GGB
BY TIMKEN

PRODUCT RANGE

Plain Bearings & Polymer Coatings

Australia

Who we are

GGB helps create a world of motion with minimal frictional loss through plain bearing and surface engineering technologies. With R&D, testing and production facilities in the United States, Germany, France, Brazil, Slovakia and China, GGB partners with customers worldwide on customized tribological design solutions that are efficient and environmentally sustainable. GGB's engineers bring their expertise and passion for tribology to a wide range of industries, including automotive, aerospace and industrial manufacturing. To learn more about tribology for surface engineering from GGB, visit **https://www.ggbearings.com**.

Our products are used in tens of thousands of critical applications every day on our planet. It is always our goal to provide superior, high-quality solutions for our customers' needs, no matter where those demands take our products. From space vehicles to golf carts and virtually everything in between; we offer the industry's most extensive range of high performance, maintenance-free bearing solutions for a multitude of applications:

Aerospace

Agriculture

Automotive

Construction

E-Mobility

Energy

Exoskeletons

Fluid Power

Industrial

Medical

Mining

Oil & Gas

Primary Metals

Railway

Recreation

Robotics & Automation

Where we are

GGB Global Sales & Distribution Network:
WHERE TO FIND US https://www.ggbearings.com/en/place-locator


Thorofare I, NJ, USA


Thorofare II, NJ, USA


Annecy, France


Heilbronn, Germany


Sučany, Slovakia


Barueri, Brasil


Suzhou, China

GGB Manufacturing Plant

The GGB Advantage

MAINTENANCE-FREE

GGB bearings are self-lubricating, making them ideal for applications requiring long bearing life without continuous lubrication.

LOW FRICTION, HIGH WEAR RESISTANCE

Low coefficients of friction eliminate the need for lubrication, while providing smooth operation, reducing wear and extending service life.

NVH (NOISE, VIBRATION, HARSHNESS)

Plain bearings provide a smooth sliding motion between surfaces and their material properties and simple design reduce noise, vibration and harshness.

LOWER SYSTEM COST

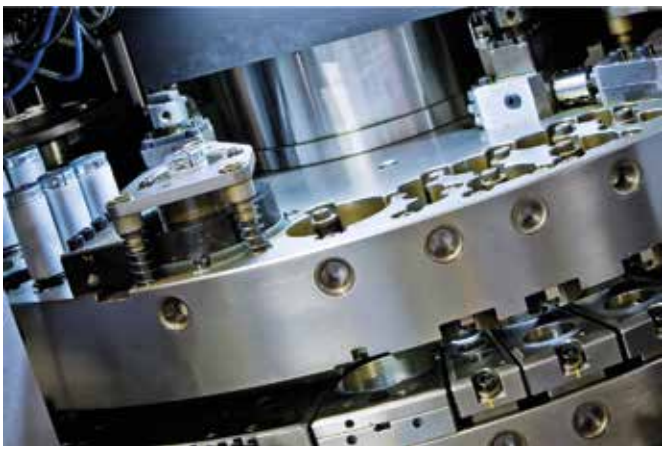
A one-piece design offers space and weight reductions and thanks to the material compositions and self-lubricating properties, less maintenance is needed.

REDUCED CO_2 FOOTPRINT

GGB's flexible and local production platforms assure timely deliveries and reduced CO2 footprint.

PARTNER SUPPORT

GGB offers tribological, application and design support, and partners with our customers to provide the most efficient solutions.



The Highest Standards in Fabrication

Our world-class manufacturing plants in the United States, Brazil, China, Germany, France and Slovakia are certified in quality and excellence according to ISO 9001, IATF 16949, ISO 14001 and ISO 45001. This allows us to access the industry's best practices while aligning our management system with global standards.

For a complete listing of our certifications, please visit our website:
https://www.ggbearings.com/en/certificates

What is Tribology

TRIBOLOGY IS THE SCIENCE OF FRICTION, WEAR, AND LUBRICATION

Tribology is the science of wear, friction and lubrication, and encompasses how interacting surfaces and other tribo-elements behave in relative motion in natural and artificial systems. This includes bearing design and lubrication.

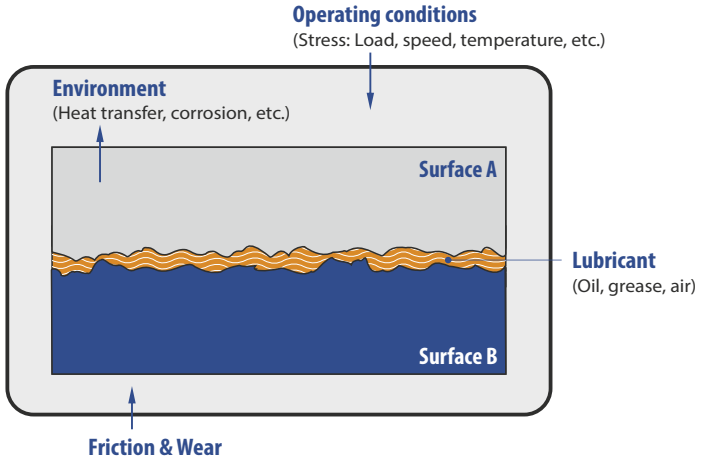
TRIBOLOGY SURROUNDS YOU

Tribology is everywhere where contacting surfaces are in relative movement to each other.

Tribology is not an isolated science, but rather a complex, multidisciplinary endeavor where advances are made by collaborative efforts of researchers from fields including mechanical engineering, manufacturing, materials science and engineering, chemistry and chemical engineering, physics, mathematics, biomedical science and engineering, computer science, and more.

THE TRIBOLOGICAL SYSTEM

Tribology is a complex science, involving 2 surfaces in relative motion that are subject to constant mechanical, thermal and chemical interaction



Bearing Selection

Plain bearings help optimise friction and minimise wear to ensure reliable lifetime performance in machines or systems with moving parts.

Selecting the right plain bearing with the appropriate material design is critical to managing friction and wear. Typically, plain bearings are made of softer materials than the shafts they support and are «sacrificial,» meaning the bearing wears faster than the shaft.

Although friction and wear may be the principal design parameters for an application, other operational requirements associated with the bearing environment must be carefully considered.

An engineer must verify that the bearing properties meet application specifications for fatigue life and resistance to corrosion, chemicals, shocks, erosion, environmental contamination and debris.

GGB products are available in a broad selection of material technologies engineered to optimise the tribological layer for a complex range of operating conditions across diverse markets.

PRODUCT FAMILY	TRIBOLOGICAL LINER DESIGN	KEY VALUE PROPOSITION
Metal-Polymer (MP)	a) PTFE + fillers	Lowest friction & transfer film formation for self- lubrication (dry operation)
	b) Thermoplastic + fillers	Optimum maintenance free durability in greased or oiled applications
Engineered Plastics (EP)	Thermoplastic + fillers	Freedom of shape and corrosion resistance at a competitive price
Fiber Reinforced Composites (FRC)	Thermoset + fillers	Low friction and robustness for high loaded, aggressive environments (corrosion, shocks, dirt)
Bimetals	Metal alloy	High temperature capability

Converging on the optimum product can be complex and imprecise due to the material science and surface interactions, but in most cases can be successfully achieved with a sound knowledge of the product capabilities (outlined in GGB product datasheets and brochures) and an understanding of the application parameters and operating conditions.

FACTORS INFLUENCING FRICTION AND WEAR

- Specific load (P)
- Speed (V)
- PV factor
- Temperature
- Lubrication
- Mating surface material, hardness, and roughness
- Other system parameters e.g., housing design, misalignment, dirt, lubrication, etc.

Each of these factors (including the choice of bearing) influence the friction and wear of the system.

Coatings, Plain Bearings & Bearing Assemblies

TRIBOLOGICAL COATINGS

PRODUCT NAME	POLYMER COATINGS	PAGE
TriboShield® TS225	Based on a nanostructured thermoset polymer designed for low friction and high wear resistance at low to medium loads in dry or lubricated conditions.	10
TriboShield® TS650	Based on high-performance thermoplastics specifically designed for constant low friction from low to moderately high loads in lubricated conditions. Highly suitable for process fluid or water lubricated contacts.	11
TriboShield® TS651	Based on high-performance thermoplastics specifically designed for constant low friction from low to moderately high loads in dry or lubricated conditions. Highly suitable for high frequency / low amplitude (HFLA) applications, particularly in dry conditions.	12
TriboShield® TS742	Based on latest generation high-performance thermoplastics, specifically developed for demanding and heavy-duty applications. Extreme load bearing capacity and low friction at moderate to high loads are some of its standout features.	13

TRIBOLOGICAL BEARINGS

PRODUCT NAME	METAL-POLYMER BEARINGS	PAGE
DP4®	Lead-free all-purpose DP4 material offering low friction and good wear resistance in both dry and lubricated applications. Suitable for linear, oscillating and rotating movements.	14
DP4-B	Same advantages as DP4, but bronze back offers additional corrosion resistance in humid/saline environments.	15
DU®	Original iconic all purpose metal-polymer product that offers exceptional wear resistance with low friction over a wide range of dry and lubricated running conditions.	16
DU-B	Same advantages as DU, but bronze back offers additional corrosion resistance in humid/saline environments.	17
DP10	DP10 offers very good performance in lubricated applications, particularly in marginally lubricated applications.	18
DP11	DP11 is particularly suited for dry applications with high frequency and low amplitude oscillating movements.	19
DP31	DP31 is ideal for oil lubricated applications as it offers superior flow erosion and cavitation resistance and fatigue strength.	20
DX®	DX bearing material for marginally lubricated applications. Optimum performance under relatively high loads and low speeds.	21
DX®10	DX10 is perfect for heavy duty and harsh environments and offers excellent abrasive and erosion resistance. Good fatigue strength.	22
HI-EX®	Marginally lubricated bearing material with ultimate robustness and wear performance under highly loaded, thin film conditions. Available with non-indented overlay for hydrodynamic applications.	23
DTS10®	DTS10 offers the ultimate performance for oil lubricated application, offering low friction and the highest level of chemical resistance, fatigue strength and wear performance. Also designed to resist cavitation and flow erosion, and good behavior in dry start-up conditions. A material that is designed to be machined after assembly for tight tolerances.	24
DS	DS is similar to DX but with lower friction and dry running capability. It particularly excels in humid environments with low amplitude oscillating movements, designed to minimize fretting corrosion damage of the shaft.	25

Coatings, Plain Bearings & Bearing Assemblies

TRIBOLOGICAL BEARINGS

PRODUCT NAME	ENGINEERED PLASTICS BEARINGS	PAGE
EP®	General purpose EP material provides good bearing performance in dry as well as lubricated or marginally lubricated working conditions. Good choice for medium working conditions compared to other Engineered Plastics materials.	26
EP®12	EP12 is a good choice for water lubricated applications, but also operates well in dry, marginally lubricated and lubricated conditions. Good choice for low temperature conditions compared to other Engineered Plastics materials.	27
EP®15	EP15 are UV-resistant bearings. The material is resistant to low temperature applications. They are lightweight with a low coefficient of friction and abrasion resistance.	28
EP®22	EP22 bearings provide a good price/performance ratio . Good performance in low load applications, also a good choice for water lubricated applications.	29
EP®30	EP30 is suitable for elasto hydrodynamic applications and is good in dry, lubricated or marginally lubricated conditions.	30
EP®43	EP43 provides a good price performance ratio for high temperature applications and is dimensionally stable. Good chemical and moisture resistance.	31
EP®44	EP44 provides a good price performance ratio. It is especially good with grease, oil, or water lubrication.	32
EP®63	EP63 is suitable for very high temperature applications and provides high mechanical strength.	33
EP®64	EP64 offers an excellent flow erosion and cavitation resistance and offers a very high mechanical performance.	34
KA Glacetal	KA-Glacetal washers provide good bearing performance in light duty working conditions and a good price and weight performance ratio.	35
Multilube	Multilube offers a good price performance ratio and operates in dry, marginally lubricated and lubricated applications.	36

PRODUCT NAME	FIBER REINFORCED COMPOSITE BEARINGS	PAGE
GAR-MAX®	GAR-MAX is known for its high load capacity and excellent shock and misalignment resistance.	37
GAR-FIL	GAR-FIL provides a machinable bearing surface for more precise assembly tolerances and offers a high rotational speed capacity. Excellent contamination resistance.	38
HSG	HSG offers twice as much high load capacity and excellent shock and misalignment resistance.	39
MLG	MLG provides high load capacity, suitable for lighter duty applications.	40
HPM	HPM is designed for hydropower applications, dimensionally stable with very low water absorption and low swelling.	41
HPMB®	HPMB provides machinable inner and outer diameters for application precision, circularity and cylindricity tolerances.	42
HPF	HPF is designed for hydropower applications and provides a machinable bearing surface.	43
GGB-MEGALIFE® XT	GGB-Megalife XT thrust washers offer excellent contamination resistance.	44
Multifil	Multifil is a sliding bearing material which can easily be bonded to any clean, rigid substance.	45
SBC with GAR-MAX®	Sealed GAR-MAX bearing to exclude contamination, offering extended service life.	46
SBC with HSG	Sealed HSG bearing to exclude contamination, offering extended service life.	47

