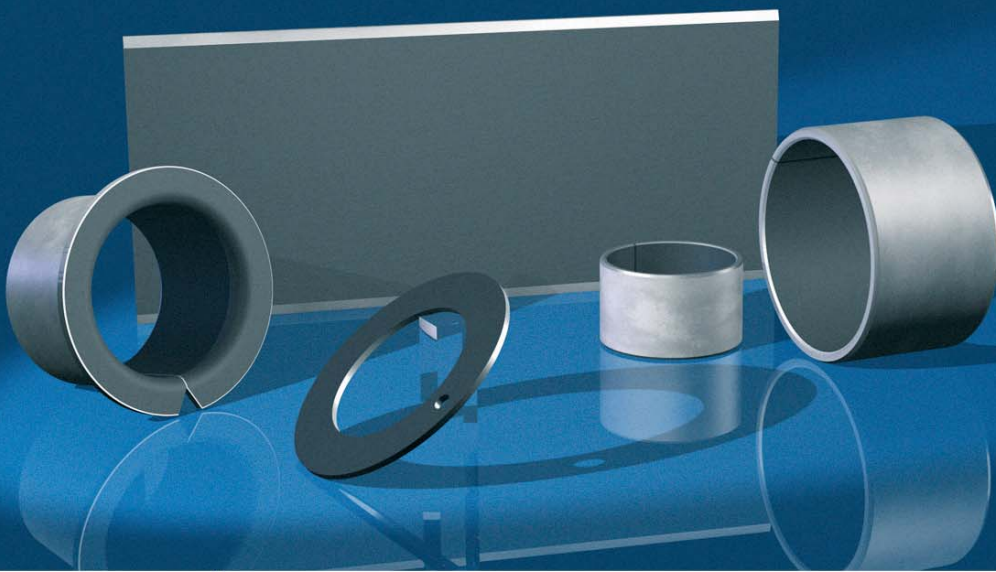


Product Information



GLYCODUR® GLYCO® 97

Lead-free dry sliding bearings and elements
for high stresses



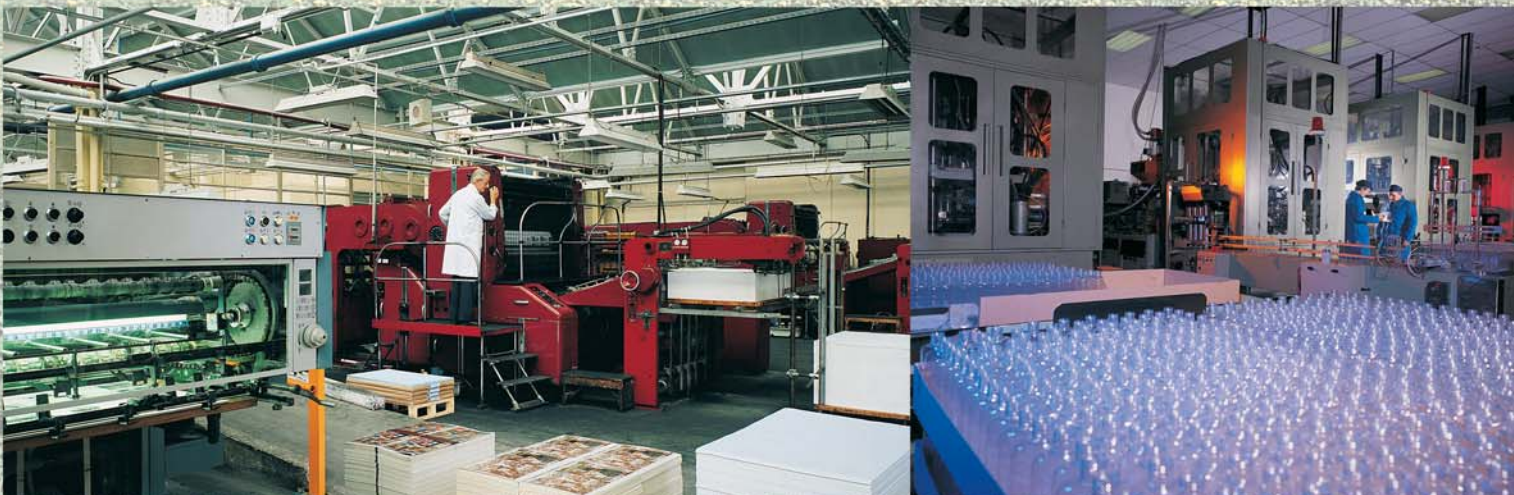
GLYCO® 97 – Lead-free dry sliding bearings and elements for high stresses

Multi-layer dry sliding bearings with steel base and porous bronze layer which are filled with a polytetrafluorethylene (PTFE) compound during a rolling process, have successfully been used for decades.

The rolled-in PTFE has very good sliding properties and can also be used as a dry lubricant, although the soft PTFE layer is only slightly abrasion resistant. As a result additional materials were added from the start, preferably lead or MoS_2 , which improve the abrasion characteristics without interfering with the tribological properties. Both materials meet the requirements in an almost equivalent

manner, one or the other variant possibly offering slight advantages depending on the application. In summary the performance has reached certain boundaries and a material variant with improved wear properties at remaining or more favourable friction values is required. Furthermore laws have been passed which prohibit lead and other materials which pollute the environment.

The PTFE/ MoS_2 /BN material system was able to meet the requirements and ensures a wear-resistance which far exceeds previous composite materials based on PTFE.



1	Sliding bearing material	
1.1	Composition	page 4
1.2	Characteristics summary of GLYCO® 97 material	page 5
1.3	Friction	page 6
1.4	Comparison of wear and friction behaviour	page 7
1.5	Chemical properties	page 8
1.6	Machinability	page 8
2	Determination of bearing size	
2.1	Determination of bearing size	page 8
2.2	Nominal service life	page 9
2.3	Load capacities	page 9
2.4	pv areas of application	page 10
2.5	Calculation for the nominal service life	page 11
2.6	Specific surface load p	page 11
2.7	Sliding velocity v	page 12
2.8	Load factor c_1	page 12
2.9	Sliding velocity factor c_2	page 13
2.10	Temperature factor c_3	page 13
2.11	Roughness factor c_4	page 13
3	GLYCO® 97 – Sliding bearing installation	
3.1	Summary of bearing installation requirements	page 14
3.2	Junction Design	page 14
3.3	Seals	page 15
3.4	Installation	page 15
3.5	Lubrication and maintenance	page 15
4	Tolerances	
4.1	Dimensions	page 16
4.2	Tolerances	page 16
4.3	Housing, shafts and bearing clearance	page 16
5	Special parts	
5.1	Special parts	page 17
6	Dimension and tolerance tables for GLYCO® 97	
6.1	GLYCO® 97 bushing tolerances for shaft, housing and bearing clearance	page 18
6.2	Dimension table for GLYCO® 97 bushings	page 20
6.3	Dimension table for GLYCO® 97 flanged bushings	page 22
6.4	GLYCO® 97 flanged bushings tolerances	page 23
6.5	Dimension and tolerance tables for GLYCO® 97 thrust washers	page 24
6.6	Dimension table for GLYCO® 97 strip material	page 25
6.7	GLYCO® 97 strip material tolerances	page 25



1

1.1 Composition

Sliding bearing material

GLYCO® 97 sliding bearings consist of a copper-plated steel base to which a 0.2 to 0.4 mm-thick, porous tin bronze has been sintered. The seal is formed by a 5 to 30 µm thick top (or running-in) layer consisting of a compound of polytetrafluorethylene (PTFE), molybdenum sulphide (MoS₂) and hexagonal boron nitride (BN) (Fig. 1.1.1). The compact bond between the PTFE compound and the porous bronze matrix is produced in a special rolling process (Fig. 1.1.2). GLYCO® 97 sliding bearings are distinguished by their high efficiency based on the proven material composition, optimum combination of materials and modern, safe production process (Fig. 1.1.2).

Particularly worth emphasising are the low friction, high wear-resistance, good dimensional accuracy and heat conductivity as well as the improved running-in characteristics.

GLYCO® 97 is a pure dry bearing sliding material. During the running-in phase a thin transfer film is transferred to the sliding partner which thus improves the friction and wear characteristics throughout the entire service life. With lead-free GLYCO® 97 a material is available which fulfils the increased demands for safety in production, the application and disposal/recycling.

GLYCO® 97 sliding bearings are available on request for special applications as well as with thicker or thinner top layers.

