrication



Bearing arrangement

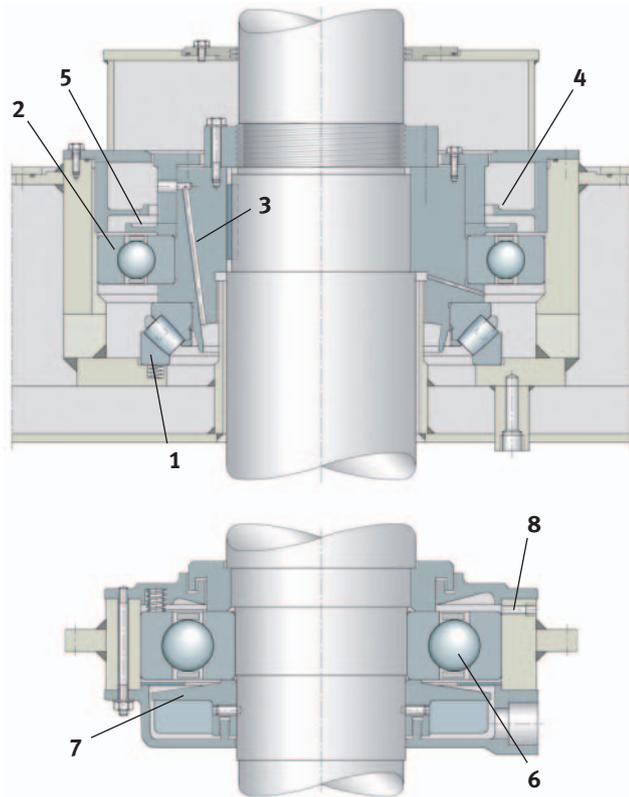
Figure 12 shows the upper and lower bearing position in a vertical electric motor. The upper bearing position is fitted with an FKB housing unit as a complete solution.

The bearings are mainly subjected to load by the heavy weight of the rotor and the axial forces. These forces are supported by the axial spherical roller bearing fitted as a supporting bearing in the upper bearing position.

The only radial forces occurring in vertical motors at the two bearing positions are guidance forces. They comprise the unilateral magnetic attraction that arises from magnetic asymmetry of the stator as well as the unbalance of the rotor and other rotating parts. If the precise values are not known, these forces can be taken into consideration adequately on the basis of experience by assuming that half the impeller weight is acting as a radial load at the centre of gravity of the impeller.

Fitting example for FKB

Figure 12: Rotor bearing arrangement in a vertical motor



The main function of the two deep groove ball bearings is to hold the rotor at its concentric position. The lower deep groove ball bearing is designed as a non-locating bearing in order to compensate thermal expansion of the rotor. The bearing is preloaded using springs so that all the balls are subject to force locking.

The upper deep groove ball bearing performs radial as well as axial counter guidance of the rotor. The axial guidance is necessary during transport as well as during running-down of the motor. In this operating state, the direction of the axial force may be reversed. The axial guide travel upwards is restricted such that the axial spherical roller bearing does not lift too much under any circumstances.

Force locking in the axial spherical roller bearing is provided by springs arranged below the housing locating washer; their spring force must be determined accordingly.

The inner rings of the deep groove ball bearings and the shaft locating washer of the axial spherical roller bearing have a tight fit. The outer rings of the deep groove ball bearings must, however, be movable. Axial spherical roller bearings that, as shown in the example in Figure 12, only transmit axial forces have a loose housing fit.

Selection of the type of lubrication and the lubricant for the upper bearing position is based on the requirements of the axial spherical roller bearing. Oil lubrication is always the better alternative here. The axial spherical roller bearing (1) runs in the oil bath and, due to its asymmetrical construction, generates independent oil recirculation from the inside to the outside. Due to this displacement effect, there is a flow in the bath from the bearing to the cooling surface.

The large volume of oil and the large cooling surface allow dissipation of the frictional heat of the bearing. If this cooling is not sufficient, an oil cooling device can be provided outside the gearbox.

The oil is fed to the deep groove ball bearing in the upper bearing position (2) by a conveying cone and riser holes (3) running upwards at an angle. Above the deep groove ball bearing, the oil exits via the radial holes and first reaches a stationary collector plate (4). From there, it drips through holes onto the flinger plate (5) which sprays the oil into the bearing (2). The purpose of the collector plate and flinger plate is to ensure the supply of oil to the bearing during startup after an extended period of stoppage until the supply of oil from the oil bath comes into operation.

The lower guide bearing (6) is lubricated with grease and is fitted with a relubrication device (8) and a grease valve (7). The supporting bearing position and the lower guide bearing are sealed by labyrinths.