Coatings, Plain Bearings & Bearing Assemblies

TRIBOLOGICAL BEARINGS

PRODUCT NAME	METAL AND BIMETAL BEARINGS	PAGE
GGB-CSM®	Thick-walled monometal GGB-CSM bearings are maintenance-free and offer a high load capacity and a temperature range of up to 600°C.	48
GGB-CBM®	Thin-walled bimetal GGB-CBM bearings are maintenance-free and offer high load capacity and are suited for a broad temperature range.	49
GGB-BP25	Maintenance-free GGB-BP25 oil impregnated sintered bronze bearings offer optimum performance in low temperature applications with relatively light loads and high speeds.	50
GGB-FP20	Maintenance-free GGB-FP20 oil impregnated sintered iron bearings are available in complex shapes for general industrial applications.	51
GGB-SO16	Maintenance-free GGB-SO16 oil impregnated sintered iron rods offer higher performance compared to GGB-FP20 under high loads and low speeds.	52
GGB-SHB®	GGB-SHB cast hardened steel bearings are available with plain or grooved sliding layer. Suitable for low rotation speed with high specific pressure.	53
AuGlide®	Lead-free bimetal AuGlide bearings are machinable and capable of supporting high specific loads and high temperatures.	54
SY	Bimetal SY (SAE standard 792) bearings are particularly suitable for high specific loads with oscillating motion and low frequency for rough operating conditions.	55
SP	Bimetal SP (SAE standard 794) bearings are suitable for oil and grease lubrication.	56
GGB-DB®	GGB-DB cast bronze bearings are suitable for heavy duty applications. Available with PTFE or graphite inserts.	57

BEARING ASSEMBLIES

PRODUCT NAME	BEARING ASSEMBLIES	PAGE
UNI	Self-aligning pillow block assembly designed for universal	58
MINI	Self-aligning pillow block assembly designed for universal	59
EXALIGN®	Self-aligning pedestal or flanged bearings housing assemblies for specific assembly requirements.	60

TriboShield®TS225

NANOSTRUCTURED COATING FOR LOW TO MEDIUM LOADS

TS225 is based on a nanostructured thermoset polymer designed for low-friction and high wear resistance at low to medium loads in dry or lubricated conditions. TS225 is part of the standard TriboShield® product range.

UNIQUE CHARACTERISTICS

- Excellent friction at high sliding speeds
- Very good friction in lubricated conditions
- Applicable to heat-sensitive substrates
- High surface hardness

BEARING PROPERTIES	UNITS	VALUE
GENERAL		
Color		Black
Max. continuous service temperature	°C / °F	120 / 248
Max. short-term peak temperature	°C / °F	130 / 266
Friction coefficient, typical range*		0,04 - 0,25
Food contact compliant**		No

* Dependent on contact pressure, sliding speed and contact geometry.
** Your specific food contact condition may require additional approval. Please contact your GGB representative for more information.

AVAILABILITY

TriboShield® coatings are applied directly to the customer's part and are suitable for complex geometries as well as various substrates e.g. steel, stainless steel, Al, Ti, Mg, etc. They can be used for both interacting surfaces that are in relative motion.

TYPICAL APPLICATIONS

- Shock absorbers
- Linear rails
- Cylinder rods
- Piston skirts for internal combustion engines
- Garden and DYI tools

TRIBOMATE® UPGRADE AVAILABLE

Yes

TRIBOMATE® PAIRED COATINGS

For optimized performance in regard of

- significant reduction of friction in dry conditions
- improved wear life
- stable performance

we offer TriboMate® paired coatings which are specifically designed to work with and enhance the performance of our polymer coating products.

Pairing a TriboShield® coating with another TriboShield® coating solution or with a GGB bearing material, offers significantly reduced friction and can further extend system lifetime.

For additional product offerings visit:
https://www.ggbearings.com/en/our-products/polymer-coatings/triboshield-ts225

TriboShield®TS650

HIGH PERFORMANCE POLYMER SURFACE COATING FOR LUBRICATED APPLICATIONS

TS650 is based on high-performance thermoplastics specifically designed for constant low friction from low to moderately high loads in lubricated conditions.
Highly suitable for process fluid or water lubricated contacts. TS650 is part of the standard TriboShield® product range.

UNIQUE CHARACTERISTICS

- Excellent performance in lubricated conditions
- Excellent cavitation resistance
- Excellent wear resistance up to moderately high loads
- Good performance in contaminated environment

BEARING PROPERTIES	UNITS	VALUE
GENERAL		
Color		Dark grey
Max. continuous service temperature	°C / °F	260 / 500
Max. short-term peak temperature	°C / °F	280 / 536
Friction coefficient, typical range*		0,08 - 0,35
Food contact compliant**		No

* Dependent on contact pressure, sliding speed and contact geometry.
** Your specific food contact condition may require additional approval.
Please contact your GGB representative for more information.

AVAILABILITY

TriboShield® coatings are applied directly to the customer's part and are suitable for complex geometries as well as various substrates e.g. steel, stainless steel, Al, Ti, Mg, etc. They can be used for both interacting surfaces that are in relative motion.

TYPICAL APPLICATIONS

- Hydraulic pumps and motors
- Hydraulic cylinders
- Fluid valves
- Thrust surfaces in gearboxes

TRIBOMATE® UPGRADE AVAILABLE

Yes

TRIBOMATE® PAIRED COATINGS

For optimized performance in regard of

- significant reduction of friction in dry conditions
- improved wear life
- stable performance

we offer TriboMate® paired coatings which are specifically designed to work with and enhance the performance of our polymer coating products.

Pairing a TriboShield® coating with another TriboShield® coating solution or with a GGB bearing material, offers significantly reduced friction and can further extend system lifetime.

For additional product offerings visit:
https://www.ggbearings.com/en/our-products/polymer-coatings/triboshield-ts650

TriboShield®TS651

HIGH PERFORMANCE LOW-FRICTION COATING

TS651 is based on high-performance thermoplastics specifically designed for constant low-friction from low to moderately high loads in dry or lubricated conditions. Highly suitable for highfrequency/ low amplitude (HFLA) applications, particularly in dry conditions. TS651 is part of the standard TriboShield® product range.

UNIQUE CHARACTERISTICS

- Excellent performance in dry conditions
- Good performance in lubricated condition
- Very low stick-slip characteristic
- Excellent wear resistance up to moderately high loads

BEARING PROPERTIES	UNITS	VALUE
GENERAL		
Color		Dark brown
Max. continuous service temperature	°C / °F	260 / 500
Max. short-term peak temperature	°C / °F	280 / 536
Friction coefficient, typical range*		0,06 - 0,30
Food contact compliant**		No

* Dependent on contact pressure, sliding speed and contact geometry.
** Your specific food contact condition may require additional approval. Please contact your GGB representative for more information.

AVAILABILITY

TriboShield coatings are applied directly to the customer's part and are suitable for complex geometries as well as various substrates e.g. steel, stainless steel, Al, Ti, Mg, etc. They can be used for both interacting surfaces that are in relative motion.

TYPICAL APPLICATIONS

- Solenoid armatures
- Struts and shock absorbers
- Compressors and radial piston pumps
- Gimbals

TRIBOMATE® UPGRADE AVAILABLE

Yes

TRIBOMATE® PAIRED COATINGS

For optimized performance in regard of

- significant reduction of friction in dry conditions
- improved wear life
- stable performance

we offer TriboMate® paired coatings which are specifically designed to work with and enhance the performance of our polymer coating products.

Pairing a TriboShield® coating with another TriboShield® coating solution or with a GGB bearing material, offers significantly reduced friction and can further extend system lifetime.

For additional product offerings visit:
https://www.ggbearings.com/en/our-products/polymer-coatings/triboshield-ts651

TriboShield®TS742

LOW FRICTION POLYMER COATING FOR HEAVY DUTY APPLICATIONS

TS742 is based on latest generation high-performance thermoplastics, specifically developed for demanding and heavyduty applications. Extreme load bearing capacity and low friction at moderate to high loads are some of its standout features. TS742 is part of the standard TriboShield® product range.

UNIQUE CHARACTERISTICS

- Extreme load bearing capacity
- Excellent wear resistance and sliding properties
- Very low friction in medium to high load conditions
- Anti-static

BEARING PROPERTIES	UNITS	VALUE
GENERAL		
Color		Dark grey
Max. continuous service temperature	°C / °F	260 / 500
Max. short-term peak temperature	°C / °F	270 / 518
Friction coefficient, typical range*		0,04 - 0,25
Food contact compliant**		No

* Dependent on contact pressure, sliding speed and contact geometry.
** Your specific food contact condition may require additional approval. Please contact your GGB representative for more information.

AVAILABILITY

TriboShield® coatings are applied directly to the customer's part and are suitable for complex geometries as well as various substrates e.g. steel, stainless steel, Al, Ti, Mg, etc. They can be used for both interacting surfaces that are in relative motion.

TYPICAL APPLICATIONS

- Highly loaded mechanisms
- Mechanisms requiring lifetime lubrication in dry or lubricated conditions
- Fretting prevention
- Harsh chemical environments
- Mechanical couplings, linear guides, struts, industrial chains, king pins.

TRIBOMATE® UPGRADE AVAILABLE

Yes

TRIBOMATE® PAIRED COATINGS

For optimized performance in regard of

- significant reduction of friction in dry conditions
- improved wear life
- stable performance

we offer TriboMate® paired coatings which are specifically designed to work with and enhance the performance of our polymer coating products.

Pairing a TriboShield® coating with another TriboShield® coating solution or with a GGB bearing material, offers significantly reduced friction and can further extend system lifetime.

For additional product offerings visit:
https://www.ggbearings.com/en/our-products/polymer-coatings/triboshield-ts742

DP4® Bearing Material

METAL-POLYMER ANTI-FRICTION PLAIN BEARINGS

CHARACTERISTICS

- DP4 anti-friction bushings offer good wear and low-friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Very good performance in lubricated applications
- Good performance in greased applications
- Suitable for linear, oscillating and rotating movements
- Lead-free material compliant to ELV, WEEE, and RoHS specifications
- Approved to standard DIN EN 1797: 2002-02 and ISO 21010: 2004-04 (Cryogenic Vessels – Gas/Material Compatibility) for piping, valves, fittings and other components in both gaseous and liquid oxygen for up to maximum temperature of 60°C and oxygen pressure of 25 bars. Contact GGB for further details.

AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes
- Flanged bushes
- Flanged washers
- Sliding plates
- Thrust washers

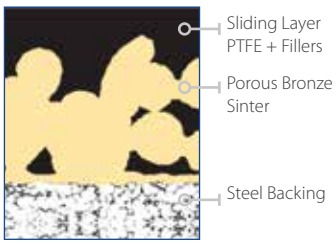
Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined/stamped grooves, customized bearing designs

APPLICATIONS

Automotive: Braking systems, clutches, gearbox and transmissions, hinges: door, bonnet, boot, cabriolet roof tops, pedals; pumps: axial piston, radial piston, gear and vane; seat mechanisms, steering systems, struts and shock absorbers, wiper systems, etc.

Industrial: Aerospace, agricultural equipment, construction equipment, food and beverage, material handling equipment, formingmachines: metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, valves, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Very good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE	
Water lubricated	DP4-B

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	250 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	11 30
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,0
Coefficient of friction, f			0,04 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, V		m/s	5,0
Maximum PV factor		N/mm² x m/s	10,0
Coefficient of friction, f			0,02 - 0,08*
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry Lubricated	µm µm	0,3 - 0,5 ≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

* Depending on operating conditions

DP4-B Bearing Material

METAL-POLYMER BRONZE BACKED PTFE PLAIN BEARINGS

CHARACTERISTICS

- Good wear and low-friction performance over a wide range of
- loads, speeds and temperatures in dry running conditions
- Very good performance in lubricated applications
- Good performance in greased applications
- Suitable for linear, oscillating and rotating movements
- Bronze back offers improved corrosion-resistance in
- humid/saline environments
- Lead-free material

AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes
- Flanged bushes
- Sliding plates

Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, flanged-thrust washers, halfbearings, special shapes obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined / stamped grooves

APPLICATIONS

Industrial: Aerospace, agricultural equipment, construction equipment, material handling equipment, forming machines - metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, valves, etc.