GLYCO® 97

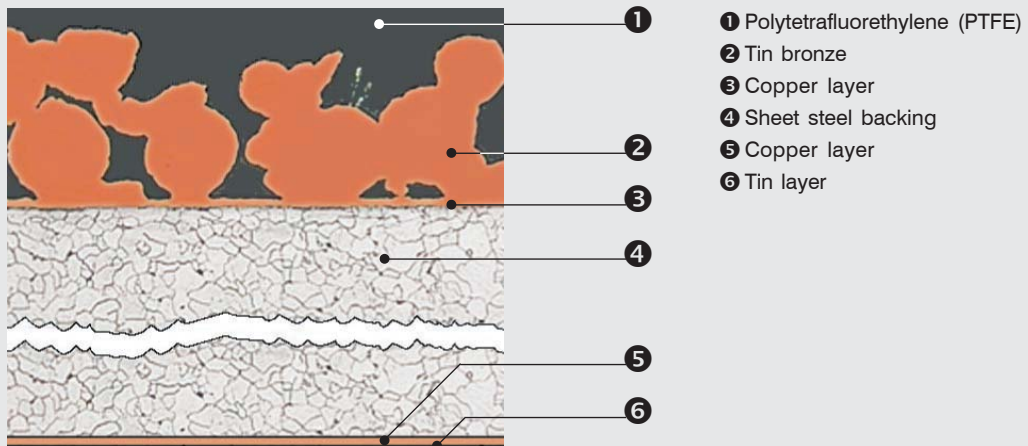


Figure 1.1.1 – Microsection GLYCO® 97

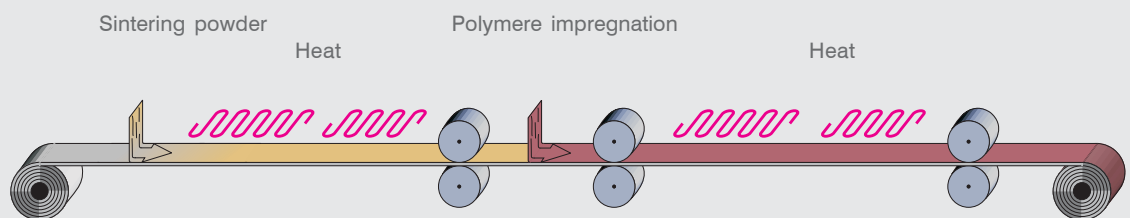


Figure 1.1.2 – Scheme production process

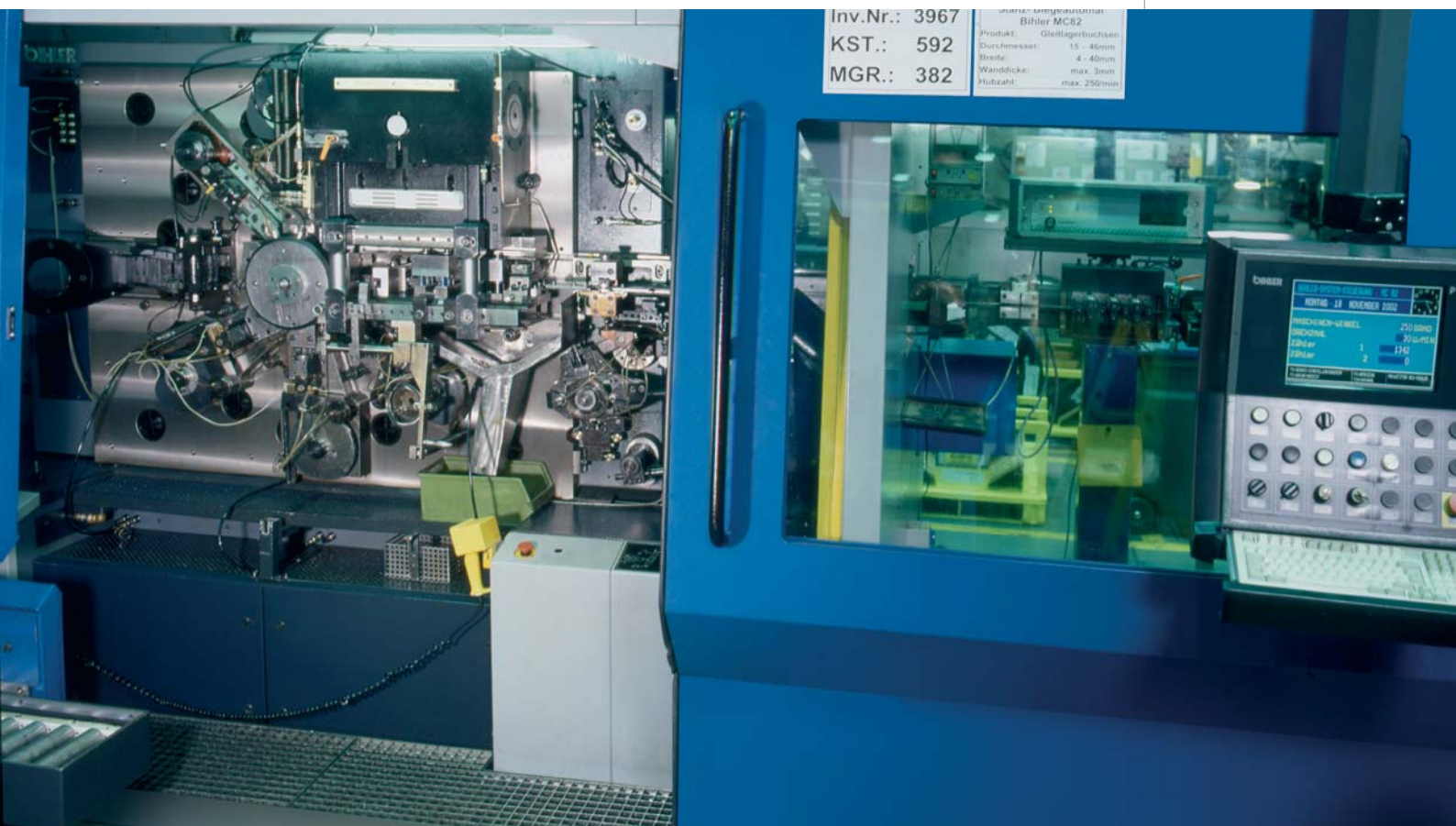
Copper plated steel backing

Finished GLYCO® 97 material

1.2 Characteristics summary of GLYCO® 97 material

Properties – mating surface requirements

Permissible static specific bearing load	250 MPa
Permissible dynamic specific load	100 MPa
Maximum sliding velocity	2 m/s
Operating temperature	-200 to +260 °C
Thermal conductivity	46 W/mK
Electrical resistance	1 to 10 Ohm/cm ²
Coefficient of friction	0.02 to 0.20
Stick-slip	negligible
Wear layer thickness	to 0.2 mm
Ability to embed dirt and foreign particles	fair
Ability to carry alternating loads	good
Machining of sliding surface after mounting	calibration
Lubrication	not required



1.3 Friction

The friction in GLYCO® 97 sliding bearings depends on the load, sliding velocity, operating temperature, composition of the sliding partner and environmental influences such as the level of pollution. In dry running a friction value of 0.02 to 0.20 is to be assumed. A lower friction value appears in the dry run at a higher specific load and lower sliding velocity

(see standard values in Fig. 1.3.1). In contrast the friction value increases with increasing operating temperature. The stick-slip effect is negligible with GLYCO® 97 sliding bearings.

We recommend carrying out tests with prototypes if the friction in an application is considered a "critical" function characteristic.

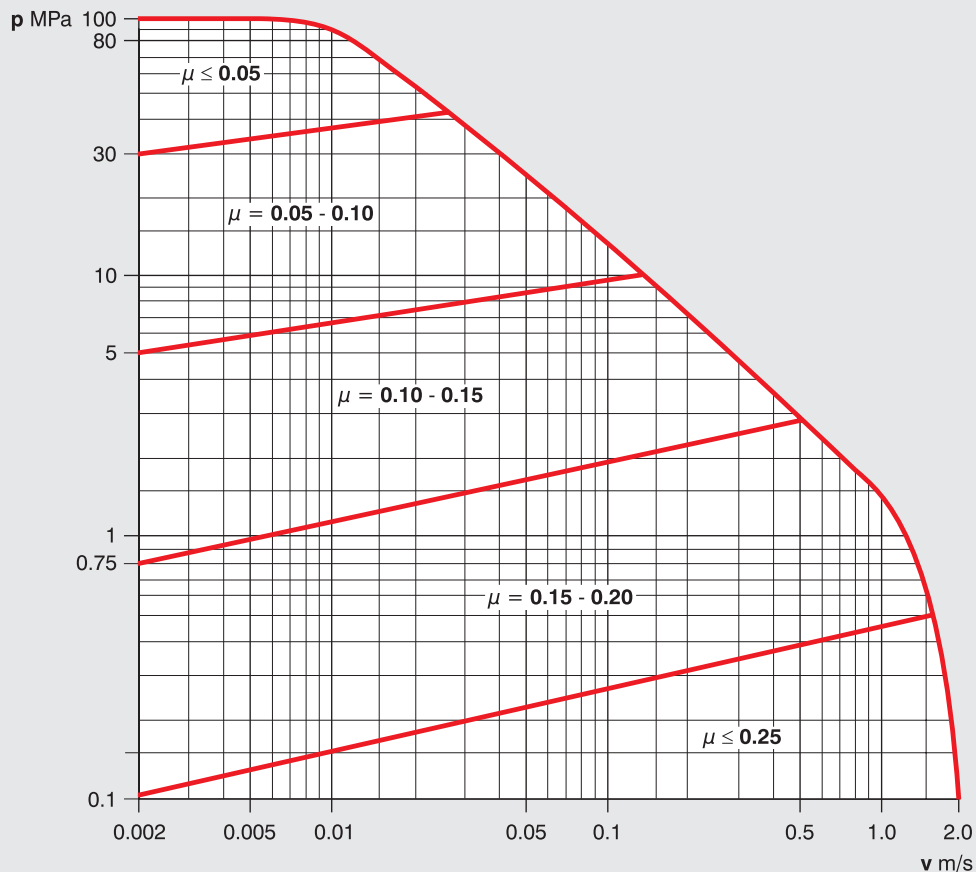
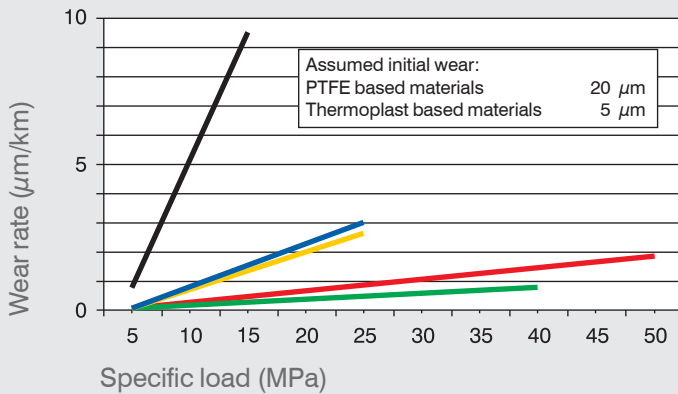


Figure 1.3.1 – Guidelines for friction coefficients for GLYCO® 97 bearings

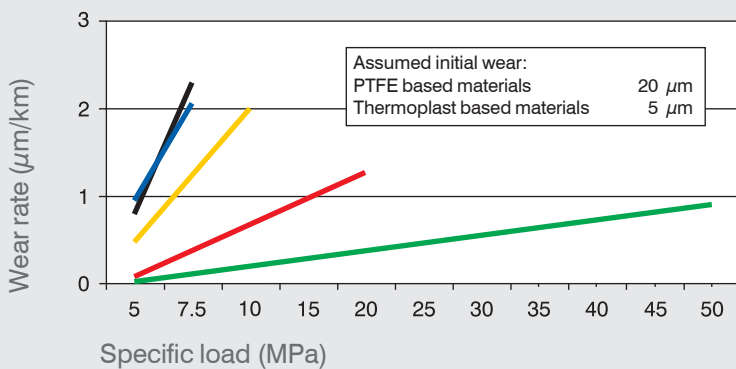
1.4 Comparison of wear and friction behaviour

Test 1: Wear rate (oscillation)



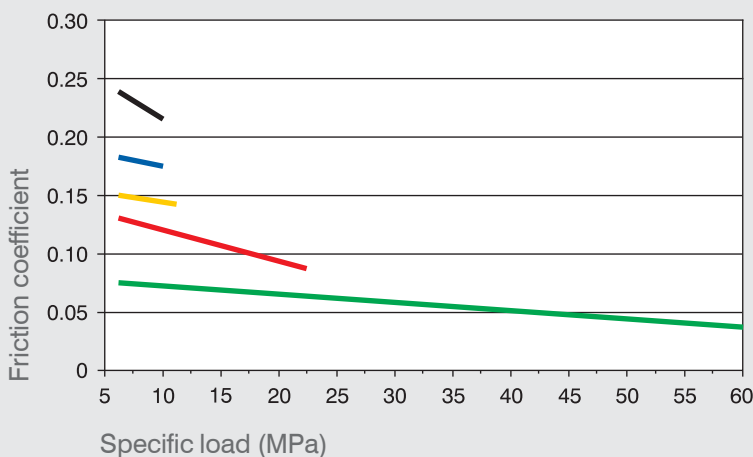
Test conditions	Test 1
Movement	oscillating
Sliding distance	11.34 km
Sliding velocity	0.063 ms ⁻¹
Dimensions	
- Inside diameter d	22 mm
- Outside diameter D	23 mm
- Width B	15 mm
Housing	100Cr6V; 56HRC
Roughness R _z	≈ 1 µm

Test 2: Wear rate (rotation)



Test conditions	Test 2 + 3
Movement	rotating
Sliding distance	22.5 km
Sliding velocity	0.125 ms ⁻¹
Dimensions	
- Inside diameter d	22 mm
- Outside diameter D	23 mm
- Width B	15 mm
Housing	100Cr6V; 56HRC
Roughness R _z	≈ 1 µm

Test 3: Friction coefficient (rotation)



	GLYCO® 92
	GLYCO® 193
	GLYCO® 97
	Competition
	Competition



1.5 Chemical properties

The chemical properties of the GLYCO® 97 sliding bearing are mainly determined by the tin bronze sinter layer and steel body. The top layer – the PTFE compound – is inert. It can be attacked by free fluorides and molten alkaline metals at elevated temperatures. The tin bronze sintered structure exhibits a good resistance to sea water, water vapour, salt solutions, atmospheric effects and sulphuric acid at room temperature, but is not resistant to oxidising acids and ammonium hydroxides.

The exposed surfaces on the steel base are electroplated with tin. In most applications there is therefore only limited protection against corrosion. If the bearings are exposed to corrosive media, or there is a risk of contact corrosion, the steel base should be protected by a sufficiently-sized, electroplated nickel, chrome or Cr6-free zinc layer. The same applies for the sliding partner. In critical applications you are recommended to carry out a suitable corrosion test or contact Federal-Mogul.

1.6 Machinability

With the exception of the sliding surface, GLYCO® 97 sliding material can be machined by all conventional methods. Burrs occurring through turning, boring, cutting etc. must be carefully removed and the exposed steel surfaces protected against corrosion again as soon as possible. **GLYCO® 97 sliding bearings are supplied ready for installation.** Subsequent machining of the sliding surfaces/bearing bore

through calibration is technically possible. The bearing clearance and bearing clearance dispersion can be restricted as a result of this. Generally, however, it leads to a shorter service life and should therefore only be carried out in exceptional cases. Data concerning the dimensions and model of calibration mandrel as well as the correct bore diameter can be obtained from Federal-Mogul.

2

2.1 Determination of bearing size

The load capacity and wear characteristics of a GLYCO® 97 sliding bearing depend on the individual application. The service life,

prevailing load, load capacity (load factor **C, C₀**) and operational safety are critical in determining the bearing size.

Determination of bearing size

2.2 Service life

The service life of a GLYCO® 97 sliding bearing is expressed the number of oscillating/rotating movements or in operating hours. It consequently depends on the prevailing dry friction of the increase in bearing clearance and the increase in the bearing friction. Both are determined by progressive wear of the sliding layers and plastic deformation and fatigue of the sliding material.

An increase in wear or friction individually differing in size can, depending on the application, be perfectly permissible. In practice the service life which can be obtained under identical operating conditions will often be different if the requirements which the bearing has to

meet vary. Conversely, it has also been shown that the effective or actual service life of the same bearings under the same operating conditions is subject to a dispersion. This has been confirmed by results from field and laboratory tests. The service life depends on the respective application conditions, that is on a large number of influencing variables which can be evaluated only partially or not at all, such as corrosion, high-frequency load and movement cycles, shocks etc.

The nominal service life, on the other hand, represents a standard value, which is attained or exceeded by the majority of bearings under definite test conditions.

