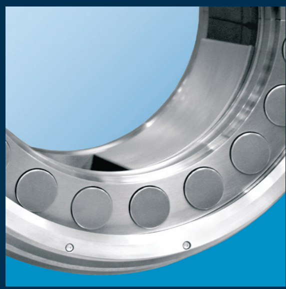
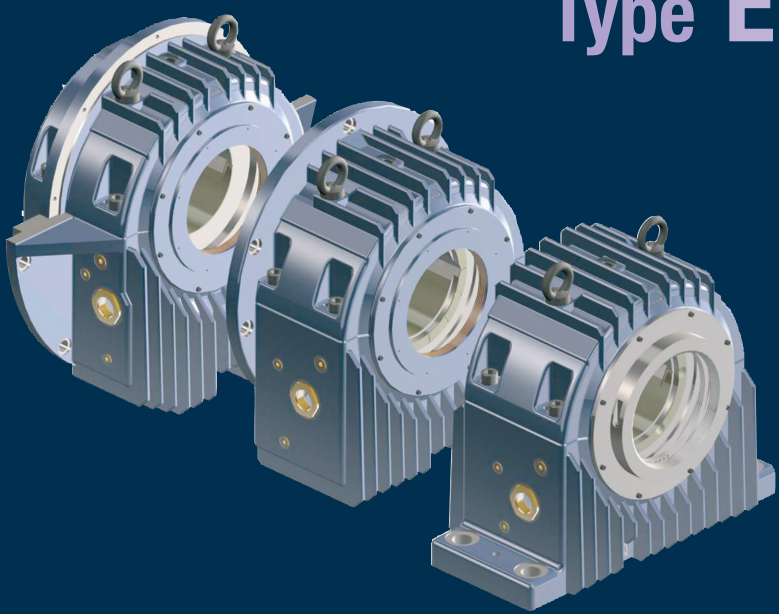
RENK



Innovative Power Transmission

Type E Slide Bearings

Introducing the E Family



Series EG/ER

Journal Range 80-355 mm

① Type

E

② Housing series

R finned, foot-mounted
G smooth, foot-mounted
F*) finned, flange mounted
M*) finned, centrally flange mounted

③ Heat dissipation

N natural cooling
Z lubrication by oil circulation with external oil cooling
X lubrication by oil circulation with external oil cooling for high oil throughput
W water cooling in oil sump
U circulating pump and natural cooling
T circulating pump and water cooled oil sump

(U, T: This pump sucks cool oil from the bearing sump and delivers to the oil inlet bore.)

④ Shape of bore and type of lubrication

C plain cylindrical bore, without oil ring
L plain cylindrical bore, with loose oil ring
F*) plain cylindrical bore, with fixed oil ring
Y two-lobe bore (lemon shape), without oil ring
W three-lobe bore, without oil ring
V four-lobe bore (MGF profile), without oil ring
K*) journal tilting pads, without oil ring

⑤ Thrust surface

Q without thrust parts (non-locating bearing)
B plain sliding surfaces (locating bearing)
E taper land faces for one sense of rotation (locating bearing)
K taper land faces for both senses of rotation (locating bearing)
A elastically supported circular tilting pads (RD thrust pads) (locating bearing)

Example
for quoting a complete bearing

① ② ③ ④ ⑤
E R N L B 11 - 110

Slide bearing type E with finned housing, foot mounted, natural cooling, plain cylindrical bore with loose oil ring, as locating or non-locating bearing, plain sliding surfaces, size 11, 110 mm shaft diameter.

*) Ask for special leaflets and technical information.

Contents

The weights given in the tables are not binding, average values and the illustrations are not strictly binding.

We reserve the right to changes made in the interests of technical improvement.

RENK E-Type bearings are slide bearings of the most up-to-date design which can be assembled together, to suit requirements in a number of alternative ways by using pre-fabricated units.

They were developed primarily as bearings for electric machines, blowers, turbocompressors and horizontal water turbines but in view of the possibility of fitting them with different alternative components they can be used almost universally in the engineering industry.

A particular advantage of installing them in production plants (e.g. refineries, power stations, iron and steelworks) is to reduce the number of parts which have to be carried in stock as it is often possible to equip driving and driven machines with the same slide bearings.

The different design types are available from stock in the range of diameters from 80 to 355 mm.

For E-bearings with bores exceeding 355 mm diameter further technical information is available on request.

Unit composed system

The use of the unit composed principle in the planning of the E-Type series of bearings was a far-reaching accomplishment. The different combinations of slide bearings are, in case of need, assembled from stock components and sub-assemblies. This ensures that there is the quik-kest possible delivery of spare parts from the Hannover Works.

Interchangeability of the parts is guaranteed and a shell with plain shoulders, for example, can be replaced if necessary by one with integral taper land thrust faces.

Bearing housing

Depending on the operating conditions, the housings are supplied either with fins or as a smooth design. (Flange bearings are finned design only).

The housing are to be considered as “main module“ in the E-Type bearing unit composed system and when they are combined with different “complementary modules“, such as shell, lubricating ring, thermometer and other accessories, additional machining is frequently unnecessary.

Even in special cases (e.g.the fitting of oil coolers or vibration detectors) finish machined housings are taken from stock and provided with additional connection holes. Tapped holes for thermometer, oil inlet and outlet, oil level, oil sump thermometer or circulating pump suction piping are provided on either side of the housing.

The rigid housing design is recognized for its good distribution of forces under radial and axial loading conditions resulting in a heavy-load carrying capacity. The height of the centre line is such that brackets can be attached to the end plates of electric machines for receiving the pedestal bearing. When the shells and seals have been removed the housing can be easily removed as well axially without the rotor having to be dis-mantled. If the housings are standing on intermediate brackets they can be lowered and withdrawn sideways after removing the brackets.

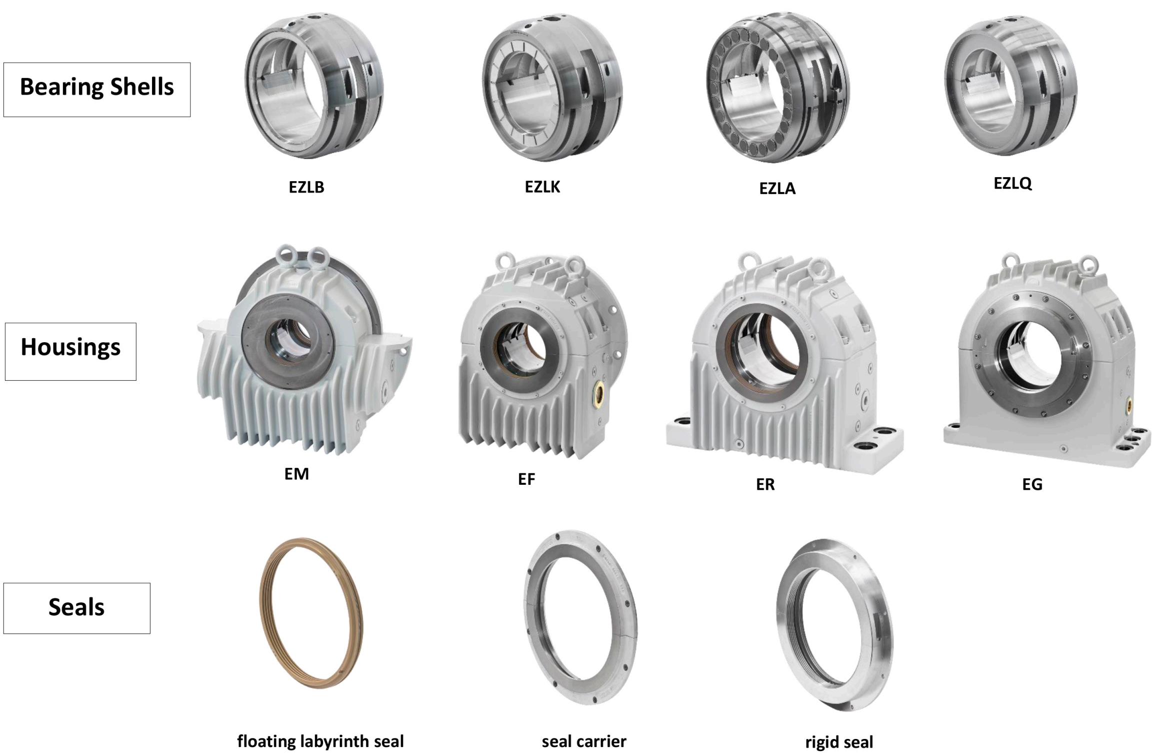
For bearings with insulated shells, the spherical seating of bearing housings is lined with synthetic material. In addition, the shaft seals are made of insulating material or an intermediate insulation will be mounted when assembling the seals (Insulated flange-mounted bearings are available from stock).

The housing material is cast iron (EN-GJL-300); nodular cast iron (EN-GJS-400-18-LT) or cast steel can be supplied for special applications.

Seals

Different types of seals can be provided depending on the operating conditions (see p.12).

