

FAG BEARING UNITS FOR FANS SERIES VRE3



for shaft diameters from 25 to 120 mm

CONTENTS

Preface	P. 2
Application, advantages, design	P. 3
Programme, material, operative ranges of designs, sealing, marking	P. 4
Design descriptions A to F	P. 5
Tolerances of bearing units	P. 6
Machining tolerances of mating parts	P. 6
Feather keys, V-rings	P. 6
Lubrication	P. 7
Mounting the complete unit	P. 8
Mounting the components	P. 8
Dismounting	P. 8
Putting into operation, maintenance	P. 9
Tightening torques	P. 9
Dimensional tables	P. 10
Calculation example	P. 16
Order examples	P. 18

PREFACE

The Industrial Bearings company of the FAG Kugelfischer Georg Schäfer AG Group supplies rolling bearings, housings, accessories, and services to original equipment customers in machinery and plant construction as well as to customers in the distribution and spare parts business. Comprehensive rolling bearing know-how, competent consultation on applications, and extensive customer service for more operational reliability make FAG an indispensable partner to its customers. Development and further development of our products is based on

the requirements of operation in the field. An ideal outline of requirements is best achieved through cooperation of our application engineers with the manufacturers and operators of machines. It forms the basis for successful solutions both technically and economically speaking.

Production locations are found in Germany, Italy, Portugal, India, South Korea and the USA. Sales are conducted by subsidiaries and distribution partners in almost every country in the world.



Application

This series of bearing units was originally developed for fans, namely for an overhung arrangement for high-speed impellers. Today, FAG bearing units VRE are used wherever a precise and easy-to-mount bearing unit is needed. For example in:

- conveyor equipment
- test rigs
- machines for materials processing
- belt drives
- laboratory equipment
- textile machines
- feeding machines

Advantages

The FAG bearing units VRE3 offer the following advantages:

- Easy mounting
- Little maintenance required
- Effective, low-friction seals keep out dust and moisture
- No time-consuming adjustment required since they are mounted in one-piece housings
- Two bearings arranged at optimum distance can accommodate considerable tilting moments
- Six designs allow adaptation to diverse stress conditions

Design of bearing units VRE3

The FAG bearing units VRE3 consist of a tubular plummer block housing with covers and seals and a shaft which is supported by rolling bearings of dimension series 3. The units are completely assembled, the bearings are greased. The units can be directly installed in existing systems without major preparations.

The bearing units VRE3 are available in six designs for diverse fields of application (see page 4). The shaft diameter ranges from 25 to 120 mm.



Programme

The complete FAG bearing units VRE3 are available in the designs A, B, C, D, E and F with shaft diameters ranging from 25 to 120 mm. In addition, the following parts are available separately:

- Housings VR with covers, seals and fastening elements
- Shafts VRW with fastening elements
- Standard rolling bearings

Material

The housing is made of grey-cast iron, material no. 0.6027, the covers and grease valves may be made of the same material or of material no. 1.0035.

The shaft is made of steel, material no. 1.0050.07.

Operative ranges of the designs

The **Design A** is suitable where mainly radial loads and high speeds have to be accommodated. It can accommodate axial loads from both sides (not alternating).

Design B is suitable for high radial loads from one side. Axial loads can be accommodated only in one direction.

Design C is suitable for high radial loads from one side. High axial loads can be accommodated from both directions.

Design D is suitable for axial loads from both directions.

Design E is suitable for high radial loads from both sides as well as axial loads from both directions.

Design F is suitable where mainly radial loads and high speeds have to be accommodated. It can accommodate axial loads from one side (away from the spring).

The maximum operating temperature which is permissible for all designs is 100°C.

Sealing

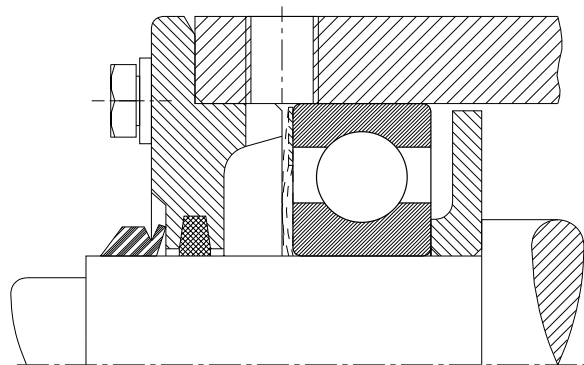
The seals of the FAG bearing units VRE3 prevent the penetration of contaminants as well as the escape of the lubricant. Friction losses are low. The sealing system consists of felt rings in the grooves of both covers as well as two externally applied V-rings made of NBR. For circumferential speeds > 8 m/s, the V-rings have to be supported axially. At speeds from 15 m/s upwards, the sealing lip lifts off and the V-ring then acts as a flinger ring.

Marking

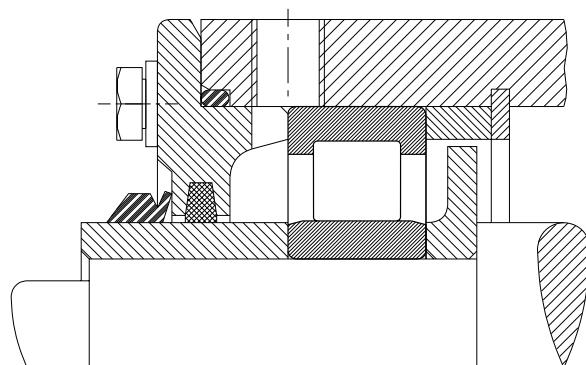
A projection at the housing body identifies:

- the position of the cylindrical roller bearing in the case of design B
- the position of the floating bearing for designs C, D and E
- the position of the ondular washer for design F

The position of the ondular washer is also marked on the shaft VRW..F.



Sealing for designs A, B and F



Sealing for designs C, D and E

DESIGN DESCRIPTIONS

Design descriptions

FAG Bearing Unit VRE3..A

- Housing VR3..A
- 2 deep groove ball bearings in floating arrangement
- Shaft VRW3..A

FAG Bearing Unit VRE3..B

- Housing VR3..A
- 1 deep groove ball bearing + 1 cylindrical roller bearing NJ in floating arrangement
- Shaft VRW3..A

FAG Bearing Unit VRE3..C

- Housing VR3..C
- Locating/floating bearing arrangement with 1 cylindrical roller bearing NU + 2 angular contact ball bearings in O arrangement
- Shaft VRW3..C