Others: Civil engineering, marine and offshore equipment, other applications in water or in outdoor environments, etc.

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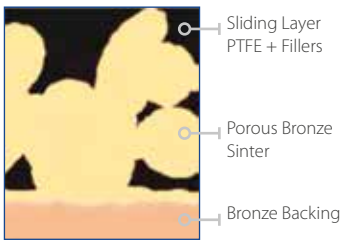


OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Very good
Grease lubricated	Good
Water lubricated	Good
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE	
Water lubricated	DP4-B

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	140 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	18 36
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,0
Coefficient of friction, f			0,02 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, V		m/s	5,0
Maximum PV factor		N/mm² x m/s	10,0
Coefficient of friction, f			0,02 - 0,08*
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry Lubricated	µm µm	0,3 - 0,5 ≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

* Depending on operating conditions

DU® Bearing Material

METAL-POLYMER ANTI-FRICTION PLAIN BEARINGS

CHARACTERISTICS

- Very good wear and low-friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Suitable for lubricated applications
- Suitable for linear, oscillating and rotating movements

AVAILABILITY

Bearing forms available in standard dimensions:

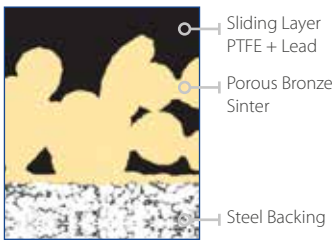
- Cylindrical bushes
- Flanged bushes
- Flanged washers
- Sliding plates
- Thrust washers

Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping or deep drawing, customized bearing designs

APPLICATIONS

Industrial: Aerospace, agricultural equipment, construction equipment, food and beverage, material handling equipment, forming machines: metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, valves, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Fair

FOR SUPERIOR / LEAD-FREE PEFORMANCE	
Dry	DP4 / DP11
Oil lubricated	DP4 / DP31
Grease lubricated	DP4 / DX
Water lubricated	DP4-B
Process fluid lubricated	DP4 /DP31

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	250 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	11 30
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,8
Coefficient of friction, f			0,04 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, V		m/s	5,0
Maximum PV factor		N/mm² x m/s	5,0
Coefficient of friction, f			0,02 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry Lubricated	µm µm	0,3 - 0,5 ≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

* Depending on operating conditions

DU-B Bearing Material

METAL-POLYMER ANTI-FRICTION PLAIN BEARINGS

CHARACTERISTICS

- Very good wear and low-friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Suitable for lubricated applications
- Suitable for linear, oscillating and rotating movements
- Bronze back offers improved corrosion-resistance in humid/saline environments
- Approved to standard EN1337-2 for structural bearings for civil engineering

AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes
- Flanged bushes
- Sliding plates

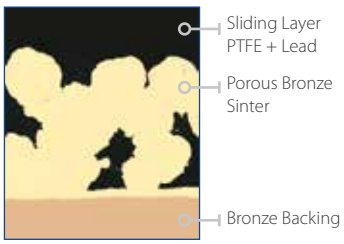
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, flanged-thrust washers, half-bearings, special shapes obtained by stamping or deep drawing, customized bearing designs

APPLICATIONS

Industrial: Aerospace, agricultural equipment, construction equipment, material handling equipment, forming machines -metal, plastic and rubber; office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, valves, etc.

Others: Marine and offshore equipment, other applications in water or in outdoor environments

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Fair
Water lubricated	Good
Process fluid lubricated	Fair

FOR SUPERIOR / LEAD-FREE PEFORMANCE	
Dry	DP4-B
Oil lubricated	DP4-B
Grease lubricated	DP4-B
Water lubricated	DP4-B
Process fluid lubricated	DP4-B

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	140 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	18 36
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,8
Coefficient of friction, f			0,02 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, V		m/s	5,0
Maximum PV factor		N/mm² x m/s	5,0
Coefficient of friction, f			0,02 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry Lubricated	µm µm	0,3 - 0,5 ≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

* Depending on operating conditions

DP10 Bearing Material

METAL-POLYMER ANTI-FRICTION PLAIN BEARINGS

CHARACTERISTICS

- Good wear and low-friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Very good performance in lubricated applications particularly in marginally lubricated applications
- Suitable for linear, oscillating and rotating movements
- Lead-free material compliant to ELV, WEEE, and RoHS specifications

AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes
- Flanged bushes
- Sliding plates
- Thrust washers

Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping or deep drawing, bearings with local notches, lubricant holes and machined/stamped grooves, customized bearing designs

APPLICATIONS

Automotive: Braking systems, clutches, hinges – door, bonnet, boot, cabriolet roof tops, pedals, pumps – axial, piston, gear, vane, seat mechanisms, steering systems, struts and shock absorbers, wiper systems, etc.

Industrial: Agricultural equipment, compressors – scroll and reciprocating, construction equipment, food and beverage, material handling equipment, forming machines – metal, plastic and rubber, office equipment, medical and scientific equipment, packaging equipment, pneumatic and hydraulic cylinders, pumps and motors, railroad and tramways, textile machinery, valves, etc.

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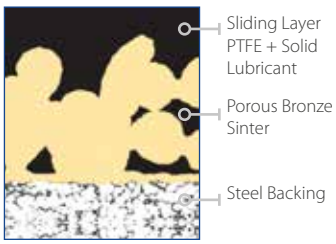


OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Fair
Water lubricated	Not recommended
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Grease lubricated	DP4 / DX
Water lubricated	DP4-B
Process fluid lubricated	DP4 / DP31

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	250 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	11 30
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,0
Coefficient of friction, f			0,03 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, V		m/s	5,0
Maximum PV factor		N/mm² x m/s	10,0
Coefficient of friction, f			0,02 - 0,08
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry Lubricated	µm µm	0,3 - 0,5 ≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

* Depending on operating conditions

DP11 Bearing Material

METAL-POLYMER ANTI-FRICTION PLAIN BEARINGS

CHARACTERISTICS

- Very good wear and low-friction performance over a wide range of loads, speeds and temperatures in dry running conditions
- Particularly suited to dry applications with high frequency and low amplitude oscillating movements
- Suitable for linear, oscillating and rotating movements
- Lead-free material compliant to ELV, WEEE, and RoHS specifications
- Approved to standard FMVSS 302 - Federal Motor Vehicle Safety
- Standard concerning the flammability of materials used in the occupant compartments of motor vehicles

AVAILABILITY

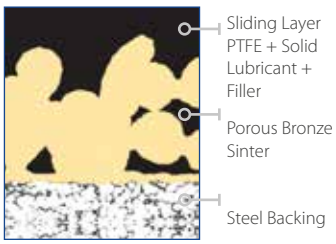
Bearing forms made-to-order: Cylindrical bushes, flanged bushes, thrust washers, flanged-thrust washers, sliding plates,half-bearings, special shapes obtained by stamping or deep drawing, customized bearing designs

APPLICATIONS

Automotive: Belt tensioners, clutches, dual mass fly-wheels, pulley dampers, etc.

Industrial: Applications with high frequency and low amplitude oscillating movements

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Fair
Water lubricated	Not recommended
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Grease lubricated	DP4 / DX
Water lubricated	DP4-B
Process fluid lubricated	DP4 / DP31

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	250 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	11 30
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,0
Coefficient of friction, f			0,04 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, V		m/s	5,0
Maximum PV factor		N/mm² x m/s	10,0
Coefficient of friction, f			0,02 - 0,08
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry Lubricated	µm µm	0,3 - 0,5 ≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

* Depending on operating conditions

DP31 Bearing Material

METAL-POLYMER HYDRODYNAMIC COMPOSITE BEARINGS

CHARACTERISTICS

- Excellent low-friction and wear resistance performance in lubricated applications
- Excellent flow erosion and cavitation resistance
- Very good fatigue strength
- Lead-free material compliant to ELV, WEEE, and RoHS specifications.

AVAILABILITY

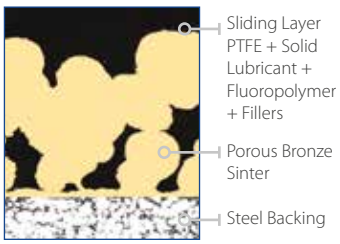
Bearing forms made-to-order: Cylindrical bushes, flanged bushes, thrust washers, flanged-thrust washers, sliding plates, half-bearings, bearings with locating notches, lubricant holes and machined/ stamped grooves, customized bearing designs

APPLICATIONS

Automotive: Air conditioning compressors, gearbox and transmissions, heavy duty struts and shock absorbers, high performance pumps: axial piston, radial piston, gear, vane, etc.

Industrial: Compressors: scroll and reciprocating; pneumatic and hydraulic cylinders, high performance pumps axial piston, radial piston, gear, vane, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Fair
Oil lubricated	Very good
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE	
Dry	DP4 / DP11
Grease lubricated	DP4 / DX
Water lubricated	DP4-B

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm^2 N/mm^2	250 140
Operating temperature	Min Max	°C °C	-200 280
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	$10^{-6}/K$ $10^{-6}/K$	11 30
OIL LUBRICATED			
Maximum sliding speed, V		m/s	10,0
Maximum PV factor		N/mm^2 x m/s	10,0
Coefficient of friction, f			0,01 - 0,05
RECOMMENDATIONS			
Shaft surface roughness, Ra	Lubricated	µm	≤ 0,05 - 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB	> 200

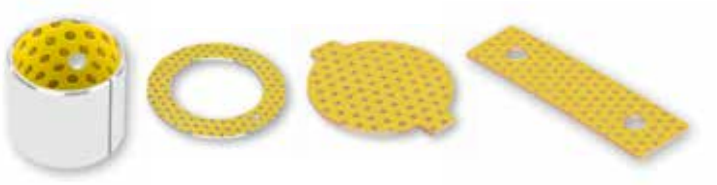
* Depending on operating conditions

DX® Bearing Material

METAL-POLYMER PLAIN BEARINGS GREASE LUBRICATED

CHARACTERISTICS

- Marginally lubricated bearing material for grease or oil lubricated applications
- Standard parts contain grease indents in the sliding layer; plain sliding layer available by request
- Optimum performance under relatively high loads and low speeds
- Suitable for linear, oscillating and rotating movements
- Wide range of parts available from stock



AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes
- Thrust washers
- Sliding plates

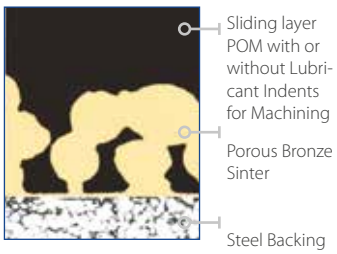
Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs

APPLICATIONS

Automotive: Steering gear, power steering, pedal bushes, seat slides, king-pin bushes, tailgate pivots, brake caliper bushes, etc.

Industrial: Mechanical handling and lifting equipment, machine slides, hydraulic cylinders, hydraulic motors, ski-lifts, pneumatic equipment, medical equipment, textile machinery, agricultural equipment, scientific equipment, etc.