1. For normal conditions floating labyrinth seals of high-quality fiber-reinforced synthetic material which are floating in the seal carrier (Type 10) are used with E-bearings. This type of seal has various advantages to offer:
   - it is insensitive to radial displacement of the shaft, resulting for example, from shaft bending or from lifting the rotor when taking out the shell. It conforms to the type of protection IP 44
   - for dismantling the shell (e.g. for inspection) only fastening screws in the bearing top have to be loosened, the labyrinth seal remaining on the shaft



- should the seal be damaged, only the seal itself need to be replaced (inexpensive)

- independent of the bearing size the same labyrinth seals are used for a given shaft diameter in way of the seals. Shorter deliveries are therefore possible in view of the simpler stocks

2. Bearings which call for a high oil throughput are provided with seals with two labyrinth systems (Type 20). The first labyrinths deflect any oil which leaves the bearing shell. Small quantities of oil which have not been wiped off by these labyrinths are collected in an intermediate chamber and then fed back, through return holes, to the oil sump. Further labyrinths then act as the seal proper i.e. they prevent oil from leaking and also the ingress of foreign particles into the inside of the bearing. This seal conforms to the type of protection IP 44.

3. For operation in dusty environments the seals Type 10 or 20 will be equipped with dust flingers (see page 12), which also prevent any possible low pressure on the shaft exit side from “drawing“ oil from inside the bearing. These seal combinations have the designation 11 or 21. They conform to type of protection IP 54.

4. To conform to type of protection IP 55, seals Type 10 or 20 are equipped with additional baffles screwed in front of them. Such seal combinations have the designation 12 or 22. The additional baffle serves to protect the seal proper against dust or water jets.

5. Special seals such as those with air ventilation can be supplied for special requirements. Details are available on request.

Bearing shells

The shells are spherically seated in the housing. This means simple assembly as well as suitability for high static and also dynamic axial and radial loads. For oil ring lubricated bearings a favourable oil flow (oil circulation) is guaranteed by the central arrangement of the oil ring. The wide spherical seating means too, that there is good heat transfer between the shell and the housing.

The shell consists of a steel body which is lined with RENK metal therm 89 (a tin based bearing metal). The shells are constructed with very thick walls to meet the requirements of the heavy engineering industries (troublefree assembly, long life, severe operating conditions).

The perfect metallic bond between steel and bearing metal is guaranteed by the specified ultrasonic tests which are carried out in the course of manufacture.

Journal bearing

Radial loads can be taken up by shells with

1. plain cylindrical bore
2. two-lobe bore (lemon shape)
3. three-lobe bore (MGF)
4. four-lobe bore (MGF profile)
5. journal tilting pads

The selection is made here on the basis of experience or of the calculated critical speed for shafts supported by slide bearings.

Three shaft diameters to DIN Series R 20 are assigned to one size of housing. Bearings for other shaft diameters can be provided as a special design. To avoid wear and high friction torques at turning speeds and when starting up and slowing down under heavy loads as well as when reversing, it is possible to install a hydrostatic jacking device as an option.

Thrust bearing

1. Small temporary loads are taken up by plain shoulders on the shell (locating bearing).

2. Thrusts of a medium size are absorbed by taper land faces integral with the shoulders and suitable forboth directions of rotation.

3. High thrusts can be taken up by tilting RD thrust pads. In addition to the oil film, the cup springs supporting of the RD thrust pads have damping properties and intercept shocks elastically.
   This design requires lubrication by circulating oil, e.g. the use of an oil pump.

4. In case of shells with oil-disc lubrication high axial loads will be absorbed by tilting RD pads. Up to certain speeds or power losses respectively, this type of bearing can be operated with oil disc lubrication only.

A pre-selection of the appropriate thrust part can be made with the aid of the loading table on page 9.

As additional heat is produced by thrust loads the values given in the table for natural cooling on page 14 cannot be fully utilized when, in case of higher operating speeds, the power loss created in the journal bearing alone reaches the limits for heat dissipation by radiation and convection.

Particularly if the max. loads given on page 9 are being used, or exceeded, a computer calculation should be run through by us, as many of the influencing factors cannot be considered in a table.

Oil supply

Self lubrication by oil rings or oil discs. Oil rings can be used with shafts having a peripheral speed of up to 20 m/s and oil discs at peripheral speed of up to 17.5 m/s measured at the outer diameter of the disc. For the emergency run down of bearings in case failure of the circulating oil lubrication, oil rings can be used up to 26 m/s. circumferential speed of the shaft, and oil discs for circumferential speed of 20 m/s. at the outer diameter of the lubricating disc. Both types of lubricating rings can also be used for service in ships (details on request). The central arrangement has the advantage that the immersion depth of the lubricating ring remains constant when the bearing housing is not leveled.

A further important advantage of the symmetrical design is that oil spray thrown off the lubricating ring cannot affect the tightness of the seal.

The inside of the housing is connected with the side compartments only in the bottom housing.

Checking of the oil level when using ring lubrication is by means of oil sight glass which, by choice, can be fitted on the left or the right.

A circulating oil system can be installed for lubrication not only in addition to the ring lubrication but also as a separate oil supply. For design "Z" the oil inlet and outlet connections can be fitted by choice on the left or right of the bottom housing. In such case a favourable oil level in the bearing housing is defined by the weir in the oil outlet pipe which is part of our supply. When using bearing shells of type E.ZLQ or E.ZLB the value indicated in the "Oil throughput graphs for plain bearings" may be reduced by approx. 30 % as the oil ring also improves to the oil feed. Design "X" is installed when particularly large quantities of oil flow through the bearing and no ring lubrication, with a definite oil level, is provided. On request a table of dimensions giving details of the position of the enlarged oil outlet holes is available. Oil outlet speed is 0.15m/s max. (referred to the total cross section). With favourable flow conditions in the piping system outlet speeds, up to 0.25 m/s max. can be permitted.

Dimensions of oil outlet in function of oil throughput

size	design Z					
		for oils ISO VG 32 and 46 at te = 40°C	for oils ISO VG 68 and 100 at te = 40°C		for oils ISO VG 32 and 46 at te = 40°C	for oils ISO VG 68 and 100 at te = 40°C
	oil outlet	l/min	l/min	oil outlet	l/min	l/min
9	G 1 ¼	9	7	2 x G 1 ¼	18	14
11	G 1 ¼	9	7	2 x G 1 ¼	18	14
14	G 1 ½	11	9	2 x G 1 ½	22	18
18	G 1 ½	11	9	2 x G 1 ½	22	18
22	G 2	18	16	2 x G 2	36	32
28	G 2 ½	28	25	2 x G 2 ½	56	50

Larger oil quantities with special outlets on request

G = B.S.P.

Arrangements for checking the oil pressure, temperature and circulating oil flow are the responsibility of the customers but we can submit proposals on request.

Circulating pumps for the oil supply can be installed, when for example, large quantities of lubricating oil must be available for continuous changes in the direction of rotation or when taper land sections or RD thrust bearings are being used and yet external oil cooling is still not required for removal of the heat. Circulating pumps suck the oil from the oil sump through a tapped hole below the oil level, and feed it directly to the shell. An oil cooler can also be connected into this closed circuit, if the permissible bearing temperature is slightly exceeded.

The grade of oil viscosity necessary for satisfactory operation of the bearing is either proposed by the user or recommended by us, and selected from the range ISO VG 32 to VG 220.

Heat dissipation

Because of the considerable increase in the heat dissipating surface with a finned housing the operating range with natural cooling (by radiation and convection) is extended. The fins produce a further improvement in the heat dissipation also when there is forced convection cooling (e.g. by a shaft-connected fan).
A design with water cooling of a cooler with smooth or finned tubes in the oil sump is also available.

A table giving the sizes and positions of the cooling water connections is obtainable on request.

If the heat generated in the bearing exceeds certain values, a circulating oil system with external oil cooling must be installed.

For temperature control two temperature probes of commercial size, and operating independently of each other, can be inserted in holes provided for them in the bottom shell. We recommend for this purpose the RENK screw-in resistance thermometer.

Bearing calculation

When the operating conditions are given by the customer, each bearing supplied by us is designed and checked on the basis of hydro-dynamic and thermal calculations. The values to be used e.g. speed, size and direction of load, grade of oil viscosity and ambient temperature are standard factors for calculating the behaviour. We must therefore ask for correct information for the values listed in our "Enquiry for Slide Bearings" form.

The bearing temperature and minimum thickness of oil film determine the reliability of a slide bearing.

With oil ring lubrication, an ISO VG 32 lubricating oil is chosen as a parameter in order to show the widening of the range of application at high speeds.

Umcompleted curves in the low speed range show that the minimum thickness of oil film is not reached here (the remedy is to select an oil with higher viscosity).

If the graph shows that the allowable bearing temperature is already exceeded as a result of the heat generated in the journal bearing, then one of the alternatives listed under the section "Heat dissipation" is to be used.

As the majority of slide bearings used in the heavy machine building industry operate at speeds up to 3600 RPM with a specific load pressure of approx. 0.5–2.5 N/mm^2, the temperature curves have been plotted for 1.0 N/mm^2, and 2.0 N/mm^2.

With a specific load of more than 2.5 N/mm^2, a computer calculation should be carried out in order to determine the grade of oil required (higher viscosity). Higher speeds and/or smaller specific loads could require bearing shells with two- or four-lobe bores, or radial tilting segments to be installed.