FAG Bearing Unit VRE3..D

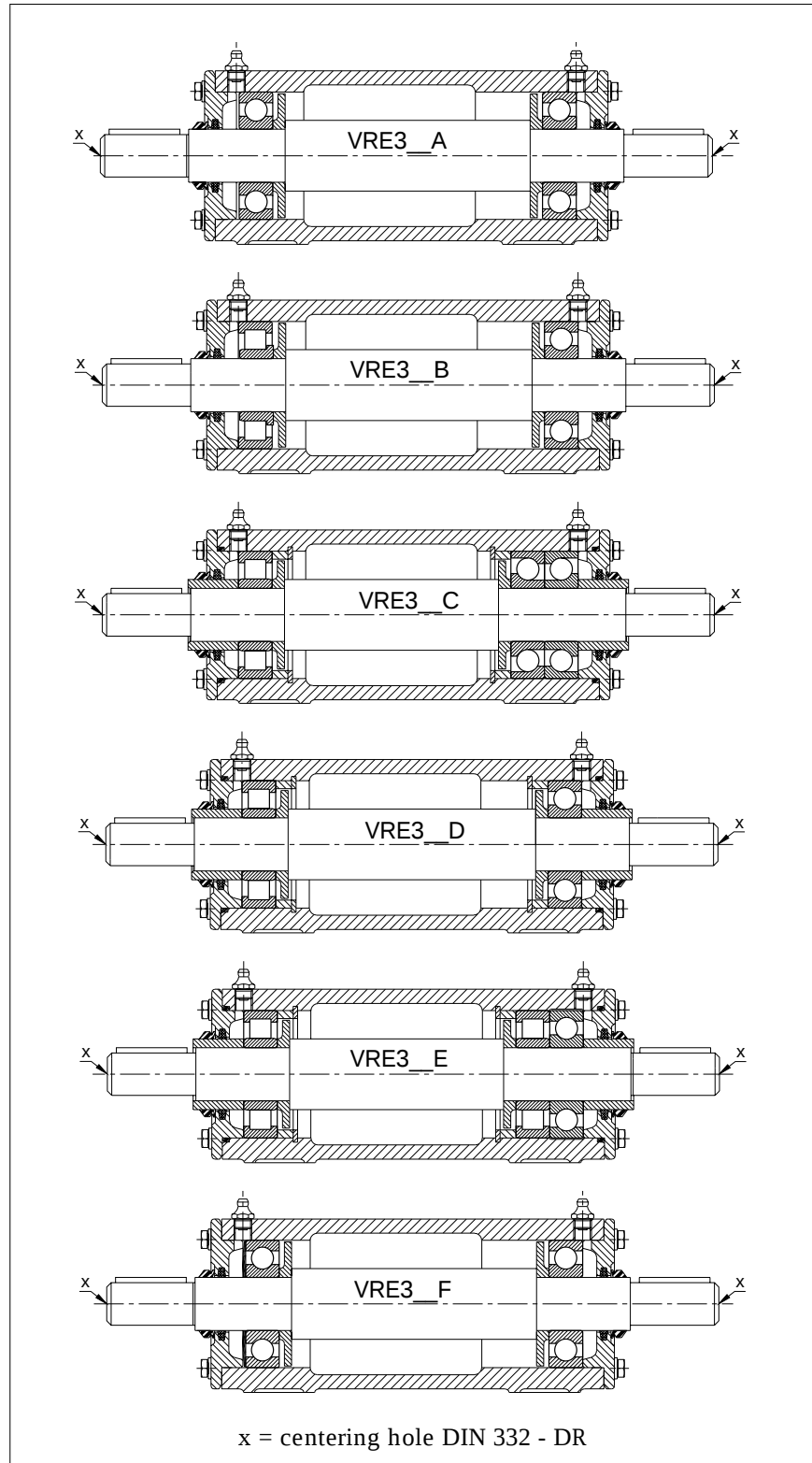
- Housing VR3..D
- Locating/floating bearing arrangement with 1 cylindrical roller bearing NU + 1 deep groove ball bearing
- Shaft VRW3..D

FAG Bearing Unit VRE3..E

- Housing VR3..E
- Locating/floating bearing arrangement with 1 cylindrical roller bearing NU + 1 cylindrical roller bearing NU + 1 deep groove ball bearing
- Shaft VRW3..C

FAG Bearing Unit VRE3..F

- (up to 316)
- Housing VR3..F
- 2 deep groove ball bearings in floating arrangement, axially spring-adjusted between outer ring and housing cover
- Shaft VRW3..F



TOLERANCES · FEATHER · KEYS · V-RINGS

Tolerances

The bearing seats in the housing are machined to:

G6 for designs A, B and F

J6 for designs C, D and E

The bearing seats on the shaft are machined to:

k6 for $d \leq 100$ mm and

m6 for $d > 100$ mm.

The necessary flatness tolerance of the clamping surface is IT8 in accordance with DIN ISO 1101, related to the distance n (see dimensional table).

Feather keys and V-rings of the FAG bearing units VRE3

Bearing unit FAG	Feather key DIN 6885, part 1	V-ring
VRE305A, B, F	A6x6x32	V-25S
VRE305C, D, E	A6x6x32	V-35S
VRE306A, B, F	A8x7x40	V-30S
VRE306C, D, E	A8x7x40	V-40S
VRE307A, B, F	A8x7x50	V-35S
VRE307C, D, E	A8x7x50	V-45S
VRE308A, B, F	A10x8x63	V-40S
VRE308C, D, E	A10x8x63	V-50S
VRE309A, B, F	A10x8x63	V-45S
VRE309C, D, E	A10x8x63	V-55S
VRE310A, B, F	A12x8x90	V-50S
VRE310C, D, E	A12x8x90	V-60S
VRE311A, B, F	A14x9x90	V-55S
VRE311C, D, E	A14x9x90	V-65S
VRE312A, B, F	A14x9x90	V-60S
VRE312C, D, E	A14x9x90	V-70S
VRE313A, B, F	A16x10x90	V-65S
VRE313C, D, E	A16x10x90	V-75S
VRE314A, B, F	A18x11x110	V-70S
VRE314C, D, E	A18x11x110	V-80S
VRE315A, B, F	A18x11x110	V-75S
VRE315C, D, E	A18x11x110	V-90S
VRE316A, B, F	A20x12x110	V-80S
VRE316C, D, E	A20x12x110	V-95S
VRE317A, B	A20x12x110	V-85S
VRE317C, D, E	A20x12x110	V-100S
VRE318A, B	A22x14x140	V-90S
VRE318C, D, E	A22x14x140	V-110S
VRE319A, B	A22x14x140	V-95S
VRE319C, D, E	A22x14x140	V-110S
VRE320A, B	A25x14x140	V-100S
VRE320C, D, E	A25x14x140	V-120S
VRE322A, B	A28x16x180	V-110S
VRE322C, D, E	A28x16x180	V-130S
VRE324A, B	A28x16x180	V-120S
VRE324C, D, E	A28x16x180	V-140S

Shaft journal (DIN 748)

Diameter [mm] over	to	Machining tolerance
50	50	k6 m6

LUBRICATION

Lubrication

The bearings in the FAG bearing units VRE3 are filled with a lithium soap base grease of consistency class 3 with a mineral base oil of the viscosity class ISO VG 100. There is a lubricating nipple at each bearing location. The bearings should be replenished with the FAG grease Arcanol L71V. If this grease is not available, a grease of the same soap base grease and consistency class should be selected as well as a base oil viscosity as similar as possible. The relubrication quantities and intervals are determined by the type (A, B, C, D, E or F) and the speed of the unit, see tables. Overlubrication is prevented by the washers located inside the housing beside the bearings. They move the grease escaping from the bearings into the free housing space between the bearings. Further information about relubrication intervals and grease types can be found in the FAG publication no. WL 81 115 "Rolling Bearing Lubrication" and WL 81 116 "Arcanol · Rolling bearing-tested grease".

Relubrication intervals for continuous operation

Speed index [min ⁻¹ · mm]	Relubrication interval [h]	
	VRE3..A VRE3..F	VRE3..B VRE3..C VRE3..D VRE3..E
200 000	3400	1050
300 000	2350	600
400 000	1800	350

Grease quantities for initial greasing and relubrication

Bearing unit FAG	Initial greasing [g] ≈	Relubrication quantity [g]	
		Floating bearing	Locat. bearing
VRE305A, B, F	40	5	5
VRE305C, E	45	5	10
VRE305D	35	5	5
VRE306A, B, F	60	5	5
VRE306C, E	65	5	10
VRE306D	55	5	5
VRE307A, B, F	80	5	5
VRE307C, E	90	5	10
VRE307D	75	5	5
VRE308A, B, F	110	10	10
VRE308C, E	120	10	20
VRE308D	100	10	10
VRE309A, B, F	140	10	10
VRE309C, E	155	10	20
VRE309D	125	10	10
VRE310A, B, F	190	10	10
VRE310C, E	210	10	20
VRE310D	170	10	10
VRE311A, B, F	240	15	15
VRE311C, E	265	15	25
VRE311D	220	15	15
VRE312A, B, F	300	15	15
VRE312C, E	330	15	25
VRE312D	270	15	15
VRE313A, B, F	380	15	15
VRE313C, E	420	15	25
VRE313D	340	15	15
VRE314A, B, F	480	20	20
VRE314C, E	525	20	35
VRE314D	425	20	20
VRE315A, B, F	590	20	20
VRE315C, E	650	20	35
VRE315D	525	20	20
VRE316A, B, F	700	20	20
VRE316C, E	770	20	40
VRE316D	620	20	20
VRE317A, B	830	25	25
VRE317C, E	900	25	40
VRE317D	750	25	25
VRE318A, B	1000	25	25
VRE318C, E	1050	25	50
VRE318D	850	25	25
VRE319A, B	1160	30	30
VRE319C, E	1300	30	55
VRE319D	1050	30	30
VRE320A, B	1450	35	35
VRE320C, E	1550	35	65
VRE320D	1250	35	35
VRE322A, B	1950	40	40
VRE322C, E	1950	40	75
VRE322D	1600	40	40
VRE324A, B	2350	45	45
VRE324C, E	2500	45	90
VRE324D	2050	45	45

Mounting the complete unit

The unit is bolted onto a clean and flat surface. Refer to the table on page 9 for the tightening torques.