MICROSECTION



OPERATING PERFORMANCE

Dry	Poor
Oil lubricated	Poor
Grease lubricated	Very good
Water lubricated	Poor
Process fluid lubricated	Poor

FOR SUPERIOR PERFORMANCE

Dry	GAR-MAX / HSG / GAR-FIL / MLG
Water lubricated	HPM / HPF / DP4-B
Process fluid lubricated	DP4 / HI-EX / GAR-FIL

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm^2 N/mm^2	140 140
Operating temperature	Min Max	°C °C	-40 130
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	$10^{-6}/K$ $10^{-6}/K$	11 29
OIL LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm^2 x m/s	2,8
Coefficient of friction, f			0,06 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4*
Shaft surface hardness	Unhardened acceptable, improved bearing life	HB HB	> 200 > 350

* Depending on operating conditions

DX®10 Bearing Material

METAL-POLYMER PLAIN BEARINGS GREASE LUBRICATED

CHARACTERISTICS

- Perfect for heavy duty and harsh environments
- Excellent chemical resistance
- Excellent erosion resistance
- Good fatigue strength
- Good wear performance
- Can be broached for tighter tolerance
- Lead-free material compliant to ELV, RoHS and WEEE specifications

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, thrust washers, sliding plates, half-bearings, special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs

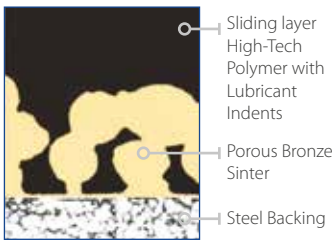
APPLICATIONS

General: Greased or oiled applications with high load, high temperature, and contamination; ideal for replacing bi-metal or bronze bushings to achieve improved wear performance

Automotive: King pins, oil pumps

Industrial: Piston pumps, agriculture equipment, construction, lift and cranes, small reciprocating bushing

MICROSECTION



OPERATING PERFORMANCE

Dry	Fair
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Poor
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE

Dry	GAR-MAX / HSG / GAR-FIL / MLG
Water lubricated	HPM / HPF / DP4-B
Process fluid lubricated	DP4 / HI-EX / GAR-FIL

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	250 140
Operating temperature	Min Max	°C °C	-40 175
GREASE LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f			0,01 - 0,10
OIL LUBRICATED			
Maximum sliding speed, V		m/s	10,0
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f			0,01 - 0,06
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4*
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

* Depending on operating conditions

HI-EX® Bearing Material

METAL-POLYMER HYDRONAMIC COMPOSITE BEARINGS

CHARACTERISTICS

- Marginally lubricated bearing material with good wear resistance under thin film conditions
- Standard bearings supplied with indents for optimum retention and distribution of the lubricant over the sliding layer
- Available with non-indented overlay for hydrodynamic applications
- Rated for high temperature use up to 250°C / 480°F
- Suitable for use with low viscosity fluids
- Good chemical resistance
- Lead-free material compliant to ELV, RoHS and WEEE specifications

AVAILABILITY

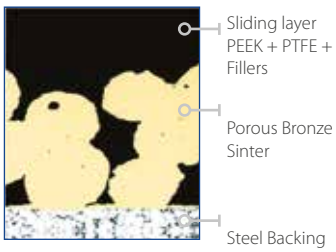
Bearing forms made-to-order: Cylindrical bushes, thrust washers, sliding plates, half-bearings, special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs

APPLICATIONS

Automotive: Diesel fuel pumps, heavy duty brakes, heavy duty axles

Industrial: Hydraulic motors, axial and radial piston pumps, agricultural equipment, wind energy equipment, yaw and teeter bearings

MICROSECTION



OPERATING PERFORMANCE

Dry	Fair
Oil lubricated	Good
Grease lubricated	Very good
Water lubricated	Good
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE

Dry	GAR-MAX / HSG / GAR-FIL / MLG

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	140 140
Operating temperature	Min Max	°C °C	-150 250
Coefficient of linear thermal expansion	Parallel to the surface Normal to the surface	10^{-6}/K 10^{-6}/K	11 29
GREASE LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f			0,08 - 0,12
OIL LUBRICATED			
Maximum sliding speed, V		m/s	10,0
Maximum PV factor		N/mm² x m/s	10,0
Coefficient of friction, f			0,03 - 0,08
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,05 - 0,4*
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

* Depending on operating conditions

DTS10® Bearing Material

METAL-POLYMER HYDRONAMIC COMPOSITE BEARINGS

CHARACTERISTICS

- The first polymer-lined bearing for lubricated conditions offering low-friction and high wear resistance that is designed to be machined on-site for tight tolerances
- Excellent wear resistance and low-friction in lubricated hydraulic applications
- Excellent chemical resistance, fatigue strength, cavitation and flow erosion resistance, and good behavior in dry start-up conditions
- A minimum overlay thickness of 0,1 mm permits, under carefully controlled conditions, machining of the assembled bore for improved dimensional tolerance and reduced geometric defects, while retaining a thin layer of PTFE sliding surface
- Compatible with most standard machining processes including turning, broaching, reaming, and milling
- Lead-free material compliant to ELV, RoHS and WEEE specifications

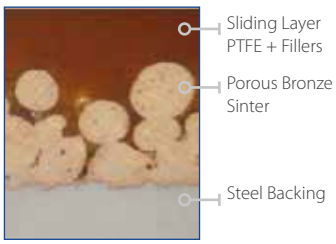
AVAILABILITY

Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined/stamped grooves, customized bearing designs

APPLICATIONS

Industrial: Compressors: scroll and reciprocating, external and internal motors, external and internal pumps, vane pumps, axial and radial piston pumps, gerotor pumps, hydraulic cylinders

MICROSECTION



OPERATING PERFORMANCE	
Dry	Fair
Oil lubricated	Excellent
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE	
Dry	GAR-MAX / HSG / GAR-FIL / MLG
Grease lubricated	DX / DX10
Water lubricated	HPM / HPF / DP4-B

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	140
Operating temperature	Min Max	°C °C	-200 280
FLUID LUBRICATED			
Maximum sliding speed, V		m/s	10,0
Maximum PV factor		N/mm² x m/s	100*
Coefficient of friction, f			0,01 - 0,08
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,05 - 0,2*
Shaft surface hardness		HB	> 200

* Depending on operating conditions

DS Bearing Material

METAL-POLYMER SELF-LUBRICATING BEARINGS

CHARACTERISTICS

- Self-lubricating bearing material for operation in mixed film lubrication conditions
- Sliding layer is machinable (ca. 0,4 mm above bronze sinter layer)
- Resistant to fretting corrosion damage to the shaft under low amplitude oscillating movements
- Similar in performance to DX® but with lower friction

AVAILABILITY

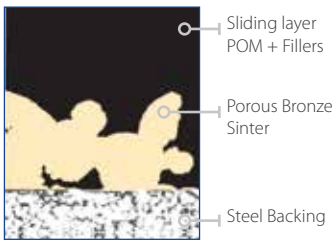
Bearing forms made-to-order: Cylindrical bushes, thrust washers, sliding plates, half-bearings, special shapes obtained by stamping, customized bearing designs

APPLICATIONS

Automotive: Steering gear, power steering, pedal bushes, seat slides, king-pin bushes, tailgate pivots, brake caliper bushes, etc.

Industrial: Mechanical handling and lifting equipment, machine slides, hydraulic cylinders, hydraulic motors, ski lifts, pneumatic equipment, medical equipment, textile machinery, agricultural equipment, scientific equipment, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Poor
Process fluid lubricated	Poor

FOR SUPERIOR PERFORMANCE	
Water lubricated	HPM / HPF / DP4-B
Process fluid lubricated	DP4 / GAR-FIL / HI-EX

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	110 45
Operating temperature	Min Max	°C °C	-60 130
DRY			
Maximum sliding speed, V		m/s	1,5
Maximum PV factor		N/mm² x m/s	1,4
Coefficient of friction, f			0,15 - 0,3
GREASE LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f			0,05 - 0,1
OIL LUBRICATED			
Maximum sliding speed, V		m/s	10,0
Maximum PV factor		N/mm² x m/s	10,0
Coefficient of friction, f			0,03 - 0,08
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

* Depending on operating conditions

EP® Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms available in standard dimensions:

- Plain cylindrical bushes
- Plain flanged bushes

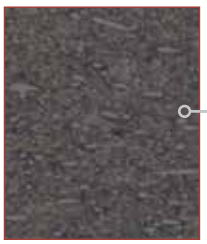
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Medical equipment, awnings and blinds, scientific equipment, gaming equipment, office equipment, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good after resistance testing

FOR SUPERIOR PERFORMANCE	
Water lubricated	EP22

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	80 140
Operating temperature	Min Max	°C °C	-40 140
Coefficient of linear thermal expansion		10^{-6}/K	22
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,06 0,24 1,00
Coefficient of friction, f			0,15 - 0,3
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HV	> 200

EP®12 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, flanged bearings, thrust washers, sliding plates, half-bearings, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, furniture, office equipment, sports equipment and many more

MICROSECTION

POM + Solid Lubricant

OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good after resistance testing

FOR SUPERIOR PERFORMANCE	
Water lubricated	EP22

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	65
Operating temperature	Min Max	°C °C	-40 125
Coefficient of linear thermal expansion		10^{-6}/K	120
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,04 0,09 0,18
Coefficient of friction, f			0,18 - 0,3
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,1 - 0,5
Shaft surface hardness		HV	> 200

EP®15 Bearing Material

UV-RESISTANT BEARINGS FOR SUN & OUTDOOR APPLICATIONS

CHARACTERISTICS

- UV-resistant bearings
- Abrasion-resistant
- Lightweight
- Low coefficient of friction
- Very good bushing performance in dry working conditions
- Good bushing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/ saline environments
- Very good price performance ratio
- Very good weight performance ratio
- Within injection molding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushings, flanged bushings, thrust washers, sliding plates, half-bushings, customized bearing designs

APPLICATIONS

Solar Power Equipment, Outdoor Applications, Recreational Applications

EP®15 ENGINEERED FOR SUN

MICROSECTION

OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good after resistance testing

BEARING PROPERTIES	STANDARD	UNITS	VALUE
CHARACTERISTIC			
Charpy unnotched impact strength	ISO 179/1eU	kJ/m²	45
Charpy notched impact strength	ISO 179/1eA	kJ/m²	45
Coefficient of linear thermal expansion	ISO 11359-2:1999-10	x10⁻⁶	120
Minimum temperature		°C / °F	- 40 / - 40
Maximum temperature		°C / °F	125 / 260
Maximum extended temperature limit		°C / °F	125 / 260
Density	DIN EN ISO 1183-1 :2013-04 DIN EN ISO 1183-2 :2004-10	g/cm³	1,50
Tensile strength	DIN EN ISO 527-1 :2012-06 DIN EN ISO 527-2 :2012-06 DIN EN ISO 527-3 :2003-07	N/mm² / psi	50 / 7252
Elastic modulus in tension	DIN EN ISO 178:2013-09 DIN EN ISO 527-1:2012-06 DIN EN ISO 604:2003-12	N/mm² / psi	2750 / 398854
Maximum static load		N/mm² / psi	65 / 9500
Coefficient of friction, f			0,09 - 0,15
Color			Blue

EP®22 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Very good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms available in standard dimensions:

- Plain cylindrical bushes
- Plain flanged bushes

Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, chemical equipment, office equipment, sports equipment and many more

MICROSECTION

OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Very good
Process fluid lubricated	Good after resistance testing

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	50
Operating temperature	Min Max	°C °C	-50 170
Coefficient of linear thermal expansion		10^{-6}/K	90
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,05 0,10 0,20
Coefficient of friction, f			0,22 - 0,37
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,1 - 0,5
Shaft surface hardness		HV	> 200

EP®30 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Very good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio
- Very good weight performance ratio
- Very good in elasto hydrodynamic applications
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms available in standard dimensions:

- Plain cylindrical bushes
- Plain flanged bushes

Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, chemical equipment, office equipment, sports equipment and many more

MICROSECTION

OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Very good
Process fluid lubricated	Good after resistance testing

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	65
Operating temperature	Min Max	°C °C	-50 200
Coefficient of linear thermal expansion		10^{-6}/K	40
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,05 0,10 0,20
Coefficient of friction, f			0,08 - 0,16
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,1 - 0,5
Shaft surface hardness		HV	> 200

EP®43 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio for high temperature applications
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms available in standard dimensions:

- Plain cylindrical bushes
- Plain flanged bushes

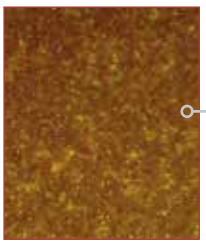
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, materials handling equipment, apparatus engineering, slot machines and cash boxes and many more

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Very good
Process fluid lubricated	Good after resistance testing

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	83
Operating temperature	Min Max	°C °C	-40 240
Coefficient of linear thermal expansion		10^{-6}/K	45
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,22 0,90 3,59
Coefficient of friction, f			0,11 - 0,2
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HV	> 200

EP®44 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio for high temperature applications
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, thrust washers, sliding plates, half-bearings, special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, valve technology, electronics assembly, apparatus engineering and many more

MICROSECTION

OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Very good
Process fluid lubricated	Good after resistance testing

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	95
Operating temperature	Min Max	°C °C	-40 240
Coefficient of linear thermal expansion		10^{-6}/K	27
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,11 0,42 1,69
Coefficient of friction, f			0,16 - 0,26
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HV	> 450

EP®63 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Good bearing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Suitable for very high temperature applications
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes
- Flanged bushes
- Flanged washers
- Sliding plates
- Thrust washers

Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined/stamped grooves, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, materials handling equipment, apparatus engineering, slot machines and cash boxes and many more

MICROSECTION

OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good after resistance testing

FOR SUPERIOR PERFORMANCE	
Water lubricated	EP64

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	90
Operating temperature	Min Max	°C °C	-100 290
Coefficient of linear thermal expansion		10^{-6}/K	50
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,16 0,66 2,63
Coefficient of friction, f			0,12 - 0,21
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,1 - 0,5
Shaft surface hardness		HV	> 200

