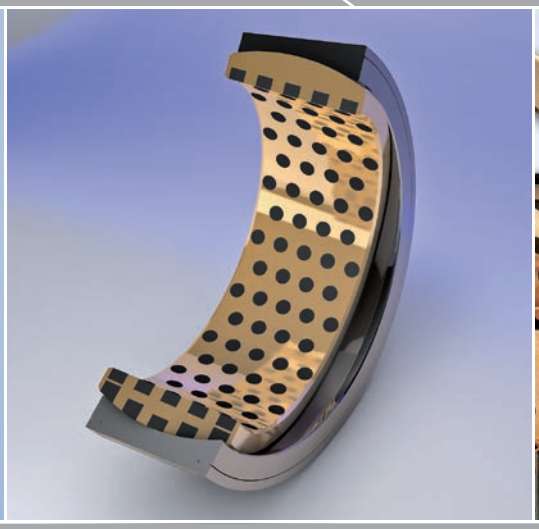
FEDERAL-MOGUL POWERTRAIN

DEVA

World Class Bearing Technology



deva.glide® sliding bearings
Maintenance-free, self-lubricating

FEDERAL-MOGUL POWERTRAIN

deva.glide®

High performance material – Bronze bearing with solid lubrication pockets

Contemporary designs represent an enormous challenge for modern-day bearing materials. Zero maintenance is often expected under severe to extreme conditions as well as under maximum loads.
The constant pressure on costs also calls for increasing uptime of machinery and equipment and uncompromising standards of operational reliability.
deva.glide materials are suitable for applications involving sustained high static and dynamic loads, relatively low sliding speeds and rotary, angular, axial or linear motion. They are also suitable for applications where conventional lubrication is not possible or permissible, or where other properties are required such as durability and resistance to operational and environmental influences or special conditions (e.g. impact load, abrasive stress, etc).

Our bearing service

- Profit from more than 60 years of experience in self-lubricating sliding bearings.
- Make use of our extensive material and application expertise spanning a very wide range of industries.
- Let our application engineering team assist you in the:
  - selection of the bearing materials,
  - design, purpose-built to your requirements,
  - assembly and installation,
  - calculation of estimated life time.
- Benefit from the latest material developments, tested using state of the art facilities.
- Ask for a simulation of your bearing application on our test rigs.
- Expect the highest quality standards, certified to DIN ISO 9001:2008, ISO/TS 16949:2009 and DIN EN ISO 14001:2004.

Content

1 Materials

deva.glide®

- allows maintenance-free operation due to the solid lubricant content of the sliding material.
- can accomodate high static and dynamic loads.
- has a consistently low coefficient of friction without stick-slip effects.
- is resistant to dirt, corrosion, impact stress and edge loading.
- is provided with a vibration absorbing base material.
- can be used over a large temperature range.
- can be used in salt water.
- does not absorb water and guarantees maximum dimensional accuracy.
- is electrically conductive. No electrostatic charging effects occur.
- tolerates a high level of misalignment.
- can also be used in applications involving additional, conventional lubrication.

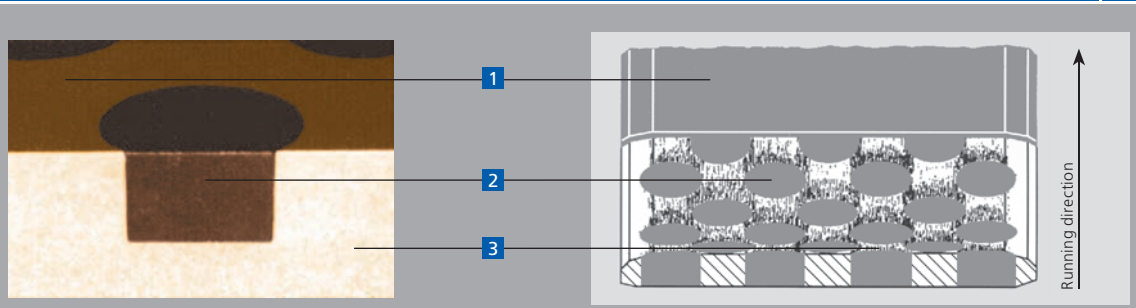
2 Material structure

2.1 deva.glide materials

deva.glide materials consist of highly wear-resistant copper cast alloys showing sliding surfaces with evenly provided solid lubricant plugs according to the so-called "macro distribution" principle. These plugs are arranged according to the movement requirements. The high density of the bronze guarantees high stability under load coupled with good dirt particle embedding properties into the lubricant plugs.

Under dry running conditions, **deva.glide** is supplied with a 10 - 20 µm thick running-in film which supports the formation of an initial transfer film on both sliding surfaces. The thickness of the running-in-film is not considered in any bushings bore tolerance because it will be consumed during the running-in-period.

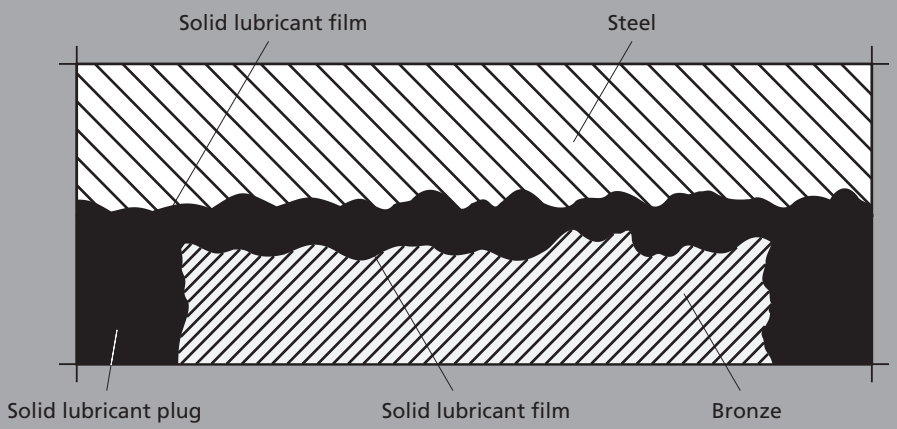
Microstructure of deva.glide — Figure 2.1.1



1 Sliding surface with running-in film
2 Solid lubricant plugs
3 Base material (bronze)

In conventionally lubricated bronze materials a „separating lubricating film“ can only be formed if the movement conditions and sliding speeds are suitable. With deva.glide, the lubrication is provided by the sliding material itself. The solid lubricant is released from the bearing material by micro abrasion as soon as the sliding movement begins. This gives the sliding partners smooth surfaces with a firmly adhesive solid lubricant film. The solid lubricant remains within the contact zone even under heavy loads, resulting in a high degree of separation between the sliding surfaces and a sustained low coefficient of friction coupled with minimal wear.