2.3 Load capacity

Dynamic load factor

The dynamic load factor **C** is a characteristic value for calculating the nominal service life of a GLYCO® 97 sliding bearing. It gives the load of the bearing constant for direction and size, at which a definite nominal service life is revealed in operating hours under continuous oscillating or rotating movements as well as definite sliding velocity and temperature.

For this a purely radial load for bushings and a purely axial and centric load for thrust washers is assumed. A dynamic stress is present if a bearing is exposed to a combination of swinging/rotating movements and load as well as micro-sliding movements, vibrations, high-frequency load changes, etc.

The different stresses frequently occur in combination. Oscillating/rotating

movements under constant load principally cause wear, while with other stresses material fatigue can occur.

The dynamic load factors are based on the respective definition of the manufacturer and cannot therefore easily be compared with the data provided by other manufacturers.

Static load factor

The static load factor **C₀** is the characteristic value for the maximum load of a bushing, flanged bushing or thrust washer when stationary at room temperature, without its functioning capability being impaired by inadmissible deformations to the sliding layer. It is assumed here that the bearing is sufficiently supported by the junction. At higher temperatures the static load factor must be reduced by multiplying it by the temperature factor **c₃** (Page 13).

2.4 pv areas of application

Figure 2.4.1 shows the pv areas of application within which the use of GLYCO® 97 sliding bearings is permissible.

Firstly the specific bearing load **p** and the sliding velocity **v** must be calculated for the planned bearings on the basis of the load occurring and the number of swinging/rotating movements according to the equations given at 2.6 and 2.7.

If the **p** and **v** values determined lie within the working range, the nominal service life of the sliding bearing can be calculated according to 2.5.

If both or one value lie outside the working range, we recommend that you contact us or ascertain the suitability of the sliding bearing through preliminary tests and select the right bearing size so that **p** and **v** lie within the working range.

GLYCO® 97

pv areas of application:

- I Basic rating, service life equation valid.
- II Possible area of application at optimum conditions, e. g. heat dissipation.

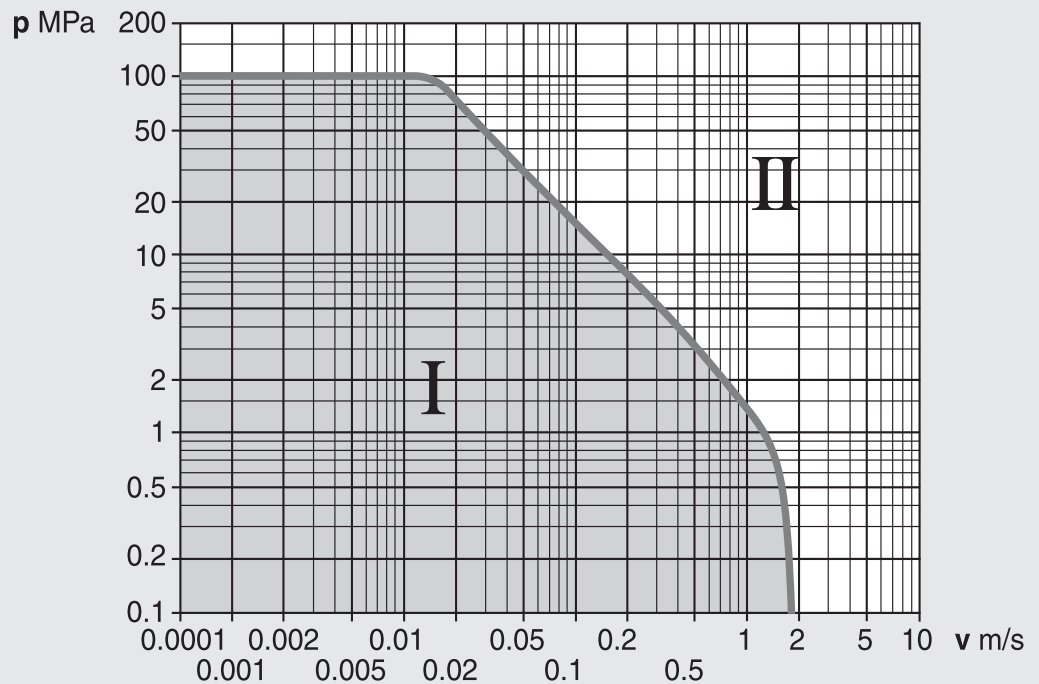


Figure 2.4.1 –
pv areas of application

2.5 Calculation for the nominal service life

The service life of a GLYCO® 97 bearing is affected by numerous factors which, however, cannot all easily be ascertained in the calculation. The load, sliding velocity, operating temperature, roughness of the mating surface and load type form the essential factors considered in the service life equation for an approximate calculation of the service life.

Rig tests and results gained from practical experience have, however, confirmed that the approximate values for the nominal service life determined by the following equation are attained and in part exceeded by the majority of bearings.

The **nominal service life**, taking the influencing factors cited into consideration, can be calculated from the equation:

$$G_h = c_1 \times c_2 \times c_3 \times c_4 \times c_5 \times \frac{K_M}{(pv)^n}$$

G_n nominal service life, operating hours

p specific bearing load, MPa

v sliding velocity, m/s

c₁ load factor
(page 12)

c₂ velocity factor
(page 13)

c₃ temperature factor
(page 13)

c₄ roughness factor
(page 13)

c₅ load distribution factor

- 1.0 for a point-focal load
(the load is always at the same point of the bearing's perimeter)
- 1.5 for a circumferential load
(the load zone travels around the entire bearing perimeter)

K_M material constant

- 540 for bushings
- 340 for thrust washers

Attention: If the product **pv** of GLYCO® 97 falls below the limit value of 0.025 at very low loads and/or sliding velocities then **pv** = 0.025 have to be used in the service life equation.

2.6 Specific surface load p

The value of the specific surface load can be determined with:

$$p = K \times \frac{F}{C}$$

Where:

p = specific load MPa

F = dynamic bearing load N

C = dynamic load capacity N

K = specific load characteristic value MPa

= 100

2.7 Sliding velocity v

The average sliding velocity is obtained for continuous movement:

$$v = 5.82 \times 10^{-7} \times d \times \beta \times f$$

Where:

- v = sliding velocity m/s
- d = bore diameter of bushing mm
= mean diameter of thrust washer mm (dimension J in bearing tables, page 24 following) or $0.5(d+D)$ mm
- f = angular frequency or rotational frequency min^{-1}
- β = half turning angle in degrees (see illustration)
= 90° in case of rotational movement

Drawing turning angle

The complete oscillation = 4β :
i.e. from point 0 to 4

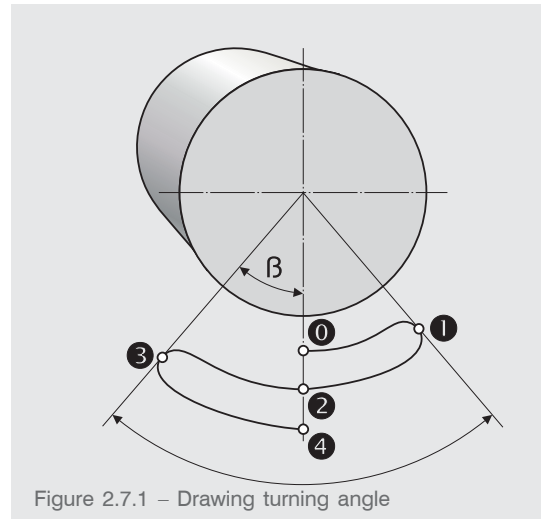
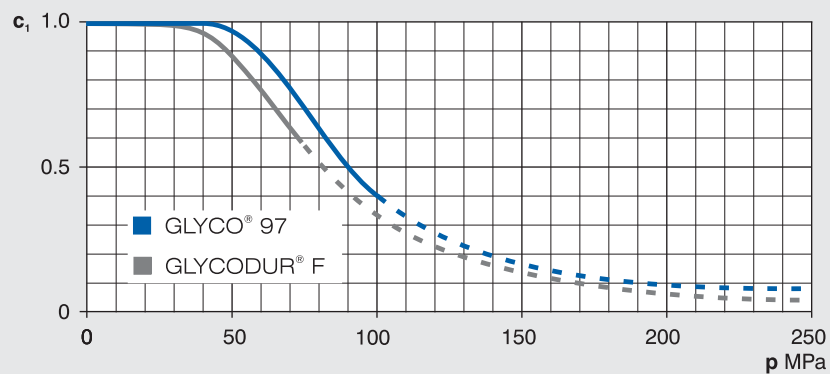
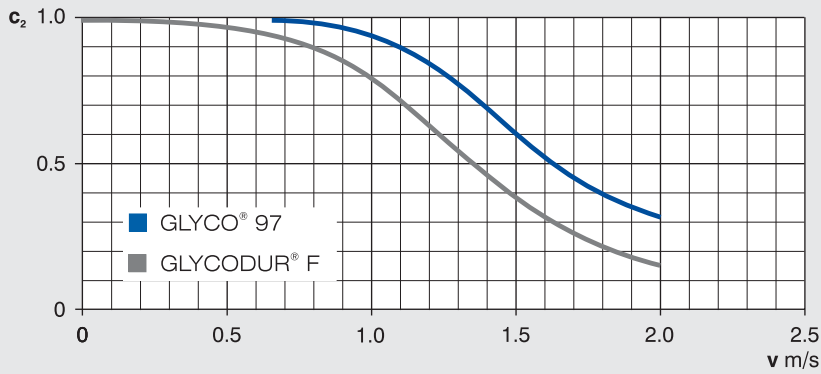


Figure 2.7.1 – Drawing turning angle

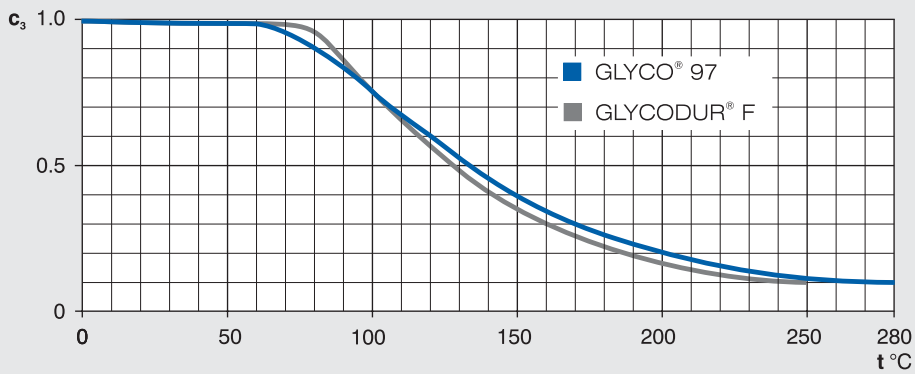
2.8 Load factor c_1



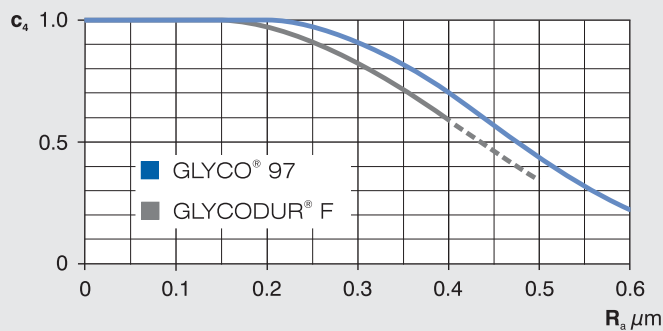
2.9 Sliding velocity factor c_2



2.10 Temperature factor c_3



2.11 Roughness factor c_4



3

3.1 Summary of bearing installation requirements

GLYCO® 97-
Sliding bearing
installation

To ensure problem-free operation, the following construction notes should be

observed when fitting the GLYCO® 97 bearing:

Standard	
Recommended housing tolerance	
≤ 4 mm Bore diameter	H6
> 4 mm Bore diameter	H7
Recommended shaft tolerance	
	h6 for d = 3 and 4 mm f7 for d ≤ 75 mm, h8 for d > 75 mm
Required surface finish of the mating surface according to DIN ISO 4288	$R_z \leq 2.5 \mu\text{m}$ $R_a \leq 0.4 \mu\text{m}$
Permissible surface treatment of the mating surface	grinded (drawn)
Higher requirements	
Required surface finish of the mating surface	$R_z \leq 2 \mu\text{m}$ $R_a \leq 0.3 \mu\text{m}$
Surface hardness or surface treatment	≤ 50HRC chrome plated, nickel plated
(the recommendations regarding the shaft tolerance and the surface finish apply also to the plated component)	

3.2 Junction Design

When positioning the junction components for GLYCO® 97 sliding bearings the following must, as a rule, be observed:

- To prevent step formations in the sliding surface of the bearing, the sliding partner must always be wider than the bearing. This applies in particular for axial displacements due to elongation.
- To carry out a problem-free mounting of the bearing and avoid possible damages to the sliding layer when introducing the shaft, the housing bore and shaft should always receive chamfers.

