



 **GGB**



Product Range

OTHER MARKETS





The Tribological Solution Provider for Industrial Progress, Regardless of Shape or Material

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 www.ggbearings.com.

GGB is an [EnPro Industries](#) company (NYSE: NPO).

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](#)
- [Railway](#)
- [Recreation](#)
- [Energy](#)
- [Agricultural](#)
- [Industrial](#)
- [Construction](#)
- [Fluid Power](#)
- [Automotive](#)
- [Primary Metals](#)
- [Oil & Gas](#)

The GGB Advantage



LOWER SYSTEM COST

GGB bearings reduce shaft costs by eliminating the need for hardening and machining grease paths. Their compact, one-piece construction provides space and weight savings and simplifies assembly.



LOW-FRICTION, HIGH WEAR RESISTANCE

Low coefficients of friction eliminate the need for lubrication, while providing smooth operation, reducing wear and extending service life. Low-friction also eliminates the effects of stick-slip or "stiction" during start up.



MAINTENANCE-FREE

GGB bearings are self-lubricating, making them ideal for applications requiring long bearing life without continuous maintenance, as well as operating conditions with inadequate or no lubrication.



ENVIRONMENTAL

Greaseless, lead-free GGB bearings comply with increasingly stringent environmental regulations such as the EU RoHS directive restricting the use of hazardous substances in certain types of electrical and electronic equipment.



CUSTOMER SUPPORT

GGB's flexible production platform and extensive supply network assure quick turnaround and timely deliveries. In addition, we offer local applications engineering and technical support.



The Highest Standards in Quality

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 OHSAS 18001. 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: www.ggbearings.com/en/company/certificates

Tribology at GGB

BY MAKING ADVANCEMENTS IN THE FIELD OF TRIBOLOGY, WE CAN:

- Reduce/control friction, decrease wear, increase lifetime and durability - **Lower overall operating cost**
- Reduce energy losses - **Make our world a little greener**
- Reduce/control stick-slip, improve precision and reduce noise - **Keep people safe, improve comfort and quality of life**



GGB Company History



FOR MORE THAN 115 YEARS, GGB HAS IMPROVED SURFACE ENGINEERING TO MOVE THE WORLD FORWARD.

GGB began in 1899 as Glacier Antifriction Metal Company, producing plain bearings and introducing many successful new products to the market, including internationally recognized polymer materials. Over the past 115 years, our company has continued forming strategic partnerships, continuously expanding into a global network of manufacturing facilities, increasing production capabilities and resources to become who we are today: world leaders in tribological innovation.

Today, our products can be found everywhere – from scientific vessels at the bottom of the ocean to race cars speeding down the tarmac to jumbo jets slicing through the sky to the Curiosity rover exploring the surface of Mars.

Throughout our history, safety, excellence and respect have formed the foundational values for the entire GGB family. They are of paramount importance as we seek to maximize personal possibility, achieve excellence and establish open, creative work environments with the highest safety standards in the industry.

SAFETY

GGB's deep-rooted culture of safety places a relentless focus on creating a secure, healthy work environment for all. A core value of GGB, safety is critical at all levels of business in order to achieve our goal of having the safest employees in the industry.

EXCELLENCE

A world-class organization is built by fostering excellence throughout the company, across all roles. Our world-class manufacturing plants are certified in quality and excellence in the industry according to ISO 9001, IATF 16949, ISO 14001 and OHSAS 18001, allowing us to access the industry's best practices while aligning our quality management system with global standards.

RESPECT

We believe that respect is consistent with the growth of individuals and groups. Our teams work together with mutual respect regardless of background, nationality or function, embracing the diversity of people and learning from one another.