View of sliding process with solid lubrication — Figure 2.1.2



2.2 Solid lubricants plugs

The **deva.glide** material system relies on solid lubricants with optimum film-forming properties, adhesive power, surface affinity and corrosion resistance. **deva.glide** uses two standard solid lubricants. There are also additional variations available for special applications. In particular, the high-purity natural graphite used in the system is not chemically pretreated and therefore no source for any electrolytic and chemical activity originating in the materials due to its inert property.

Solid lubricants plugs — Table 2.2.1

	Base
dg 12	Graphite and additives
dg 16	PTFE and additives

3

Material properties

3.1 Composition and properties

Composition and properties of deva.glide®

	dg	DIN EN	Mat. no.	Designation delivery form [1]	ASTM standard standard	ASTM standard Alloy no.	Propor. weights DIN EN 1982	Propor. weights ASTM	Physical properties of the base bronze (min.) [2] Density	Linear coefficient of thermal expansion 20 - 200 °C	0.2% Strain	Tensile strength	Strain	E-modulus [2]	Hardness
Symbol									ρ	α_l	$R_{p0.2}$	R_m			
Unit							%		g/cm³	10^{-6}/K	MPa	MPa	%	MPa	HB
	01	1982	CC493K (former 2.1090)	CuSn7Zn4Pb7-C-GS	B 584	C932 00	Cu 81.0 - 85.0 Ni max. 2.0 P max. 0.1 Pb 5.0 - 8.0 Sn 6.0 - 8.0 Zn 2.0 - 5.0 permissible max. additions Al 0.01 Fe 0.2 S 0.10 Sb 0.3 Si 0.01	Cu 81 - 85 Sn 6.3 - 7.5 Zn 2 - 4 Pb 6 - 8 Ni 1 Sb0.35	8.83	18.3	120	230	15	106.000	60
				CuSn7Zn4Pb7-C-GZ	B 271	C932 00					180	260	12	106.000	70
				CuSn7Zn4Pb7-C-GC	B 505	C932 00					120	260	12	106.000	70
	02	1982	CC482K (former 2.1061)	CuSn11Pb2-C-GS	B 584	C925 00	Cu 83.5 - 87.0 Ni max. 2.0 P max. 0.40 Pb 0.7 - 2.5 Sn 10.0 - 12.5 Zn max. 2.0 permissible max. additions Al 0.01 Fe 0.20 Mn 0.20 S 0.08 Sb 0.20 Si 0.01	Cu 85 - 88 Sn 10 - 12 Pb 1 - 1.5 Ni 0.8 - 1.5	8.75	17.2	130	240	5	112.000	80
				CuSn11Pb2-C-GZ	B 271	C925 00					150	280	5	112.000	90
				CuSn11Pb2-C-GC	B 505	C925 00					150	280	5	112.000	90
	03	1982	CC333G (former 2.0975)	CuAl10Fe5Ni5-C-GS	B 584	C955 00	Cu 76.0 - 83.0 Al 8.5 - 10.5 Fe 4.0 - 5.5 Mn max. 3.0 Ni 4.0 - 5.5 permissible max. additions Bi 0.01 Cr 0.05 Mg 0.05 Pb 0.03 Si 0.10 Sn 0.10 Zn 0.50	Cu min. 78 Al 10 - 11.5 Ni 3 - 5.5 Fe 3 - 5 Mn max. 3.5	7.60	16.5	250	600	13	122.000	140
				CuAl10Fe5Ni5-C-GM	B 30	C955 00					280	650	7	122.000	150
				CuAl10Fe5Ni5-C-GZ	B 271	C955 00					280	650	13	122.000	150
				CuAl10Fe5Ni5-C-GC	B 505	C955 00					280	650	13	122.000	150
	04	1982	CC762S (former 2.0598)	CuZn25Al5Mn4Fe3-C-GS	B 584	C863 00	Cu 60.0 - 67.0 Zn rest Al 3.0 - 7.0 Mn 2.5 - 5.0 Fe 1.5 - 4 permissible max. additions Ni 3.00 Pb 0.20 Sn 0.20 Si 0.10 P 0.03 Sb 0.03	Cu 60 - 66 Al 5 - 7.5 Fe 2 - 4 Mn 2.5 - 5 Zn 22 - 28 Ni max. 1	8.20	18.0	450	750	8	115.000	180
				CuZn25Al5Mn4Fe3-C-GM	B 30	C863 00					480	750	8	115.000	180
				CuZn25Al5Mn4Fe3-C-GZ	B 271	C863 00					480	750	5	115.000	190
	05	1982	CC483K (former 2.1052)	CuSn12-C-GS	B 584	C908 00	Cu 85.0 - 88.5 Ni max. 2.0 P max. 0.6 P max. 0.7 Sn 11.0 - 13.0 permissible max. additions Al 0.01 Fe 0.20 Mn 0.20 S 0.05 Sb 0.15 Si 0.01 Zn 0.05	Cu 89 Sn 10 - 13 Pb 0.5 Ni 0.5	8.72	18.1	140	260	7	110.000	80
				CuSn12-C-GZ	B 271	C908 00					150	280	5	110.000	90
				CuSn12-C-GC	B 505	C908 00					150	300	6	110.000	90

[1] delivery form: GS = sand casting, GM = gravity casting, GC = continuous casting, GZ = centrifugal casting