- To minimise high edge loads due to alignment errors between the bearing positions that cannot always be avoided, the housing bore must receive larger chamfers.
- When using flanged bushings or thrust washers the (axial) sliding surfaces must be completely covered by the sliding partner.
- Thrust washers can be radially located in a turned recess in the housing and secured using a dowel pin or grub screw or fixed using two countersunk screws. The pins or screws must be recessed at least 0.3 mm below the sliding surface.

3.3 Seals

It is recommended that the bearings are sealed if the bearing is exposed to a certain level of pollution or if other damaging environmental factors can affect the bearing.

The quality of the seal can be crucial for the service life. In critical applications we recommend contacting our application technicians.

3.4 Installation

Cleanliness and care are the prerequisites for problem-free installation and correct functioning of the bearings in daily operation. Test and mounting instructions, which contain the following parameters for example, should be available and implemented:

- Inspection of housing and shaft diameter
- Insertion chamfer at an angle of 10 to 20° in the housing bore
- Burr-free edges on the housing and shaft
- Clean and undamaged surfaces on the shaft and housing bore

- Lubrication of the seats in the housing with oil or grease in order to make installation easier
- Inspection of mounting tools (mounting mandrel/ring)
- Position gap joint of the bushing approx. 90° to the direction of load
- Alignment of the bushing with the housing bore (no bending out of line) during the friction setting etc.

If you have queries concerning arranging the mounting tools or in respect to standard values for friction setting forces and similar, we recommend that you contact our application engineers.

3.5 Lubrication and maintenance

GLYCO 97® has been developed for pure dry running and should not be lubricated, therefore, **an initial lubrication and regulation lubrication is not required.**

The tribological system is impaired more than it is assisted by the presence of lubricants.



4

Tolerances

4.1 Dimensions

The dimensions of GLYCO® 97 bushings from 4 mm inside diameter upwards conform – with the exception of several intermediate sizes – to the values given in DIN ISO 3547-1: 2000-11. The flanged bushings and thrust washers given in the product tables have not yet been included in the DIN ISO-standards.

Their dimensions, however, have achieved widespread acceptance. They are standard in industry and are guaranteed replaceable. The dimension tables for the products bushings, flanged bushings, thrust washers and strip material are given on pages 22ff.

4.2 Tolerances

The tolerances according to "Test A" for the outside diameter of the GLYCO® 97 bushings and flanged bushings correspond to the values given in DIN ISO 3547-1:2000-11. To check these tolerances the test instructions given in DIN ISO 3547-2:2000-11 Section 7 must be observed.

The dimension for bushing width **B** is a uniform ± 0.25 mm (Table page 23). The tolerances for the remaining products are given in the following:

- Flanged bushings in 6.4 page 23
- Thrust washers in 6.5 page 24
- Strip material in 6.7 page 25

4.3 Housing, shafts and bearing clearance

The bearing clearance is independent of the selected tolerances for the shaft and housing. The standard values for the bearing clearance with the recommended tolerances are given in 6.1 page 18f. They apply at room temperature.

The bearing clearance is reduced by 0.0016 mm for every 20° C increase in temperature. This should be noted for bearings in the lower diameter range. Tolerance fields H6 or H7 for the housing seat apply to housings made of steel and grey-cast iron.

For this dimension it is ensured that the installation-ready bushing/flanged bushing rests sufficiently firmly in the housing bore.

Firmer housing seats are to be envisaged for light alloy housings and high operating temperatures on account of thermal expansion. Under these conditions a reduction of the shaft diameter is usually required. In special cases you are recommended to contact Federal-Mogul.

5.1 Special parts

Special parts on request.

5

Special parts



6

6.1 GLYCO® 97 bushing tolerances for shaft, housing and bearing clearance

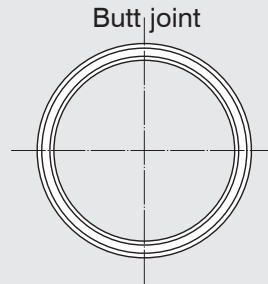
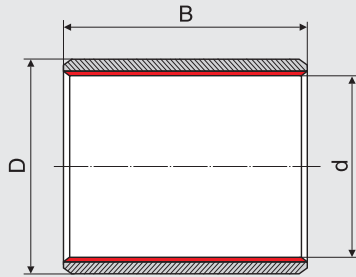
GLYCO® 97

Dimensions bushings				Diameter limits				Bore diameter of mounted bushing		Bearing clearance	
Bore diameter	Outside diameter	Wall thickness		Shaft (f7 for d ≤ 75 mm) (h8 for d > 75 mm)		Housing bore (H7)		max.	min.	min.	max.
d	D	max.	min.	max.	min.	max.	min.				
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	μm	μm
3	4.5	0.750	0.730	3.000 _(h6)	2.994 _(h6)	4.508 _(H6)	4.500 _(H6)	3.048	3.000	0	54
4	5.5	0.750	0.730	4.000 _(h6)	3.992 _(h6)	5.508 _(H6)	5.500 _(H6)	4.048	4.000	0	56
5	7	1.007	0.981	4.990	4.978	7.015	7.000	5.053	4.986	-4	75
6	8	1.007	0.981	5.990	5.978	8.015	8.000	6.053	5.986	-4	75
7	9	1.007	0.981	6.987	6.972	9.015	9.000	7.053	6.986	-1	81
8	10	1.007	0.981	7.987	7.972	10.015	10.000	8.053	7.986	-1	81
10	12	1.007	0.981	9.987	9.972	12.018	12.000	10.056	9.986	-1	84
12	14	1.007	0.981	11.984	11.966	14.018	14.000	12.056	11.986	2	90
13	15	1.007	0.981	12.984	12.966	15.018	15.000	13.056	12.986	2	90
14	16	1.007	0.981	13.984	13.966	16.018	16.000	14.056	13.986	2	90
15	17	1.007	0.981	14.984	14.966	17.018	17.000	15.056	14.986	2	90
16	18	1.007	0.981	15.984	15.966	18.018	18.000	16.056	15.986	2	90
17	19	1.007	0.981	16.984	16.966	19.021	19.000	17.059	16.986	2	93
18	20	1.007	0.981	17.984	17.966	20.021	20.000	18.059	17.986	2	93
20	23	1.507	1.475	19.980	19.959	23.021	23.000	20.071	19.986	6	112
22	25	1.507	1.475	21.980	21.959	25.021	25.000	22.071	21.986	6	112
24	27	1.507	1.475	23.980	23.959	27.021	27.000	24.071	23.986	6	112
25	28	1.507	1.475	24.980	24.959	28.021	28.000	25.071	24.986	6	112
28	32	2.007	1.971	27.980	27.959	32.025	32.000	28.083	27.986	6	124
30	34	2.007	1.971	29.980	29.959	34.025	34.000	30.083	29.986	6	124
32	36	2.007	1.971	31.975	31.950	36.025	36.000	32.083	31.986	11	133
35	39	2.007	1.971	34.975	34.950	39.025	39.000	35.083	34.986	11	133
37	40	1.507	1.475	36.975	36.950	40.025	40.000	37.075	36.986	11	125
40	44	2.007	1.971	39.975	39.950	44.025	44.000	40.083	39.986	11	133
45	50	2.508	2.462	44.975	44.950	50.025	50.000	45.101	44.984	9	151

Dimension and tolerance tables

Dimensions bushings				Diameter limits				Bore diameter of mounted bushing		Bearing clearance	
Bore diameter	Outside diameter	Wall thickness		Shaft (f7 for d ≤ 75 mm) (h8 for d > 75 mm)		Housing bore (H7)		max.	min.	min.	max.
		max.	min.	max.	min.	max.	min.				
d	D	mm	mm	mm	mm	mm	mm	mm	mm	μm	μm
50	55	2.508	2.462	49.975	49.950	55.030	55.000	50.106	49.984	14	166
55	60	2.508	2.462	54.970	54.940	60.030	60.000	55.106	54.984	14	166
60	65	2.508	2.462	59.970	59.940	65.030	65.000	60.106	59.984	14	166
65	70	2.508	2.462	64.970	64.940	70.030	70.000	65.106	64.984	14	166
70	75	2.508	2.462	69.970	69.940	75.030	75.000	70.106	69.984	14	166
75	80	2.508	2.462	74.970	74.940	80.030	80.000	75.106	74.984	14	166
80	85	2.490	2.440	80.000	79.954	85.035	85.000	80.155	80.020	20	201
85	90	2.490	2.440	85.000	84.946	90.035	90.000	85.155	85.020	20	209
90	95	2.490	2.440	90.000	89.946	95.035	95.000	90.155	90.020	20	209
95	100	2.490	2.440	95.000	94.946	100.035	100.000	95.155	95.020	20	209
100	105	2.490	2.440	100.000	99.946	105.035	105.000	100.155	100.020	20	209
105	110	2.490	2.440	105.000	104.946	110.035	110.000	105.155	105.020	20	209
110	115	2.490	2.440	110.000	109.946	115.035	115.000	110.155	110.020	20	209
115	120	2.490	2.440	115.000	114.946	120.035	120.000	115.155	115.020	20	209
120	125	2.465	2.415	120.000	119.946	125.040	125.000	120.210	120.070	70	264
125	130	2.465	2.415	125.000	124.937	130.040	130.000	125.210	125.070	70	273
130	135	2.465	2.415	130.000	129.937	135.040	135.000	130.210	130.070	70	273
135	140	2.465	2.415	135.000	134.937	140.040	140.000	135.210	135.070	70	273
140	145	2.465	2.415	140.000	139.937	145.040	145.000	140.210	140.070	70	273
150	155	2.465	2.415	150.000	149.937	155.040	155.000	150.210	150.070	70	273
160	165	2.465	2.415	160.000	159.937	165.040	165.000	160.210	160.070	70	273
180	185	2.465	2.415	180.000	179.937	185.046	185.000	180.216	180.070	70	279
200	205	2.465	2.415	200.000	199.928	205.046	205.000	200.216	200.070	70	288
210	215	2.465	2.415	210.000	209.928	215.046	215.000	210.216	210.070	70	288
220	225	2.465	2.415	220.000	219.928	225.046	225.000	220.216	220.070	70	288
250	255	2.465	2.415	250.000	249.928	255.052	255.000	250.222	250.070	70	294
280	285	2.465	2.415	280.000	279.919	285.052	285.000	280.222	280.070	70	303
300	305	2.465	2.415	300.000	299.919	305.052	305.000	300.222	300.070	70	303

6.2 Dimension table for GLYCO® 97 bushings



Dimensions			Basic load rates		Mass	Designation
d	D	B	dyn. C	stat. C ₀		
mm	mm	mm	N	N	g	
3	4.5	3	900	2240	0.2	PG 030403 D/4.5
	4.5	5	1500	3750	0.3	PG 030405 D/4.5
	4.5	6	1800	4500	0.4	PG 030406 D/4.5
4	5.5	3	1200	3000	0.2	PG 040503 D/5.5
	5.5	4	1600	4000	0.3	PG 040504 D/5.5
	5.5	6	2400	6000	0.6	PG 040506 D/5.5
	5.5	10	4000	10000	0.8	PG 040510 D/5.5
5	7	5	2500	6200	0.7	PG 050705 D
	7	8	4000	10000	1.1	PG 050708 D
	7	10	5000	12500	1.4	PG 050710 D
6	8	6	3650	9000	1	PG 060806 D
	8	8	4750	12000	1.3	PG 060808 D
	8	10	6000	15000	1.6	PG 060810 D
7	9	7	4900	12250	1.3	PG 070907 D
8	10	6	4750	12000	1.2	PG 081006 D
	10	8	6400	16000	1.7	PG 081008 D
	10	10	8000	20000	2.1	PG 081010 D
	10	12	9500	24000	2.5	PG 081012 D
10	12	8	8000	20000	2	PG 101208 D
	12	10	10000	25000	2.5	PG 101210 D
	12	12	12000	30000	3	PG 101212 D
	12	15	15000	37500	3.8	PG 101215 D
	12	20	20000	50000	5.1	PG 101220 D
12	14	8	9600	24000	2.4	PG 121408 D
	14	10	12100	30000	3	PG 121410 D
	14	12	14500	36000	3.6	PG 121412 D
	14	15	17900	45000	4.5	PG 121415 D
	14	20	24100	60000	6	PG 121420 D
	14	25	30000	75000	7.6	PG 121425 D
13	15	10	13000	32500	3.2	PG 131510 D
14	16	10	14000	34500	3.5	PG 141610 D
	16	12	16750	41500	4.2	PG 141612 D
	16	15	20750	52000	5.2	PG 141615 D
	16	20	28000	70000	7	PG 141620 D
	16	25	35000	88000	8.7	PG 141625 D