The graphs on pages 16 and 17 give the oil throughput for lubrication by a circulating oil system or by means of a circulating pump for:

a) E-Type bearing with shells with plain cylindrical bore

b) E-Type bearing with shells with two- or four-lobe bore, journal tilting pads

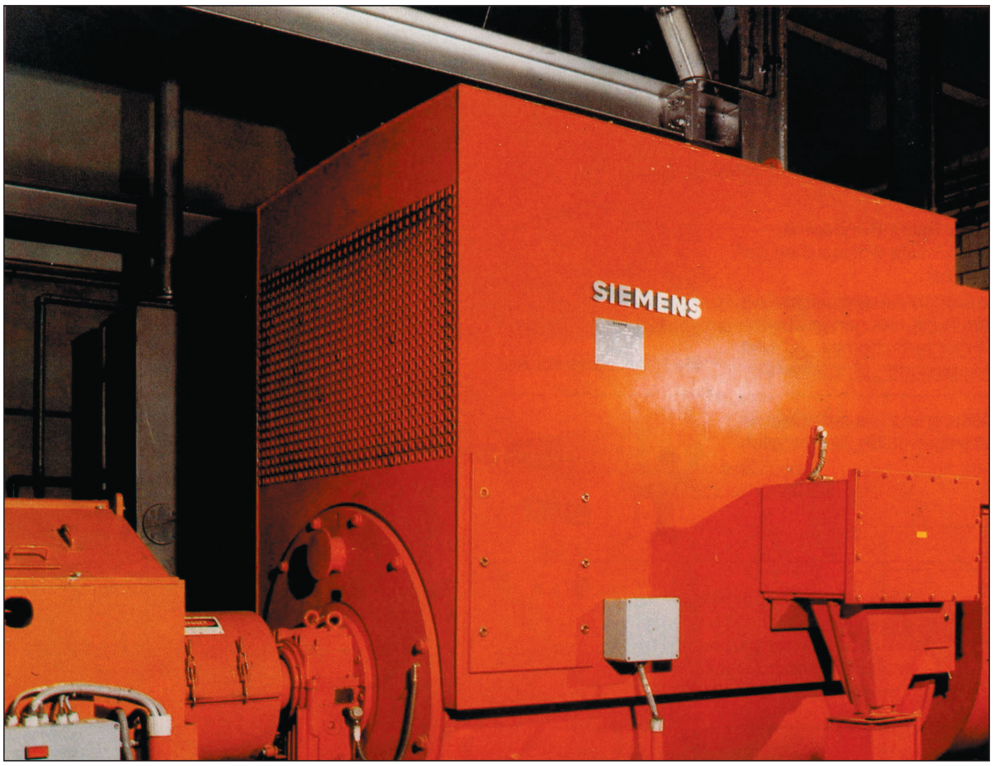
c) additional throughput for E-Type bearing with taper land faces in the thrust part

d) additional throughput for E-Type bearing with RD thrust pads.

Stability

In order to be able to judge the influence of slide bearings on the stability of high-speed rotors, the anisotropy of the lubricating film is taken into consideration by specifying 4 elasticity and 4 damping values and the quasi-orthotropy of the bearing housing by specifying the horizontal and vertical elasticity constants. RENK-Hannover can, on request, calculate the critical speed of the shaft taking into account the properties of the oil film, the mass and stiffness of the housing and the foundations.
With electric machines the magnetic elasticity constant may be included.

When using the E-bearings, please also consult our "Instructions for assembly, operation and maintenance" available for every special design.



High-voltage threephase generator Siemens-H-modul with RENK-Slide Bearing EF. (Photo: Siemens AG, Erlangen)

❶ **Type**

E slide bearing for electric machines, fans, turbocompressors, water turbines, etc.

❷ **Housing**

R foot-mounted, with cooling fins

G foot-mounted, without fins

F flange-mounted, with cooling fins

M centrally flange-mounted, with cooling fins

❸ **Heat dissipation**

N natural cooling by radiation and convection

Z oil circulating system with external oil cooling (with supplementary ring lubrication)

X oil circulating system with external oil cooling for high oil throughput

W water cooling by finned tube cooler incorporated into the oil sump

U circulating pump (with natural cooling) (where large oil quantities are required, e.g. shells with taper land faces or RD thrust pads)

T circulating pump (with water cooled oil sump) The increased flow speed intensifies the heat dissipation, and larger quantities of lubricant are available for the lubrication of e.g. taper land faces and RD thrust pads

❹ **Shape of bore and type of lubrication**

C plain cylindrical bore, without lubricating ring, e.g. for high sliding velocity or with radial load direction upwards

L plain cylindrical bore, oil ring (basic design)

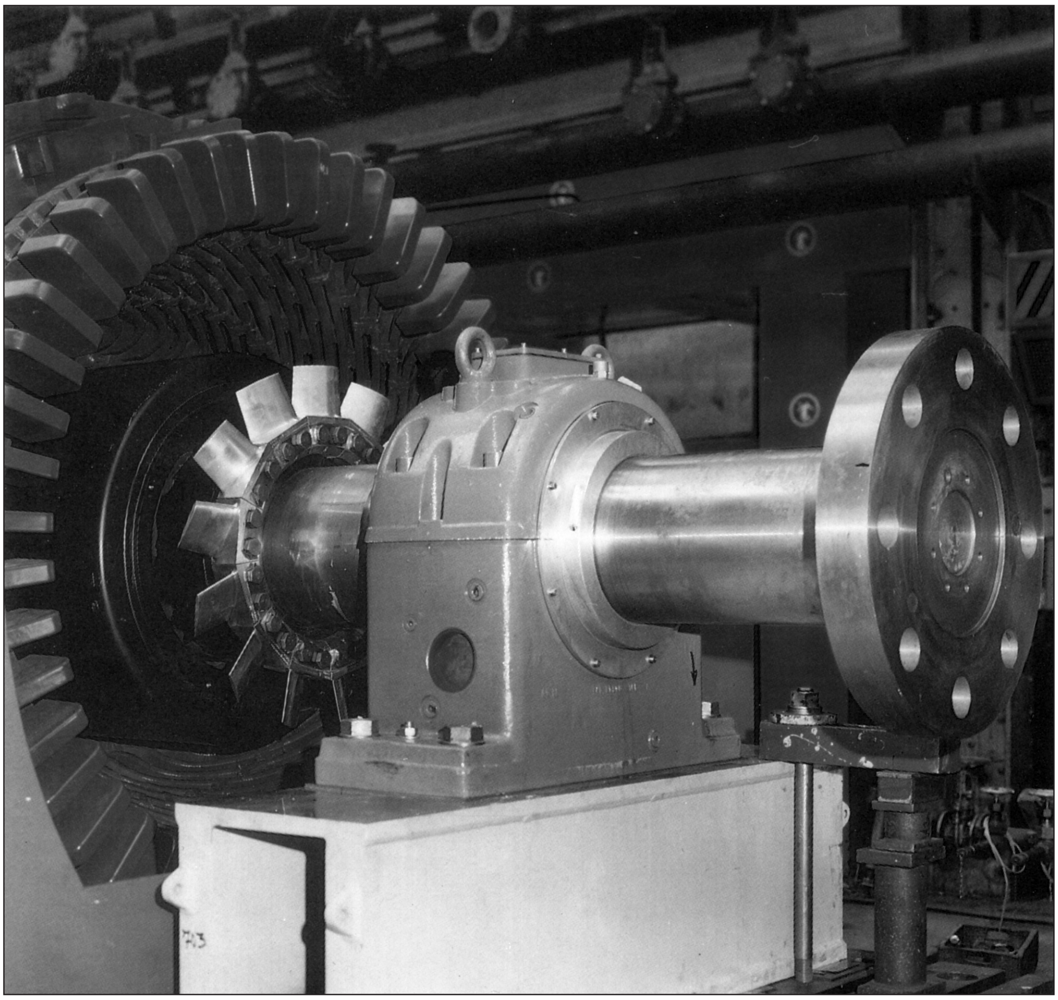
F plain cylindrical bore, oil disc

Y two-lobe bore (lemon shape), without lubricating ring for high sliding velocity and small loads

W three-lobe bore, without lubricating ring for high sliding velocities and small loads

V four-lobe bore, without lubricating ring for very high sliding velocity and very small loads

K bearing with journal tilting pads, for very high sliding velocity and very small loads



Alternator equipped with RENK-Slide Bearing EGXYQ 28-300 for shaft speed n = 3600 rpm (Photo: GEC Alstom, F-Belfort)

❺ Thrust surface

B axial load absorbed by plain white-metal lined thrust faces

These shells are designed as ”locating bearings“ for limited non- continuous thrust loads. In combination with the non-locating shaft design (see page 13) they can be used as ”non-locating bearings“ as well.

K axial load absorbed by taper lands incorporated in the white-metal lined faces of the shell, suitable for both directions of rotation

A axial load absorbed by pivoting RD thrust pads for high also transient axial loads

Q shell identical to A, but without thrust pads. It can be converted to design A

Admissible axial loads F_A for design B (temporary loads), K and A.