[2] Referred to base bronze

Table 3.1.1

Bearing properties										dg	
Max. permissible load		Max. sliding velocity	Max. p̄U value	Temperature range		Coeficient of friction[4]		Min. shaft hardness	Shaft surface finish		
[static][3]	[dynamic][3]	[dry]	[dry]	[max]	[min]	[dry]	[in water]		[optimum]		
$\bar{p}_{stat/max}$	$\bar{p}_{dyn/max}$	U_{max}	$\bar{p}U_{max}$	T_{max}	T_{min}	f	f		R_a		*Symbol*
MPa	MPa	m/s	MPa × m/s	°C	°C			HB	µm		*Unit*
140	60	0.4	1.0	250	-100	0.10 - 0.12	0.08 - 0.12	180	0.2 - 0.8	**01**	
175	100	0.4	1.0	250	-100	0.10 - 0.12	0.08 - 0.12	180	0.2 - 0.8	**02**	
300	180	0.4	1.5	250	-100	0.10 - 0.13	0.08 - 0.12	300	0.2 - 0.8	**03**	
340	120	0.4	1.5	250	-100	0.12 - 0.15	0.08 - 0.12	300	0.2 - 0.8	**04**	
175	100	0.4	1.0	250	-100	0.10 - 0.12	0.08 - 0.12	180	0.2 - 0.8	**05**	

[3] It is recommended that the Application Engineering department of F-M DEVA is consulted after each preselection.

[4] The stated sliding friction coefficients are not guaranteed properties. They have been determined on our test rigs using field-proven parameters that do not necessarily reflect the actual application of our products and their service environment. We offer customer-specific friction and wear tests on request.

3.2 Chemical resistance

The following decision chart provides guidance on the selection of the appropriate **deva.glide®** alloy according to the environmental conditions of the application.

Definitions

- ✓ Resistant
- o Resistant depending on construction, oxygen content, temperature, etc.
- × Not recommended
- – No data available

Chemical resistance of deva.glide — Table 3.2.1

Medium / chemical substance	Concentration in %	Temperature in °C	Alloys deva.glide dg01	dg02	dg03	dg04	dg05
Strong acids							
Hydrochloric acid	5	20	×	×	×	×	×
Hydroflouric acid	5	20	o	o	o	×	o
Nitric acid	5	20	×	×	×	×	×
Sulphuric acid	5	20	o	✓	✓	×	✓
Phosphoric acid	5	20	o	✓	✓	×	✓
Weak acids							
Acetic acid	5	20	×	✓	✓	×	✓
Formic acid	5	20	×	✓	✓	×	✓
Boric acid	5	20	×	✓	✓	×	✓
Citric acid	5	20	×	✓	✓	×	✓
Bases							
Ammonia	10	20	×	×	×	×	×
Sodium hydroxide	5	20	o	✓	✓	o	✓
Potassium hydroxide	5	20	o	✓	✓	o	✓
Solvents							
Acetone		20	o	✓	✓	o	✓
Carbon tetrachloride		20	o	✓	✓	o	✓
Ethanol		20	o	✓	✓	o	✓
Ethyl acetate		20	o	✓	✓	o	✓
Ethyl chloride		20	o	✓	✓	o	✓
Glycerin		20	o	✓	✓	o	✓
Salts							
Ammonuim nitrate			×	×	×	×	×
Calcium chloride			✓	✓	✓	✓	✓
Magnesium chloride			✓	✓	✓	✓	o
Magnesium sulphate			✓	✓	✓	✓	o
Sodium chloride			✓	✓	✓	✓	✓
Sodium nitrate			✓	✓	✓	✓	✓
Zinc chloride			×	×	✓	×	×
Zinc sulfate			o	✓	✓	o	✓
Gases							
Ammonia			o	o	o	o	o
Chlorine			×	×	×	×	×
Carbon dioxide			✓	✓	✓	o	✓
Fluorine			×	×	×	×	×
Sulphur dioxide			o	✓	✓	×	✓
Hydrogen sulphide			o	o	o	o	o
Nitrogen			o	✓	✓	×	✓
Hydrogen			o	✓	✓	×	✓
Fuels and lubricants							
Paraffin		20	✓	✓	✓	✓	✓
Petroleum		20	✓	✓	✓	✓	✓
Fuel oil		20	✓	✓	✓	✓	✓
Diesel fuel		20	✓	✓	✓	✓	✓
Mineral oil		70	✓	✓	✓	✓	✓
HFA - ISO46 water-in-oil		70	✓	✓	✓	✓	✓
HFC - water-glycol		70	✓	✓	✓	✓	✓
HFD - phosphate ester		70	✓	✓	✓	✓	✓
Others							
Water		20	✓	✓	✓	o	✓
Seawater		20	o	✓	✓	×	✓
Resin			✓	✓	✓	o	✓
Hydrocarbon			✓	✓	✓	o	✓

Mating material

In order to obtain a suitable surface finish it is also possible to use shaft sleeves of a suitable hardness. With restrictions hard-facing or galvanic protective layers (normally coated, hard-chromium-plated or nickel-plated) are thinkable. But be aware that any applied galvanic layer "softens" the surface roughness structure.
The required corrosion protection of the mating material is determined by actual operating conditions. The djacent table provides an overview of some of the possible mating materials.

Recommended mating materials for standard applications Table 4.1.A

Material number	DIN designation	Comparable standards		
		USA – ANSI	GB – B.S. 9 70	F – AFNOR
1.0543	St 60-2	Grade 65	55C	A60-2
1.0503	C45	1045	080M46	CC45
1.7225	42CrMo4	4140	708M40	42CD4

Recommended mating materials for corrosive environments Table 4.1.B

Material number	DIN designation	Comparable standards		
		USA – ANSI	GB – B.S. 9 70	F – AFNOR
1.4021	X20Cr13	420	420S37	Z20C13
1.4057	X17CrNi-16-2	431	432S29	Z15CN16.02
1.4112	X90CrMoV18	440B	–	(Z70CV17)
1.4122	X35CrMo17-1	–	–	–

Recommended mating materials for seawater applications Table 4.1.C

Material number	DIN designation	Comparable standards		
		USA – ANSI	GB – B.S. 9 70	F – AFNOR
1.4460	X3CrNiMoN27-5-3	329	–	–
1.4462	X2CrNiMoN22-5-3	UNS531803	318513	Z3CND24-08
2.4856	Inconel 625	–	–	–

5

Fits

Fits and tolerances for reliable operation

For sliding bearings with an outer diameter D_1 greater than 500 mm the fits must be determined according to the actual requirements. For this purpose please contact our technical department. The subsequent proposals are valid for sliding bearings with a diameter D_1 smaller than 500 mm.