Other variants to meet specific requirements can be designed and supplied by agreement with the relevant Application Engineering department.

Lubrication

Special rolling bearing greases such as Arcanol offer the best conditions for achieving reliable, durable and cost-effective bearing arrangements. For Arcanol gives you certainty, since Schaeffler KG carries out selection tests, provides quality assurance and gives practice-based lubrication recommendations. Bearings that fail prematurely because they were lubricated with the wrong grease, with all the unpleasant and expensive consequences, are increasingly a thing of the past.

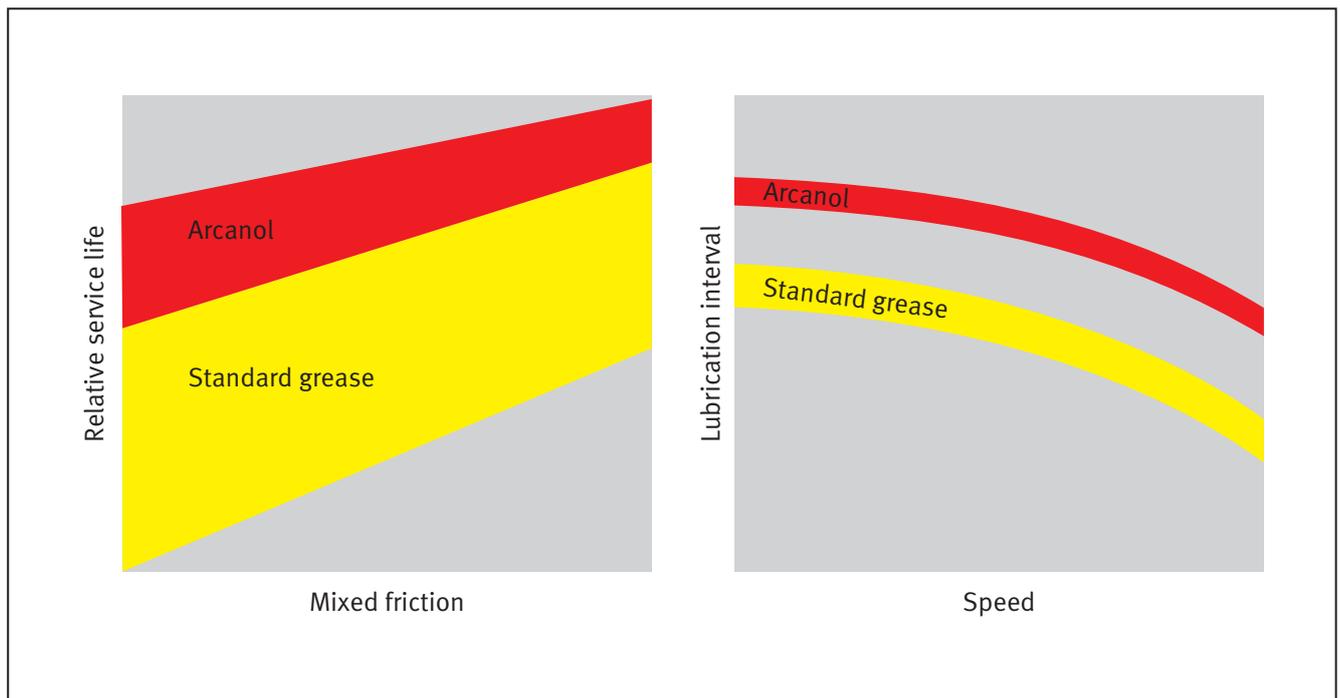
In co-operation with renowned lubricant manufacturers, we have for many years developed lubricants that are particularly suitable for rolling bearings. However, before a new grease can be included in the Arcanol range, it is subjected to a series of tests in the Schaeffler lubricant laboratory.

The greases are tested thoroughly. On our lubricant test rigs FE8 (DIN 51819) and FE9 (DIN 51821), the greases are tested in rolling bearings to determine their service life, friction and wear characteristics. Only the best greases are then selected to undergo the subsequent tests under simulated field conditions in far more complex rolling bearing test rigs. If the results fulfil the requirements of the stringent Schaeffler specifications, the grease is “decorated”. It receives the Arcanol seal of quality.

In addition, we test every single batch to ensure the uniform quality of the product. It is only after this final test that approval can be given to designate the grease as Arcanol. The range is graduated such that almost all areas of application can be optimally covered using these greases.

The overview on page 21 shows chemical-physical data, fields of application and the conditions for which these greases are suitable. The selection of a suitable grease is considerably facilitated by the electronic INA/FAG rolling bearing catalogue.