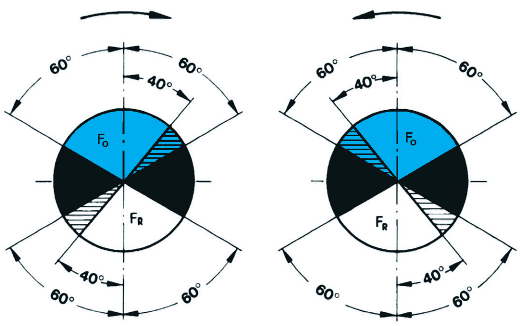
Size	Diameter D [mm]	F_A [N] B	K	A
9	80	900	3000	8800
	90	1000	3500	10000
	100	1100	3500	6000
11	100	1300	4000	10000
	110	1700	5500	11300
	125	1550	4950	6600
14	125	2100	6250	22100
	140	2700	8950	24550
	160	2150	6950	15000
18	160	3250	11000	42100
	180	4050	12100	46750
	200	3400	11000	29400
22	200	4800	15000	67850
	225	5300	17250	75400
	250	5700	18500	56100
28	250	6850	22000	106000
	280	7550	24500	117800
	300	8000	26500	90400

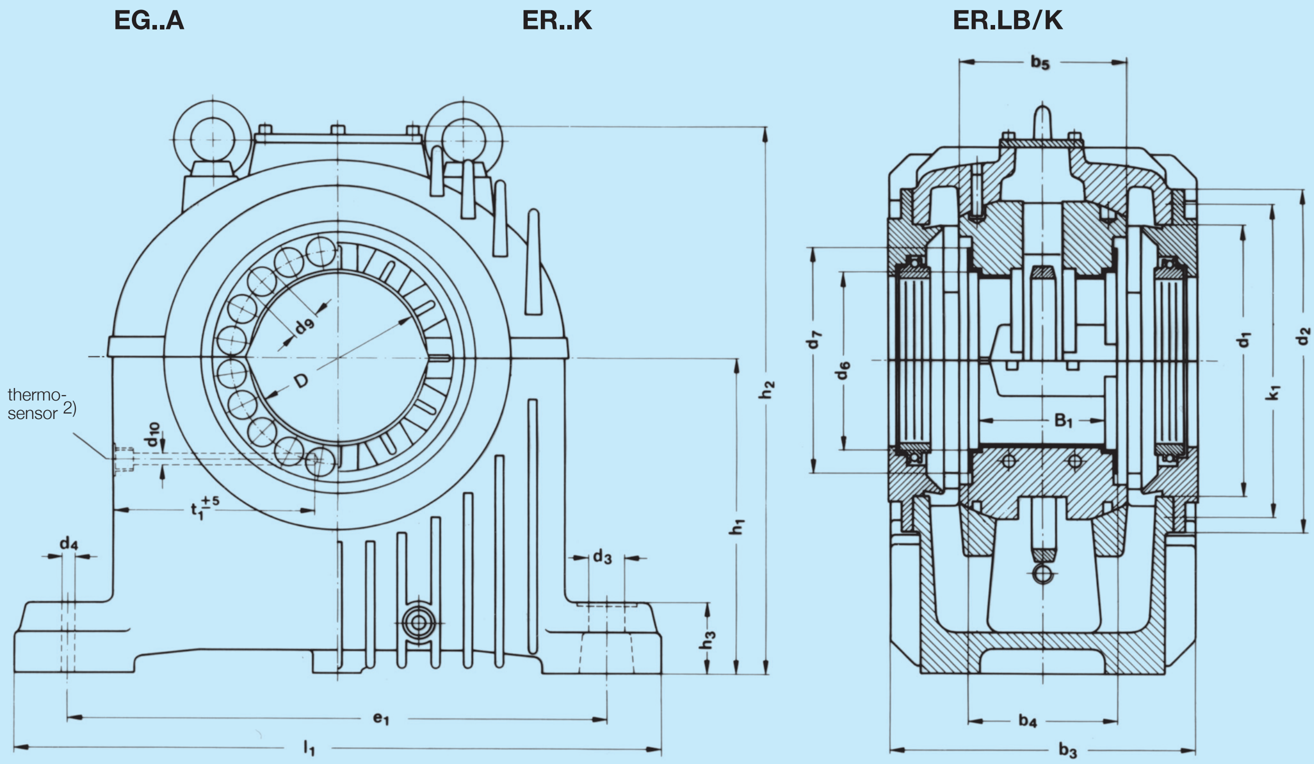
❻ Admissible upward loads

If there are loads (static or dynamic) directed to the housing top (within the blue section) the following loads as per margin apply, depending on the different shapes of bore.

For loads directed to the lower half of shell (within the white section) the values indicated in the diagrams on page 14 and 15 apply.
When directed to the hatched section special adaption of the bearing shell is required. For loads directed to the split line of the bearing (black section), please contact us.

Size	Diameter D [mm]	F_O adm. [N] for shape of bore L	F	C, V, Y
9	80	2000	3550	9600
	90	2250	4000	10800
	100	2500	4450	12000
11	100	4000	6400	16000
	110	4400	7000	17600
	125	5000	8000	20100
14	125	6250	14300	26250
	140	7000	16000	29400
	160	8000	18300	33500
18	160	10400	26000	43200
	180	11700	29000	48600
	200	13000	32500	53000
22	200	18000	42000	68000
	225	20250	48000	76500
	250	22500	53000	85000
28	250	31250	65000	107500
	280	35000	73000	120400
	300	37500	78000	129000





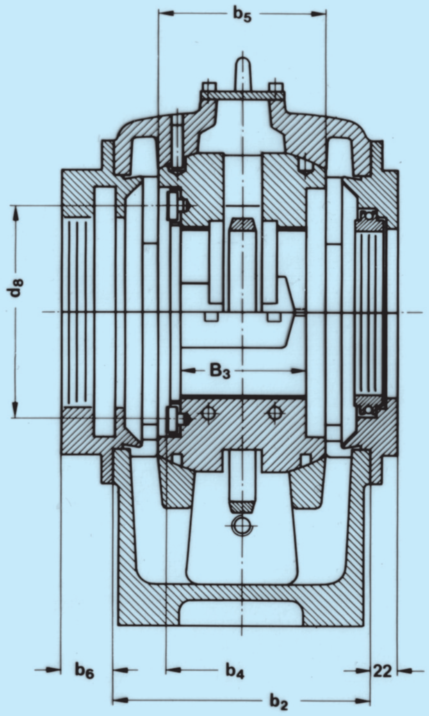
Dimensions in mm

Size	Shaft-Ø D	B_1	B_3	b_1	b_2	b_3	b_4	b_5	b_6	d_1	d_2	d_3	d_4 1)	d_5	d_6	d_7	d_8	d_9	d_{10}
9	80 90 100	60	61,4 61,4 65	145	150	190	80 -0,22	95	39	150	190	22 for M 16	10,4	120	86 96 106	110 120 130	110 120 125	20 20 16	11
11	100 110 125	80	81,4 81,4 85	165	170	205	100 -0,22	110	41	180	215	26 for M 20	10,4	120	108 118 133	135 150 160	135 140 150	20 20 16	11
14	125 140 160 180	105 106,4	105,4 105,4 106,4 106,4	205	215	255	125 -0,22	140	43	230	290	30 for M 24	10,4	130	135 150 170 190	170 190 200 220	165 180 195 –	25 25 20 –	11
18	160 180 200 225	135 140,4	135,7 135,7 140,4 140,4	245	255	300	160 -0,22	170	46	275	340	40 for M 30	15,5	130	172 192 212 237	215 240 250 275	210 230 245 –	31,5 31,5 25 –	13
22	200 225 250 280 300	170 175,7	168,5 168,5 175,7 175,7 175,7	310	320	380	200 -0,22	212	49	340	400	46 for M 36	15,5	140	214 239 264 294 310	265 290 315 345 345	265 285 305 – –	40 40 31,5 – –	13
28	250 280 300 315 335 355	215 218,5	213,2 213,2 218,5 218,5 218,5 218,5	370	380	450	250 -0,24	262	53	440	525	55 for M 42	20,6	160	266 296 316 331 351 371	325 355 375 390 410 430	325 355 365 380 – –	50 50 40 40 – –	13

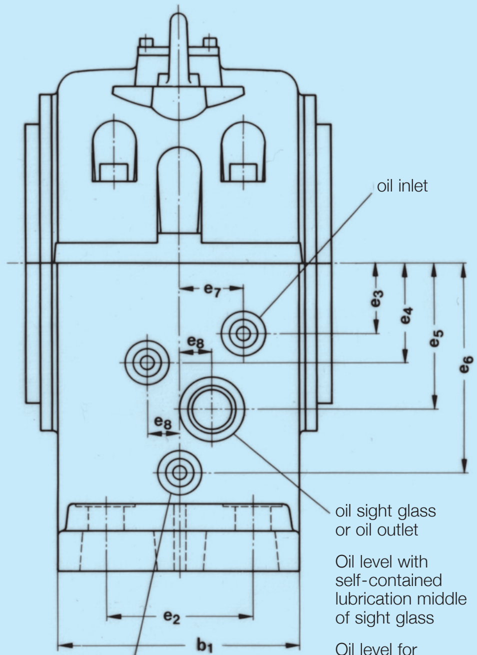
1) Rough bore d_4 for later fitting of cylindrical or taper pins.
2) Threaded hole $^1/_2$" for thermometer on both sides.