Overview of Bearing Materials & Accessory Products

TRIBOLOGICAL BEARINGS

PRODUCT NAME	METAL-POLYMER BEARINGS	WORKING CONDITIONS	PAGE
DP4®	Steel + Porous Bronze Sinter + PTFE + Fillers	self-lubricating, low-maintenance	9
DP4-B	Bronze + Porous Bronze Sinter + PTFE + Fillers	self-lubricating, corrosion-resistant	10
DU®	Steel + Porous Bronze Sinter + PTFE + Pb	self-lubricating	11
DU-B	Bronze + Porous Bronze Sinter + PTFE + Pb	self-lubricating, corrosion-resistant	12
DP10	Steel + Porous Bronze Sinter + PTFE + Solid Lubricants	self-lubricating, low-maintenance	13
DP11	Steel + Porous Bronze Sinter + PTFE + Solid Lubricants + Fillers	self-lubricating, low-maintenance	14
DP31	Steel + Porous Bronze Sinter + PTFE + Fluoropolymer + Fillers	low-maintenance	15
DX®	Steel + Porous Bronze Sinter + POM with Lubrication indents	low-maintenance, machinable	16
DX®10	Steel + Porous Bronze Sinter + High Tech Polymer with Lubrication indents	low-maintenance, machinable	17
HI-EX®	Steel + Porous Bronze Sinter + PEEK + PTFE + Fillers	low-maintenance, machinable	18
DTS10®	Steel + Porous Bronze Sinter + PTFE + Fillers	low-maintenance, machinable	19
DS	Steel + Porous Bronze Sinter + POM Modified	self-lubricating, low-maintenance	20

PRODUCT NAME	ENGINEERED PLASTIC BEARINGS	WORKING CONDITIONS	PAGE
EP®	PA6.6T + Solid Lubricant + Fillers	self-lubricating	21
EP®12	POM + Solid Lubricant	self-lubricating	22
EP®15	POM + Solid Lubricant	self-lubricating	23
EP®22	PBT + Solid Lubricant	self-lubricating	24
EP®30	PA 6.6 + AF + Solid Lubricant	self-lubricating	25
EP®43	PPS + Solid Lubricant + Fillers	self-lubricating	26
EP®44	PPS + Solid Lubricant + Fillers	self-lubricating	27
EP®63	PEEK + Solid Lubricant + Fillers	self-lubricating	28
EP®64	PEEK + Solid Lubricant + Fillers	self-lubricating	29
EP®73	PAI + Solid Lubricant + Fillers	self-lubricating	30
EP®79	PAI + Solid Lubricant + Fillers	self-lubricating	31
KA Glacetal	POM	self-lubricating, low-maintenance	32
Multilube	POM + Solid Lubricant + Fillers	self-lubricating	33

PRODUCT NAME	FIBER REINFORCED COMPOSITE BEARINGS	WORKING CONDITIONS	PAGE
GAR-MAX®	Continuous wound PTFE and high-strength fibers encapsulated in an internally lubricated, high temperature filled epoxy resin sliding layer + continuous wound fiberglass encapsulated in a high temperature epoxy resin	self-lubricating	34
GAR-FIL	Proprietary filled PTFE tape liner + continuous wound fiberglass encapsulated in a high temperature epoxy resin	self-lubricating	35
HSG	Continuous wound PTFE and high-strength fibers encapsulated in an internally lubricated, high temperature filled epoxy resin sliding layer + continuous wound fiberglass encapsulated in a high temperature epoxy resin	self-lubricating	36
MLG	Continuous wound PTFE and high-strength fibers encapsulated in an internally lubricated, high temperature filled epoxy resin sliding layer + continuous wound fiberglass encapsulated in a high temperature epoxy resin	self-lubricating	37
HPM	Continuous wound PTFE and high-strength fibers encapsulated in an internally lubricated, high temperature filled epoxy resin sliding layer + continuous wound fiberglass encapsulated in a high temperature epoxy resin	self-lubricating	38
HPMB®	Machinable continuous wound PTFE and high-strength fibers encapsulated in an internally lubricated, high temperature filled epoxy resin sliding layer + continuous wound fiberglass encapsulated in a high temperature epoxy resin	self-lubricating	39
HPE	Proprietary filled PTFE tape liner + continuous woven cloth laminate impregnated and cured with epoxy resin	self-lubricating	40
GGB-MEGALIFE®XT	Proprietary filled PTFE tape liner on both sides + continuously woven layer of filament glass fiber encapsulated in a high temperature epoxy resin	self-lubricating	41
Multifil	PTFE + proprietary filler system	self-lubricating	42
SBC with GAR-MAX®	Composite material with sealing SBC bearings are available with GAR-MAX are sealed to exclude containments. SBC are optionally available with a steel outer shell.	self-lubricating, low-maintenance	43
SBC with HSG	Composite material with sealing SBC bearings are available with HSG are sealed to exclude containments. SBC are optionally available with a steel outer shell.	self-lubricating, low-maintenance	44