EP®64 Bearing Material

SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Good bearing performance in lubricated or marginally lubricated applications
- Excellent flow erosion and cavitation resistance
- Corrosion-resistant in humid/saline environments
- Suitable for very high temperature applications
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features
- Compliant to ELV, WEEE and RoHS specifications

AVAILABILITY

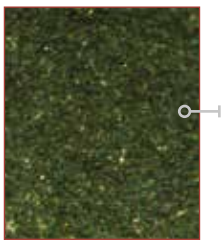
Bearing forms made-to-order: Cylindrical bushes, flanged bearings, thrust washers, sliding plates, half-bearings, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, transportation equipment, apparatus engineering, conveyor equipment and many more

MICROSECTION



OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Good
Process fluid lubricated	Good after resistance testing

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static	N/mm²	125
Operating temperature	Min Max	°C °C	-100 290
Coefficient of linear thermal expansion		10^{-6}/K	14
DRY			
Maximum sliding speed, V		m/s	1,0
Maximum PV factor	for $A_H/A_C = 5$ for $A_H/A_C = 10$ for $A_H/A_C = 20$	N/mm² x m/s N/mm² x m/s N/mm² x m/s	0,09 0,35 1,40
Coefficient of friction, f			0,3 - 0,5
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,1 - 0,5
Shaft surface hardness		HV	> 450

KA Glacetal Bearing Material

ENGINEERED PLASTIC THRUST WASHERS

CHARACTERISTICS

- Good bearing performance in light duty working conditions
- Good performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Very good price performance ratio
- Very good weight performance ratio

AVAILABILITY

Bearing forms available in standard dimensions:

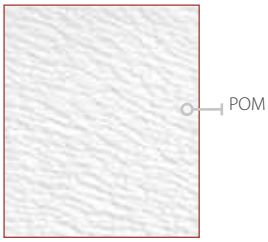
- Plain thrust washers

Non standard parts made-to-order

APPLICATIONS

Industrial: Thrust washers are used as axial bearings in conjunction with all cylindrical bushes according to ISO 3547 to prevent metal-to-metal contact and fretting damage

MICROSECTION



OPERATING PERFORMANCE	
Dry	Fair
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Dry	EP22
Water lubricated	EP22
Process fluid lubricated	EP22

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm^2 N/mm^2	20 10
Operating temperature	Min Max	°C °C	-40 80
GREASED			
Maximum sliding speed, V		m/s	1,5
Maximum PV factor		N/mm^2 x m/s	0,35
Coefficient of friction, f			0,08 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

Multilube Bearing Material

THERMOPLASTIC PLAIN BEARINGS

CHARACTERISTICS

- Good bearing performance in dry working conditions
- Good performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/saline environments
- Good price performance ratio
- Very good weight performance ratio
- Within injection moulding tool feasibility unlimited dimensions and design features

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, flanged bearings, thrust washers, sliding plates, half-bearings, customized bearing designs

APPLICATIONS

Industrial: Linkages, seat suspensions

MICROSECTION

OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Water lubricated	EP22
Process fluid lubricated	EP22

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm^2 N/mm^2	60 30
Operating temperature	Min Max Momentary	°C °C °C	-40 80 120
Coefficient of linear thermal expansion		$10^{-6}/K$	101
DRY			
Maximum sliding speed, V		m/s	1,5
Maximum PV factor		N/mm^2 x m/s	0,6
Coefficient of friction, f			0,1 - 0,2
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

GAR-MAX® Bearing Material

SELF-LUBRICATING FIBERGLASS REINFORCED PLAIN BEARINGS

CHARACTERISTICS

- High load capacity
- Excellent shock and misalignment resistance
- Excellent contamination resistance
- Very good friction and wear properties
- Good chemical resistance
- Very good dry wear performance
- GAR-MAX® bearing sizes available according to DIN ISO 4379 for the replacement of traditional greased bronze bearings

AVAILABILITY

Bearing forms available in standard dimensions:

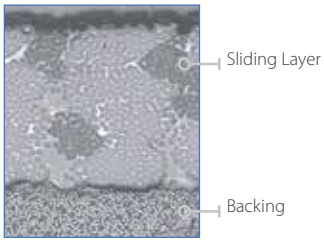
- Plain cylindrical bushes

Non-standard parts made-to-order: Cylindrical bushes with non-standard lengths and wall thickness, customized bushing designs

APPLICATIONS

Industrial: Steering linkages, hydraulic cylinder pivots, king pin bearings, boom lifts, scissor lifts, cranes, hoists, lift gates, backhoes, trenchers, skid steer loaders, front end loaders, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Fair
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Poor

FOR SUPERIOR PERFORMANCE	
Oil lubricated	GAR-FIL
Grease lubricated	DX / DX10
Water lubricated	HPF / HPM
Process fluid lubricated	GAR-FIL

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	210 140
Operating temperature	Min Max	°C °C	-195 160
DRY			
Maximum sliding speed, V		m/s	0,13
Maximum PV factor		N/mm² x m/s	1,05
Coefficient of friction, f			0,05 - 0,3*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness		HB HB	> 350 > 480

GAR-FIL Bearing Material

FIBER REINFORCED COMPOSITE BEARINGS WITH PTFE TAPE LINER

CHARACTERISTICS

- Proprietary filled PTFE tape liner
- High load capacity
- Good chemical resistance
- Machinable bearing surface
- High rotational speed capacity
- Very good friction and wear properties
- Excellent contamination resistance

AVAILABILITY

Bearing forms available in standard dimensions:

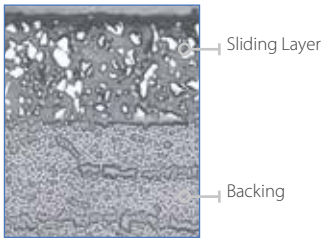
- Cylindrical bushes
- Flanged bushes
- Flanged washers
- Sliding plates
- Thrust washers

Bearing forms made-to-order: Cylindrical bushes with non-standard lengths and wall thickness, flanged bearings, hexagonal and square bores, liner on outer diameter, customized bearing designs

APPLICATIONS

Industrial: Valves, scissor lifts, pulleys, toggle linkages, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Very good
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Very good

FOR SUPERIOR PERFORMANCE	
Grease lubricated	DX / DX10
Water lubricated	HPF / HPM

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	140 140
Operating temperature	Min Max	°C °C	-195 205
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,23
Coefficient of friction, f			0,02 - 0,12*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4
Shaft surface hardness	Normal	HB	> 200

HSG Bearing Material

HIGH-LOAD FIBER REINFORCED COMPOSITE PTFE BEARINGS

CHARACTERISTICS

- Self-lubricating plain bearing material
- High load capacity (twice as much as standard GAR-MAX® bearings)
- Excellent shock and misalignment resistance
- Excellent contamination resistance
- Very good friction and wear properties
- Good chemical resistance

AVAILABILITY

Bearing forms available in standard dimensions:

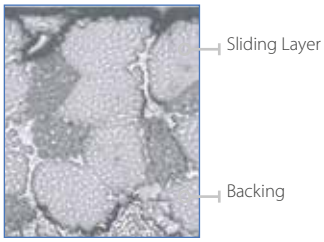
- Plain cylindrical bushes

Non-standard parts made-to-order: Cylindrical bushes with non-standard lengths and wall thickness, flanged bearings, hexagonal and square bores, liner on outer diameter, customized bearing designs

APPLICATIONS

Industrial: Steering linkages, hydraulic cylinder pivots, king pin bearings, boom lifts, scissor lifts, cranes, hoists, lift gates, backhoes, trenchers, skid steer loaders, front end loaders, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Very good
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Oil lubricated	GAR-FIL
Grease lubricated	DX / DX10
Water lubricated	HPF / HPM
Process fluid lubricated	GAR-FIL

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	415 140
Operating temperature	Min Max	°C °C	-195 160
DRY			
Maximum sliding speed, V		m/s	0,13
Maximum PV factor		N/mm² x m/s	1,05
Coefficient of friction, f			0,05 - 0,3*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness	Normal For longer service life	HB HB	> 350 > 480

* Depending on operating conditions

MLG Bearing Material

SELF-LUBRICATING FIBER REINFORCED COMPOSITE BEARINGS

CHARACTERISTICS

- Value engineered filament-wound bearing for lighter duty applications
- High load capacity
- Good misaligment resistance
- Excellent shock resistance
- Good friction and wear properties
- Good chemical resistance

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes with nonstandard lengths and wall thickness, flanged bearings, hexagonal and square bores, liner on outer diameter, customized bearing designs

APPLICATIONS

Industrial: Construction and earth moving equipment, conveyors, cranes, hoists, hydraulic cylinder pivots, etc.

MICROSECTION

OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Good
Grease lubricated	Poor
Water lubricated	Fair
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Grease lubricated	DX / DX10
Water lubricated	HPF / HPM
Process fluid lubricated	GAR-FIL

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	210 140
Operating temperature	Min Max	°C °C	-195 160
DRY			
Maximum sliding speed, V		m/s	0,13
Maximum PV factor		N/mm² x m/s	1,05
Coefficient of friction, f			0,05 - 0,3*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness		HB	> 350

* Depending on operating conditions

HPM Bearing Material

FIBER REINFORCED COMPOSITE HYDRO BEARINGS

CHARACTERISTICS

- Designed for hydropower applications
- High load capacity
- Excellent shock and edge loading capacity
- Low-friction, superior wear rate and bearing life
- Excellent corrosion-resistance
- Dimensionally stable - very low water absorption, low swelling
- Environmentally friendly

AVAILABILITY

Bearing forms available in standard dimensions:

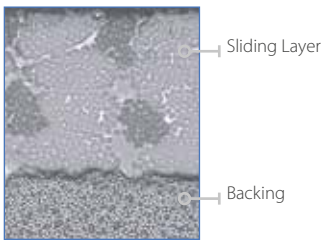
- Plain cylindrical bushes

Non-standard parts made-to-order: Cylindrical bushes with non-standard dimensions, customized bearing designs

APPLICATIONS

Industrial: Servo-motor bearings, operating ring sliding segments, linkage bearings, wicket gate bearings, guide vane bearings, intake gate sliding segments, intake gate roller bearings, spillway gate bearings, trash rate bearings, fish screen bearings, trunnion bearings, blade bearings, injector bearings, deflector bearings, ball and butterfly trunnion bearings, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Fair
Grease lubricated	Poor
Water lubricated	Very good
Process fluid lubricated	Poor

FOR SUPERIOR PERFORMANCE	
Oil lubricated	GAR-FIL / HPF
Grease lubricated	DX / DX10
Process fluid lubricated	GAR-FIL / HPF

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	210 140
Operating temperature	Min Max	°C °C	-195 160
DRY			
Maximum sliding speed, V		m/s	0,13
Maximum PV factor		N/mm² x m/s	1,23
Coefficient of friction, f			0,03 - 0,12*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness	Normal For longer service life	HB HB	> 180 > 480

HPMB® Bearing Material

HIGH PRECISION FIBER REINFORCED COMPOSITE BEARINGS

CHARACTERISTICS

- Machinable inner and outer diameters for superior application precision, circularity and cylindricity tolerances
- Pre-machined high precision HPMB bearings available for immediate installation
- High precision through easy single point machining of the bearing liner, on-site prior to installation
- Superior precision achieved with post-installation (inner diameter tolerance IT7 attainable) single point machining of the bearing liner High load capacity
- Excellent shock and edge loading capacity
- Low-friction with negligible stick-slip
- Low wear rate for extended bearing life
- Excellent corrosion-resistance

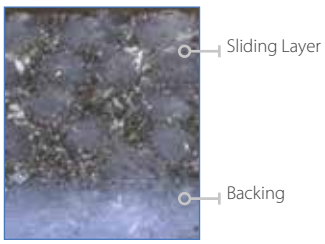
AVAILABILITY

Bearing forms made-to-order: Finished cylindrical bushings, pre-machined cylindrical bushings, flanged cylindrical bushings (subject to design review)

APPLICATIONS

Industrial: Railroad stabilization system, railroad brake linkages, injection molding machines – guide bushings, hydraulic cylinder pivots, water turbines – wicket gates, servomotors, links, water gates, valves

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Fair
Grease lubricated	Not recommended
Water lubricated	Very good
Process fluid lubricated	To be tested by final user

FOR SUPERIOR PERFORMANCE	
Oil lubricated	GAR-FIL / HPF
Grease lubricated	DX / DX10
Process fluid lubricated	GAR-FIL / HPF

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	210 140
Operating temperature	Min Max	°C °C	-196 163
Coefficient of linear thermal expansion		10^{-6}/K	12,6
DRY			
Maximum sliding speed, V		m/s	0,13
Maximum PV factor		N/mm² x m/s	1,23
Coefficient of friction, f			0,03 - 0,12*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness	Normal For longer service life	HB HB	> 180 > 480