*) per side

EG.LA EG.LQ



EG...



suction pipe of circulating pump or oil sump thermometer (same thread as for oil inlet)

oil sight glass or oil outlet

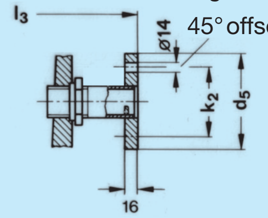
Oil level with self-contained lubrication middle of sight glass

Oil level for circulating oil approx. 6 mm above lower edge of sight glass

Oil outlet

As for bearing types E.ZL., the oil outlet with weir is to be mounted horizontally at the bottom. The mark at the flange will then be visible centrally at the top.

to centre of bearing



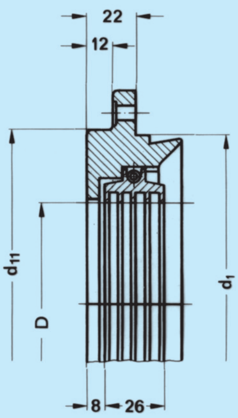
flange DIN 2573

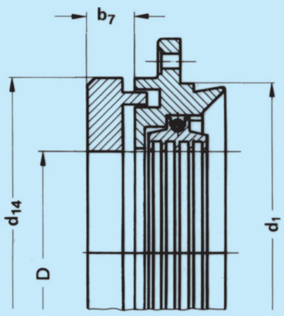
e_1	e_2	e_3	e_4	e_5	e_6	e_7	e_8	h_1	h_2	h_3	k_1 Threads	k_2	l_1	l_3 approx.	t_1	RD-*) thrust pads [Stck]	circulating oil: oil inlet	circulating oil: oil outlet	Oil-content [l]	Weight [kg]
300	90	30	60	85	135	35,5	20	190	325	35	170 6 x M6	90	355	205	105 105 105	14 16 20	G $^3/_8$	G 1$^1/_4$	1,8	45
375	100	40	70	100	150	42	22,5	225	380	50	195 6 x M6	90	450	235	138 138 130	16 18 22	G $^3/_8$	G 1$^1/_4$	3,8	70
450	125	60	85	125	180	55	27,5	265	460	60	270 6 x M6	100	540	280	170 170 148 128	18 20 24 –	G $^3/_8$	G 1$^1/_2$	5,4	135
560	150	70	105	155	215	68	30	315	565	70	320 8x M8	100	660	330	210 210 190 165	18 20 24 –	G $^1/_2$	G 1$^1/_2$	9,2	240
670	200	80	135	175	245	83	40	375	680	80	380 8x M8	110	800	400	260 260 248 202 187	18 20 24 – –	G $^3/_4$	G 2	17,5	430
800	250	95	155	220	310	106	50	450	830	90	500 8x M8	130	950	470	315 315 265 260 235 222	18 20 24 24 – –	G $^3/_4$	G 2$^1/_2$	28,6	780

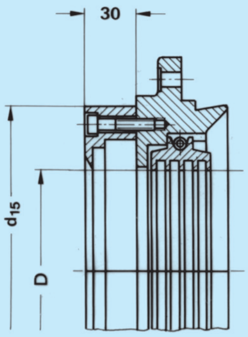
Shell with cylindrical bore (E.ZC.), four-lobe bore (E.ZY.), two-lobe bore (E.ZV.) have the same main dimension as oil ring lubricated shells (E..L.).

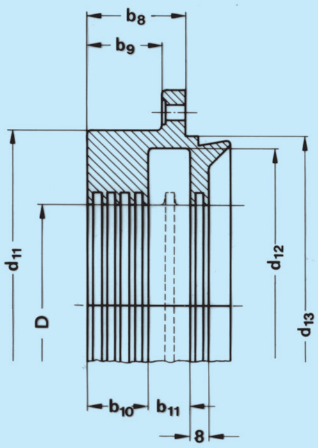
Dimension sheets for shells with radial tilting pads are available on request.

G = B.S.P









Type 10
floating
labyrinth seal

protection IP 44

Type 11
floating labyrinth seal
with dust flinger

protection IP 54

Type 12
floating labyrinth seal
with bolt-on baffle

protection IP 55

Type 20
rigid seal with two labyrinth
systems insulated
dimension "b_8" + 3 mm
protection IP 44

Type 21
rigid seal with two labyrinth
systems and dust
flinger + dimension "b_7"
protection IP 54

Type 22
rigid seal with
two labyrinth systems and
bolt-on baffle + 30 mm
protection IP 55

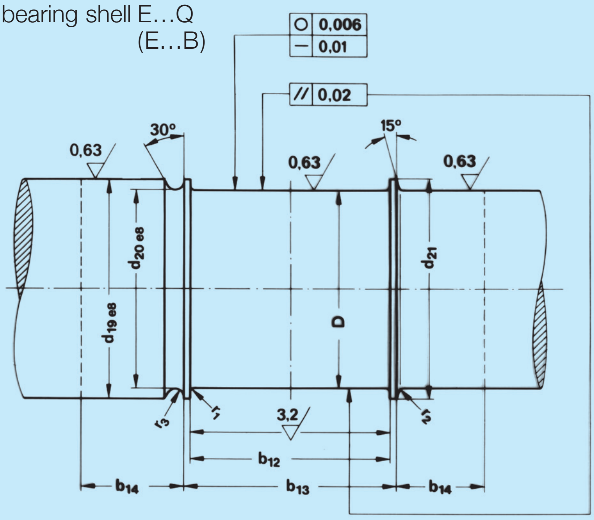
Seals conforming to protection grade IP 56
are available. Information upon request.

Dimensions in mm

Size	D	b_7	b_8	b_9	b_{10}	b_{11}	d_1	d_{11}	d_{12}	d_{13}	d_{14}	d_{15}
9	80	21	39	29	27	14	150	155	140	148	155	135
	90	21									155	145
	100	21									155	155
	110	21									155	155
11	100	21	41	31	27	16	180	180	170	178	155	155
	110	21									155	155
	125	21									180	180
	140	21									180	186
14	125	21	43	33	27	18	230	240	212	226	180	180
	140	21									186	186
	160	26									240	240
	180	26									240	240
18	160	26	46	36	27	21	275	280	260	273	240	240
	180	26									240	240
	200	26									280	270
	225	26									280	280
22	200	26	49	39	27	24	340	340	316	338	280	270
	225	26									280	280
	250	33									340	320
	280	33									340	340
28	250	33	53	43	28	27	440	410	390	438	340	320
	280	33									340	340
	315	33									410	385
	355	33									410	410

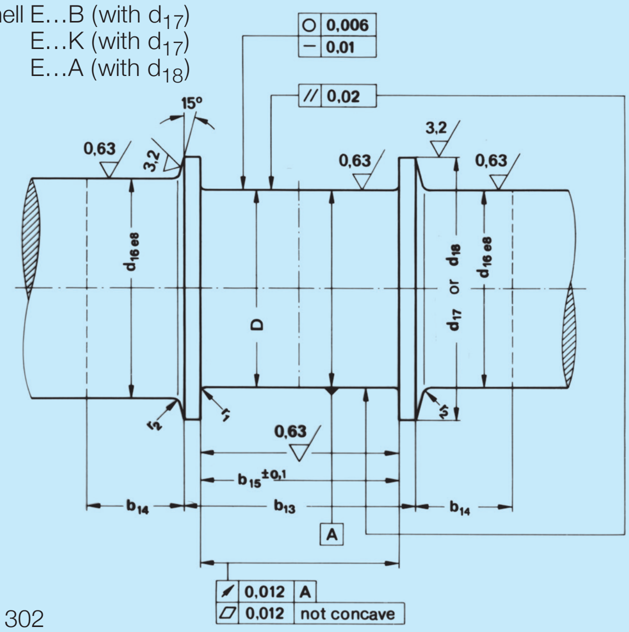
Non-locating bearing

Type of
bearing shell E…Q
(E…B)



Locating bearing

Type of
bearing shell E…B (with d_{17})
E…K (with d_{17})
E…A (with d_{18})



Chamfered edges 0,5x45°
Surface condition DIN ISO 1302

Dimensions in mm

Size	D[1]	b_{12}[2]	b_{13}	b_{14} seal-type 10	b_{14} seal-type 20	b_{15}[3]	d_{16}	d_{17}	d_{18}	d_{19}/d_{20}[4]	d_{21}	r_1	r_2	r_3
9	80 90 100	90	100	50	75	80,4	80/ 90/100/110	110 120 130	132 142 143	80/- 90/80 100/90 110/100	90 100 110	2,5	4	1,6
11	100 110 125	110	120	50	75	100,4	100/110/125/140	135 150 160	157 162 168	100/- 110/100 125/110 140/125	110 125 140	2,5	4	1,6
14	125 140 160 180	140	150	60	85	125,4	125/140/160/180	170 190 200 220	192 207 217 –	125/- 140/125 160/140 180/160	140 160 180 200	4	6	2,5
18	160 180 200 225	180	190	60	85	160,4	160/180/200/225	215 240 250 275	244 264 273 –	160/- 180/160 200/180 225/200	180 200 225 250	4	6	2,5
22	200 225 250 280 300	220	240	70	105	200,4	200/225/250/280	265 290 315 345 345	308 328 339 – –	200/- 225/200 250/225 280/250	225 250 280 315 330	6	10	4
28	250 280 300 315 335 355	280	300	85	120	250,4	250/280/315/355	325 355 375 390 410 430	378 408 408 423	250/- 280/250 315/280 355/315	280 315 315 345 365 385	6	10	6

1) See page 18 „Clearances" and our "Manual for the application of RENK Slide Bearings"
2) If the locating bearing has to cope with considerable axial expansion (for example due to heat transfer) distance b_{12} between the collars can be increased.
3) The normal axial clearance considered is approx. 0,5 mm. For changing direction of thrust or shock loads, dimensions b_{15} may be reduced by further 0,2 mm. If the locating bearing is used for test run only, dimension b_{15} may be increased by 3…6 mm, depending on the bearing size.