PRODUCT NAME	METAL & BIMETAL BEARINGS	WORKING CONDITIONS	PAGE
PyroSlide™1100	Powder metallurgical monometallic bearing material consisting of a solid lubricant homogeneously distributed in a metallic matrix	self-lubricating	45
GGB-CSM®	Powder metallurgical monometallic bearing material (bronze, nickel or iron-based) + solid graphite lubricant, MoS ₂	self-lubricating	46
GGB-CBM®	Thin walled powder metallurgical bimetal bearing material stainless steel, carbon steel or bronze with bronze + based backing): + solid graphite lubricant	self-lubricating	47
GGB-BP25	Sintered bronze impregnated with oil, similar to SINT A 50, impregnation group 1	self-lubricating	48
GGB-FP20	Steel alloy sinter impregnated with oil, similar to SINT A 10, impregnation group 1	self-lubricating	49
GGB-SO16	Sintered steel alloy impregnated with oil	self-lubricating	50
GGB-SHB®	Case hardened steel bearings for lubricated applications	conventional lubrication	51
AuGlide™	Steel backing and lead-free bronze overlay	low-maintenance	52
SY	Steel backing and leaded bronze overlay + CuPb10Sn10	low-maintenance	53
SP	Steel backing and leaded bronze overlay + CuPb26Sn2	low-maintenance	54
MBZ-B09	Monometallic material CuSn8	self-lubricating	55
LD®	Monometallic material CuSn8	self-lubricating	56
LDD®	Monometallic material CuSn8	self-lubricating	57
GGB-DB®	Dry bearing material: cast bronze + solid lubricant inserts	self-lubricating	58
Solid Bronze	Solid bronze alloy bearings	conventional lubrication	59

Overview of Bearing Materials & Accessory Products

ACCESSORY PRODUCTS

PRODUCT NAME	BUSHING BLOCKS & THRUST PLATES	WORKING CONDITIONS	PAGE
SICAL®3 / SICAL®3D	Aluminum alloys, for use with different GGB cylindrical bushes	depends on bearing material	60
PICAL®2 / PICAL®3	Aluminum alloys, for use with different GGB cylindrical bushes	depends on bearing material	61

PRODUCT NAME	BEARING ASSEMBLIES	PAGE
UNI	Self-aligning bearing housings	62
MINI	Self-aligning bearing housings	63
EXALIGN®	Self-aligning bearing housings	64

ADDITIONAL INFORMATION	PAGE
Technical Data Sheet	65
Product Information / Fabrication	66

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.

MICROSECTION



- Sliding layer PTFE + Fillers
- Porous Bronze Sinter
- Steel Backing

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
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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, 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.

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	250
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	30
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	1,0
Coefficient of friction, f			0,04 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, U		m/s	5,0
Maximum pU factor		N/mm ² x m/s	10,0
Coefficient of friction, f			0,02 - 0,08
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry	µm	0,3 - 0,5
	Lubricated	µm	≤ 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

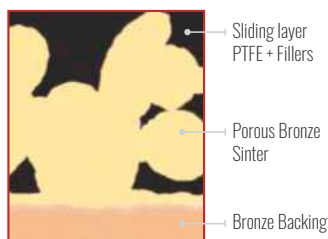
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, flanged-thrust washers, halfbearings, special shapes obtained by stamping or deep drawing, bearings with locating notches, lubricant holes and machined / stamped grooves

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.