Dimensions			Basic load rates		Mass	Designation
d	D	B	dyn. C	stat. C ₀		
mm	mm	mm	N	N	g	
15	17	10	15000	37500	3.7	PG 151710 D
	17	12	17900	45000	4.4	PG 151712 D
	17	15	22500	56000	5.6	PG 151715 D
	17	20	30000	75000	7.4	PG 151720 D
	17	25	37500	93000	9.3	PG 151725 D
16	18	10	16100	40000	3.9	PG 161810 D
	18	12	19100	48000	4.7	PG 161812 D
	18	15	24100	60000	5.9	PG 161815 D
	18	20	31800	80000	7.9	PG 161820 D
	18	25	40000	100000	9.9	PG 161825 D
17	19	12	20300	51000	5	PG 171912 D
18	20	15	27000	67000	6.6	PG 182015 D
	20	20	36250	90000	8.8	PG 182020 D
	20	25	45000	112000	11	PG 182025 D
20	23	10	18250	45500	7.4	PG 202310 D
	23	15	28500	71000	11	PG 202315 D
	23	20	38100	96500	15	PG 202320 D
	23	25	48750	120000	19	PG 202325 D
	23	30	58100	146000	23	PG 202330 D
22	25	10	21250	52000	8.3	PG 222510 D
	25	15	31250	78000	12	PG 222515 D
	25	20	42500	106000	16	PG 222520 D
	25	25	53100	134000	21	PG 222525 D
	25	30	63750	160000	25	PG 222530 D
24	27	15	34400	85000	13	PG 242715 D
	27	20	45600	116000	18	PG 242720 D
	27	25	58100	146000	22	PG 242725 D
	27	30	70000	176000	26	PG 242730 D
25	28	15	35600	88000	14	PG 252815 D
	28	20	47500	120000	18	PG 252820 D
	28	25	60000	150000	23	PG 252825 D
	28	30	73100	183000	28	PG 252830 D
	28	40	97500	245000	37	PG 252840 D
28	28	50	122500	310000	47	PG 252850 D
	32	15	41250	102000	21.3	PG 283220 D
	32	20	53750	134000	28	PG 283220 D
	32	25	67500	170000	35	PG 283225 D
32	30	81900	204000	42	PG 283230 D	

Note: A minimum mass production quantity order is necessary for all the reference in GLYCO® 97. Availability on request.

Dimension and tolerance tables

Dimensions			Basic load rates		Mass	Designation
d	D	B	dyn. C	stat. C ₀		
mm	mm	mm	N	N	g	
30	34	15	42500	106000	22	PG 303415 D
	34	20	58100	143000	30	PG 303420 D
	34	25	73100	180000	37	PG 303425 D
	34	30	86900	220000	45	PG 303430 D
	34	40	118750	300000	60	PG 303440 D
32	36	20	61250	153000	31	PG 323620 D
	36	30	93750	232000	48	PG 323630 D
	36	40	125000	315000	64	PG 323640 D
35	39	20	67500	166000	34	PG 353920 D
	39	30	101875	255000	52	PG 353930 D
	39	40	137500	345000	68	PG 353940 D
	39	50	171250	430000	87	PG 353950 D
37	40	20	71250	176000	27	PG 374020 D
40	44	20	76250	193000	39	PG 404420 D
	44	30	116250	290000	59	PG 404430 D
	44	40	156250	390000	78	PG 404440 D
	44	50	195000	490000	98	PG 404450 D
45	50	20	86900	216000	65	PG 455020 D
	50	30	132500	325000	83	PG 455030 D
	50	40	175000	440000	110	PG 455040 D
	50	50	220000	550000	140	PG 455050 D
50	55	20	95600	240000	62	PG 505520 D
	55	30	145000	365000	93	PG 505530 D
	55	40	195000	490000	125	PG 505540 D
	55	50	250000	620000	155	PG 505550 D
	55	60	295000	735000	185	PG 505560 D
55	60	20	106250	265000	67	PG 556020 D
	60	30	161250	400000	100	PG 556030 D
	60	40	216250	540000	135	PG 556040 D
	60	50	270000	680000	170	PG 556050 D
	60	60	325000	815000	200	PG 556060 D
60	65	20	114400	290000	75	PG 606520 D
	65	30	175000	440000	110	PG 606530 D
	65	40	237500	585000	145	PG 606540 D
	65	60	356250	880000	220	PG 606560 D
	65	70	418750	1040000	255	PG 606570 D
65	70	30	191250	475000	120	PG 657030 D
	70	50	318750	800000	200	PG 657050 D
	70	70	450000	1120000	275	PG 657070 D
70	75	40	275000	680000	170	PG 707540 D
	75	50	343750	865000	210	PG 707550 D
	75	70	487500	1220000	300	PG 707570 D
75	80	50	375000	930000	230	PG 758050 D
	80	60	443750	1100000	270	PG 758060 D
	80	80	593750	1500000	365	PG 758080 D
80	85	40	312500	780000	200	PG 808540 D
	85	60	468750	1180000	290	PG 808560 D
	85	100	787500	1960000	485	PG 8085100 D

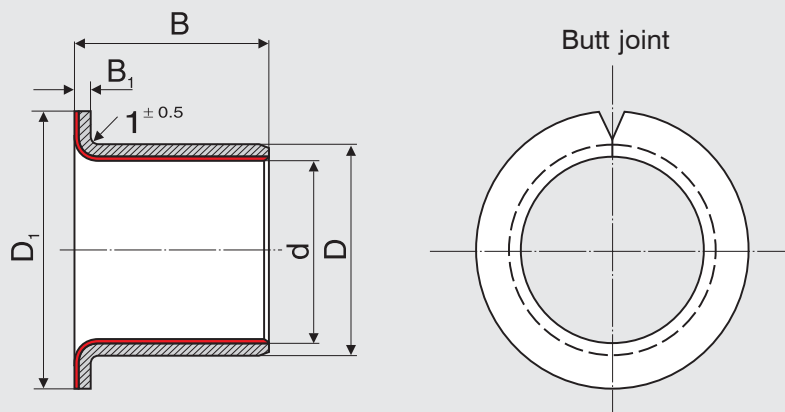
Dimensions			Basic load rates		Mass	Designation
d	D	B	dyn. C	stat. C ₀		
mm	mm	mm	N	N	g	
85	90	30	245000	610000	150	PG 859030 D
	90	60	500000	1250000	305	PG 859060 D
	90	100	837500	2080000	510	PG 8590100 D
90	95	60	531250	1320000	325	PG 909560 D
	95	100	887500	2240000	540	PG 9095100 D
95	100	60	562500	1400000	340	PG 9510060 D
	100	100	937500	2360000	570	PG 95100100 D
100	105	50	487500	1220000	305	PG 10010550 D
	105	60	593750	1460000	360	PG 10010560 D
	105	115	1143750	2850000	690	PG 100105115 D
105	110	60	612500	1530000	375	PG 10511060 D
	110	115	1187500	3000000	725	PG 105110115 D
110	115	60	650000	1630000	395	PG 11011560 D
	115	115	1250000	3150000	760	PG 110115115 D
115	120	50	562500	1400000	340	PG 11512050 D
	120	70	787500	1960000	480	PG 11512070 D
120	125	50	593750	1460000	358	PG 12012550 D
	125	60	700000	1760000	430	PG 12012560 D
	125	100	1187500	3000000	715	PG 120125100 D
125	130	100	1225000	3100000	745	PG 125130100 D
130	135	60	762500	1900000	465	PG 13013560 D
	135	100	1275000	3200000	775	PG 130135100 D
135	140	60	800000	2000000	480	PG 13514060 D
	140	80	1062500	2650000	645	PG 13514080 D
140	145	60	818750	2040000	500	PG 14014560 D
	145	100	1375000	3450000	835	PG 140145100 D
150	155	60	887500	2200000	535	PG 15015560 D
	155	80	1187500	3000000	715	PG 15015580 D
	155	100	1500000	3750000	890	PG 150155100 D
160	165	80	1250000	3150000	780	PG 16016580 D
	165	100	1587500	3900000	970	PG 160165100 D
180	185	80	1425000	3550000	870	PG 18018580 D
	185	100	1787500	4400000	1100	PG 180185100 D
200	205	100	2000000	4900000	1200	PG 200205100 D
210	215	100	2075000	5200000	1250	PG 210215100 D
220	225	100	2162500	5400000	1350	PG 220225100 D
250	255	100	2450000	6100000	1500	PG 250255100 D
280	285	80	2200000	5500000	1350	PG 28028580 D
300	305	100	2950000	7350000	1800	PG 300305100 D

Note: A minimum mass production quantity order is necessary for all the reference in GLYCO® 97. Availability on request.

6.3 Dimension table for GLYCO® 97 flanged bushings

Dimensions					Basic load rates				Mass	Designation
d	D	D ₁	B	B ₁	rad. dyn. C	stat. C ₀	ax. dyn. C _a	stat. C _{0a}		
mm	mm	mm	mm	mm	N	N	N	N	g	
5	7	11.5	4	1	1000	2500	3600	9000	1.1	PBG 050704 D
6	8	12	4	1	1200	3000	3500	8650	1.3	PBG 060804 D
	8	12	8	1	3600	9000	3500	8650	1.9	PBG 060808 D
8	10	15	5.5	1	2800	6950	6400	16000	2.1	PBG 081005.5 D
	10	15	7.5	1	4500	11000	6400	16000	2.5	PBG 081007.5 D
	10	15	9.5	1	6000	15000	6400	16000	2.9	PBG 081009.5 D
10	12	18	7	1	5000	12500	10000	25000	3.1	PBG 101207 D
	12	18	9	1	7000	17600	10000	25000	3.6	PBG 101209 D
	12	18	12	1	10000	25000	10000	25000	4.3	PBG 101212 D
	12	18	17	1	15000	37500	10000	25000	5.6	PBG 101217 D
	12	18	20	1	18000	45000	10000	25000	6.1	PBG 101220 D
12	14	20	7	1	6000	15000	11500	28500	3.6	PBG 121407 D
	14	20	9	1	8400	20800	11500	28500	4.2	PBG 121409 D
	14	20	12	1	12000	30000	11500	28500	5.1	PBG 121412 D
	14	20	15	1	16000	39000	11500	28500	6.1	PBG 121415 D
	14	20	17	1	18000	45000	11500	28500	6.6	PBG 121417 D
13	15	21	17	1	19500	48750	12000	29800	6.8	PBG 131517 D
14	16	22	12	1	14000	34500	12500	31500	5.8	PBG 141612 D
	16	22	17	1	20800	52000	12500	31500	7.5	PBG 141617 D
15	17	23	9	1	10400	26000	13000	32500	5.1	PBG 151709 D
	17	23	12	1	15000	37500	13000	32500	6.2	PBG 151712 D
	17	23	17	1	22500	56000	13000	32500	7.6	PBG 151717 D
16	18	24	12	1	15300	38000	10600	26500	6.2	PBG 161812 D
	18	24	15	1	20800	52000	10600	26500	7.1	PBG 161815 D
	18	24	17	1	23300	58500	10600	26500	8.1	PBG 161817 D
18	20	26	12	1	17200	42500	11600	29000	7.3	PBG 182012 D
	20	26	17	1	26000	65500	11600	29000	9.5	PBG 182017 D
	20	26	22	1	35000	88000	11600	29000	12	PBG 182022 D
20	23	30	11.5	1.5	18000	45000	21600	54000	13	PBG 202311.5 D
	23	30	15	1.5	25000	62000	21600	54000	16	PBG 202315 D
	23	30	16.5	1.5	27500	69500	21600	54000	17	PBG 202316.5 D
	23	30	21.5	1.5	38000	95000	21600	54000	21	PBG 202321.5 D
25	28	35	11.5	1.5	21600	54000	25500	64000	16	PBG 252811.5 D
	28	35	16.5	1.5	35000	85000	25500	64000	21	PBG 252816.5 D
	28	35	21.5	1.5	47000	116000	25500	64000	25	PBG 252821.5 D
30	34	42	16	2	38000	95000	36300	91500	35	PBG 303416 D
	34	42	26	2	67500	170000	36300	91500	50	PBG 303426 D
35	39	47	16	2	45000	110000	42000	104000	43	PBG 353916 D
	39	47	26	2	79000	196000	42000	104000	61	PBG 353926 D
40	44	53	20	2	64000	160000	51500	124400	44.7	PBG 404420 D
	44	53	26	2	88000	220000	51500	124400	61.9	PBG 404426 D

Note: A minimum mass production quantity order is necessary for all the reference in GLYCO® 97. Availability on request.