Reliable fits and tolerances for deva.glide® — Table 5.1

Description	Tolerance
Housing bore	H7
Outer diameter of bearing < 200 mm under normal operating conditions (t ≈ 80° C) ≥ 200 mm	s6 r6
Bearing bore prior to installation into housing	E7
Bearing bore after installation into housing (approx. within) The press-fit leads to a contraction of the bearing bore from E7 to H9	H9
Tolerance of bearing length	average
Surface finish standard of housing bore	(ISO:N8) R_a to 3.2 µm
Surface finish standard of shaft, ground	R_a 0.2 to 0.8 µm
Tolerance of shaft: under normal operating conditions (t < 80° C)	c8 / d8

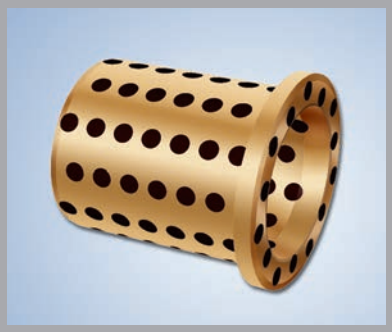
deva.glide bearings are installed into the housing with interference or supercooling. The housing bore should have a **H7** tolerance with an average roughness of R_a = 3.2 µm. To facilitate bearing installation, the housing bore should be provided with a lead in chamfer of 1 mm x 15° to 20°. Depending on the application, customised fits and tolerances are possible. Please contact our technical department.

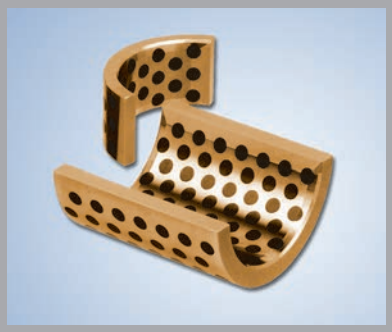
Design

In order to ensure proper operation of the sliding bearing and to prevent the counter surface from damaging the sliding surface, the mating surface should be free of flats and grooves and should always extend beyond the bearing surface.
deva.glide® bearings can tolerate misalignment to a certain extent. Nevertheless the shaft and housing should be correctly aligned for optimum running conditions. In cases of lateral thrust due to axial forces, the **deva.glide** flanged bearing is likely to be the most economic solution for small dimensions. With larger diameters, on the other hand, the combined use of a **deva.glide** bearing with an additional **deva.glide** thrust washer can provide an economic alternative.

Bearing design


Plain bearing

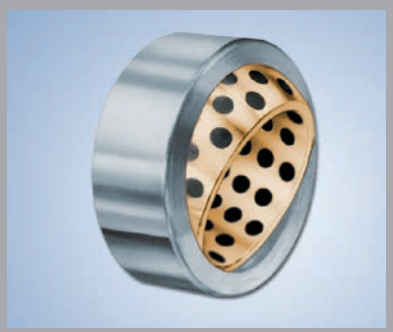

Flanged bearing


Half-shells


Thrust washer


Axial and radial bearing segments


Sliding plate


Spherical bearing, floating


Spherical bearing, fixed

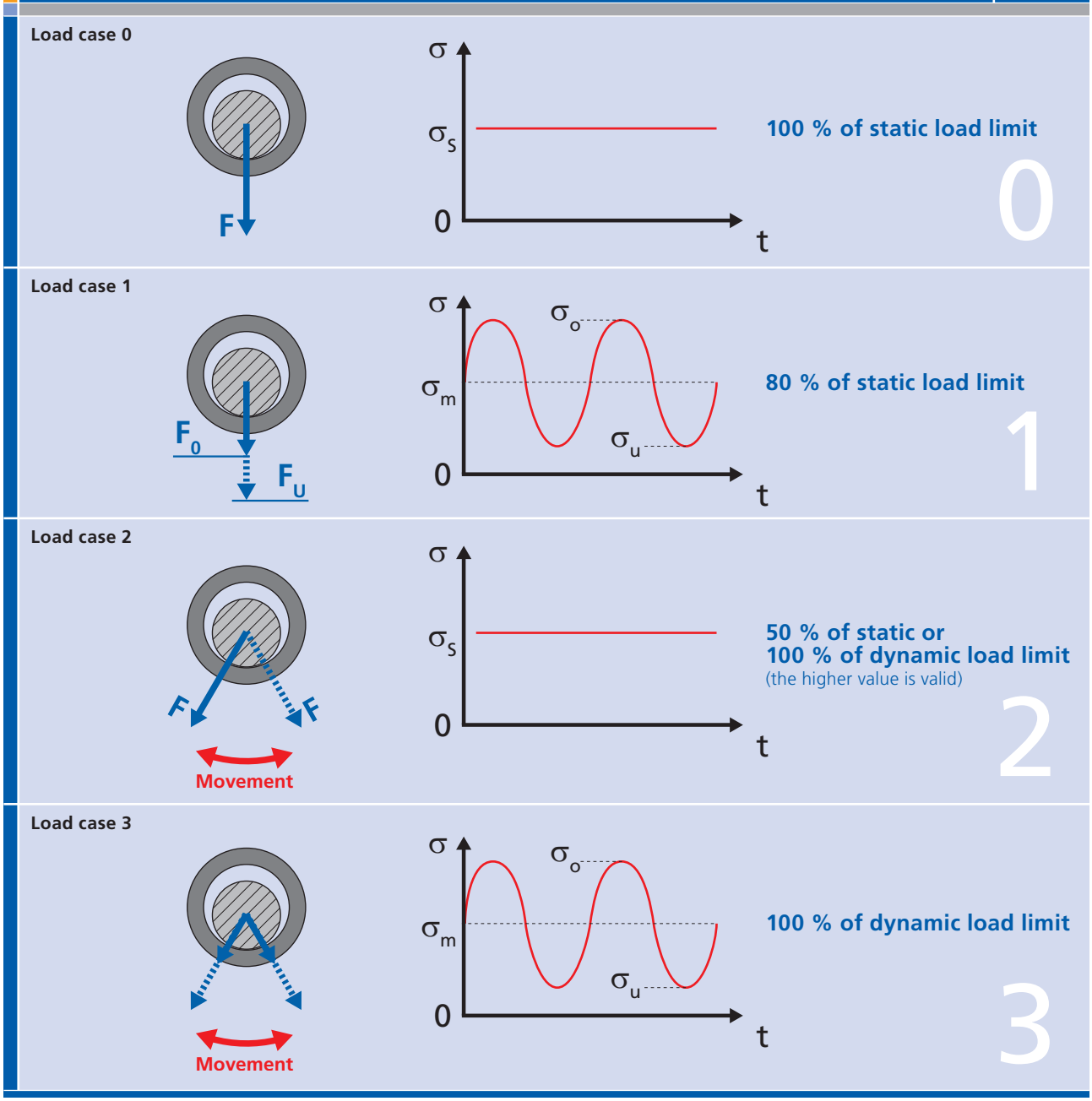
The illustrated **deva.glide** sliding bearings are shown without a running-in film.