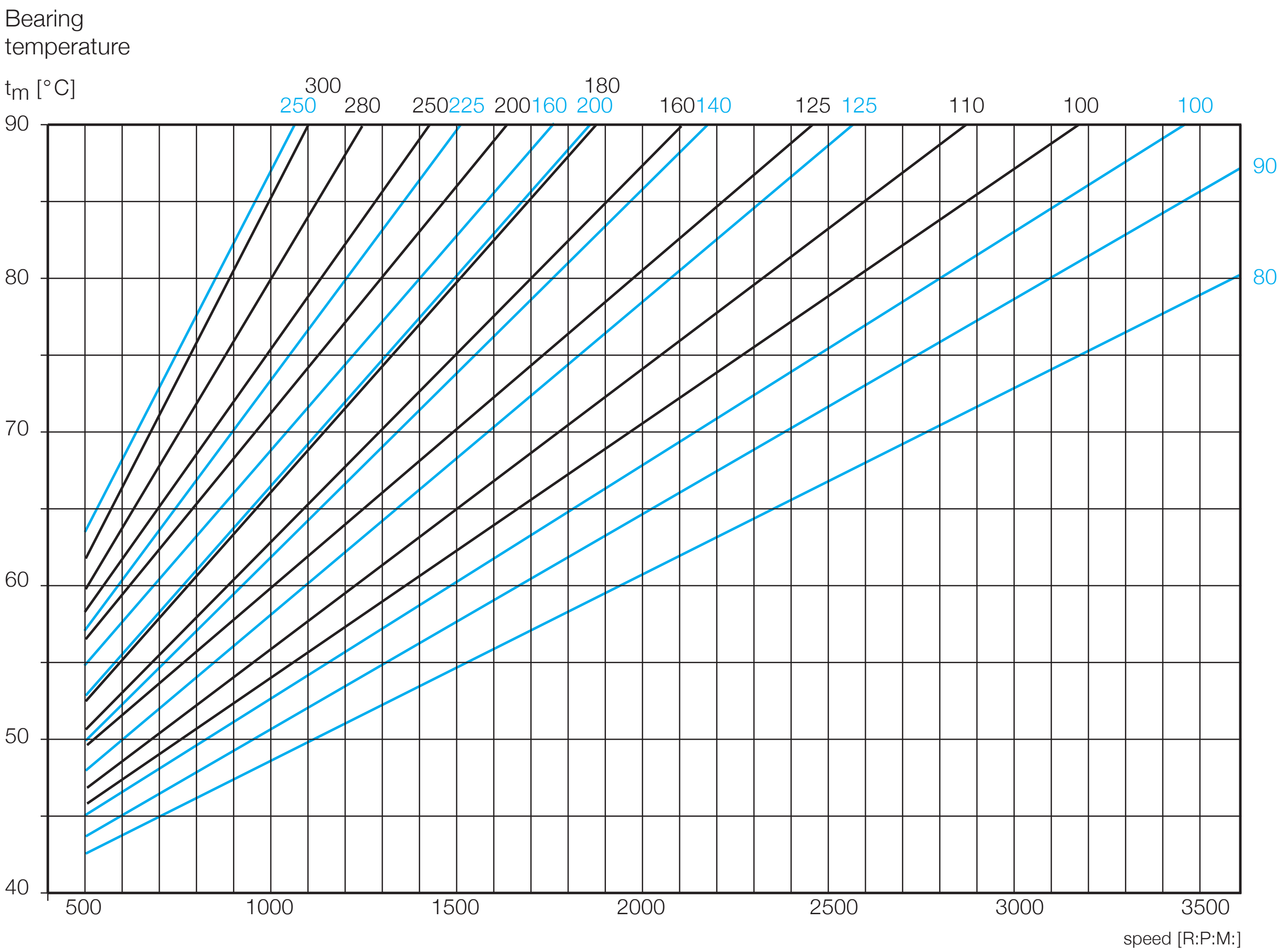
4) Omit recess d_{20} if d_{19} is equal or smaller than shaft diameter D.

In case the shaft ends within the bearing, the length of journal corresponds to dimension b_{12}
Tolerances of form and position follow DIN 31 699.
Degree of accuracy B 10 (radial).
Degree of accuracy B 20 (axial); others upon request.

To pre-determine the resulting bearing temperature in the planning stage, bearing temperatures of E-Type bearings with finned housings and oil lubrication, mean specific load of 1.0 and 2.0 N/mm^2, diameters 80…300 mm and speeds up to 3600 R.P.M. are shown.

These graphs are valid for the following operating conditions:

- oil viscosity ISO VG 32
- ambient temperature 40° C
- calm air



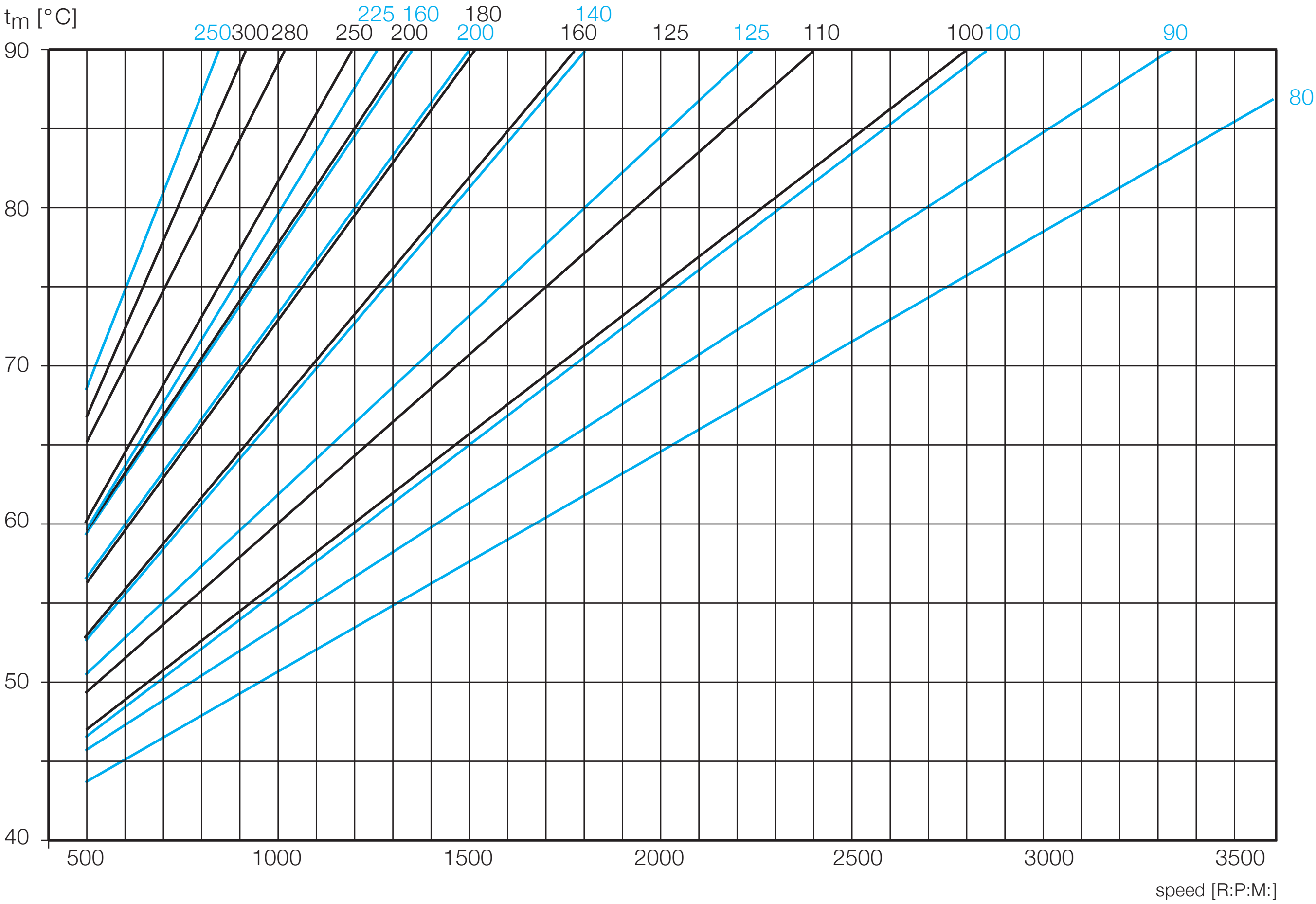
specific load 1.0 N/mm^2

Size	9			11			14		
Ø D [mm]	80	90	100	100	110	125	125	140	160
FR [N]	4900	5500	6000	8000	8800	10000	13000	14500	16800

Size	18			22			28		
Ø D [mm]	160	180	200	200	225	250	250	280	300
FR [N]	21800	24500	27000	33500	38000	42500	53000	59400	65500

For specific load between 0.5 and 2.5 N/mm^2, bearing temperatures can be interpolated or extrapolated.