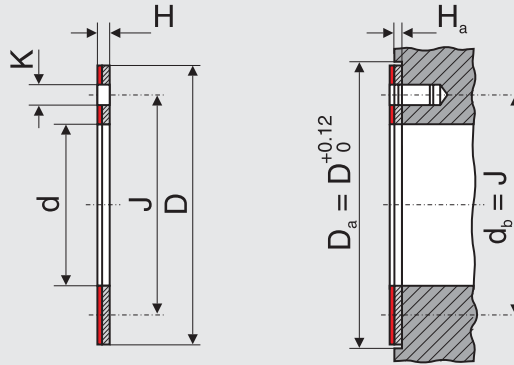


6.4 GLYCO® 97 flanged bushing tolerances

Flange thickness	Deviation	
	high	low
	mm	mm
$B_1 = 1$	+0.05	-0.05
$B_1 = 1.5$	+0.05	-0.10
$B_1 = 2$	+0.05	-0.10

Flange diameter	Deviation	
	high	low
	mm	mm
D_1	+0.5	-0.5

6.5 Dimension and tolerance tables for GLYCO® 97 thrust washers



Dimensions						Basic load rates		Mass	Designation
d	D	H	J	K	H _a	dyn. C	stat. C ₀		
mm	mm	mm	mm	mm	mm	N	N	g	
10	20	1.5	15	1.75	1	30000	75000	2.3	PXG 102001.5 D
12	24	1.5	18	1.75	1	35000	85000	3.8	PXG 122401.5 D
14	26	1.5	20	2.25	1	37500	93000	4.2	PXG 142601.5 D
16	30	1.5	23	2.25	1	50000	126000	5.4	PXG 163001.5 D
18	32	1.5	25	2.25	1	55000	137000	6.1	PXG 183201.5 D
20	36	1.5	28	3.25	1	70000	176000	7.8	PXG 203601.5 D
22	38	1.5	30	3.25	1	75000	186000	8.4	PXG 223801.5 D
26	44	1.5	35	3.25	1	97500	245000	11	PXG 264401.5 D
28	48	1.5	38	4.25	1	116500	290000	13	PXG 284801.5 D
32	54	1.5	43	4.25	1	145000	365000	16	PXG 325401.5 D
38	62	1.5	50	4.25	1	187500	465000	21	PXG 386201.5 D
42	66	1.5	54	4.25	1	203800	510000	23	PXG 426601.5 D
48	74	2	61	4.25	1.5	250000	620000	37	PXG 487402 D
52	78	2	65	4.25	1.5	260000	655000	39	PXG 527802 D
62	90	2	76	4.25	2	332000	825000	85	PXG 629002 D

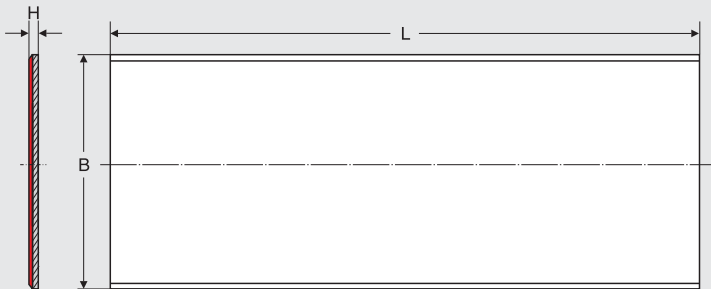
Table 6.5.1 –
GLYCO® 97 thrust washer dimensions

Note: A minimum mass production quantity order is necessary for all the reference in GLYCO® 97. Availability on request.

Dimensions	Deviations	
	high	low
	mm	mm
Bore diameter d	+0.250	0
Outside diameter D	0	-0.250
Hole pitch diameter J	+0.120	-0.120
Hole diameter K	+0.125	-0.125
Height H	0	-0.050

Table 6.5.2 –
GLYCO® 97 thrust washer tolerances

6.6 Dimension table for GLYCO® 97 strip material



Dimensions				Mass	Designation
B	B ₁ ¹⁾	L ²⁾	H		
mm	mm	mm	mm	kg	
200	182	500	0.75	0.54	PLG 2005000.75 D
200	182	500	1.00	0.73	PLG 2005001.0 D
250	232	500	1.50	1.39	PLG 2505001.5 D
250	232	500	2.00	1.89	PLG 2505002.0 D
225	207	500	2.50	2.14	PLG 2255002.5 D
200	200	500	3.06	2.35	PLG 2005003.06 D

¹⁾ Effective strip width (width of sliding layer)

²⁾ Other lengths to order

Note: A minimum mass production quantity order is necessary for all the reference in GLYCO® 97. Availability on request.

6.7 GLYCO® 97 strip material tolerances

Dimensions		Deviations	
		high	low
		mm	mm
Width B		+0.500	0
Length L		+3	0
Height	H ≤ 2.5	0	-0.040
	H = 3.06	+0.020	-0.020

Our national partners

Partners national

0/1

ASW Walzlager und Antriebstechnik GmbH
Neusalzaer Straße 49
D-02625 Bautzen
Phone +49 (0) 35 91/37 72-0
Fax +49 (0) 35 91/37 72-22
info@asw-bautzen.com
www.asw-bautzen.com

Reiff-Technische Produkte GmbH
VA 368 Dölzig
Westringstraße 98
D-04435 Schkeuditz
Phone +49 (0) 3 42 05/7 76-10
Fax +49 (0) 3 42 05/7 76-50
www.reiff-gmbh.de

August Kuhfuss
Kabelweg 38
D-06842 Dessau
Phone +49 (0) 3 40/8 00 26-0
Fax +49 (0) 3 40/8 00 26-26
info@kuhfussonline.com

2

Paul Herkt GmbH
Albert-Schweizer-Ring 13
D-22045 Hamburg
Phone +49 (0) 40/6 69 60 75
Fax +49 (0) 40/6 69 60 70
info@paul-herkt.de

3

H. Lohmann Gleitelem. u. Wälzlager
Meierstraße 36
D-32120 Hiddenhausen
Phone +49 (0) 52 23/99 87-0
Fax +49 (0) 52 23/99 87-22
info@lohmang-leitlager.de
www.lohmang-leitlager.de

Ernst Drechsler GmbH & Co. KG
Am Rodland 12
D-34346 Hann.-Münden
Phone +49 (0) 55 41/70 98-0
Fax +49 (0) 55 41/70 98-44
info@drechsler-gmbh.de
www.drechsler-gmbh.de

Federal-Mogul Deva GmbH
Schulstraße 20
D-35260 Stadtlendorf
Phone +49 (0) 64 28/7 01-0
Fax +49 (0) 64 28/70 11 08
info@deva.de
www.deva.de

Kuhfuß Nachf. Ohlendorf GmbH
Münchenstraße 9
D-38118 Braunschweig
Phone +49 (0) 5 31/2 81 78-0
Fax +49 (0) 5 31/89 37 05
info@kuhfussonline.com
busset@kuhfussonline.com
www.kuhfussonline.com

4

Röttcher GmbH & Co. KG
Kortental 67
D-44149 Dortmund
Phone +49 (0) 2 31/17 64-0
Fax +49 (0) 2 31/17 64-52
info@roecodo.de
www.roecodo.de

benno Vertriebsgesellschaft für technischen Bedarf mbH
Kasteelstraße 6
D-47119 Duisburg
Phone +49 (0) 2 03/8 00 07-20
Fax +49 (0) 2 03/8 00 07-45
benno-duisburg@t-online.de
www.benno.de

Hans Müllenmeister GmbH
Heinr.-Malina-Straße 112
D-47809 Krefeld
Phone +49 (0) 21 51/5 59 50
Fax +49 (0) 21 51/54 87 69
info@muellenmeister.de
www.muellenmeister.de

5

Hertel Technischer Handel
Rudolf-Diesel-Straße 11
D-52428 Jülich
Phone +49 (0) 24 61/69 22-0
Fax +49 (0) 24 61/69 22-33
info@hertel-tp.de

J. Kentenich Inh. H. Hebenstrick GmbH
Siegburger Straße 42c
D-53229 Bonn-Beuel
Phone +49 (0) 2 28/4 21 10-0
Fax +49 (0) 2 28/4 21 10-26
hebenstrick@kugellager.com
www.kugellager.com

Wilhelm Jung GmbH
Einheitsstraße 2
D-57076 Siegen
Phone +49 (0) 2 71/7 72 66-0
Fax +49 (0) 2 71/7 72 66-33
info@jung-siegen.de
www.jung-siegen.de

6

Just & Co. Industriebedarf GmbH & Co. KG
Benzstraße 2a
D-63741 Aschaffenburg
Phone +49 (0) 60 21/41 73-0
Fax +49 (0) 60 21/41 73-33
info@just-co.de
www.just-co.de

Just & Co. Industriebedarf GmbH & Co. KG
Lärchenstraße 69
D-65933 Frankfurt am Main
Phone +49 (0) 69/38 03 19-0
Fax +49 (0) 69/38 03 19-40
info@just-co.de
www.just-co.de

WLB Antriebselemente

Scarrastraße 12
D-68307 Mannheim
Phone +49 (0) 6 21/7 77 81-11
Fax +49 (0) 6 21/7 77 81-25
info@wlb-gmbh.de
www.wlb-gmbh.de

7

Künemund GmbH & Co. KG
Julius-Hölder-Straße 4
D-70597 Stuttgart
Phone +49 (0) 7 11/7 25 87-0
Fax +49 (0) 7 11/7 25 87-50
vertrieb@kuenemund.net
www.kuenemund.de

Reiff-Technische Produkte GmbH
Tübinger Straße 4-6
D-72762 Reutlingen
Phone +49 (0) 71 21/3 23-0
Fax +49 (0) 71 21/3 23-3 46
marlene.seiz@reiff-gmbh.de
www.reiff-gmbh.de

Reiff-Technische Produkte GmbH
Esslinger Straße 3
D-73037 Göppingen
Phone +49 (0) 71 61/67 36-0
Fax +49 (0) 71 61/67 36-2 35
www.reiff-gmbh.de

Boie GmbH
Ohmstraße 5
D-74076 Heilbronn
Phone +49 (0) 71 31/15 97-0
Fax +49 (0) 71 31/15 97-56
info@boie.de
www.boie.de

Reiff-Technische Produkte GmbH
In der Lieste 4
D-77665 Offenburg
Phone +49 (0) 7 81/9 69 18-21
Fax +49 (0) 7 81/9 69 18-33
www.reiff-gmbh.de

Künemund GmbH
Max-Planck-Straße 6
D-77694 Kehl
Phone +49 (0) 78 51/8 70 20
Fax +49 (0) 78 51/7 33 82
info@kuenemund.com
www.kuenemund.com

Reiff-Technische Produkte GmbH
Freibuehlstraße 23
D-78224 Singen-Hohentwiel
Phone +49 (0) 77 31/90 58-32
Fax +49 (0) 77 31/90 58-58
www.reiff-gmbh.de

Kugellager Schleer Freiburg GmbH
Walteshofener Straße 17
D-79111 Freiburg
Phone +49 (0) 7 61/4 90 74-0
Fax +49 (0) 7 61/4 90 74-4
mschleer@schleer.de
www.schleer.de

8

Ludwig Meister GmbH & Co. KG Technik Handel München
Otto-Hahn-Straße 11
D-85221 Dachau
Phone +49 (0) 81 31/33 31-0
Fax +49 (0) 81 31/33 31-56
info@meisterkg.de
www.meisterkg.de

Ludwig Meister GmbH & Co. KG
Zusamstraße 22
D-86165 Augsburg
Phone +49 (0) 8 21/7 20 72-0
Fax +49 (0) 8 21/7 20 72-99
info@meisterkg.de
www.meisterkg.de

Schäfer Technik GmbH
Bleichstraße 24
D-89077 Ulm
Phone +49 (0) 7 31/9 66 22-0
Fax +49 (0) 7 31/9 66 22-51
info@schaefer-technik.de
www.schaefer-technik.de

9

Ludwig Meister GmbH & Co. KG
Im Gewerbepark D6
D-93059 Regensburg
Phone +49 (0) 9 41/4 64 38-0
Fax +49 (0) 9 41/4 64 38-99
info@meisterkg.de
www.meisterkg.de

Schwarz GmbH
Alfred-Nobel-Straße 10
D-97080 Würzburg
Phone +49 (0) 9 31/9 70 57-0
Fax +49 (0) 9 31/9 70 57-30
info@schwarz-skf.de
www.schwarz-skf.de

Our international partners

Australia

SUPER SEALS Australia
384 Huntingdale Road
Oakleigh South Victoria 2/384
Phone +6 13 95 48 85 55
Fax +6 13 95 48 87 77
sales@superseals.com.au
www.superseals.com.au

Austria

**Kugellager Beham
Handelsgesellschaft m.b.H.**
Bahnhofstraße 67
4910 Ried im Innkreis
Phone +43-77 52-8 79 31-0
Fax +43-77 52-8 79 31-22
beham@beham.com
www.beham.com