6.1 Description what values to be considered for design

DEVA® differentiates load cases (0 to 3) regarding the character of load stressing a bearing. This is to consider fatigue influences in case of dynamic pressure. The percentage values are refering to the limit values described in the material data sheet or technical handbooks.

This worksheet is related to DEVA work instruction A 616 (see also "Qualitäts-, Umwelt- und Arbeitsschutz-Management Handbuch, Verfahrensanweisungen + Arbeitsanweisung").

Load cases 0-3 — Figure 6.1.1



Installation

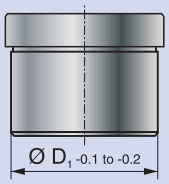
7.1 Press-fitting of deva.glide® radial bearings

Installation of deva.glide bearings

Figure 7.1.1

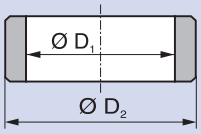
Installation of deva.glide bearings by press-fitting

Press-fit mandrel



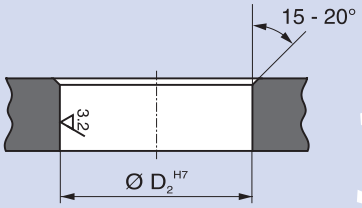
1

deva.glide bearing



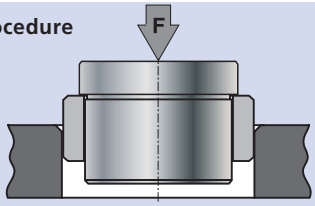
2

Housing



3

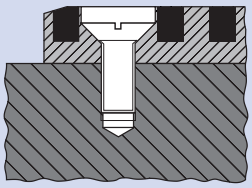
Press-fit procedure



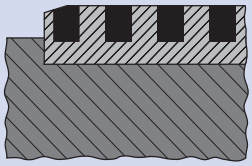
4

Installation of deva.glide thrust washers

Countersunk screws



Mechanical location



Sealing

The structure of the **deva.glide** bearings enables dirt particles to become embedded in the relatively soft solid lubricant plug thus reducing damage to the bearing and shaft. This embedding process allows the bearing to be used without performance restrictions. However, if the ingress of highly abrasive partlicles cannot be avoided it is advisable to seal the bearing area.

Installation of deva.glide bearings by supercooling

deva.glide bearings may also be supercooled to facilitate assembly. The shrinkage (**s**) is calculated using the following equation:

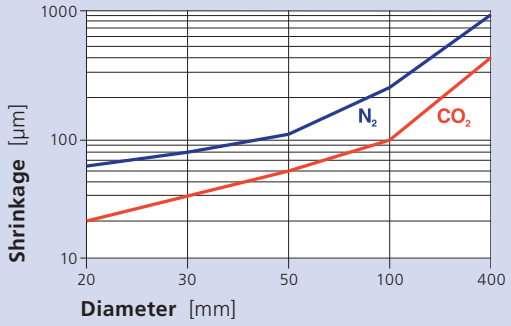
$$s = 0.8 \times \alpha_1 \times \Delta T \times D_2 \text{ (mm)}$$

where:

α_1 = linear coefficient of thermal expansion (1/106K)

ΔT = temperature difference (°C)

D_2 = outer diameter (mm)



If using dry ice (CO_2), we recommend using a wodden box fully lined with polystyrene as a cooling container. An insulating lid ensures quicker cooling of the bearings. Always wear protective goggles and gloves when handling dry ice or liquid nitrogen, as well as the cooled parts. In order to ensure uniform supercooling, the dry ice should be crushed into walnut size. It takes between 0.5 and 2 hours for complete cooling of the bearings. The supercooled parts can then be inserted without effort into the housing bore.

Federal-Mogul DEVA recommends supercooling with liquid Nitrogen for bearings $D_1 < 200$ mm and dry ice for $D_1 > 200$ mm.

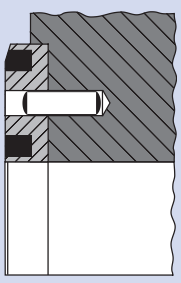
Installation of deva.glide thrust washers

Thrust washers should be fixed on the outer diameter e.g. in a recess of the housing. The inner diameter of the thrust washer must exceed the shaft diameter in order to avoid wear and chip removal. Thrust washers can also be fixed with locking pins if there is no suitable recess in the housing.