Bearing
temperature

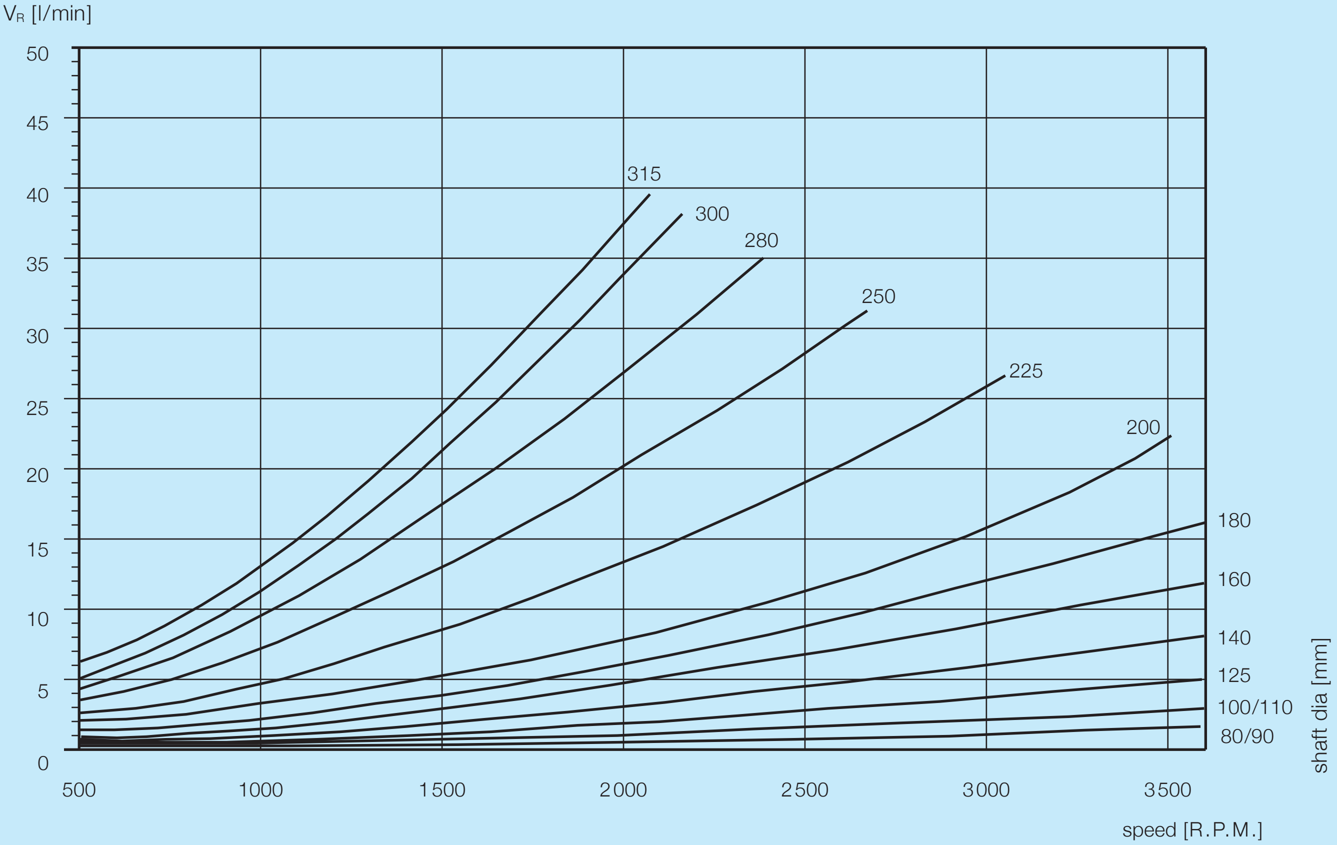


specific load 2.0 N/mm²

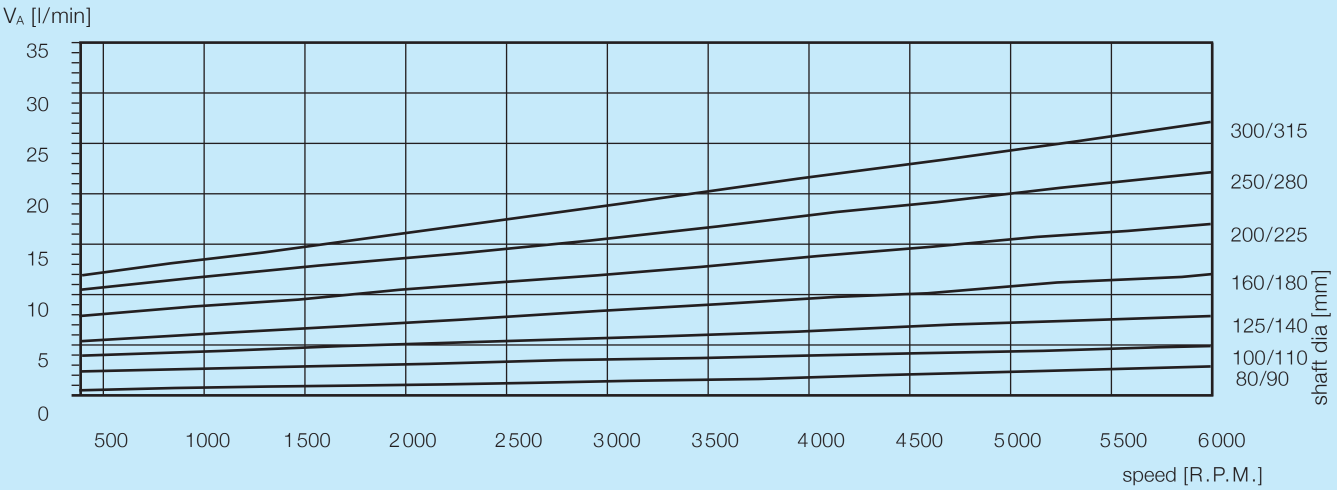
Size	9			11			14		
Ø D [mm]	80	90	100	100	110	125	125	140	160
FR [N]	9800	11000	12000	16000	17600	20000	26000	29000	33600

Size	18			22			28		
Ø D [mm]	160	180	200	200	225	250	250	280	300
FR [N]	43600	49000	54000	67000	76000	85000	106000	118800	131000

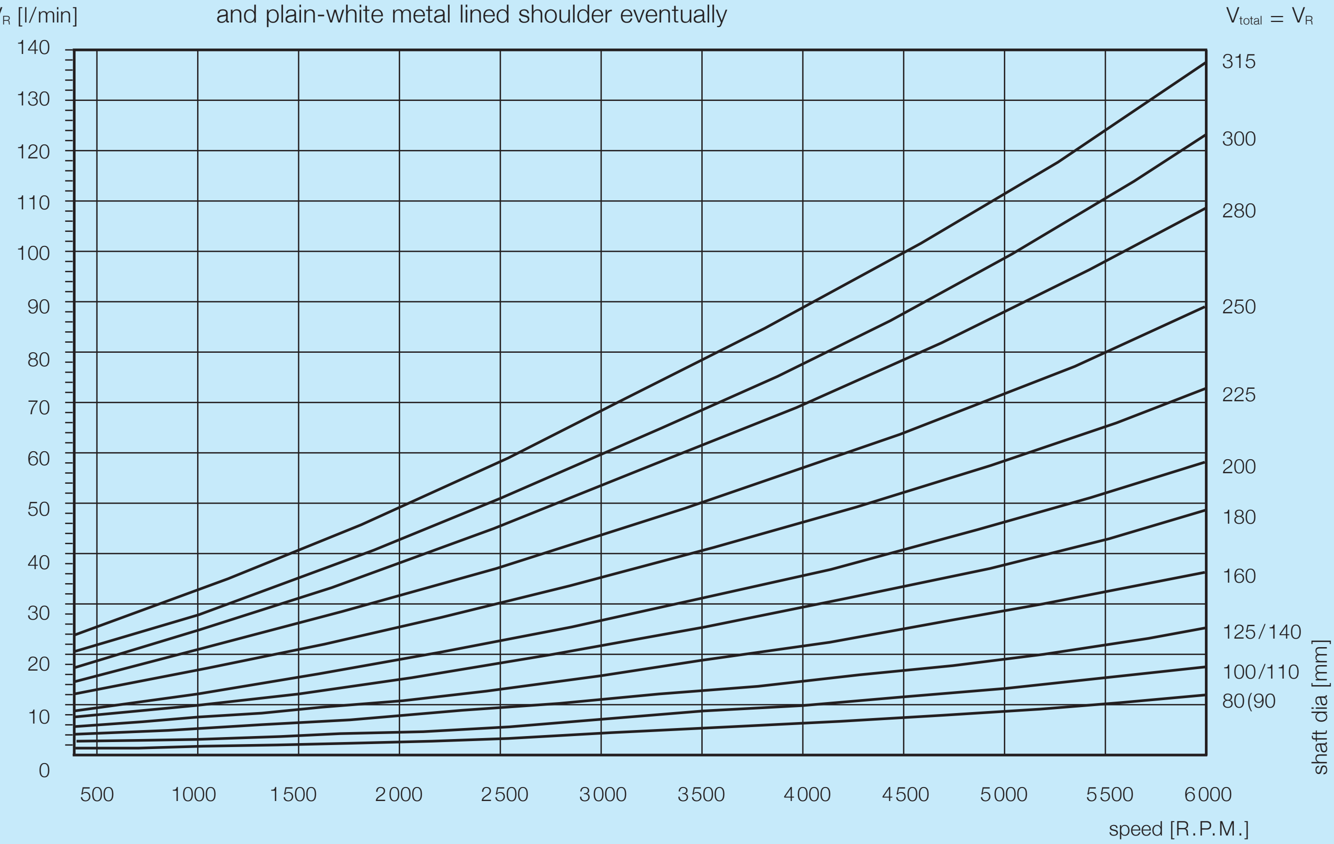
Oil throughput V_R for cyl. journal bearing and plain-white metal lined shoulder eventually $V_{total} = V_R$