MICROSECTION



OPERATING PERFORMANCE

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

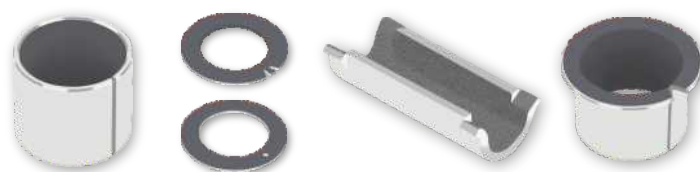
FOR SUPERIOR PERFORMANCE

Water lubricated	DP4-B
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	18
	Normal to the surface	10 ⁻⁶ /K	36
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	1,0
Coefficient of friction, f			0,04 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, U		m/s	5,0
Maximum pU factor		N/mm ² x m/s	10,0
Coefficient of friction, f			0,02 - 0,08*
RECOMMENDATIONS			
Shaft surface roughness, Ra	Dry	µm	0,3 - 0,5
	Lubricated	µm	≤ 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

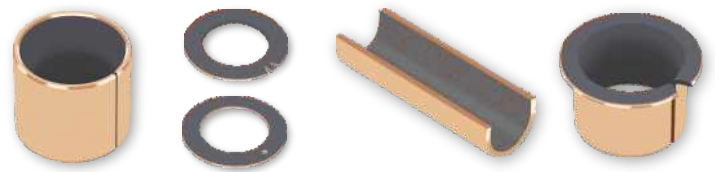
FOR SUPERIOR / LEAD-FREE PERFORMANCE

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	N/mm ²	250
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	30
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	1,8
Coefficient of friction, f			0,02 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, U		m/s	5,0
Maximum pU factor		N/mm ² 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 BRONZE BACKED PTFE 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

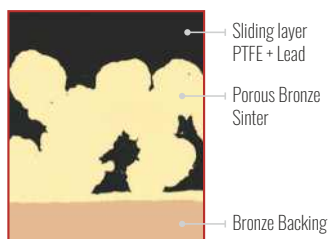
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, flanged-thrust washers, half-bearings, special shapes obtained by stamping or deep drawing, customized bearing designs

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 PERFORMANCE

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	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	18
	Normal to the surface	10 ⁻⁶ /K	36
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	1,8
Coefficient of friction, f			0,02 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, U		m/s	5,0
Maximum pU factor		N/mm ² 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

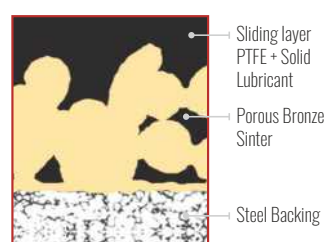


METAL-POLYMER ANTI-FRICTION PLAIN BEARINGS

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

MICROSECTION



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



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.

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	250
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	30
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	1,0
Coefficient of friction, f			0,03 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, U		m/s	5,0
Maximum pU factor		N/mm ² 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

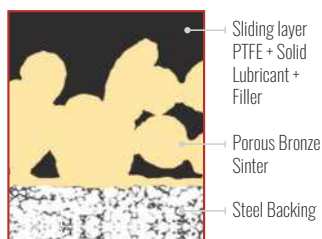
Bearing forms made-to-order: Cylindrical bushes, flanged bushes, thrust washers, flanged-thrust washers, sliding plates, half-bearings, special shapes obtained by stamping or deep drawing, customized bearing designs

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	N/mm ²	250
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	30
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	1,0
Coefficient of friction, f			0,04 - 0,25*
OIL LUBRICATED			
Maximum sliding speed, U		m/s	5,0
Maximum pU factor		N/mm ² 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

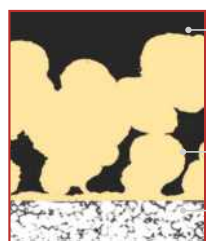


METAL-POLYMER HYDRODYNAMIC COMPOSITE BEARINGS

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

MICROSECTION



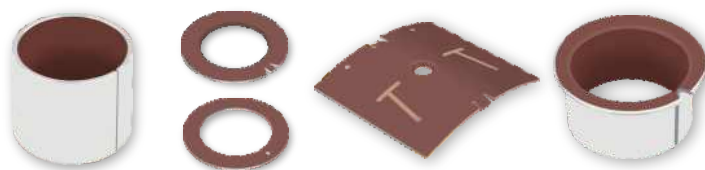
- Sliding layer
PTFE + Solid
Lubricant +
Fluoropolymer
+ Fillers
- Porous Bronze
Sinter
- Steel Backing

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



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.