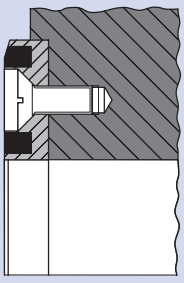
Note:

- The locking pins should be recessed below the bearing surface with sufficient allowance for wear.
- Screws should be countersunk below the bearing surface also observing sufficient allowance for wear.
- Ensure that the inside diameter of the washer does not touch the shaft after assembly.

Locking pins



Screw



Recomended dimensions

Recommended dimensions deva.glide®

Table 8.1

Plain bearing, radial					Flanged bearing					Thrust washer			Spherical bearing					
D_1	D_2	B_1			D_1	D_2	D_3	S_F	B_1	D_5	D_6	S_T	D_1		D_K	D_2	B_1	B_F
50	60	50	35	65	50	60	80	5.0	On request.		80	5.0						
55	65	55	40	70	55	65	85	5.0			85	5.0						
60	75	60	45	75	60	75	90	7.5			90	7.5						
65	80	65	45	80	65	85	95	7.5			95	7.5						
70	85	70	50	85	70	85	100	7.5			100	7.5						
75	90	75	55	90	75	90	105	7.5			105	7.5						
80	95	80	60	100	80	95	110	7.5			110	7.5						
85	100	85	60	105	85	100	115	7.5			115	7.5						
90	105	90	65	115	90	105	120	7.5			120	7.5						
95	115	95	70	120	95	115	125	10.0			125	10.0						
100	120	100	75	125	100	120	140	10.0			140	10.0		100	130	150	70	55
110	130	110	80	140	110	130	150	10.0			150	10.0	100	110	140	160	70	55
120	140	120	90	150	120	140	160	10.0			160	10.0	110	120	160	180	85	70
140	160	140	100	175	140	160	180	10.0			180	10.0	120	140	180	210	90	70
150	170	150	110	185	150	170	190	10.0			190	10.0						
													140	160	200	230	105	80
180	205	180	135	225	180	205	230	12.5		185	230	12.5	160	180	225	260	105	80
200	225	200	150	250	200	225	250	12.5		205	250	12.5	180	200	250	290	130	100
													200	220	275	320	135	100
225	250	225	170	280	225	250	275	12.5		230	275	12.5						
													220	240	300	340	140	100
250	278	250	190	315	250	278	300	14.0		255	300	14.0						
													240	260	325	370	150	110
280	310	280	210	350	280	310	340	15.0		285	340	15.0	260	280	350	400	155	120
300	332	300	225	375	300	332	360	16.0		305	360	16.0	280	300	375	430	165	120
													300	320	380	440	160	135
													320	340	400	460	160	135
350	385	350	260	435	350	385	420	17.5		355	420	17.5						
													340	360	420	480	160	135
													360	380	450	520	190	160
400	440	400	300	500	400	440	480	20.0		405	480	20.0	380	400	470	540	190	160
													400	420	490	560	190	160
													420	440	520	600	218	185
450	495	450	340	580	450	495	530	22.5		455	530	22.5						
													440	460	540	620	218	185
													460	480	565	650	230	185
500	550	500	375	625	500	550	600	25.0		510	600	25.0	480	500	585	670	230	195
													500	530	620	710	243	205
550	605	550	415	690	550	605	650	25.0		560	650	25.0						
													530	560	655	750	258	215
600	660	600	450	750[1)]	600	660	720	25.0		610	720	25.0	560	600	700	800	272	230
													600	630	740	850	300	260
650	715	650	490	815[1)]	650	715	780	25.0		660	780	25.0						
													630	670	785	900	308	260
700	770	700	525	875[1)]	700	770	840	25.0		710	840	25.0						
													670	710	830	950	325	275
750	825	750[1)]	560	940[1)]	750	825	900	25.0		760	900	25.0	710	750	875	1000	335	280
800	880	800[1)]	600	1000[1)]	800	880	960	25.0		810	960	25.0	750	800	930	1060	355	300
850	935	850[1)]	640	1060[1)]	850	935	1020	25.0		860	1020	25.0	800	850	985	1120	365	310
900	990	900[1)]	675	1125[1)]	900	990	1080	25.0		910	1080	25.0	850	900	1040	1180	375	320
950	1045	950[1)]	710[1)]	1200[1)]	950	1045	1140	25.0		960	1140	25.0	900	950	1100	1250	400	340
1000	1100	1000[1)]	750[1)]	1250[1)]	1000	1100	1200	25.0		1010	1200	25.0	950	1000	1160	1320	438	370
1200	1320	2000[1)]	900[1)]	1500[1)]	1200	1320	1440	25.0		1210	1440	25.0						

[1)] Length of bearing subdivided (2 x 0.5) for production reasons.

Further sizes available on request.

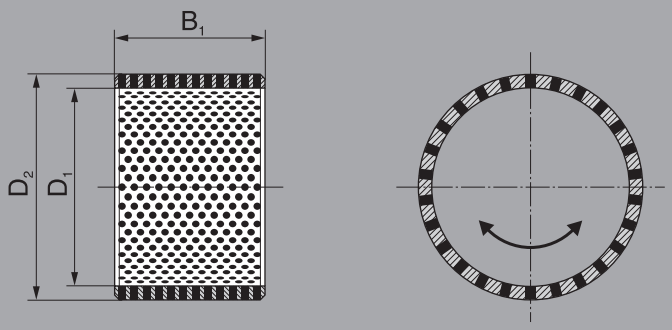
Plain bearing, radial

Standard version
$ØD_1 \leq 500$ mm

The direction of movement determines the arrangement of the lubrication plugs.

All **deva.glide** bearings can be provided with a running-in film (not shown in order to give a clearer view).

Note:
In the standard version $ØD_1 > 500$ mm and special versions, solid lubricant plugs are introduced into blind holes if required.