Brasil

Federal-Mogul Electrical Brasil Ltda.
Rua Georg Rexroth, 773
09951-270 Diadema Sao Paulo
Phone +55-11-40 70 62 59
Fax +55-11-40 70 62 71

England

FTL Seals Technology Ltd
Bruncliffe Avenue
Leeds 27 Business Park
Morley, Leeds LS 27 OTG, UK
Phone +44-1 13-2 52 10 61
Fax +44-1 13-2 52 26 27
tonys@ftlseals.co.uk
www.ftlseals.co.uk

France

ECMU RBR
Zone Industrielle
Z. I. rue de la Briqueterie
95380 Louvres
Phone +331 30 29 13 13
Fax +331 34 68 60 20
e.c.m.u.@wanadoo.fr
www.ecmu-rbr.com

Oliver Borne
Route des Roynac
BP 32
26450 Cleon d'Ándran
Phone +33-475 90 28 40
Fax +33-475 90 29 70
Mobil +33-67 2 66 30 08
olivier.borne-glycodur@wanadoo.fr

Italy

Minetti Bergamo S. R. L
Via Canovine 14
24126 Bergamo
Phone +39-0 35 32 71 11
Fax +39-0 35 31 67 67
sergio.minetti@minettigroup.com
www.minettigroup.com

Netherlands

**IPAR INDUSTRIAL
PARTNERS B.V.**
Tjalkkade 25
NL-5902 RG Venlo
NETHERLANDS
Phone +31-77 3 87 96 00
Fax +31-77 3 82 21 37
info@ipar.nl

Portugal

José Rosell Arnabat
Delegado para España y Portugal
Ronda Ibérica no. 165 5th A
08800 Vilanova I la Geltrú
(Barcelona/Spain)
Phone +34-619-28 72 87
Fax +34-938-14 59 64
joserosell@telefonica.net

**CIBEROL – Comercio Iberico De
Rolamentos, Ltda.**
R/San Sebastiao, Lote 11 Pav. 8
Parque Ind. de Albarraque Cabra Figa
2635-047 Rio de Mouro (Lisboa)
Phone +351-21 915 29 82
Fax +351-21 915 29 83

Rep. of South Africa

**Federal-Mogul
Large Bearings (PTY) LTD**
1 Essex Street Tunney
Ind. Township
Elandsfontein 1406
Phone +27-11-9 74 12 91
Fax +27-11-9 74 12 66
cobus_roux@fmo.com

Spain

José Rosell Arnabat
Delegado para España y Portugal
Ronda Ibérica no. 165 5th A
08800 Vilanova I la Geltrú (Barcelona)
Phone +34-619-28 72 87
Fax +34-938-14 59 64
joserosell@telefonica.net

BOADA Industrial S. A.
Pol. Ind. Cova Solera
C/Roma 13
E-08191 Rubi (Barcelona)
Phone +34-902 19 05 00
Fax +34-902 19 05 55
rubi@boadaindustrial.com
www.boadaindustrial.com

BOADA Industrial S. A.
Central: C/Bondia, s/n
E-17481 Sant Julia de Ramis
(Girona)
Phone +34-902 19 05 00
Fax +34-902 19 05 55
girona@boadaindustrial.com
www.boadaindustrial.com

PERMARIN, S. A.
Central: P. I. Fuente del jarro.
C/Ciudad de Sevilla, 10
46988 Paterna (Valencia)
Phone +34-961 36 80 00
Fax +34-961 36 80 01
permarin@permarin.es
www.permarin.es

Sweden

**NOMO Kullager AB
Göteborg**
Backa Bergogata 14
422 46 Hisings Backa
SWEDEN
Phone +46-31-58 50 80
Fax +46-31-58 50 81

**NOMO Kullager AB
Malmö**
Trehogsgaten 2
200 39 Malmö
SWEDEN
Phone +46-40-21 04 70
Fax +46-40-94 59 70

**NOMO Kullager AB
Stockholm**
Gribbylundsvägen 2
183 25 Täby, SWEDEN
Phone +46-8-7 56 73 00
Fax +46-8-7 56 34 75
nomo@nomo.se
www.nomo.se

Switzerland

Hans Saurer Kugellager AG
Niederfeld 38
9320 Stachen
Phone +41-714 46 85 85
Fax +41-714 46 70 83
info@hans-saurer.ch
www.saurer-kugellager.ch

Schubarth+Co. AG
Lange Gasse 90
4052 Basel
Phone +41-6 12 05 84 84
Fax +41-6 12 05 84 44
info@schubarth.ch
www.schubarth.ch

Turkey

EREN RULMAN
Sanayi ve Ticaret Ltd. Şti.
Tersane caddesi
Mahkeme sokak No.12
80000 Karaköy-Istanbul
Phone +90-2 12-2 54 38 77
Fax +90-2 12-2 50 71 40
ayhaneren@superonline.com

USA

**Federal-Mogul
Engineered Bearings Inc.**
3500 Massillon Road, Suite 310
Uniontown, Ohio 44685
Phone +1 (330) 8 99 93 30
Fax +1 (330) 8 99 93 40
john_tark@fmo.com

General sales conditions

1. General - Area of Application

1.1 Our sales conditions apply exclusively; we are not acknowledging General Terms and Conditions (T&C) of the customer contrary to or deviating from these Sales Conditions, unless otherwise agreed upon in writing. General Terms and Conditions of the customer also do not apply should the customer at some time in the business relationship refer to those T&C and we did not oppose to them. We fulfill deliveries only under our T&C. These General Sales Conditions apply to all, also future business transactions covering sales of goods, work and service performances with us, including the phase of preparation of contract. Already with our quotation or the answer to an inquiry our General Sales Conditions are included in the legal relationship to the customer. Our Sales Conditions apply towards enterprises within the meaning of Section 14 German Civil Code (§ 14 BGB), if the contract pertains to the operation of the enterprise. In respect to consumers they apply unless statutory regulations mandatorily prevail.

1.2 "Customer" in the sense of these Sales Conditions is each recipient of our products, work or services ("Products") based upon contractual agreement. Terms define primarily according to the definition of the respective actual Technical Standards as DIN/ISO 8402.

1.3 All agreements made between us and the customer for the purpose of fulfillment of a contract must be made in writing. Verbal side agreements are not valid unless confirmed by us in writing. Amendments of the contract or annulment require the written form. This also applies for provisions about the abandonment of the written form.

1.4 We are entitled to process and to share for our own purposes also personal data originating from the business relationship. The Customer is herewith informed thereof pursuant to Sections 28 ff Federal Law on Data Protection (§ 28 ff BDSG).

2. Quotations, Order

2.1 Our quotation remains without engagement until final order confirmation.

2.2 The order of the customer is a binding quotation. We are entitled to accept this quotation within two weeks by sending an order confirmation or to provide the products ordered to the customer within an agreed upon period.

2.3 Each order applies only for the market for which it is destined. We have to be informed of the destination market. In the event the customer cannot deliver to a country of destination, e.g. due to an embargo, he - upon request - has to return to us the delivered products. In the case of any deviation hereof the customer shall compensate us for any costs and damages and shall indemnify us from any those claims.

2.4 In the event the order is based on our specifications of products and/or materials or if reference is made to them, the respective specifications for these products and materials apply; respective information will be provided to the customer upon request. If products deviating from those specified in the purchase order are approved by the customer, these are deemed as owed. Further information, e.g. in brochures, pamphlets, catalogues, etc., will not become part of the contract, unless expressly agreed upon. They do not constitute any legally binding declarations and particularly do not construe the acceptance of assured qualities, of otherwise independent guarantees or specific instructions for any application. This also applies for the use of standard - or conformity certificates.

2.5 The customer exclusively decides on the fitness of the products for the intended purpose to be delivered by us for the cases of application and construction chosen by him. A purpose for the application of our products ordered by the customer shall only become part of the contract if agreed upon in writing. This also applies insofar as we were participating in the development of the products created by the customer or contributed advice and recommendations. Article 2.4 applies accordingly.

2.6 The customer solely decides about the readiness of our products for their purposes. In the relationship towards us the customer is debarred from the objection of delivery of products not tested or insufficiently tested.

2.7 The customer assures the retraceability of the products delivered by us. Rights to refuse performance of the customer are insofar excluded. We may request at any time the proof of keeping documentation.

2.8 The customer has to point out to us the use of the products delivered by us as a part requiring safety or as a part requiring special documentation. He is liable to us for each damage originating from the non-fulfillment of this obligation. Our products may not be used in aviation or in nuclear plants without our consent.

2.9 We reserve the copyrights as well as property rights in any illustrations, drawings, calculations and other documents, models or patterns. This also applies to such written documentation which are designated to be "confidential". Before handing them to third parties customer needs our express written consent.

3. Prices and Payment Conditions

3.1 Only prices confirmed by us are binding. In the event deliveries and partial deliveries are - as per agreement - carried out later than two months after date of order confirmation, then the sales price stated by us at the time of delivery is valid. Insofar as the order confirmation does not state otherwise, our prices are "ex works" including loading at the factory, however, excluding packing, freight, transfer, insurance, customs, assembly and the respective valid value added tax. The value added tax will be shown separately on the invoice on the date of invoicing in its legal amount.

3.2 Unless stipulated otherwise our accounts receivables are payable net within 30 days after invoice date. Discounts we only grant if so agreed. We may request pre-payment or security prior to delivery. Upon default of the customer we are entitled to at least 8 % p.a. above the base rate of the European Central Bank valid on the due date. The customer is entitled to prove that either no or a lower damage has incurred.

3.3 Payments may only be made in the currency determined by us. All payment obligations resulting from the legal relationship with us are according to our option deemed to be agreed in EURO.

3.4 The acceptance of bills of exchange and cheques will be effected only upon special agreement and only on account of payment. Discount and collection charges are for account of the customer.

3.5 The set-off of counterclaims by the customer is excluded, unless the counterclaim is undisputed or has become res indicata and results from the same legal transaction. The customer is only entitled to exercise a right of retention insofar as his counterclaim is based on the same contractual relationship. The customer is not entitled to a right of retention because of partial performance pursuant to Section 320 Subsection 2 German Civil Code (§320 Abs.2 BGB). The assignment or pledge of existing claims towards us require our written consent.

3.6 The duties of the customer out of a contract concluded with us continue to be in effect, if the product manufactured by customer is included into the product delivered by us and may not be marketed for reasons not within our responsibility.

3.7 Deviating from Sections 366, 367 German Civil Code (§§ 366, 367 BGB) we are at all times entitled to determine which claims are fulfilled by the payments of customer.

4. Delivery Time and Default in Delivery

4.1 Only delivery times which have been confirmed by us in writing are binding. They only bind us if the customer has made all order specifications and has made participative actions. Transactions to be performed at a fixed date require a separate written agreement.

4.2 In case of force majeure or other unpredictable, extraordinary circumstances and circumstances not due to anyone's fault (interruption of operation, strike, lockout, interventions by authorities, difficulties in supplying energy, belated or defective supply of raw material, semi-finished or finished products necessary for the production of the delivery items, etc.) the delivery time will be extended by the duration of this impediment plus an appropriate allowance for setting up if, for this reason, we are prevented from timely fulfillment of our obligation. This also applies if these circumstances occur at our subcontractor. In important cases we will inform the customer of begin and end of such circumstances as soon as possible. If the impediment lasts longer than six months we and the customer may withdraw from the contract.

Should, due to the circumstances delivery or performance become impossible or unreasonable, then we are discharged from our delivery obligation. In case the delivery time is extended or we are discharged from the delivery obligation, the customer may not derive any claims for damage hereof. Insofar as we become discharged of the delivery obligation we grant back any possible advance performances of the customer.

4.3 Claims for compensation of damages by the customer due to belated delivery, also after expiration of a grace period granted to us, are limited to damages which are predictable and typical for contract.

4.4 Unless otherwise agreed, work-contractual acceptances have to be carried out by the customer at our premises at his own cost. If the customer fails to carry out this acceptance, the products are deemed to be unconditionally accepted upon leaving our premises.

4.5 For deliveries of our products within logistic systems - e.g. just-in-time - a written agreement is required.

4.6 Delivery periods start with the date of order confirmation, however, not before the timely and proper fulfillment of the obligations of the customer, i.e. especially not before the provision of documents, approvals, releases to be obtained by customer, as well as before receipt of an agreed advance payment.

4.7 The delivery time is deemed to be met if our product at the expiration of the delivery period has left the factory or the distribution centre or the readiness for dispatch has been announced. This does not apply if by contract an acceptance is agreed upon or if an assembly obligation has been stipulated.