Mounting the components

Dirt particles in rolling bearings reduce the bearing life. Care must therefore be taken during mounting to insure that dirt cannot penetrate the bearings or housings.

If necessary (e.g. in case of repair) housings and bearings have to be thoroughly cleaned with kerosene, a cold-cleaning agent or some similar agent.

Rolling bearings should not be removed from their original packaging until immediately before mounting; they are not rinsed.

Mounting designs A and F:

First, the two grease valves are pressed onto the shaft until they are in positive contact with the shaft shoulders.

The rolling bearings are then heated to approximately 80°C (e.g. with the FAG induction heating device (AWG3,5), slipped onto the shaft until they abut the grease valves, and filled with grease.

The premounted shaft is then cautiously inserted into the housing with a slow rotary movement. Finally, the two covers (whose cavities have to be filled up with grease) are positioned and fastened. The opening for the grease

inlet must be at the top. The bolts are locked by means of spring washers.

For design F, the ondular washer has to be inserted on one side between bearing outer ring and cover, please note markings (see pg. 4). If the shaft for design F is not from FAG, please make sure that the centre section of it is marked to match the housing (position of ondular washer). Only then is easy mounting possible.

Deviating measures for designs B, C, D and E:

Just the inner rings of the cylindrical roller bearings are mounted on the shaft. Then, in the case of designs C, D, and E the snap rings and the spacers are inserted into the housings.

Then the outer ring with roller and cage assembly is filled with grease and slipped into the housing.

As in the case of design A, the premounted shaft is then cautiously slid, while rotating, into the housing.

After bolting the cover a spacer sleeve is placed at both ends of the shaft so that they abut the bearing inner rings. Then the mating parts can be placed on the trunnion and locked by means of bolts screwed into the centering hole.

The bearing seats of designs C, D, and E on the shafts differ in width (see pg. 5). When mounting the bearings the correct position of shaft seat and floating/locating bearing has to be observed.

Dismounting

Dismounting shaft and bearings is done in reverse order to mounting. Attention must be paid to the following in order to avoid bearing damage when dismounting:

The force applied to remove the bearings from the shaft must not be transmitted via the rolling elements. To ensure avoidance of damage to the raceway, the extraction force should be applied via the bearing inner ring or the grease valve.

Putting into operation

The FAG bearing units of the series VRE3.. are supplied ready for use. When first being put into operation twice as much grease as normally recommended for relubrication (see table on page 7, right) is applied on both sides immediately after start-up.

Maintenance

The units are occasionally checked to make sure that they are running smoothly and that there are no vibrations. The development of temperature is also observed. Irregular noises and/or a temperature curve which does not reach steady state or which suddenly increases indi-

cate trouble. This trouble can be caused either by an imbalance which grows during operation or it may be caused by starved lubrication. If relubrication does not help, the unit must be stopped to avoid consequential damage. If necessary, the unit may then be dismantled and the bearings inspected.

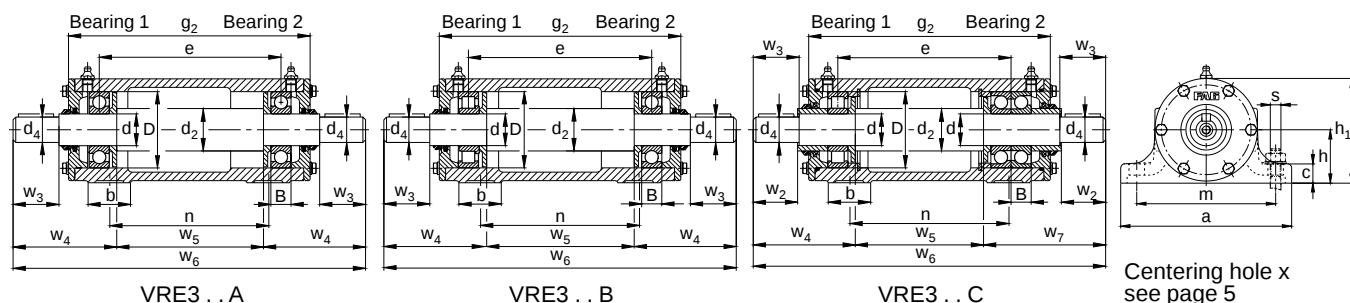
Tightening torques M for holding-down and cover bolts

Bearing unit FAG	Holding-down bolts, material 8.8 in accordance with DIN 13	M [Nm]	Cover bolts, material 8.8 in accordance with DIN 13	M [Nm]
VRE305	M12	85	M6	10
VRE306	M12	85	M6	10
VRE307	M12	85	M6	10
VRE308	M12	85	M6	10
VRE309	M12	85	M6	10
VRE310	M12	85	M6	10
VRE311	M16	210	M8	25
VRE312	M16	210	M8	25
VRE313	M16	210	M8	25
VRE314	M16	210	M8	25
VRE315	M16	210	M8	25
VRE316	M16	210	M10	50
VRE317	M16	210	M10	50
VRE318	M16	210	M10	50
VRE319	M20	410	M10	50
VRE320	M20	410	M10	50
VRE322	M24	710	M10	50
VRE324	M30	1450	M10	50

The tightening torques indicated are maximum values at 90% utilization of the yielding point of the bolt material and a coefficient of friction of 0.14. We recommend tightening the bolts to 70% of these values.