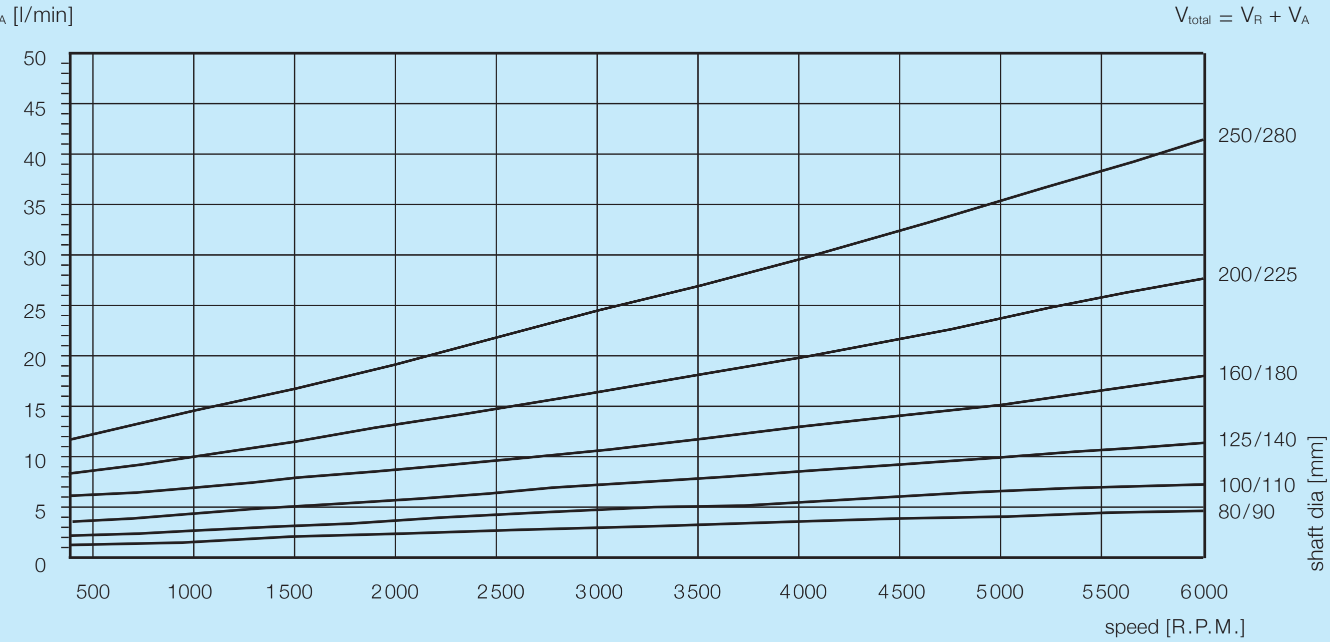
Additional oil throughput V_A for shoulders with integral taper land faces $V_{total} = V_R + V_A$



Oil throughput V_R for two-lobe or bore four-lobe bearings,
V_R [l/min] and plain-white metal lined shoulder eventually



Additional oil throughput V_A for RD thrust pads
V_A [l/min]



The bearing bores are made according to the basic bore system specified in DIN EN ISO 286-1, with tolerance field H 7. The bearing clearance has to be considered within the shaft tolerance. The shaft tolerances for 5 different relative bearing clearances ψm can be obtained from DIN 31698 (see extract).

For normal operating conditions, the following recommendation applies for the choice of mean bearing clearance Ψm, in relation to peripheral velocity v:

This table does not take into account any extraordinary factors, such as, for example:

- high shaft temperature within the bearing in case of heat transfer through the shaft
- considerable elastic deformation through loading of the bearing
- particularly high or low viscosity lubricants-thermal deformation or greatly varying expansion of journal and bearing shells.

v [m/s]	Ψm [‰] cyl. bearing Ø … 100	D [mm] > 100…250	>250
… 3	1,32	1,12	1,12
> 3…10	1,6	1,32	1,12
>10…25	1,9	1,6	1,32
>25…50	2,24	1,9	1,6

Nominal shaft range [mm] over	up to	Permissible deviations of the shaft in µm for Ψm [‰] 1,12	1,32	1,6	1,9	2,24
70	80	– 60 – 79	– 75 – 94	– 96 – 115	– 118 – 137	– 144 – 163
80	90	– 67 – 89	– 84 – 106	– 108 – 130	– 133 – 155	– 162 – 184
90	100	– 78 – 100	– 97 – 119	– 124 – 146	– 152 – 174	– 184 – 206
100	110	– 89 – 111	– 110 – 132	– 140 – 162	– 171 – 193	– 207 – 229
110	120	– 100 – 122	– 122 – 145	– 156 – 178	– 190 – 212	– 229 – 251
120	140	– 113 – 138	– 139 – 164	– 176 – 201	– 215 – 240	– 259 – 284
140	160	– 136 – 161	– 166 – 191	– 208 – 233	– 253 – 278	– 304 – 329
160	180	– 158 – 183	– 192 – 217	– 240 – 265	– 291 – 316	– 348 – 373
180	200	– 175 – 204	– 213 – 242	– 267 – 296	– 324 – 353	– 388 – 417
200	225	– 201 – 230	– 243 – 272	– 303 – 332	– 366 – 395	– 439 – 468
225	250	– 229 – 258	– 276 – 305	– 343 – 372	– 414 – 443	– 495 – 524
250	280	– 255 – 287	– 308 – 340	– 382 – 414	– 462 – 494	– 552 – 584
280	315	– 291 – 323	– 351 – 383	– 434 – 466	– 523 – 555	– 624 – 656

Shaft tolerances to DIN 31 698

RENK

Series EF	Journal Range	80 – 355 mm	brochure RH 1085
	Journal Range	300 – 560 mm	brochure RH 1182

Series EM	Journal Range	80 – 355 mm	brochure RH 1046
	Journal Range	300 – 560 mm	brochure RH 1184

Series EG	Journal Range	300 – 560 mm	brochure RH 1180
ER	Journal Range	475 – 1250 mm	brochure RH 1178

Sales Agencies *)

Australia
Austria
Brazil
Canada
Czech Republic
Finland
G.B. and Ireland
India
Italy
Japan
Mexico
Netherlands/Belgium
Norway
Portugal
PR China
South Africa
South Korea
Spain
Turkey
USA

Assembly and Distribution Centers *) with Sales and Engineering Support

RENK Corporation
304, Tucapau Road
29334 Duncan S.C.
USA
Phone: +1 864 433 0069
Telefax: +1 864 433 0636
Email: bearings@renkusa.com

MAN Diesel & Turbo China Production Co., Ltd.
Fengming Road 9
Jiangsu Wujin High-Tech Industrial Zone
213164 Changzhou
Phone: +86 519 8622 7888
Telefax: +86 519 8622 7999
Email: changzhou@cn.man.eu

MAN Diesel & Turbo Japan Ltd.
RH Division
PMO Nihonbashi-Odemmacho Bldg 10F
6-8 Nihonbashi-Odemmacho
Chuo-ku, Tokyo 103-0011
Japan
Phone: +81 3 6667 2461
Telefax: +81 3 6667 2470
Email: renkj_hm@zab.att.ne.jp

COFICAL RENK MANCAIS DO BRASIL
LTDA. Rodovia BR-280, km 54 -
Em frente ao Parque Municipal de
Exposições
CEP 89270-000 - Guaramirim - SC - Brasil
Phone: +55 47 3373 6400
Telefax: +55 47 3373 6499
Email: coficalrenk@uol.com.br

*) All other countries will be served from the German headquarter Hannover Works

RENK AKTIENGESELLSCHAFT

Werk Hannover
Weltausstellungsallee 21
30539 Hannover
Germany
Phone: + 49 (5 11) 86 01-0
Fax: + 49 (5 11) 86 01-182
Email: info.hannover@renk.biz

www.renk.eu

RH-1009-B (01.18) Printed in Germany