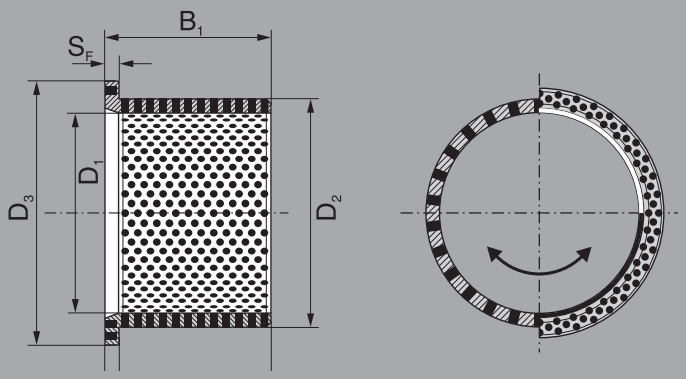
Flanged bearing

For $ØD_1 > 150$ mm, it may be advantageous to use a combination of plain bearing and thrust washer (subject to consultation with DEVA®).

The direction of movement determines the arrangement of the lubrication plugs.

All **deva.glide** bearings can be provided with a running-in film (not shown in order to give a clearer view).

The flange will be provided with solid lubricant plugs only if demanded by the operating conditions.

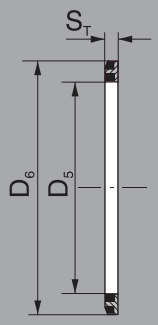


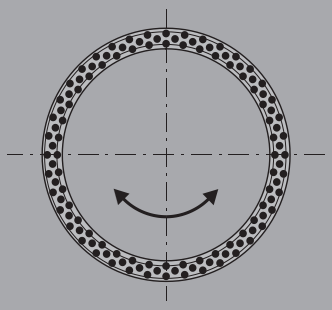
Thrust washer (axial bearings)

Standard version
$ØD_5 > 150$ mm
Special version
$ØD_5 \leq 150$ mm

The direction of movement determines the arrangement of the lubrication plugs.

All **deva.glide®** bearings can be provided with a running-in film (not shown in order to give a clearer view).



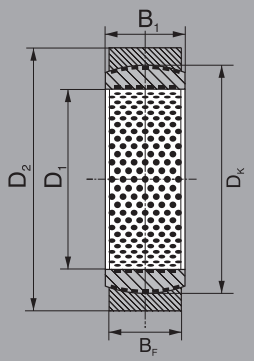


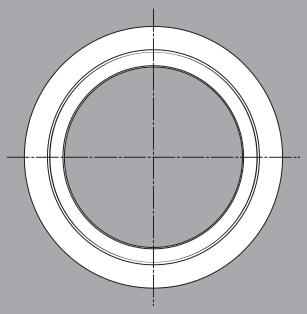
Spherical bearing

Floating bearing

The direction of movement determines the arrangement of the lubrication plugs.

All **deva.glide** bearings can be provided with a running-in film (not shown in order to give a clearer view).

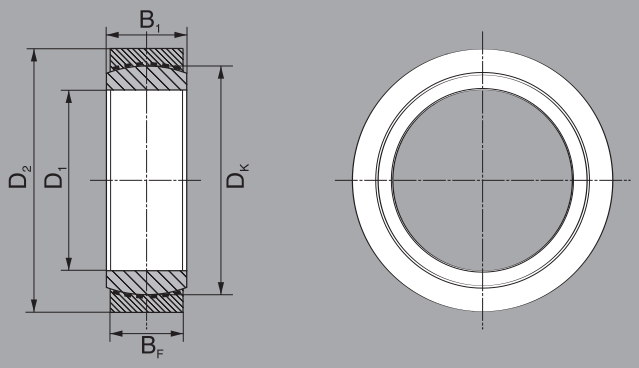




Spherical bearing

Fixed bearing

All **deva.glide** bearings can be provided with a running-in film (not shown in order to give a clearer view).

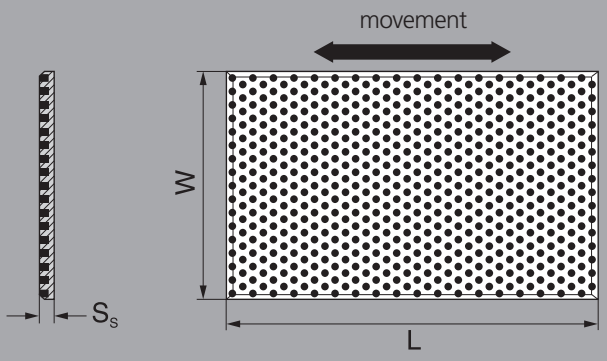


Sliding plates (slideways)

The direction of movement determines the arrangement of the lubrication plugs.

All **deva.glide** bearings can be provided with a running-in film (not shown in order to give a clearer view).

All dimensions on request.



Data relevant to the design of DEVA® bearings

Questionaire 9.1.A

Description of application

☐ Steel Industry ☐ Steam and Gas Turbines ☐ Railway

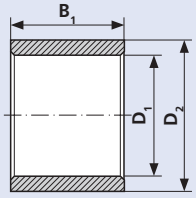
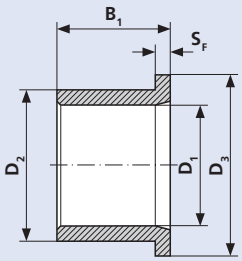
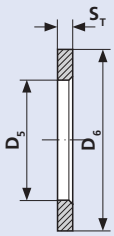
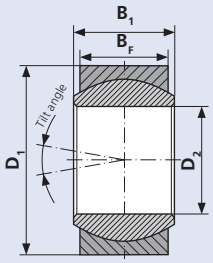
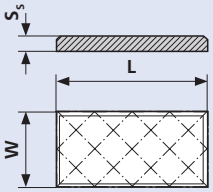
☐ Wind Energy ☐ Offshore and Marine ☐ Hydro Power

☐ Rubber and Plastic Industry ☐ Heavy-duty Vehicles ☐ Others

☐ New design

☐ Existing design

Project No.