FAG BEARING UNITS VRE

Dimensions



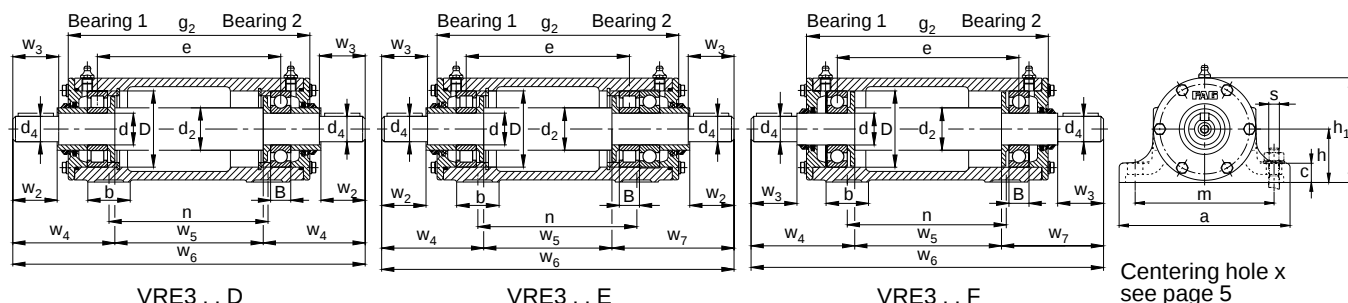
Dimensions

d	D	B	d ₂	d ₄	w ₂	w ₃	w ₄	w ₅	w ₆	w ₇	e	g ₂	b	n*)	m	a	c	h	h ₁	s
mm																				
25	62	17	35	19		40	90.5	117	298		148	198	35	135	120	155	16	45	87	M12
25	62	17	35	19		40	90.5	117	298		149	198	35	135	120	155	16	45	87	M12
25	62	17	35	19	40	42	90	101	298	107	140.5	198	35	135	120	155	16	45	87	M12
25	62	17	35	19	40	42	90	118	298		149	198	35	135	120	155	16	45	87	M12
25	62	17	35	19	40	42	90	101	298	107	132	198	35	135	120	155	16	45	87	M12
25	62	17	35	19		40	91.25	116.25	298	90.5	147.25	198	35	135	120	155	16	45	87	M12
30	72	19	40	24		50	102.5	140	345		173	225	40	150	130	160	18	50	98	M12
30	72	19	40	24		50	102.5	140	345		174	225	40	150	130	160	18	50	98	M12
30	72	19	40	24	50	52	104	122	349	123	164.5	225	40	150	130	160	18	50	98	M12
30	72	19	40	24	50	52	104	141	349		174	225	40	150	130	160	18	50	98	M12
30	72	19	40	24	50	52	104	122	349	123	155	225	40	150	130	160	18	50	98	M12
30	72	19	40	24		50	103.25	139.25	345	102.5	172.25	225	40	150	130	160	18	50	98	M12
35	80	21	45	28		60	117.5	160	395		197	255	45	175	150	190	18	60	113	M12
35	80	21	45	28		60	117.5	160	395		198	255	45	175	150	190	18	60	113	M12
35	80	21	45	28	60	62	119	140	399	140	187.5	255	45	175	150	190	18	60	113	M12
35	80	21	45	28	60	62	119	161	399		198	255	45	175	150	190	18	60	113	M12
35	80	21	45	28	60	62	119	140	399	140	177	255	45	175	150	190	18	60	113	M12
35	80	21	45	28		60	118.5	159	395	117.5	196	255	45	175	150	190	18	60	113	M12
40	90	23	50	32		80	143.5	214	501		257	317	52	225	150	190	20	60	118	M12
40	90	23	50	32		80	143.5	214	501		258	317	52	225	150	190	20	60	118	M12
40	90	23	50	32	80	82	143	192	501	166	246.5	317	52	225	150	190	20	60	118	M12
40	90	23	50	32	80	82	143	215	501		258	317	52	225	150	190	20	60	118	M12
40	90	23	50	32	80	82	143	192	501	166	235	317	52	225	150	190	20	60	118	M12
40	90	23	50	32		80	144.5	213	501	143.5	256	317	52	225	150	190	20	60	118	M12
45	100	25	55	38		80	145.5	236	527		281	343	52	250	170	210	22	70	135	M12
45	100	25	55	38		80	145.5	236	527		282	343	52	250	170	210	22	70	135	M12
45	100	25	55	38	80	82	145	212	527	170	269.5	343	52	250	170	210	22	70	135	M12
45	100	25	55	38	80	82	145	237	527		282	343	52	250	170	210	22	70	135	M12
45	100	25	55	38	80	82	145	212	527	170	257	343	52	250	170	210	22	70	135	M12
45	100	25	55	38		80	146.5	235	527	145.5	280	343	52	250	170	210	22	70	135	M12
50	110	27	60	42		110	179.5	266	625		313	381	60	275	170	210	25	70	138	M12
50	110	27	60	42		110	179.5	266	625		314	381	60	275	170	210	25	70	138	M12
50	110	27	60	42	110	112	179	240	625	206	300.5	381	60	275	170	210	25	70	138	M12
50	110	27	60	42	110	112	179	267	625		314	381	60	275	170	210	25	70	138	M12
50	110	27	60	42	110	112	179	240	625	206	287	381	60	275	170	210	25	70	138	M12
50	110	27	60	42		110	180.5	265	625	179.5	312	381	60	275	170	210	25	70	138	M12

*) Housing feet symmetrical to housing body

FAG BEARING UNITS VRE

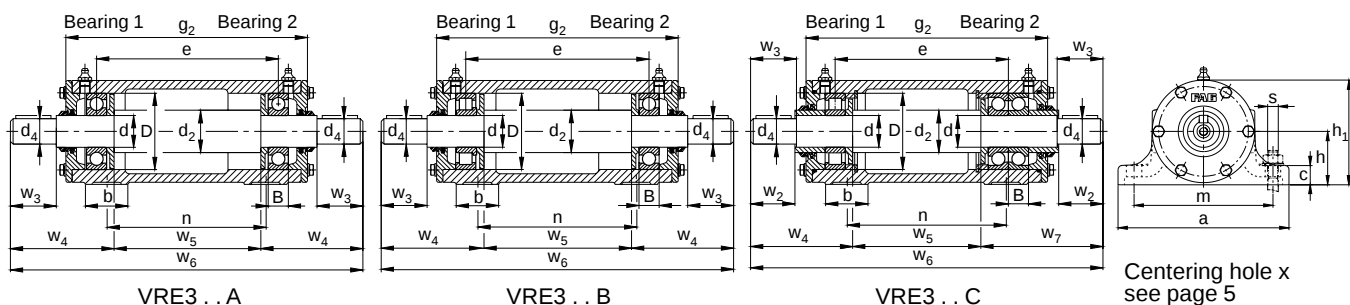
Codes · Load rating · Permissible speed · Mass



Bearing unit	Bearing 1	Load rating		Bearing 2	Load rating		Housing	Complete shaft	Permissible speed	Mass	
FAG	FAG	dyn. C	stat. C ₀	FAG	dyn. C	stat. C ₀	FAG	FAG	min ⁻¹	Unit	Housing
		kN			kN					kg	
VRE305A	6305.C3	22.4	11.4	6305.C3	22.4	11.4	VR305A	VRW305A	11000	7	5
VRE305B	NJ305E.TVP2	41.5	37.5	6305.C3	22.4	11.4	VR305A	VRW305A	9500	7	5
VRE305C	NU305E.TVP2.C3	41.5	37.5	2 x 7305B.TVP.UA	42.5	30	VR305C	VRW305C	7500	7.4	5.2
VRE305D	NU305E.TVP2.C3	41.5	37.5	6305.C3	22.4	11.4	VR305D	VRW305D	9500	7.2	5.2
VRE305E	NU305E.TVP2.C3	41.5	37.5	NU305E.TVP2.C3	41.5	37.5	VR305E	VRW305C	9500	7.5	5.2
				+6305.C3	22.4	11.4					
VRE305F	6305.C3	22.4	11.4	6305.C3	22.4	11.4	VR305F	VRW305F	11000	7	5
VRE306A	6306.C3	29	16.3	6306.C3	29	16.3	VR306A	VRW306A	9500	9	5.8
VRE306B	NJ306E.TVP2	51	48	6306.C3	29	16.3	VR306A	VRW306A	8500	9	5.8
VRE306C	NU306E.TVP2.C3	51	48	2 x 7306B.TVP.UA	53	40	VR306C	VRW306C	6300	9.4	6
VRE306D	NU306E.TVP2.C3	51	48	6306.C3	29	16.3	VR306D	VRW306D	8500	9.2	6
VRE306E	NU306E.TVP2.C3	51	48	NU306E.TVP2.C3	51	48	VR306E	VRW306C	8500	9.4	6
				+6306.C3	29	16.3					
VRE306F	6306.C3	29	16.3	6306.C3	29	16.3	VR306F	VRW306F	9500	9	5.8
VRE307A	6307.C3	33.5	19	6307.C3	33.5	19	VR307A	VRW307A	8500	13	8.5
VRE307B	NJ307E.TVP2	64	63	6307.C3	33.5	19	VR307A	VRW307A	7500	13	8.5
VRE307C	NU307E.TVP2.C3	64	63	2 x 7307B.TVP.UA	63	50	VR307C	VRW307C	5600	13.6	8.8
VRE307D	NU307E.TVP2.C3	64	63	6307.C3	33.5	19	VR307D	VRW307D	7500	13.3	8.8
VRE307E	NU307E.TVP2.C3	64	63	NU307E.TVP2.C3	64	63	VR307E	VRW307C	7500	13.6	8.8
				+6307.C3	33.5	19					
VRE307F	6307.C3	33.5	19	6307.C3	33.5	19	VR307F	VRW307F	8500	13	8.5
VRE308A	6308.C3	42.5	25	6308.C3	42.5	25	VR308A	VRW308A	7500	18	10.9
VRE308B	NJ308E.TVP2	81.5	78	6308.C3	42.5	25	VR308A	VRW308A	6300	18	10.9
VRE308C	NU308E.TVP2.C3	81.5	78	2 x 7308B.TVP.UA	81.5	65.5	VR308C	VRW308C	5000	19.1	11.7
VRE308D	NU308E.TVP2.C3	81.5	78	6308.C3	42.5	25	VR308D	VRW308D	6300	18.8	11.7
VRE308E	NU308E.TVP2.C3	81.5	78	NU308E.TVP2.C3	81.5	78	VR308E	VRW308C	6300	19.2	11.7
				+6308.C3	42.5	25					
VRE308F	6308.C3	42.5	25	6308.C3	42.5	25	VR308F	VRW308F	7500	18	10.9
VRE309A	6309.C3	53	32	6309.C3	53	32	VR309A	VRW309A	6700	24.3	14.9
VRE309B	NJ309E.TVP2	98	100	6309.C3	53	32	VR309A	VRW309A	5600	24.4	14.9
VRE309C	NU309E.TVP2.C3	98	100	2 x 7309B.TVP.UA	98	80	VR309C	VRW309C	4500	25.3	15.3
VRE309D	NU309E.TVP2.C3	98	100	6309.C3	53	32	VR309D	VRW309D	5600	24.8	15.3
VRE309E	NU309E.TVP2.C3	98	100	NU309E.TVP2.C3	98	100	VR309E	VRW309C	5600	25.3	15.3
				+6309.C3	53	32					
VRE309F	6309.C3	53	32	6309.C3	53	32	VR309F	VRW309F	6700	24.2	14.9
VRE310A	6310.C3	62	38	6310.C3	62	38	VR310A	VRW310A	6000	30.3	17.3
VRE310B	NJ310E.TVP2	110	114	6310.C3	62	38	VR310A	VRW310A	5300	30.3	17.3
VRE310C	NU310E.TVP2.C3	110	114	2 x 7310B.TVP.UA	112	95	VR310C	VRW310C	4300	31.7	17.9
VRE310D	NU310E.TVP2.C3	110	114	6310.C3	62	38	VR310D	VRW310D	5300	30.9	17.9
VRE310E	NU310E.TVP2.C3	110	114	NU310E.TVP2.C3	110	114	VR310E	VRW310C	5300	31.8	17.9
				+6310.C3	62	38					
VRE310F	6310.C3	62	38	6310.C3	62	38	VR310F	VRW310F	6000	30.3	17.3