* Depending on operating conditions

HPF Bearing Material

FIBER REINFORCED COMPOSITE BEARINGS WITH PTFE TAPE LINER

CHARACTERISTICS

- Proprietary filled PTFE tape machinable liner
- Designed for hydropower applications
- Machinable bearing surface
- High load capacity
- Excellent shock and edge loading capacity
- Low-friction, superior wear rate and bearing life
- Excellent corrosion-resistance
- Dimensionally stable - very low water absorption, low swelling
- Environmentally friendly

AVAILABILITY

Bearing forms available in standard dimensions:

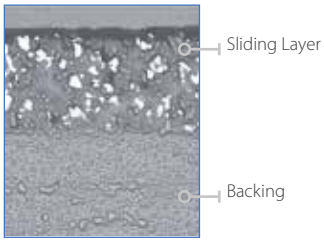
- Plain cylindrical bushes
- Sliding plates

Non-standard parts made-to-order: Cylindrical bushes with non-standard dimensions, customized bearing designs

APPLICATIONS

Industrial: Servo-motor bearings, operating ring sliding segments, linkage bearings, wicket gate bearings, guide vane bearings, intake gate sliding segments, intake gate roller bearings, spillway gate bearings, trash rate bearings, fish screen bearings, trunnion bearings, blade bearings, injector bearings, deflector bearings, ball and butterfly trunnion bearings, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Very good
Grease lubricated	Poor
Water lubricated	Very good
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE	
Grease lubricated	DX / DX10

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	140 140
Operating temperature	Min Max	°C °C	-195 140
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	1,23
Coefficient of friction, f			0,02 - 0,1*
GREASE LUBRICATED			
Coefficient of friction, f			0,02 - 0,08*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness	Normal For longer service life	HB HB	> 180 > 480

* Depending on operating conditions

GGB-MEGALIFE® XT

FIBER REINFORCED COMPOSITE PTFE THRUST WASHERS

CHARACTERISTICS

- Proprietary filled PTFE tape liner on both surfaces
- Excellent shock resistance
- High load capacity
- Excellent misalignment resistance
- Excellent contamination resistance
- Good surface speed capability
- Very good friction and wear properties
- Good chemical resistance

AVAILABILITY

Bearing forms available in standard dimensions:

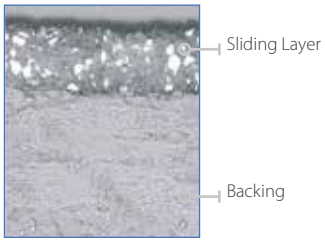
- Plain thrust washers

Bearing forms made-to-order: Thrust washers with non-standard dimensions

APPLICATIONS

Industrial: Pulley spacers, gear spacers, aerial lifts, fork lift masts, king pins, steering links, lift gates, cranes, backhoes, valve actuator linkages, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Fair
Grease lubricated	Poor
Water lubricated	Very good
Process fluid lubricated	Fair

FOR SUPERIOR PERFORMANCE	
Oil lubricated	HPF
Grease lubricated	DX
Process fluid lubricated	HPF

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	140 140
Operating temperature	Min Max	°C °C	-195 175
DRY			
Maximum sliding speed, V		m/s	0,5
Maximum PV factor		N/mm² x m/s	1,23
Coefficient of friction, f			0,02 - 0,12*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4
Shaft surface hardness	Normal	HB	> 200

* Depending on operating conditions

Multifil Bearing Material

PROPRIETARY FILLED PTFE SLIDING BEARING TAPE

CHARACTERISTICS

- Superior sliding bearing material which can be easily bonded to any clean, rigid substrate
- Reduces vibration

AVAILABILITY

Bearing forms available in standard dimensions:

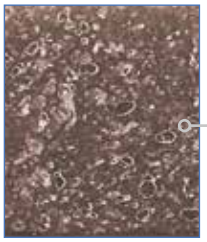
- Bearing tape

Tape with 0,015" to 0,125" (0,38 to 3,2 mm) thickness and 12" (305 mm) width or 24" (610 mm) width

APPLICATIONS

Industrial: Machine tool ways, gibs and other sliding applications

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Good
Process fluid lubricated	Good

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm^2 N/mm^2	70 35
Operating temperature	Min Max	°C °C	-200 280
DRY			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm^2 x m/s	0,32
Coefficient of friction, f			0,07
GREASE / OIL LUBRICATED			
Maximum PU factor		N/mm^2 x m/s	1,25
Coefficient of friction, f			0,05
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,4
Shaft surface hardness		HB	> 200

SBC with GAR-MAX® Bearing Material

SEALED FIBER REINFORCED COMPOSITE BEARINGS

CHARACTERISTICS

- Self-lubricating bearings
- High static load capacity
- Excellent resistance to shock loading and misalignment
- Very good friction and wear properties
- Good chemical resistance
- Sealed to exclude contaminates to offer extended service life
- Environmentally friendly and eliminates need for automated grease system and grease

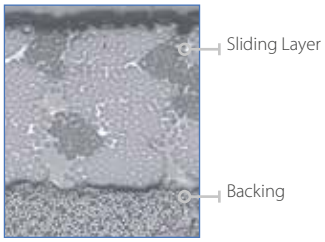
AVAILABILITY

Bearing forms made-to-order: GGB SBC with GAR-MAX® sealed assemblies with or without steel outer shell, customized bearing designs

APPLICATIONS

Industrial: Steering linkages, hydraulic cylinder pivots, king pin bearings, boom lifts, scissor lifts, cranes, hoists, lift gates, backhoes, trenchers, skid steer loaders, front end loaders, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Fair
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Fair

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	210 140
Operating temperature	Min Max	°C °C	93 104
DRY			
Maximum sliding speed, V		m/s	0,13
Maximum PV factor		N/mm² x m/s	1,05
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness	Normal For longer service life	HB HB	> 350 > 480

SBC with HSG Bearing Material

SEALED FIBER REINFORCED COMPOSITE BEARINGS

CHARACTERISTICS

- Self-lubricating bearings
- High static load capacity
- Excellent resistance to shock loading and misalignment
- Very good friction and wear properties
- Good chemical resistance
- Sealed to exclude contaminates to offer extended service life
- Environmentally friendly and eliminates need for automated grease system and grease

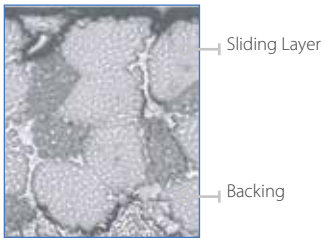
AVAILABILITY

Bearing forms made-to-order: GGB SBC with HSG sealed assemblies with or without steel outer shell, customized bearing designs

APPLICATIONS

Industrial: Steering linkages, hydraulic cylinder pivots, king pin bearings, boom lifts, scissor lifts, cranes, hoists, lift gates, backhoes, trenchers, skid steer loaders, front end loaders, etc.

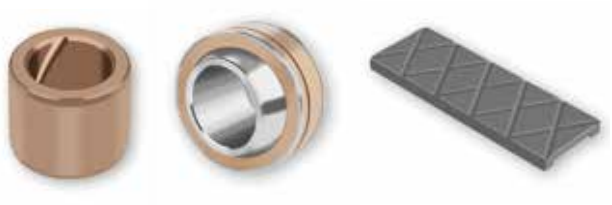
MICROSECTION



OPERATING PERFORMANCE	
Dry	Very good
Oil lubricated	Fair
Grease lubricated	Fair
Water lubricated	Fair
Process fluid lubricated	Fair

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	415 140
Operating temperature	Min Max	°C °C	93 104
DRY			
Maximum sliding speed, V		m/s	m/s 0,13
Maximum PV factor		N/mm² x m/s	1,05
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness	Normal For longer service life	HB HB	> 350 > 480

GGB-CSM® Bearing Material



THICK WALLED MONOMENTAL BEARINGS

CHARACTERISTICS

- Self-lubricating metal bearings produced by metallurgic powder
- Maintenance-free bearings with homogeneously distributed solid lubricant (graphite, MoS2) in the metallic matrix
- High load capacity and temperature ranges up to 600°C possible depending on the alloy
- Corrosion-resistant alloys are available
- Lead-free alloys are available

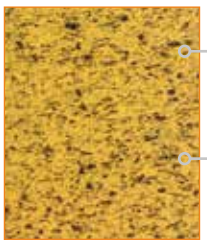
AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, flanged bushes, thrust washers, sliding plates, half-bearings, axial and radial segment rings, self-aligning spherical bearings, special shapes, customized bearing designs

APPLICATIONS

Industrial: General mechanical engineering, applications with elevated temperatures and corrosion risk, exhaust or smoke flaps, valves, turbines, iron foundry, steel and aluminum industry, furnaces, blower, steel works and civil engineering, turbines (water, steam and gas), pumps and compressors, sewage purification plants, thermal treatment furnaces, hot rolling mills, food and beverage industry, packaging equipment, agriculture and construction machines, handling equipment, tire molds, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Depending on alloy
Process fluid lubricated	Depending on fluid or alloy

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm^2 N/mm^2	100 - 260 55 - 130
Operating temperature	Min Max	°C °C	-200 600
Coefficient of linear thermal expansion		$10^{-6}/K$	13 - 18
DRY			
Maximum sliding speed, V		m/s	0,2 - 0,5
Maximum PV factor		N/mm^2 x m/s	0,8 - 1,5
Coefficient of friction, f			0,11 - 0,5
WATER LUBRICATED			
Coefficient of friction, f		m/s	0,08 - 0,18
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HB HRC	> 180 > 45

Bearing properties and recommendations depending on GGB-CSM material grade

GGB-CBM® Bearing Material

THIN WALLED BIMETAL BEARINGS MADE BY METALLURGIC POWDER

CHARACTERISTICS

- Self-lubricating and maintenance-free with homogeneously distributed solid lubricant (graphite) in the sliding layer
- High load capacity and suited to temperatures from -150°C up to 280°C
- Different metallic backings are available: stainless steel, carbon steel or bronze
- Lead-free alloys are available

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, flanged bushes, thrust washers, axial washers, sliding plates, half shells, axial and radial segment rings, spherical bushings, customized bearing designs

APPLICATIONS

Industrial: General mechanical engineering, applications at high loads, iron foundry, steel and aluminum industry, furnaces, blower, steel works, food and beverage industry, packaging equipment, agriculture and construction machines, handling equipment, tire molds, etc.

MICROSECTION

OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Good
Process fluid lubricated	Depending on fluid

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	260 - 280 80 - 150
Operating temperature	Min Max	°C °C	-150 280
Coefficient of linear thermal expansion		10^{-6}/K	12 - 16
DRY			
Maximum sliding speed, V		m/s	0,3 - 0,5
Maximum PV factor		N/mm² x m/s	0,5 - 1,0
Coefficient of friction, f			0,10 - 0,2
WATER LUBRICATED			
Coefficient of friction, f			0,10 - 0,15
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HB	> 180 - > 250

Bearing properties and recommendations depending on GGB-CBM material grade

GGB-BP25 Bearing Material

METAFRAM OIL IMPREGNATED SINTERED BRONZE BEARINGS

CHARACTERISTICS

- Similar to SINT A 50, impregnation group 1
- Maintenance-free bearing for general engineering applications
- Optimum performance under relatively light loads and high speeds
- Produced by powder metallurgy process and therefore suitable for complex shapes

AVAILABILITY

Bearing forms available in standard dimensions:

- Plain cylindrical bushes
- Plain flanged bushes

Non-standard parts made-to-order: Cylindrical bushes and flanged bushes with non-standard dimensions, spherical bearings, tubes and rod blanks, customized bearing designs

APPLICATIONS

Industrial: FHP motor bearings, domestic appliances and hand tools
Plain cylindrical bushes

MICROSECTION

BP25 with composition
Sn 8 - 10,5 %
Other < 2 %
Cu Rest
Impregnation group 1 (up to 80°C)

OPERATING PERFORMANCE

Dry	Good (PTFE / MoS2)
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Not recommended
Process fluid lubricated	Not recommended

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	20 10
Operating temperature	Min Max	°C °C	-180 / 0* 90 / 300*
Minimum density		g/cm³	6,2
Minimum apparent porosity		%	23
OIL IMPREGNATED			
Maximum sliding speed, V		m/s	0,1 - 6,0*
Maximum PV factor		N/mm² x m/s	0,1 - 1,8*
Coefficient of friction, f			0,05 - 0,25*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,3 - ≤ 0,6*
Shaft surface hardness		HB	> 240 - > 355*