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	250
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	30
OIL LUBRICATED			
Maximum sliding speed, U		m/s	10,0
Maximum pU 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

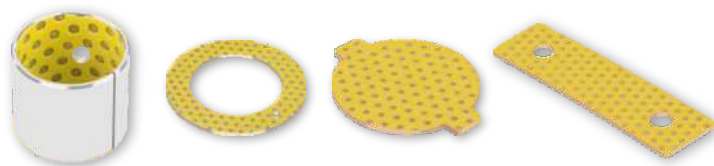
DX[®] Bearing Material



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

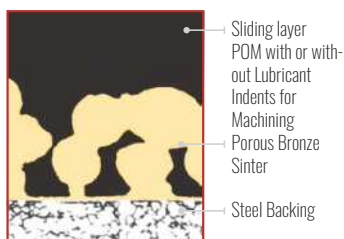
Bearing forms made-to-order: Standard forms in special dimensions, half-bearings, special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs

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	Good
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	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-40
	Max	°C	130
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	29
OIL LUBRICATED			
Maximum sliding speed, U		m/s	2,5
Maximum pU 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,	HB	> 200
	improved bearing life	HB	> 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



Sliding layer
High-Tech
Polymer
with Lubricant
Indents
Porous Bronze
Sinter
Steel Backing

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	N/mm ²	250
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-40
	Max	°C	175
GREASE LUBRICATED			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	2,8
Coefficient of friction, f			0,01 - 0,10
OIL LUBRICATED			
Maximum sliding speed, U		m/s	10,0
Maximum pU factor		N/mm ² 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	HB	> 200
	For longer service life	HB	> 350

HI-EX[®] Bearing Material



METAL-POLYMER HYDRODYNAMIC 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



Sliding layer
PEEK + PTFE
+ Fillers

Porous Bronze
Sinter

Steel Backing

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
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-150
	Max	°C	250
Coefficient of linear thermal expansion	Parallel to the surface	10 ⁻⁶ /K	11
	Normal to the surface	10 ⁻⁶ /K	29
GREASE LUBRICATED			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	2,8
Coefficient of friction, f			0,08 - 0,12
OIL LUBRICATED			
Maximum sliding speed, U		m/s	10,0
Maximum pU factor		N/mm ² 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	HB	> 200
	For longer service life	HB	> 350

* Depending on operating conditions

DTS10[®] Bearing Material



METAL-POLYMER HYDRODYNAMIC 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



- Sliding layer PTFE + Fillers
- Porous Bronze Sinter
- Steel Backing

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/mm ²	140
Operating temperature	Min	°C	-200
	Max	°C	280
FLUID LUBRICATED			
Maximum sliding speed, U		m/s	10,0
Maximum pU factor		N/mm ² 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

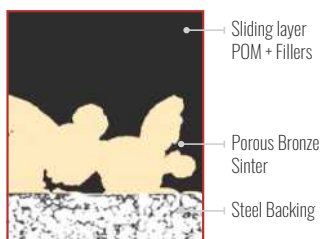
Bearing forms made-to-order: Cylindrical bushes, thrust washers, sliding plates, half-bearings, special shapes obtained by stamping, customized bearing designs

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	N/mm ²	110
	Dynamic	N/mm ²	45
Operating temperature	Min	°C	-60
	Max	°C	130
DRY			
Maximum sliding speed, U		m/s	1,5
Maximum pU factor		N/mm ² x m/s	1,4
Coefficient of friction, f			0,15 - 0,3
GREASE LUBRICATED			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	2,8
Coefficient of friction, f			0,05 - 0,1
OIL LUBRICATED			
Maximum sliding speed, U		m/s	10,0
Maximum pU factor		N/mm ² 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	HB	> 200
	For longer service life	HB	> 350

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



PA 6,6T +
Solid Lubricant
+ Fillers

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
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	80
	Dynamic	N/mm ²	40
Operating temperature	Min	°C	-40
	Max	°C	140
Coefficient of linear thermal expansion		10 ⁻⁶ /K	22
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,06
	for A _H /A _C = 10	N/mm ² x m/s	0,24
	for A _H /A _C = 20	N/mm ² x m/s	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