FAG BEARING UNITS VRE

Dimensions



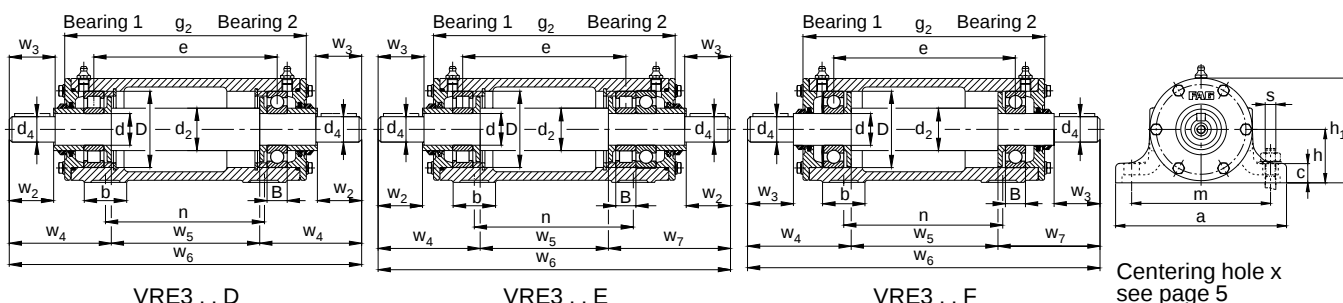
Dimensions

d	D	B	d ₂	d ₄	w ₂	w ₃	w ₄	w ₅	w ₆	w ₇	e	g ₂	b	n*)	m	a	c	h	h ₁ ≈	s	
mm																					
55	120	29	65	48			110	181.5	288	651		337	407	60	300	210	260	25	80	158	M16
55	120	29	65	48			110	181.5	288	651		338	407	60	300	210	260	25	80	158	M16
55	120	29	65	48	110	112	181	260	651	210	323.5	407	60	300	210	260	25	80	158	M16	
55	120	29	65	48	110	112	181	289	651		338	407	60	300	210	260	25	80	158	M16	
55	120	29	65	48	110	112	181	260	651	210	309	407	60	300	210	260	25	80	158	M16	
55	120	29	65	48			110	182.5	287	651	181.5	336	407	60	300	210	260	25	80	158	M16
60	130	31	70	48			110	183.5	334	701		385	457	70	340	210	260	25	80	162	M16
60	130	31	70	48			110	183.5	334	701		386	457	70	340	210	260	25	80	162	M16
60	130	31	70	48	110	112	185.5	304	706	216.5	370.5	457	70	340	210	260	25	80	162	M16	
60	130	31	70	48	110	112	185.5	335	706		386	457	70	340	210	260	25	80	162	M16	
60	130	31	70	48	110	112	185.5	304	706	216.5	355	457	70	340	210	260	25	80	162	M16	
60	130	31	70	48			110	184.5	333	701	183.5	384	457	70	340	210	260	25	80	162	M16
65	140	33	75	55			110	187.5	349	724		404	480	70	360	230	290	25	95	183	M16
65	140	33	75	55			110	187.5	349	724		405	480	70	360	230	290	25	95	183	M16
65	140	33	75	55	110	112	189.5	317	729	222.5	388.5	480	70	360	230	290	25	95	183	M16	
65	140	33	75	55	110	112	189.5	350	729		405	480	70	360	230	290	25	95	183	M16	
65	140	33	75	55	110	112	189.5	317	729	222.5	372	480	70	360	230	290	25	95	183	M16	
65	140	33	75	55			110	189	347.5	724	187.5	402.5	480	70	360	230	290	25	95	183	M16
70	150	35	80	60			140	223	365	811		422	500	70	380	230	290	25	95	188	M16
70	150	35	80	60			140	223	365	811		423	500	70	380	230	290	25	95	188	M16
70	150	35	80	60	140	143	222.5	331	811	257.5	405.5	500	70	380	230	290	25	95	188	M16	
70	150	35	80	60	140	143	222.5	366	811		423	500	70	380	230	290	25	95	188	M16	
70	150	35	80	60	140	143	222.5	331	811	257.5	388	500	70	380	230	290	25	95	188	M16	
70	150	35	80	60			140	224.5	363.5	811	223	420.5	500	70	380	230	290	25	95	188	M16
75	160	37	90	65			140	226	389	841		450	530	80	400	260	320	30	100	198	M16
75	160	37	90	65			140	226	389	841		451	530	80	400	260	320	30	100	198	M16
75	160	37	90	65	140	143	225.5	353	841	262.5	432.5	530	80	400	260	320	30	100	198	M16	
75	160	37	90	65	140	143	225.5	390	841		451	530	80	400	260	320	30	100	198	M16	
75	160	37	90	65	140	143	225.5	353	841	262.5	414	530	80	400	260	320	30	100	198	M16	
75	160	37	90	65			140	227.5	387.5	841	226	448.5	530	80	400	260	320	30	100	198	M16
80	170	39	95	70			140	228	405	861		468	550	80	420	260	320	30	112	217	M16
80	170	39	95	70			140	228	405	861		469	550	80	420	260	320	30	112	217	M16
80	170	39	95	70	140	143	227.5	367	861	266.5	449.5	550	80	420	260	320	30	112	217	M16	
80	170	39	95	70	140	143	227.5	406	861		469	550	80	420	260	320	30	112	217	M16	
80	170	39	95	70	140	143	227.5	367	861	266.5	430	550	80	420	260	320	30	112	217	M16	
80	170	39	95	70			140	229.5	403.5	861	228	466.5	550	80	420	260	320	30	112	217	M16