Bearing properties depending on oil or solid lubricants

GGB-FP20 Bearing Material

METAFRAM OIL IMPREGNATED SINTERED IRON BEARINGS

CHARACTERISTICS

- Similar to SINT A 50, impregnation group 1
- Maintenance-free bearing for general engineering applications
- Optimum performance under relatively light loads and high speeds
- Produced by powder metallurgy process and therefore suitable for complex shapes

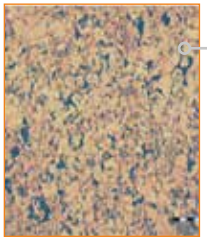
AVAILABILITY

Non-standard parts made-to-order: Plain cylindrical bushes, plain flanged bushes, non standard parts

APPLICATIONS

Industrial: FHP motor bearings, domestic appliances and hand tools

MICROSECTION



Cu 1 - 4 %
C < 0,25 %
Other < 2%
Rest Fe
Impregnation group 1 (up to 80°C)

OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Very good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good

FOR SUPERIOR PERFORMANCE	
Water lubricated	DP4-B

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	45 8,0 - 22,5
Operating temperature	Min Max	°C °C	-180 / -5* 90 / 300*
Minimum density		g/cm³	5,6
Minimum apparent porosity		%	20
OIL IMPREGNATED			
Maximum sliding speed, V		m/s	0,1 -4,0*
Maximum PV factor		N/mm² x m/s	0,1 - 1,8*
Coefficient of friction, f			0,05 - 0,25*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,2 - ≤ 0,3*
Shaft surface hardness		HB	> 240 - > 355*

Bearing properties depending on oil or solid lubricants

GGB-SO16 Bearing Material

METAFRAM OIL IMPREGNATED SINTERED IRON BEARINGS

CHARACTERISTICS

- Maintenance-free bearing for general engineering applications
- Superior performance compared to GGB-FP20 under high loads and low speeds
- Produced by powder metallurgy process and therefore suitable for complex shapes

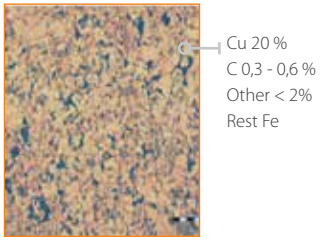
AVAILABILITY

Blanks are made-to-order

APPLICATIONS

Industrial: FHP motor bearings, domestic appliances and hand tools, heavy duty applications: construction equipment, railway equipment, military equipment

MICROSECTION



OPERATING PERFORMANCE

Dry	Not applicable
Oil lubricated	Good (Oil impregnated)
Grease lubricated	Not recommended
Water lubricated	Not recommended
Process fluid lubricated	Not recommended

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	120 60
Operating temperature	Min Max	°C °C	0 105
Minimum density		g/cm³	6
Minimum apparent porosity		%	16
OIL IMPREGNATED			
Maximum sliding speed, V		m/s	0,3
Maximum PV factor		N/mm² x m/s	0,9
Coefficient of friction, f			0,05 - 0,15*
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,2*
Shaft surface hardness		HB	> 355

Bearing properties depending on oil or solid lubricants

GGB-SHB® Bearing Material

CASE HARDENED STEEL BEARINGS

CHARACTERISTICS

- For lubricated applications
- With plain or grooved sliding layer
- Suitable for grease lubrication
- Low rotation speed with high specific pressure

AVAILABILITY

Bearing forms available in standard dimensions:

- Plain cylindrical bushes

Non-standard parts made-to-order: Bearings with various lubrication grooves, non-standard parts

APPLICATIONS

Industrial: Earth moving machinery, excavators and loaders, farming machinery, power harrows, ploughs and harvesters, grabs, buckets and grippers, hydraulic cylinders for the protection against wear of bottoms and eyelets, industrial washing machines, sliding guides for industrial presses, suction pumps, sliding seats, machine tools

MICROSECTION

Steel E410, E470 (20MnV6, AISI A381) acc. to EN 10305

OPERATING PERFORMANCE

Dry	Poor
Oil lubricated	Good
Grease lubricated	Very good
Water lubricated	Not recommended
Process fluid lubricated	Depending on fluid

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	300 150
Tensile strength		N/mm²	550
Operating temperature	Min	°C	150
Density			7,8
Coefficient of linear thermal expansion		%	12
GREASE LUBRICATED			
Maximum sliding speed, V		m/s	0,1
Maximum PV factor		N/mm² x m/s	1,5
Coefficient of friction, f			0,2
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 08
Shaft surface hardness		HRC	58 - 62

Bearing properties depending on oil or solid lubricants

AuGlide® Bearing Material

BIMETAL LEAD-FREE PLAIN BEARINGS

CHARACTERISTICS

- Lead-free
- Machinable
- Design freedom – customizable to meet specific indentation and shape needs
- Capable of supporting high specific loads and high temperatures
- Excellent fatigue strength under dynamic and shock load conditions
- Excellent wear resistance
- Suitable for hydrodynamic operation
- Suitable for oil and grease lubrication
- Superior performance under oscillating movement

AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes and sliding plates with non-standard dimensions, RoHS customized bearing designs

APPLICATIONS

Automotive: Transmissions, king pin, truck brake caliper

Industrial: Agricultural machinery, earth-movers, textile machinery, pneumatic equipment, mechanical handling and lifting equipment, hydraulic cylinders, offhighway equipment, and many more.

- Thin-wall construction permits compact bearing assembly
- Indents in the bearing surface provide a reservoir for grease and thus allow extended re-greasing

MICROSECTION

OPERATING PERFORMANCE	
Dry	Poor
Oil lubricated	Good
Grease lubricated	Very good
Water lubricated	Poor
Process fluid lubricated	Poor

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	300 140
Operating temperature	Min Max greased Max oil lubricated	°C °C °C	- 40 150 250
OIL LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f	Greased Oil		0,05 - 0,12 0,04 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra	Normal	µm	≤ 0,8
Shaft surface hardness	Normal For longer service life		> 200 HB > 350 HB

SY Bearing Material

BIMETAL PLAIN BEARINGS TO STANDARD SAE 792

CHARACTERISTICS

- Bimetal bearing with steel backing and bronze overlay
- Particularly suitable for high specific loads with oscillating motion and low frequency
- Applicable in rough operation conditions
- High load capacity, very good resistance to fatigue strength at higher temperatures

AVAILABILITY

Bearing forms available in standard dimensions:

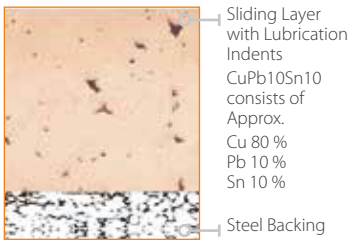
- Cylindrical bushes
- Thrust washers

Bearing forms made-to-order: Cylindrical bushes and thrust washers with non-standard dimensions, sliding plates, customized bearing designs

APPLICATIONS

Industrial: Mechanical handling and lifting equipment, hydraulic cylinders, agricultural equipment, off highway equipment etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Poor
Oil lubricated	Good
Grease lubricated	Very good
Water lubricated	Poor
Process fluid lubricated	Poor

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	300 140
Operating temperature	Min Max greased Max oil lubricated	°C °C °C	-40 150 250
OIL/GREASE LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f	Greased Oil lubricated		0,05 - 0,12 0,04 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,8
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

Bearing properties depending on oil or solid lubricants

SP Bearing Material

BIMETAL PLAIN BEARINGS TO STANDARD SAE 794

CHARACTERISTICS

- Bimetal bearing with steel backing and leaded bronze overlay
- For lubricated applications with plain sliding layer
- Suitable for oil and grease lubrication

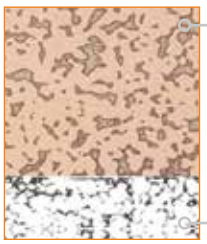
AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, thrust washers, sliding plates, customized bearing designs

APPLICATIONS

Industrial: Mechanical handling and lifting equipment, machine slides, hydraulic cylinders, hydraulic motors, pneumatic equipment, medical equipment, textile machinery, agricultural equipment, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Poor
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Poor
Process fluid lubricated	Poor

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	250 120
Operating temperature	Min Max greased Max oil lubricated	°C °C °C	-40 150 250
GREASED / OIL LUBRICATED			
Maximum sliding speed, V		m/s	2,5
Maximum PV factor		N/mm² x m/s	2,8
Coefficient of friction, f	Greased Oil lubricated		0,05 - 0,12 0,04 - 0,12
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,4
Shaft surface hardness	Normal For longer service life	HB HB	> 200 > 350

Bearing properties depending on oil or solid lubricants

GGB-DB® Bearing Material

CAST BRONZE BEARINGS WITH SOLID LUBRICANT INSERTS

CHARACTERISTICS

- Maintenance-free bearing material for heavy duty applications
- Excellent performance under high loads and intermittent operation
- Also available with graphite inserts for temperatures above 250°C

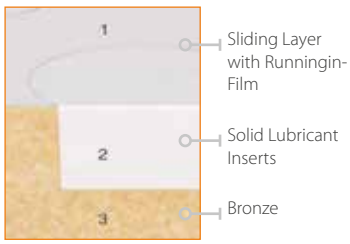
AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes, flanged bushes, thrust washers, sliding plates, pintle bearings, half-bearings, axial and radial segment rings, self-aligning spherical bearings, customized bearing designs

APPLICATIONS

Industrial: Offshore industry, underwater equipment, bridges and civil engineering, iron and steel industry equipment, cranes and conveyors, deep and open cast mining equipment, construction and earthmoving equipment, etc.

MICROSECTION



OPERATING PERFORMANCE	
Dry	Good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Good
Process fluid lubricated	Fair

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, P	Static Dynamic	N/mm² N/mm²	200 100
Operating temperature	Min Max greased	°C °C	-50 350
DRY			
Maximum sliding speed, V		m/s	0,5
Maximum PV factor		N/mm² x m/s	1,5
Coefficient of friction, f			0,05 - 0,18
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness	Normal	HB	> 200

UNI Self-Aligning Bearing Housing

SELF-ALIGNING PILLOW BLOCK BEARING HOUSING

CHARACTERISTICS

- Adjusting bearing for misalignment equalisation
- All-purpose as flange or pedestal bearing, suitable for high loads
- Self-aligning spheric avoids edge load to the bearing
- Adjustable up to ± 5°
- Spheric is secured against distortion
- Depending on choice of housing, spherics and bearings, simple to most demanding bearing solutions are possible
- For optimum design solutions, various bearings from the GGB product program are applicable

Housing Material: **GGG40**
Spherical Material: **16MnCr5**
Corrosion-resistant material possible

AVAILABILITY

Made-to-order

APPLICATIONS

Industrial: Wind energy plants, car washes, cleaning machines, drum systems, bevelling equipment, handling systems, conveyor belts (pulleys), printing machines, heating and ventilation equipment, hoists, cranes, textile machinery, special machine engineering, bakery equipment, marine equipment

LOAD LIMIT VALUES FOR RADIAL FORCES

SIZE	BUSH ID	MAX RADIAL LOAD [N] (HOUSING)	MAX RADIAL LOAD [N] (BOLT)	MAX SHEAR OFF LOAD [N] (BOLT)
1	10 - 25	20 000	10 000	1 000
2	28 - 40	30 000	15 000	1 500
3	45 - 60	50 000	25 000	2 500
4	65 - 80	90 000	45 000	4 500
5	85 - 100	125 000	62 500	6 000

The given data for UNI bearing housings are valid for 12.9 screws (DIN EN 20898, part 1), since the housing stability exceeds the permissible load of the fixing screws.

MINI Self-Aligning Bearing Housing

SELF-ALIGNING PILLOW BLOCK BEARING HOUSING

CHARACTERISTICS

- Adjusting bearing for misalignment equalisation
- All-purpose as flange or pedestal bearing, suitable for high loads
- Self-aligning spheric avoids edge load to the bearing
- Adjustable up to ± 5°
- Spheric is secured against distortion
- Depending on choice of housing, spherics and bearings, simple to most demanding bearing solutions are possible
- For optimum design solutions, various bearings from the GGB product program are applicable

Housing Material: **AlMgSi12**
Spherical Material: **9SMn28K**
Stainless steel and other materials available

AVAILABILITY

Made-to-order

APPLICATIONS

Industrial: Domestic appliances, materials handling equipment, apparatus engineering, slot machines and cash boxes and many more

LOAD LIMIT VALUES FOR RADIAL FORCES

SIZE	BUSH ID	MAX RADIAL LOAD [N] (HOUSING)	MAX RADIAL LOAD [N] (BOLT)	MAX SHEAR OFF LOAD [N] (BOLT)
0	8 - 15	0 10 000	5 000	500

The permissible loads for MINI bearings housings are defined by the housing stability or the strength of the fixing screws (6mm diameter), depending on the load direction.