☐ Plain bearing	☐ Flanged bearing	☐ Thrust washer	☐ Spherical bearing	☐ Sliding plate
			☐ Floating bearing ☐ Fixed bearing 	

☐ Shaft rotates ☐ Bearing rotates ☐ Angular motion ☐ Axial motion

		Item 1	Item 2	Item 3
Quantity				
Dimensions [mm]		Item 1	Item 2	Item 3
Inner diameter	D_1 (D_5)			
Outer diameter	D_2 (D_6)			
Bearing width	B_1			
Outer ring width	B_F			
Flange outer diameter	D_3			
Flange thickness	S_F			
Wall thickness	S_T			
Plate length	L			
Plate width	W			
Plate thickness	S_S			
Loading		Item 1	Item 2	Item 3
Static		☐	☐	☐
Dynamic		☐	☐	☐
Alternating		☐	☐	☐
Impact		☐	☐	☐
Radial load [kN]				
Axial load [kN]				
Surface pressure				
Radial [MPa]				
Axial [MPa]				
Mating material		Item 1	Item 2	Item 3
Material no./type				
Hardness [HB/HRC]				
Roughness R_a [µm]				
Housing material		Item 1	Item 2	Item 3
Material no./type				
Lubrication		Item 1	Item 2	Item 3
Dry running		☐	☐	☐
Permanent lubrication		☐	☐	☐
Medium lubrication		☐	☐	☐
Medium				
Lubricant				
Initial lubrication		☐	☐	☐
Hydrodyn. lubrication		☐	☐	☐
Dynamic viscosity				

Motion	Item 1	Item 2	Item 3
Speed [rpm]			
Sliding speed [m/s]			
Stroke length [mm]			
Double strokes [/min]			
Rotating angle [°]			
Frequency [n/min]			
Tilt angle (spherical bearing) [°]			
Operating time	Item 1	Item 2	Item 3
Continuous operation			
Intermittent operation			
Duty operation [%/h]			
Days/year			
Frictional distance [km]			
Fits/tolerances	Item 1	Item 2	Item 3
Shaft			
Bearing housing			
Environmental conditions	Item 1	Item 2	Item 3
Temperature at bearing			
Contact medium			
Other influences			
Lifetime	Item 1	Item 2	Item 3
Desired operating time [h]			
Permissible wear [mm]			

Company	
Company name	
Address	
Contact person	
Phone	
Fax	
Cell-phone	
E-mail	

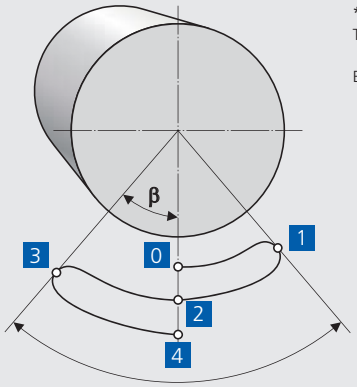
02.13

Questionaire 9.1.B

Remarks

	yes	no
Certificate required (e.g. 3.1)	☐	☐
Acceptance procedure (e.g. 3.2)	☐	☐

Explaination



* angle: According to DEVA® definition, one cycle is four times the angle **β**.
This is the basis to calculate the expected sliding distance.

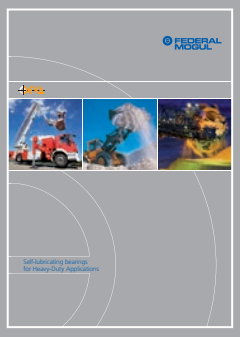
Example: Bushing D_1 = 50 mm and agle **β** = 5° → 1 cycle shows a sliding distance of 8,73 mm

Notes

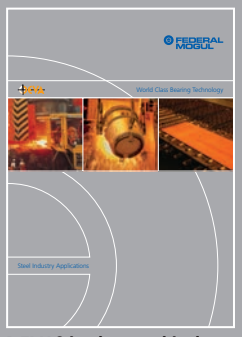
Notes

Portfolio

DEVA® in marine/offshore

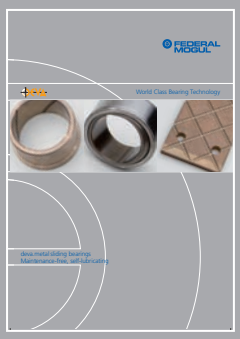


DEVA® in heavy-duty

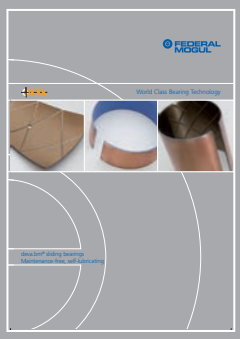


DEVA® in the steel industry

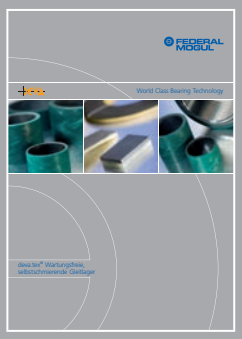
Industry solutions



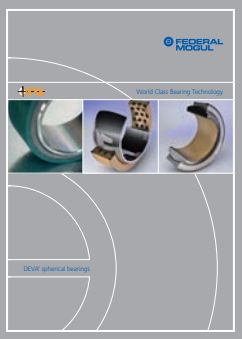
deva.metal®



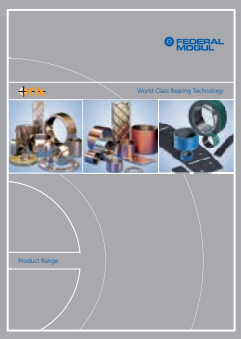
deva.bm®



deva.tex®



DEVA® spherical bearings



Product range

Product information

Disclaimer

The present technical documentation has been prepared with care and all the information verified for its correctness. No liability, however, can be accepted for any incorrect or incomplete information. The data given in the documentation are intended as an aid for assessing the suitability of the material. They are derived from our own research as well as generally accessible publications.

The sliding friction and wear values stated by us or appearing in catalogues and other technical documentation do not constitute a guarantee of the specified properties. They have been determined in our test facilities under conditions that do not necessarily reflect the actual application of our products and their service environment or permit comprehensive simulation in relation to them.

We provide guarantees only after written agreement of the test procedures and parameters and of all the relevant characteristics which the product is required to have.

All transactions conducted by DEVA are subject, in principle, to our terms of sale and delivery as indicated in our offers, product brochures and price lists. Copies are available on request. Our products are subject to a constant process of development. DEVA reserves the right to amend the specification or improve the technological data without prior notice.

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