*) Housing feet symmetrical to housing body

FAG BEARING UNITS VRE

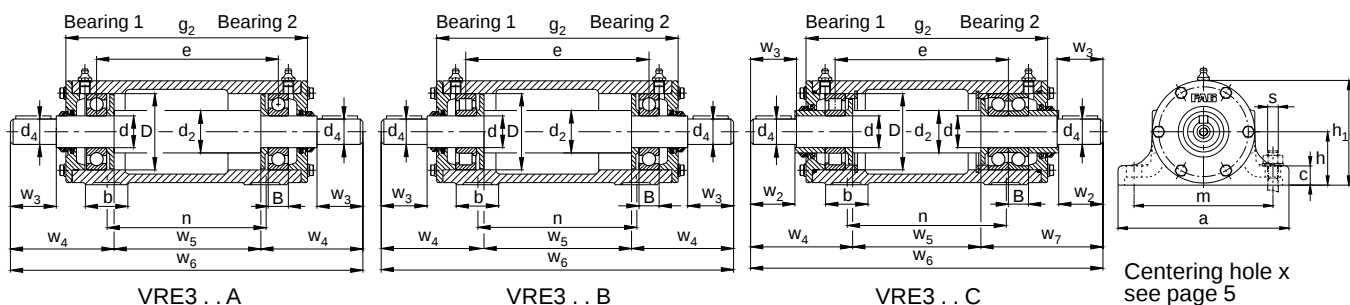
Codes · Load rating · Permissible speed · Mass



Bearing unit	Bearing 1	Load rating		Bearing 2	Load rating		Housing	Complete shaft	Permissible speed	Mass	
		dyn. C	stat. C ₀		dyn. C	stat. C ₀				Unit	Housing
FAG	FAG	kN		FAG	kN		FAG	FAG	min ⁻¹	kg	
VRE311A	6311.C3	76.5	47.5	6311.C3	76.5	47.5	VR311A	VRW311A	5300	38.6	22
VRE311B	NJ311E.TVP2	134	140	6311.C3	76.5	47.5	VR311A	VRW311A	4800	38.7	22
VRE311C	NU311E.TVP2.C3	134	140	2 x 7311B.TVP.UA	127	112	VR311C	VRW311C	3800	40.2	22.5
VRE311D	NU311E.TVP2.C3	134	140	6311.C3	76.5	47.5	VR311D	VRW311D	4800	39.2	22.5
VRE311E	NU311E.TVP2.C3	134	140	NU311E.TVP2.C3	134	140	VR311E	VRW311C	4800	40.2	22.5
				+6311.C3	76.5	47.5					
VRE311F	6311.C3	76.5	47.5	6311.C3	76.5	47.5	VR311F	VRW311F	5300	38.6	22
VRE312A	6312.C3	81.5	52	6312.C3	81.5	52	VR312A	VRW312A	5000	51.2	30.7
VRE312B	NJ312E.TVP2	150	156	6312.C3	81.5	52	VR312A	VRW312A	4300	51.4	30.7
VRE312C	NU312E.TVP2.C3	150	156	2 x 7312B.TVP.UA	146	132	VR312C	VRW312C	3400	53.8	31.7
VRE312D	NU312E.TVP2.C3	150	156	6312.C3	81.5	52	VR312D	VRW312D	4300	52.4	31.7
VRE312E	NU312E.TVP2.C3	150	156	NU312E.TVP2.C3	150	156	VR312E	VRW312C	4300	53.7	31.7
				+6312.C3	81.5	52					
VRE312F	6312.C3	81.5	52	6312.C3	81.5	52	VR312F	VRW312F	5000	51.1	30.7
VRE313A	6313.C3	93	60	6313.C3	93	60	VR313A	VRW313A	4500	58	32.8
VRE313B	NJ313E.TVP2	180	190	6313.C3	93	60	VR313A	VRW313A	4000	58.2	32.8
VRE313C	NU313E.TVP2.C3	180	190	2 x 7313B.TVP.UA	166	150	VR313C	VRW313C	3200	60.8	33.8
VRE313D	NU313E.TVP2.C3	180	190	6313.C3	93	60	VR313D	VRW313D	4000	59.3	33.8
VRE313E	NU313E.TVP2.C3	180	190	NU313E.TVP2.C3	180	190	VR313E	VRW313C	4000	60.8	33.8
				+6313.C3	93	60					
VRE313F	6313.C3	93	60	6313.C3	93	60	VR313F	VRW313F	4500	58	32.8
VRE314A	6314.C3	104	68	6314.C3	104	68	VR314A	VRW314A	4300	66.9	35
VRE314B	NJ314E.TVP2	204	220	6314.C3	104	68	VR314A	VRW314A	3800	67.1	35
VRE314C	NU314E.TVP2.C3	204	220	2 x 7314B.TVP.UA	186	173	VR314C	VRW314C	3000	70.4	36
VRE314D	NU314E.TVP2.C3	204	220	6314.C3	104	68	VR314D	VRW314D	3800	68	36
VRE314E	NU314E.TVP2.C3	204	220	NU314E.TVP2.C3	204	220	VR314E	VRW314C	3800	70.6	36
				+6314.C3	104	68					
VRE314F	6314.C3	104	68	6314.C3	104	68	VR314F	VRW314F	4300	66.8	35
VRE315A	6315.C3	114	76.5	6315.C3	114	76.5	VR315A	VRW315A	4000	84.8	44.8
VRE315B	NJ315E.TVP2	240	265	6315.C3	114	76.5	VR315A	VRW315A	3400	85	44.8
VRE315C	NU315E.TVP2.C3	240	265	2 x 7315B.TVP.UA	208	200	VR315C	VRW315C	2700	89.3	46.4
VRE315D	NU315E.TVP2.C3	240	265	6315.C3	114	76.5	VR315D	VRW315D	3400	86.4	46.4
VRE315E	NU315E.TVP2.C3	240	265	NU315E.TVP2.C3	240	265	VR315E	VRW315C	3400	89.4	46.4
				+6315.C3	114	76.5					
VRE315F	6315.C3	114	76.5	6315.C3	114	76.5	VR315F	VRW315F	4000	84.8	44.8
VRE316A	6316.C3	122	86.5	6316.C3	122	86.5	VR316A	VRW316A	3800	90.8	44
VRE316B	NJ316E.TVP2	255	275	6316.C3	122	86.5	VR316A	VRW316A	3200	91	44
VRE316C	NU316E.TVP2.C3	255	275	2 x 7316B.TVP.UA	228	228	VR316C	VRW316C	2600	96.2	45
VRE316D	NU316E.TVP2.C3	255	275	6316.C3	122	86.5	VR316D	VRW316D	3200	91.9	45
VRE316E	NU316E.TVP2.C3	255	275	NU316E.TVP2.C3	255	275	VR316E	VRW316C	3200	95.3	45
				+6316.C3	122	86.5					
VRE316F	6316.C3	122	86.5	6316.C3	122	86.5	VR316F	VRW316F	3800	90.8	44