EXALIGN® Self-Aligning Bearing Housing

SELF-ALIGNING PEDESTAL AND FLANGE BEARING HOUSING

CHARACTERISTICS

- Adjusting bearing for misalignment equalisation
- All-purpose as flange (EXALIGN® DF and FL) or pedestal bearing (EXALIGN® PB), suitable for high loads
- Self-aligning spheric avoids edge load to the bearing
- Adjustable up to ± 5°
- Spheric is secured against distortion
- Depending on choice of housing, spherics and bearings, simple to most demanding bearing solutions are possible
- For optimum design solutions, various bearings from the GGB product program are applicable

Housing Material: **Cast Iron**
Spherical Material: **Cast Iron**
Corrosion-free and corrosion-resistant models possible

AVAILABILITY

Made-to-order

APPLICATIONS

Industrial: Wind energy plants, car washes, cleaning machines, drum systems, bevelling equipment, handling systems, conveyor belts (pulleys), printing machines, heating and ventilation equipment, hoists, cranes, textile machinery, special machine engineering, bakery equipment, marine equipment

LOAD LIMIT VALUES FOR RADIAL FORCES		TYPE PB 2-HOLE PEDESTAL BEARING	TYPE FL/DF 4-HOLE / 2-HOLE FLANGE BEARING
SIZE	**BUSH ID**	**MAX RADIAL LOAD [N]**	**MAX RADIAL LOAD [N]**
1	10 - 15	4 250	3 750
2	20 - 25	7 700	5 900
3	30	9 500	8 000
4	35 - 40	17 000	11 000
5	45	23 000	12 000
6	50	25 000	14 500
7	55 - 60	30 000	16 000
8	70 - 75	38 000	17 000
9	80 - 85	45 500	27 000
10	90 - 100	74 500	30 500

Special Parts to Customer's Requirements

GGB SPECIAL BEARINGS

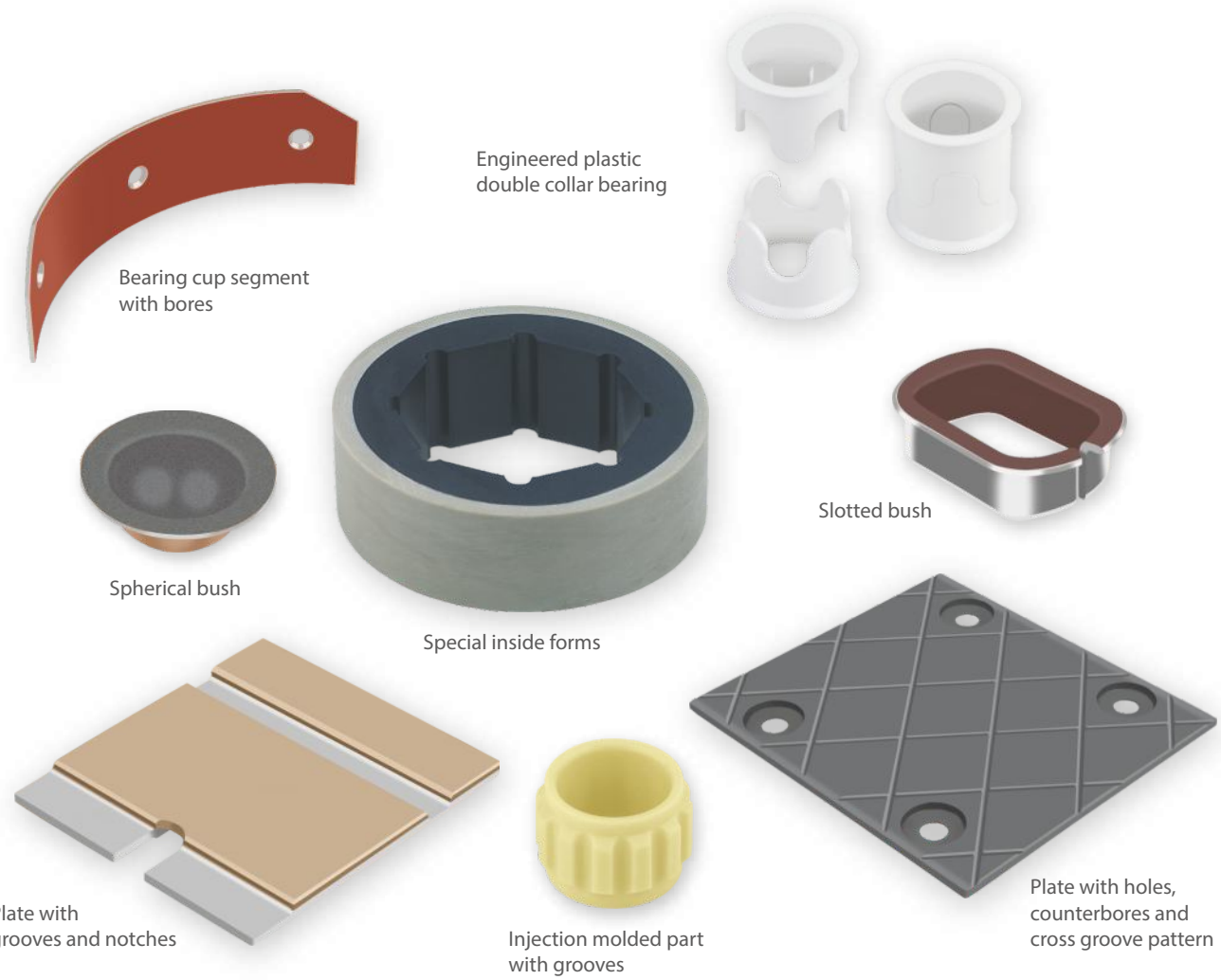
In addition to our broad range of standard bearing solutions, GGB can custom manufacture a variety of non-standard bearings throughout our product range. Our materials and manufacturing engineers help customers identify and develop innovative solutions for the most demanding bearing applications.

Non-standard configurations can be manufactured to any scale – even a single piece – using mono- and bimetallic, metal-polymer, solid polymer, filament wound and even turned parts.

Depending on customer requirements, we can machine, stamp, water jet cut, deep draw or injection mold non-standard parts according to an affordable pricing structure with typically short lead times.

All non-standard components are manufactured under DIN/ISO 14001 and ISO/TS 16949 quality management systems. We can also provide factory certifications and test reports for initial samples according to customer specifications.

Contact our technical support team to discuss non-standard bearing solutions for your application.



Bearing Application Data Sheet

Please complete the form below and share it with your sales engineer.

DATA FOR BEARING DESIGN CALCULATION

Application: .....

.....

Project/No.: ..... Quantity: ..... ☐ New Design ☐ Existing Design

☐ Steady load ☐ Rotating load ☐ Rotational movement ☐ Oscillating movement ☐ Linear movement

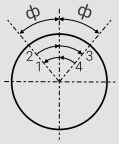
DIMENSIONS [MM]

Inside diameter	D_i	
Outside diameter	D_o	
Length	B	
Flange Diameter	D_{fl}	
Flange thickness	B_{fl}	
Wall thickness	S_T	
Length of slideplate	L	
Width of slideplate	W	
Thickness of slideplate	S_S	

LOAD

☐ Static load ☐ Dynamic load		
Axial load F	[N]	
Radial load F	[N]	

MOVEMENT

Rotational speed	N [1/min]	
Speed	U [m/s]	
Length of stroke	L_S [mm]	
Frequency of stroke	[1/min]	
Oscillating cycle 	ϕ [°]	
Osc. frequence	Nosz [1/min]	

MATING SURFACE

Material		
Hardness	HB/HRC	
Surface finish	Ra [µm]	

FITS & TOLERANCES

Shaft	D_J	
Bearing housing	D_H	

OPERATING ENVIRONMENT

Ambient temperature	T_{amb}[°]	
Bearing housing material		

☐ Housing with good heating transfer properties

☐ Light pressing or insulated housing with poor heat transfer properties

☐ Non metal housing with poor heat transfer properties

☐ Alternate operation in water and dry

LUBRICATION

☐ Dry ☐ Continuous lubrication ☐ Process fluid lubrication ☐ Initial lubrication only ☐ Hydrodynamic conditions		
Process fluid		
Lubricant		
Dynamic viscosity	η[mPas]	

SERVICE HOURS PER DAY

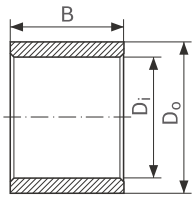
Continuous operation		
Intermittent operation		
Operating time		
Days per year		

SERVICE LIFE

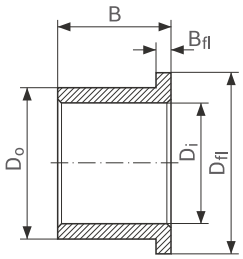
Required service life	L_H [h]	

BEARING TYPE

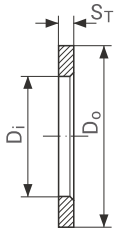
☐ Cylindrical bush



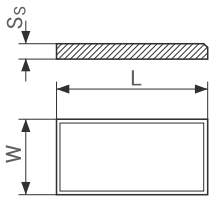
☐ Flanged bush



☐ Thrust washer



☐ Slideplate



☐ Special parts (sketch)

CUSTOMER INFORMATION

Company .....

Street .....

City / State / Province / Post Code .....

Telephone ..... Fax .....

Name .....

Email Address ..... Date .....

Product Information

This document is provided to give you the analysis tools or information to assist you in product selection. Product performance is affected by many factors beyond the control of GGB. Therefore, you must validate the suitability and feasibility of all product selections for your applications.

GGB products are sold subject to GGB's Terms of Sale and Delivery, which include our limited warranty and remedy. You can find these here: **https://www.ggbearings.com/en/terms-and-conditions**, or ask your GGB representative for a copy.

Products are subject to continual development. GGB retains the right to make specification amendments or improvements to the technical data without prior announcement.

DOCUMENT INFORMATION

Edition 2024. This edition replaces earlier editions which hereby lose their validity.

Every reasonable effort has been made to ensure the accuracy of the information in this writing, but GGB assumes no liability for errors or omissions or for any other reason.

HEALTH AND SAFETY

GGB is committed to adhering to all U.S., European and international standards and regulations with regard to lead content. We have established internal processes that monitor any changes to existing standards and regulations, and we work collaboratively with customers and distributors to ensure that all requirements are followed. This includes RoHS and REACH guidelines.GGB is committed to operating in an environmentally conscious and safe manner. We follow numerous industry best practices and are committed to meeting or exceeding a variety of internationally recognized standards for emissions control and workplace safety.

Each of our global locations has management systems in place that adhere to IATF 16949, ISO 9001, ISO 14001 and ISO 45001 quality regulations.
Our certificates can be found here: **https://www.ggbearings.com/en/company/certificates.**

A detailed explanation of our commitment to REACH and RoHS directives can be found at
https://www.ggbearings.com/en/company/qualityand- environment.

POLYMER FUMES

At temperatures up to 250°C the polytetrafluroethylene (PTFE) present in the lining material is completely inert so that even on the rare occasions in which DP4, DP4-B, DP10 or DP11 bushes are drilled or sized after assembly there is no danger in boring or burnishing.

At higher temperatures however, small quantities of toxic fumes can be produced and the direct inhalation of these can cause an influenza type of illness which may not appear for some hours but which subsides without after-effects in 24-48 hours.

Such fumes can arise from PTFE particles picked up on the end of a cigarette. Therefore smoking should be prohibited where DP4, DP4-B, DP10 or DP11 are being machined.

TRADEMARKS

GGB®, TriboShield®, TriboMate®, DP4®, DP4-B, DU®, DU-B, DP10, DP11, DP31, DX®, DX®10, HI-EX®, DTS10®, DS, EP®, EP®12, EP®15, EP®22, EP®30, EP®43, EP®44, EP®63, EP®64, EP®73, EP®79, FLASH-CLICK , KA Glacetal, Multilube, GAR-MAX®, GAR-FIL, HSG, MLG, HPM, HPMB®, HPF, GGB-MEGALIFE® XT, Multifil, SBC with GAR-MAX®, SBC with HSG, GGB-CSM®, GGB-CBM®, GGB-BP25, GGB-FP20, GGB-SHB®, GGB-SO16, AuGlide®, SY, SP, GGB-DB®, UNI, MINI and EXALIGN® are registered trademarks or trademarks, as the case may be, of GGB and its affiliates. TIMKEN® is a registered trademark of The Timken Company.

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Stronger. **Together.**

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Notting Hill, Victoria 3168 Australia

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www.ggbearings.com

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