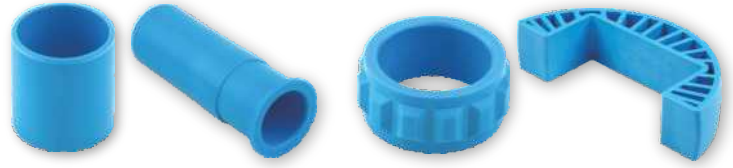
Dry	Very good
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Fair
Process fluid lubricated	Good after resistance testing

FOR SUPERIOR PERFORMANCE

Water lubricated	EP22
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	65
Operating temperature	Min	°C	-40
	Max	°C	125
Coefficient of linear thermal expansion		10 ⁻⁶ /K	120
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,04
	for A _H /A _C = 10	N/mm ² x m/s	0,09
	for A _H /A _C = 20	N/mm ² x m/s	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

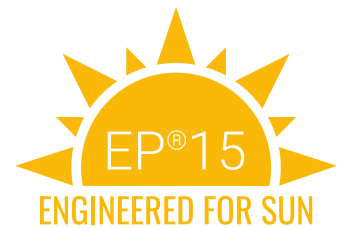
- UV-resistant bearings
- Abrasion-resistant
- Lightweight
- Low coefficient of friction
- Very good bushing performance in dry working conditions
- Good bushing performance in lubricated or marginally lubricated applications
- Corrosion-resistant in humid/ saline environments
- Very good price performance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

AVAILABILITY

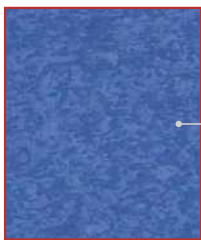
EP[®]15 Bearing forms made-to-order: Cylindrical bushings, flanged bushings, thrust washers, sliding plates, half-bushings, customized bearing designs

APPLICATIONS

Solar Power Equipment, Outdoor Applications, Recreational Applications



MICROSECTION



POM + PTFE +
UV Stabilizer

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
CHARACTERISTICS			
Charpy unnotched impact strength	ISO 179/1eU	kJ/m ²	45
Charpy notched impact strength	ISO 179/1eA	kJ/m ²	4,5
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/cm ³	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/mm ² / 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/mm ² / psi	2750 / 398854
Maximum static load		N/mm ² / 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



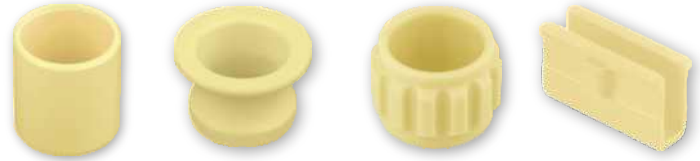
PBT +
Solid Lubricant

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/mm ²	50
Operating temperature	Min	°C	-50
	Max	°C	170
Coefficient of linear thermal expansion		10 ⁻⁶ /K	90
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,05
	for A _H /A _C = 10	N/mm ² x m/s	0,10
	for A _H /A _C = 20	N/mm ² x m/s	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

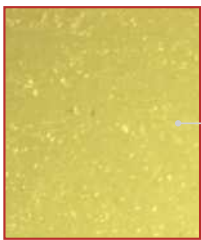
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

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

MICROSECTION



PA 6,6 + AF
Solid Lubricant

OPERATING PERFORMANCE

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

BEARING PROPERTIES

GENERAL

BEARING PROPERTIES		UNITS	VALUE
Maximum load, p	Static	N/mm ²	65
Operating temperature	Min	°C	-50
	Max	°C	200
Coefficient of linear thermal expansion		10 ⁻⁶ /K	40

DRY

Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,05
	for A _H /A _C = 10	N/mm ² x m/s	0,10
	for A _H /A _C = 20	N/mm ² x m/s	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

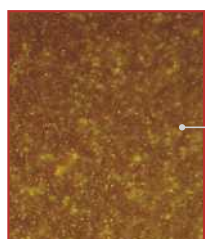
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

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



PPS +
Solid Lubricant
+ Fillers

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/mm ²	83
Operating temperature	Min	°C	-40
	Max	°C	240
Coefficient of linear thermal expansion		10 ⁻⁶ /K	45
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,22
	for A _H /A _C = 10	N/mm ² x m/s	0,90
	for A _H /A _C = 20	N/mm ² x m/s	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 bushings, 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, valve technology, electronics assembly, apparatus engineering and many more