FAG BEARING UNITS VRE

Dimensions



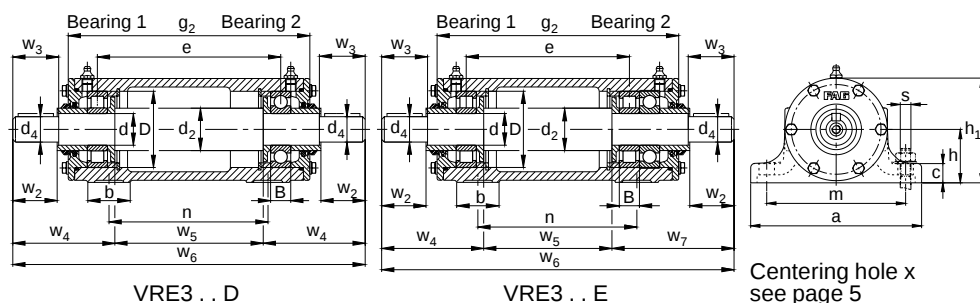
Dimensions

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mm																				
85	180	41	100	75		140	230	421	881		486	570	80	440	290	350	30	112	222	M16
85	180	41	100	75		140	230	421	881		487	570	80	440	290	350	30	112	222	M16
85	180	41	100	75	140	143	229.5	381	881	270.5	466.5	570	80	440	290	350	30	112	222	M16
85	180	41	100	75	140	143	229.5	422	881		487	570	80	440	290	350	30	112	222	M16
85	180	41	100	75	140	143	229.5	381	881	270.5	446	570	80	440	290	350	30	112	222	M16
90	190	43	105	80		170	263	445	971		510	600	85	460	290	350	30	112	227	M16
90	190	43	105	80		170	263	445	971		511	600	85	460	290	350	30	112	227	M16
90	190	43	105	80	170	173	264.5	403	975	307.5	489.5	600	85	460	290	350	30	112	227	M16
90	190	43	105	80	170	173	264.5	446	975		511	600	85	460	290	350	30	112	227	M16
90	190	43	105	80	170	173	264.5	403	975	307.5	468	600	85	460	290	350	30	112	227	M16
95	200	45	110	85		170	267.5	469	1004		540	633	90	480	320	400	35	125	248	M20
95	200	45	110	85		170	267.5	469	1004		541	633	90	480	320	400	35	125	248	M20
95	200	45	110	85	170	173	269	425	1008	314	518.5	633	90	480	320	400	35	125	248	M20
95	200	45	110	85	170	173	269	470	1008		541	633	90	480	320	400	35	125	248	M20
95	200	45	110	85	170	173	269	425	1008	314	496	633	90	480	320	400	35	125	248	M20
100	215	47	120	90		170	268	500	1036		570	665	95	500	320	400	40	130	260	M20
100	215	47	120	90		170	268	500	1036		571	665	95	500	320	400	40	130	260	M20
100	215	47	120	90	170	173	269.5	454	1040	316.5	547.5	665	95	500	320	400	40	130	260	M20
100	215	47	120	90	170	173	269.5	501	1040		571	665	95	500	320	400	40	130	260	M20
100	215	47	120	90	170	173	269.5	454	1040	316.5	524	665	95	500	320	400	40	130	260	M20
110	240	50	130	100		210	313	507	1133		580	678	95	520	380	450	40	150	295	M24
110	240	50	130	100		210	313	507	1133		581	678	95	520	380	450	40	150	295	M24
110	240	50	130	100	210	213	312.5	458	1133	362.5	556	678	95	520	380	450	40	150	295	M24
110	240	50	130	100	210	213	312.5	508	1133		581	678	95	520	380	450	40	150	295	M24
110	240	50	130	100	210	213	312.5	458	1133	362.5	531	678	95	520	380	450	40	150	295	M24
120	260	55	140	110		210	318	524	1160		602	705	100	540	410	500	40	160	320	M30
120	260	55	140	110		210	318	524	1160		603	705	100	540	410	500	40	160	320	M30
120	260	55	140	110	210	213	317.5	470	1160	372.5	575.5	705	100	540	410	500	40	160	320	M30
120	260	55	140	110	210	213	317.5	525	1160		603	705	100	540	410	500	40	160	320	M30
120	260	55	140	110	210	213	317.5	470	1160	372.5	548	705	100	540	410	500	40	160	320	M30

*) Housing feet symmetrical to housing body

FAG BEARING UNITS VRE

Codes · Load rating · Permissible speed · Mass



Bearing unit	Bearing 1	Load rating		Bearing 2	Load rating		Housing	Complete shaft	Permissible speed	Mass	
		dyn. C	stat. C ₀		dyn. C	stat. C ₀				Unit	Housing
FAG	FAG	kN		FAG	kN		FAG	FAG	min ⁻¹	kg	
VRE317A	6317.C3	125	88	6317.C3	125	88	VR317A	VRW317A	3400	114	59.2
VRE317B	NJ317E.TVP2	270	300	6317.C3	125	88	VR317A	VRW317A	3000	115	59.2
VRE317C	NU317E.TVP2.C3	270	300	2 x 7317B.TVP.UA	245	255	VR317C	VRW317C	2400	120	60
VRE317D	NU317E.TVP2.C3	270	300	6317.C3	125	88	VR317D	VRW317D	3000	115	60
VRE317E	NU317E.TVP2.C3	270	300	NU317E.TVP2.C3 +6317.C3	270 125	300 88	VR317E	VRW317C	3000	120	60
VRE318A	6318.C3	134	102	6318.C3	134	102	VR318A	VRW318A	3400	128	62
VRE318B	NJ318E.TVP2	315	345	6318.C3	134	102	VR318A	VRW318A	2800	128	62
VRE318C	NU318E.TVP2.C3	315	345	2 x 7318B.TVP.UA	260	280	VR318C	VRW318C	2200	134	63
VRE318D	NU318E.TVP2.C3	315	345	6318.C3	134	102	VR318D	VRW318D	2800	129	63
VRE318E	NU318E.TVP2.C3	315	345	NU318E.TVP2.C3 +6318.C3	315 134	345 102	VR318E	VRW318C	2800	134	63
VRE319A	6319.C3	143	112	6319.C3	143	112	VR319A	VRW319A	3200	156	84.1
VRE319B	NJ319E.TVP2	335	380	6319.C3	143	112	VR319A	VRW319A	2800	157	84.1
VRE319C	NU319E.TVP2.C3	335	380	2 x 7319B.TVP.UA	280	305	VR319C	VRW319C	2200	164	86
VRE319D	NU319E.TVP2.C3	335	380	6319.C3	143	112	VR319D	VRW319D	2800	158	86
VRE319E	NU319E.TVP2.C3	335	380	NU319E.TVP2.C3 +6319.C3	335 143	380 112	VR319E	VRW319C	2800	164	86
VRE320A	6320.C3	163	134	6320.C3	163	134	VR320A	VRW320A	3000	177	90
VRE320B	NJ320E.TVP2	380	425	6320.C3	163	134	VR320A	VRW320A	2600	177	90
VRE320C	NU320E.TVP2.C3	380	425	2 x 7320B.TVP.UA	315	360	VR320C	VRW320C	2000	186	92
VRE320D	NU320E.TVP2.C3	380	425	6320.C3	163	134	VR320D	VRW320D	2600	179	92
VRE320E	NU320E.TVP2.C3	380	425	NU320E.TVP2.C3 +6320.C3	380 163	425 134	VR320E	VRW320C	2600	186	92
VRE322A	6322.C3	190	166	6322.C3	190	166	VR322A	VRW322A	2600	226	130
VRE322B	NJ322E.TVP2	415	475	6322.C3	190	166	VR322A	VRW322A	2400	226	130
VRE322C	NU322E.TVP2.C3	415	475	2 x 7322B.TVP.UA	365	450	VR322C	VRW322C	1900	238	132
VRE322D	NU322E.TVP2.C3	415	475	6322.C3	190	166	VR322D	VRW322D	2400	228	132
VRE322E	NU322E.TVP2.C3	415	475	NU322E.TVP2.C3 +6322.C3	415 190	475 166	VR322E	VRW322C	2400	238	132
VRE324A	6324.C3	212	190	6324.C3	212	190	VR324A	VRW324A	2400	276	170
VRE324B	NJ324E.TVP2	520	600	6324.C3	212	190	VR324A	VRW324A	2200	277	170
VRE324C	NU324E.TVP2.C3	520	600	2 x 7324B.TVP.UA	405	520	VR324C	VRW324C	1800	294	172
VRE324D	NU324E.TVP2.C3	520	600	6324.C3	212	190	VR324D	VRW324D	2200	278	172
VRE324E	NU324E.TVP2.C3	520	600	NU324E.TVP2.C3 +6324.C3	520 212	600 190	VR324E	VRW324C	2200	291	172

CALCULATION AND DESIGN EXAMPLE

Calculation and design example

The bearing arrangement in an axial flow fan for fresh air –

known data:

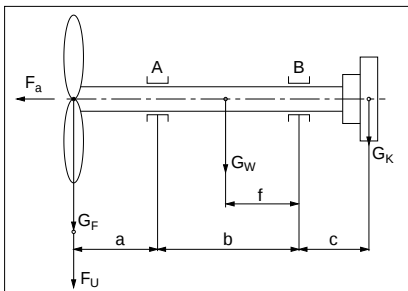
Speed	$n = 3000 \text{ min}^{-1}$
Impeller weight	$G_F = 4 \text{ kN}$
Proportional weight of coupling	$G_K = 0.15 \text{ kN}$
Shaft weight	$G_W = 0.256 \text{ kN}$
Thrust	$F_a = 5 \text{ kN}$
Bearing seat dia	$d = 70 \text{ mm}$
Operating temp.	appr. 70°C
Required f_L value = 3.5 based on $L_h = 21,500$ hours for ball bearings (from catalogue WL 41 520 "FAG Rolling Bearings")	

The bearing unit **VRE314D** is selected with

bearing A: cylindrical roller bearing NU314E.TVP2.C3,
bearing B: deep groove ball bearing 6314.C3.