- **More than 80% of all rolling bearings are lubricated with grease**
- **More than 40% of all cases of rolling bearing damage are caused by defective lubrication**
- **Users therefore require lubricants and lubrication recommendations they can rely on**
- **Arcanol rolling bearing greases ensure that a bearing arrangement can be used to its full performance capacity**
 - long service life
 - good running behaviour
 - high operational security.



Lubrication

Arcanol rolling bearing greases

The advantages of Arcanol greases

- With 100% testing, the lubricants guarantee consistent quality for long rolling bearing life
- Developed and tested in the field by application and tribology experts
- Close co-operation at all times with well known lubricant manufacturers
- Arcanol lubricants are optimally designed for rolling bearing applications

Reduced costs through:

- Longer maintenance intervals
- Lower friction
- Less wear and bearing damage
- Considerably longer bearing operating life
- Increased operational security



Grease selection table for flanged housing units in large electrical machinery

MULTITOP	MULTI3	LOAD150	LOAD220	LOAD400	TEMP90	TEMP110	TEMP120	TEMP200	SPEED2,6	VIB3
Universal grease for ball and roller bearings	Universal grease for ball bearings ØD > 62 mm	Special grease for ball, roller and needle roller bearings, linear guidance systems	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball bearings	Special grease for ball and roller bearings
in rolling mills, construction machinery, automotive engineering, spinning and grinding spindles	in large electric motors, agricultural and construction machinery, household appliances	in machine tools	in rolling mill plant, rail vehicles	in mining machinery, construction machinery	in couplings, electric motors, automotive engineering	in electrical equipment, automotive engineering	in continuous casting plant	in track rollers in automatic baking equipment, piston pins in compressors, kiln trucks, chemical plant	in machine tools, instruments	in blade adjustment in rotors in wind turbines, packaging machinery
for increased speeds, high load, low and high temperatures		for high load, large speed range, swivel motion	for high load, large speed range	for very high load, moderate temperature, moderate speed	for high temperature, high load	for high temperature, high speed	for high temperature, high load	for very high temperature, chemically aggressive environment	for very high speed, low temperature	for high temperature, high load, oscillating motion

Lubrication

Lubricators

Automatic FAG lubricators Motion Guard

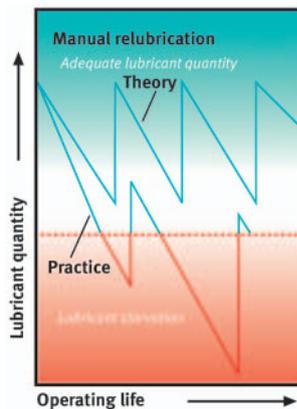
Almost half of all bearing failures can be traced back to inadequate or incorrect lubrication. Bearing failures can be very costly. Bearing failures in motors, pumps, generators or rotor systems, for example in the steel industry, in wind turbines, in the paper industry, in mining or the automotive industry, frequently lead to unplanned and expensive downtime.

In many cases, this incurs costs for repairs and lost production that not infrequently run to tens of thousands of Euros.

Reliable and cost-effective prevention using FAG Motion Guard

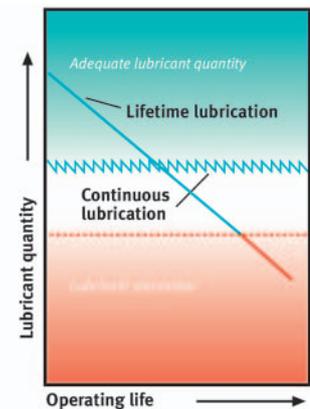
Such damage can be prevented by using automatic lubricators from the FAG Motion Guard range.

Based on the application and cost situation, you can decide which lubricator from the FAG Motion Guard range is the most suitable and the most cost-effective. With FAG Motion Guard lubricators, available as single point or multi-point versions, you are always on the safe side!



Their advantages:

- Individual, precise supply to each bearing position using the most suitable lubricant
- Fully automatic, maintenance-free operation due to continuous lubrication
- Extended service life and maintenance intervals
- Increased availability of plant
- Considerable cost savings



Automatic FAG lubricators Motion Guard



The single and multi-point lubrication systems provide a lubricant supply for up to six different lubrication points with lubricant constantly, precisely and irrespective of temperature.

The advantages include:

- Maintenance-free and cost-effective
- Versatile in application
- Individually matched to the bearing position
- Precise quantity dispensing even over long periods
- Simple, user-friendly handling
- High flexibility
- Maintenance-free and cost-effective
- No manual relubrication necessary

Notes

Notes

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TPI 152 GB-D