4.8 In the event the dispatch is delayed upon the request of the customer, then we will charge him – commencing 1 month after notice of readiness for dispatch – the costs for the storage. However, we are entitled, after setting and expiration of an adequate grace period and after adequate advance notice, to otherwise dispose of the delivery item and to make delivery to the customer with an appropriate extended period.

4.9 We are entitled at any time, for the fulfillment of our delivery obligation, to carry out a contractual delivery by an affiliated entity, or to have manufactured the ordered product by an affiliated entity.

5. Delivery, Transfer of Risk and Transportation.

5.1 Partial deliveries are permissible to a reasonable extent.

5.2 With the dispatch of the products, the notification of readiness of dispatch or with the occurrence of default in taking delivery by the customer – whichever happens first – the transfer risk including the risk of accidental loss of the goods sold passes on to the customer.

5.3 Packaging and means of transport as well as dispatch may be selected by us, if the customer does not make a timely decision confirmed by us prior to expiration of the delivery time. The costs of the change shall be borne by the customer.

5.4 If dispatch is delayed as a consequence of circumstances within the responsibility of the customer, then the transfer risk passes on to the customer as of the date of readiness of dispatch.

5.5 Upon request of the customer the delivery will be insured at his expense against theft, breakage, transportation, fire and water damages as well as against other risks that may be insured. The date of transfer of risk pursuant to article 5.2 remains unaffected hereof.

6. Retention of Title

6.1 We reserve the right of retention of title on the delivered products up to the receipt of all payments resulting from the business relationship with the customer and his affiliated entities. He is not authorized to provide as security to third parties products owed by us. In case of violation of the contract, especially payment delay, we are - after setting an adequate period - entitled to take back the product. The taking back of the product by us – unless expressly otherwise provided – is not deemed a rescission from the contract. After taking back our product we are entitled to its exploitation; the proceeds of the exploitation is to be set off against the obligations of the customer – less appropriate exploitation costs.

In the event we pledge the products we are entitled to exploitation under set-off against our claims.

6.2 The customer is obligated to handle our products properly and to store them with the care specifically required for the products. Especially he is obligated to insure these at his own expense against fire, water and theft at replacement value. Replacement claims against the insurer are to be assigned to us. We hereby accept the assignment. The customer instructs the insurer to perform payment only to us. Insofar as maintenance and inspection are necessary, the customer shall carry these services out in time at his own expense.

6.3 Upon pledges or other encumbrances of third parties on our products the customer has to notify us immediately in writing, to enable us to file action pursuant to Section 771 Code of Civil Procedure (§ 771 ZPO). He has to take all measures necessary for abolition and defense of such encumbrances and claims and to support us in securing our rights in every manner, also in our name. Insofar as third parties are not in a position to reconstitute to us the court and out-of-court costs of an action pursuant to Section 771 Code of Civil Procedure (§ 771 ZPO), the customer is liable for the loss incurred.

6.4 The customer is entitled to process our products in the ordinary course of business and/or to resell them in that scope; however, he already at this time assigns to us all receivables in the amount of the final invoice amount (including value added tax) of our claim accruing from the resale against his buyers or third parties, and irrespective of the fact, whether our products have been sold without or after processing. The customer remains also after assignment authorized to collect this receivable. Our entitlement to collect the receivable ourselves remains unaffected hereof. However, we agree not to collect the receivable as long as the customer fulfills his payment obligations from the proceeds collected, is not in default with payments and especially no filings for insolvency proceedings exist or payments have been stopped. In such case we may demand that the customer informs us of the assigned receivables and name their debtors, of all information necessary for the collection, hands over all documents pertaining to the case and informs the debtors (third parties) of the assignment. Furthermore, all receivables out of bills of exchange which were drawn on receivables resulting from the resale of our property (customer bills of exchange). We may – at any time – demand the surrender of the bills of exchange and request endorsement by the customer. We are entitled at any time to inform third parties of the assignment of the receivables of the customer to us. Any assignments are herewith accepted.

6.5 The process or transformation of our products by the customer is always carried out for us. In the event our product is processed with other objects not owed by us, then we acquire the co-ownership in the new object in the ratio of the value of our products (final invoice amount including value added tax) to the other processed objects at the time of processing. For the object created due to processing the same applies as for the purchase item delivered without reserve.

6.6 We agree to release the securities due to us upon request of customer insofar as the realizable value of our securities exceeds the claims to be secured by more than 10 %; it is our option to choose the securities to be released.

7. Liability for Defects

7.1 We furnish the assured deliveries according to the contractual agreement.

7.2 Insofar as our delivery within the period of the statute of limitations shows a material defect (hereinafter: Defect), the cause of which already existed at the time of transfer of risk, then the customer – in our discretion – may claim subsequent fulfillment by repair or new delivery of respective products at the place of delivery.

7.3 In the event the subsequent fulfillment fails, then the customer – at his discretion – is entitled, irrespective of any claims for damages and claims for reimbursement of expenditures pursuant to article 7.9 through 7.14, to reduce the purchase price or – insofar as our failure to comply with our duty is essential – to withdraw from the contract.

7.4 Preconditions of any warranty claim are

- especially the proper storage, handling and usage of our products for applications we were informed of as well as the application of only suitable operation equipment when applying our products. The customer is solely responsible for the correctness and completeness of the specifications in the purchase order and the respective documentation handed over to us. Drawings and technical stipulations or documentation handed over by the customer do not constitute any assured qualities or otherwise extended bases for claims against us, unless prior expressly agreed upon with us in writing.

- that no own processing or subsequent improvement was carried out by the customer

- that the customer has fulfilled his legally owed inspection obligations and requirements to make a complaint in respect of a defect. Defects have to be evidenced insofar stating their kind and extent within 10 days after receipt of the delivery item at the place of destination.

7.5 In order to carry out all subsequent improvements and replacement deliveries deemed necessary to us in our fair judgment the customer has, after coordinating with us, to grant the necessary time and opportunity. Otherwise we are released from the damage consequences which would exist because of non-fulfillment. Also, in the event of considerable defects we are entitled to subsequent improvement or replacement delivery.

7.6 The statute of limitations for claims of defects expires in one year. This does not apply insofar as these are based upon an intentional conduct within our responsibility and insofar as the law pursuant to Sections 438 I No. 2, 479 I, 634 a I No. 2 German Civil Code (§§ 438 I Nr.2, 479 I, 634 a I Nr.2 BGB) imperatively provides for longer time periods. The statute of limitations commences with the delivery of the products unless otherwise agreed upon in writing.

7.7 If we should become exposed to no-fault liability claims of third parties under local or foreign law, which are caused by products delivered by us, then the customer has to hold us harmless and indemnify us in any case from all claims and costs of legal defense against such claims of product liability. This also applies for each recourse claim against us, no matter who lodges, asserts or acquires such claim. Compensation claims in case of defectiveness and cause of damage of the products delivered by us can be asserted by the customer, even in case of joint and several liability, only if we are responsible for the defect. The customer shall make available to us at our disposal all information required for prosecution of our rights, also such from his areas. The customer shall support us in the exonerating evidence encumbered on us by third parties by surrender of documents pursuant to article 2.8.

7.8 The customer agrees to hold sufficient insurance coverage against liability cases especially arising from liability with or without fault. He has to inform his insurer of the obligations from these conditions.

7.9 According to the legal stipulations we are liable insofar as the customer asserts claims for damage or claims for reimbursement of expenditures (hereinafter: damage compensation claims) based on intention or gross negligence, including those of intention or gross negligence of our representatives or persons employed in the performance of our obligation. Further are we liable pursuant to legal provisions if we culpably violated an essential contractual

obligation as well as in cases of injury of life, body or health and insofar as we have assumed guarantees.

7.10 The compensation for damages for the violation of an essential contractual duty is limited to the predictable, typical damage, insofar as no intent or gross negligence exists and insofar as no liability has been assumed for injury of life, body or health or from assumed guarantees. Insofar claims for these damages become statute barred in one year.

7.11 Further damage compensation claims as designated in these General Sales Conditions are excluded.

7.12 The imperative stipulations of the Product Liability Law remain unaffected.

7.13 Claims for reimbursement of expenses of the customer are limited to the value of the interest, which the customer has in the fulfillment of contract.

7.14 Insofar as our liability is excluded or limited, this applies also for the personal liability of our employees, staff members, co-workers representatives and persons employed in the performance of our obligation.

7.15 Claims are excluded if they are not asserted in court within three months after written refusal by us.

8. Tools and Inventor's Rights

8.1 Tools being manufactured in connection with the manufacture of our products for the customer and all rights therein and thereof, belong to us, irrespective of cost contribution by the customer. Each transfer of rights on them to the customer is excluded.

8.2 In the event of orders, the execution of which requires development work from us, the customer does not acquire an inventor's right in the developed objects or procedures, in our know-how as well as in the equipment for the manufacture of these objects, also if he has contributed a part of the development and/or manufacturing costs. Rights pursuant to the Employee Invention Act remain unaffected.

9. Secrecy, Place of Performance, Place of Jurisdiction and Applicable Law

9.1 The customer shall treat confidential any knowledge and information from the business relationship with us which are not evident or have permissibly become evident. This also especially applies to knowledge about our know-how and our manufacturing methods and processes acquired upon auditing us or including us in the co-development of his products. The customer shall impose this on third parties engaged by him as own obligation. The customer is liable to us for all damages arising from the violation of this obligation excluding the continuation of offense, as one offense. The obligation to preservation of confidentiality is considered an independent legal duty surviving any termination of the business relationship with us.

9.2 Place of performance for the delivery is the place of manufacturing, resp. our distribution center. Place of performance for the payment is our business seat.

9.3 All legal relationships between us and customer are subject to German law, excluding the United Nations Conventions on Contracts for the International Sales of Goods (CISG). Should claims be asserted against us abroad, we may assert claims against the customer at the place of jurisdiction of the main claim.

10. Concluding Terms

10.1 If orders and correspondence are not made out in German language, relevant for the interpretation of the contents of contract are the documents in German language.

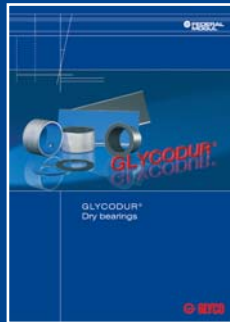
10.2 Should one or several stipulations of these conditions be or will be ineffective, then the effectiveness of the remaining stipulations will not be effected thereof. The customer is obligated to cooperate in agreeing on a valid provision which is legally and economically as close as possible to the original.

This catalog provides a description of our products. Information contained herein does not imply any guarantee of performance or recommendation of suitability for a specific application. Loading capacities and wear characteristics of GLYCODUR® dry sliding bearings depend on individual, specific environmental effects, therefore all calculations shown can be approximations only. In cases where the relevant experience is not available the user is advised to carry out tests with the product under the required application conditions. The right is reserved to

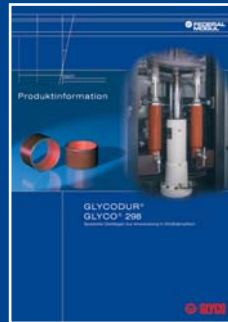
make any changes necessitated by technological developments without prior notification, also to adopt alternative standards, norms and regulations. The respective contractual agreements, especially the agreed specifications, drawings and additional data are binding and take priority. Any deviation from the information contained in the brochure requires our written confirmation. No responsibility arising from the information or illustrations contained in the brochure will be accepted by us or by those acting on our behalf.

Please check availability.

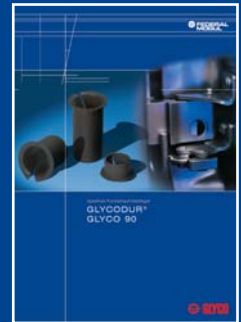




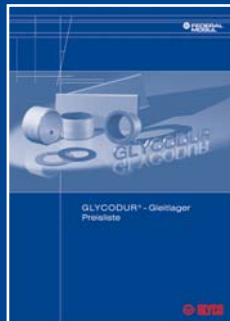
GLYCODUR®
Bearings Catalogue



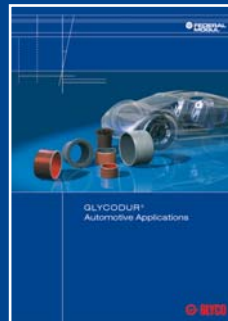
GLYCODUR®
GLYCO® 298



GLYCODUR®
GLYCO® 90



GLYCODUR®
Price List



Automotive
Applications



GLYCODUR®
Product Range



Federal-Mogul Wiesbaden GmbH & Co. KG

Postfach 13 03 35 · D-65091 Wiesbaden
Stielstraße 11 · D-65201 Wiesbaden

Phone +49 (0) 6 11/2 01-91 30

Fax +49 (0) 6 11/2 01-91 38

e-mail info@glycodur.de

Internet <http://www.glycodur.de>