With the distance dimensions of this unit ($a = 170 \text{ mm}$, $b = 423 \text{ mm}$, $c = 126 \text{ mm}$, $f = 216 \text{ mm}$), the above mentioned weights and the imbalance force $F_U = 2 \text{ kN}$ ($F_U = f_z \cdot G_F$, $f_z = 0.5$ from catalogue) the bearing reaction forces are calculated by means of the balance of moments.

Load system



Bearing reaction forces

For bearing A:

$$F_{rA} = 8.5 \text{ kN from } F_{rA} \cdot b = (F_U + G_F) \cdot (a + b) + G_W \cdot f - G_K \cdot c$$

For bearing B:

$$F_{rB} = 2 \text{ kN from } F_{rB} \cdot b = (F_U + G_F) \cdot a - G_W \cdot (b - f) - G_K \cdot (b + c) \text{ and } F_{aB} = 5 \text{ kN}$$

Nominal life L_h

Bearing A:

FAG NU314E.TVP2.C3
dynamic load rating $C = 204 \text{ kN}$,
 $f_n = 0.259$

Equivalent dynamic load

$$P = F_r = 8.5 \text{ kN}$$

$$f_L = f_n \cdot C/P = 0.259 \cdot 204/8.5 = 6.2 \text{ corresponding to } L_h > 200,000 \text{ h}$$

Bearing B:

FAG 6314.C3
dynamic load rating $C = 104 \text{ kN}$,
 $f_n = 0.223$

static load rating $C_0 = 68 \text{ kN}$

Equivalent dynamic load

$$P = X \cdot F_r + Y \cdot F_a$$

The X and Y values depend on the ratio $f_0 \cdot F_a/C_0$.

The f_0 factor is 13.2 according to catalogue WL 41 520.

Therefore for the mounted bearing (with operating clearance CN, to be on the safe side):

$$f_0 \cdot F_a/C_0 = 13.2 \cdot 5/68 = 0.97 \text{ and } e = 0.28$$

$X = 0.56$ and $Y = 1.58$ since

$F_a/F_r > e$ and therefore

$$P = 0.56 \cdot 2 + 1.58 \cdot 5 = 9 \text{ kN}$$

$$f_L = f_n \cdot C/P = 0.223 \cdot 104/9 = 2.58 \text{ corresponding to } L_h = 8550 \text{ h.}$$

The nominal life is not 21,500 hours, as required.

Attainable bearing life L_{hna}

The bearing position **B** is checked with the lower f_L value.

$L_{hna} = L_h \cdot a_1 \cdot a_{23}$ (see FAG cat. WL 41 520)

With a base oil viscosity of $100 \text{ mm}^2/\text{s}$ of the grease Arcanol L71V and an assumed operating temperature of 70°C an operating viscosity $v = 25 \text{ mm}^2/\text{s}$ is obtained.

For the mean bearing diameter $d_m = 110 \text{ mm}$ and the speed $n = 3000 \text{ min}^{-1}$ the rated viscosity $v_1 = 8 \text{ mm}^2/\text{s}$. Viscosity ratio $\kappa = v/v_1 = 25/8 \approx 3$.

Stress index $f_{s*} = C_0/P_{0*}$

$$P_{0*} = X_0 \cdot F_r + Y_0 \cdot F_a = 0.6 \cdot 2 + 0.5 \cdot 5 = 3.7 \text{ kN}$$

$$f_{s*} = 68/3.7 = 18$$

Values:

$K_1 = 0$ for ball bearings and

$K_2 = 0$ for $f_{s*} > 12$ and $\kappa = 3$, i.e.

$$K = K_1 + K_2 = 0$$

With $\kappa = 3$ the basic factor a_{23II} of 3.2 is at the upper curve of zone II. For the given condition of "normal cleanliness" the basic factor is multiplied by the cleanliness factor $s = 1$, i.e.

$$a_{23} = a_{23II} = 3.2.$$

At the usual failure probability of 10% $a_1 = 1$.

The attainable life for bearing B is therefore:

$$L_{hna} = 1 \cdot 3.2 \cdot 8550 \approx 27,400 \text{ h}$$

The adjusted rating life calculation shows that the bearing is adequately dimensioned.

Service life, relubrication

The observance of relubrication intervals and maintenance of cleanliness conditions during operation are decisive for the service life.

The relubrication interval depends on $k_f \cdot n \cdot d_m$ according to publ. no. WL 81 115. This implies that the cylindrical roller bearing has the shorter relubrication interval. A relubrication interval $t_f \approx 1700$ h is obtained when

$$k_f \cdot n \cdot d_m = 1155 \cdot 10^3 \text{ min}^{-1} \cdot \text{mm}.$$

Taking reduction factors such as dust, vibrations, and air currents into consideration the reduced relubrication interval is calculated to be approx. 1000 hours.

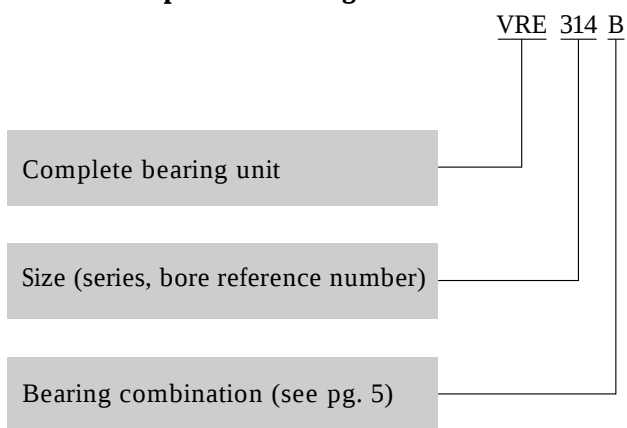
For safety reasons 20 g of Arcanol L71V should be used per bearing after a period of $0.6 \cdot 1000 \text{ h} = 600 \text{ h}$ (see tables, pg. 7).

Bearing selection and calculation on the PC

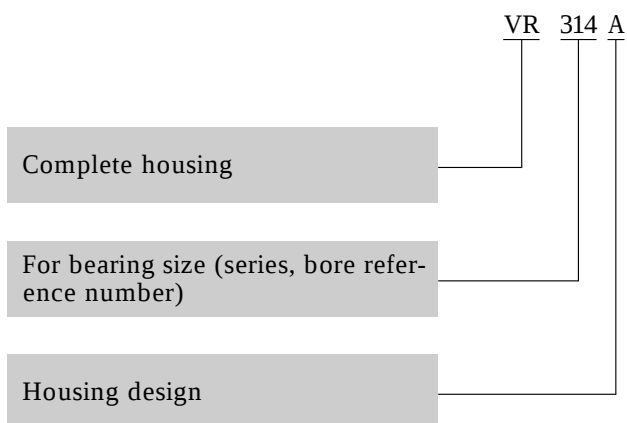
The electronic FAG rolling bearing catalogue is a comfortable consulting system. You can quickly choose the right FAG rolling bearing with Windows and confidently calculate its life, speed, friction, temperature and cycles frequencies.

ORDER EXAMPLES

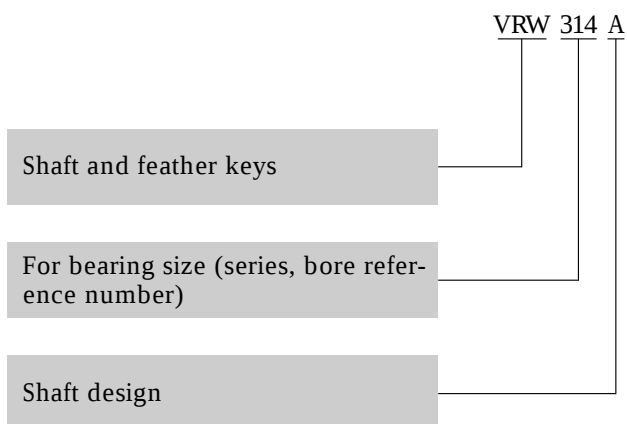
Order example for bearing unit:



Order example for housing:



Order example for shaft and feather keys:



NOTES

NOTES

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