MICROSECTION



PPS +
Solid Lubricant
+ Fillers

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/mm ²	95
Operating temperature	Min	°C	-40
	Max	°C	240
Coefficient of linear thermal expansion		10 ⁻⁶ /K	27
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,11
	for A _H /A _C = 10	N/mm ² x m/s	0,42
	for A _H /A _C = 20	N/mm ² x m/s	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:

- Plain cylindrical bushes
- Plain flanged bushes

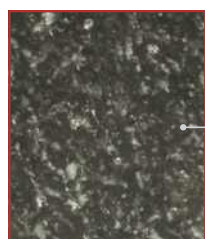
Bearing forms made-to-order: Standard forms in special dimensions, thrust washers, half-bearings, sliding plates, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

Industrial: Domestic appliances, valve technology, electronics assembly, agricultural machinery and many more

MICROSECTION



PEEK +
Solid Lubricant
+ Fillers

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
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	90
Operating temperature	Min	°C	-100
	Max	°C	290
Coefficient of linear thermal expansion		10 ⁻⁶ /K	50
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,16
	for A _H /A _C = 10	N/mm ² x m/s	0,66
	for A _H /A _C = 20	N/mm ² x m/s	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

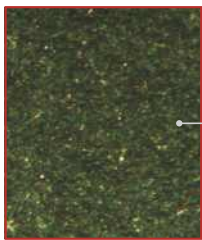
Bearing forms made-to-order: Cylindrical bushes, flanged bearings, thrust washers, sliding plates, half-bearings, customized bearing designs

APPLICATIONS

General: Generally applicable within the limits of the material properties

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

MICROSECTION



PEEK +
Solid Lubricant
+ Fillers

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/mm ²	125
Operating temperature	Min	°C	-100
	Max	°C	290
Coefficient of linear thermal expansion		10 ⁻⁶ /K	14
DRY			
Maximum sliding speed, U		m/s	1,0
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,09
	for A _H /A _C = 10	N/mm ² x m/s	0,35
	for A _H /A _C = 20	N/mm ² x m/s	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

EP[®]73 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 dimensional stability
- 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

Automotive: Automatic gears, pumps, sealing in turbo compressors, piston rings, valve seats, sealings

Industrial: Continuous furnaces, drying furnaces for coating, textile machines and many more

Aerospace: Weight saving by replacement of aluminum or metal alloys, while providing superior stability and viscosity. Applicable in extreme high and low temperatures e.g. turbojet engine compressor blade

MICROSECTION



PAI +
Solid Lubricant
+ Fillers

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
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	105
Operating temperature	Min	°C	-200
	Max	°C	260
Coefficient of linear thermal expansion		10 ⁻⁶ /K	25
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor	for A _H /A _C = 5	N/mm ² x m/s	0,10
	for A _H /A _C = 10	N/mm ² x m/s	0,39
	for A _H /A _C = 20	N/mm ² x m/s	1,57
Coefficient of friction, f			0,19 - 0,31
LUBRICATED			
Maximum sliding speed, U		m/s	5,0
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HV	> 200

EP[®]79 Bearing Material



SELF-LUBRICATING ENGINEERED PLASTIC BEARINGS

CHARACTERISTICS

- Excellent flow erosion and cavitation resistance
- Excellent performance in fully lubricated applications
- Corrosion-resistant in humid/saline environments
- Excellent dimensional stability
- 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

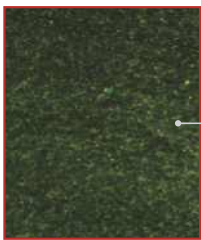
APPLICATIONS

General: Generally applicable within the limits of the material properties

Automotive: Automatic gears

Industrial: Domestic appliances, control valves, fittings, textile machines and many more

MICROSECTION



PAI+
Solid Lubricant
+ Fillers

OPERATING PERFORMANCE

Dry	Not recommended
Oil lubricated	Very good
Grease lubricated	Very good
Water lubricated	Fair
Process fluid lubricated	Good after resistance testing

FOR SUPERIOR PERFORMANCE

Dry	EP73
Water lubricated	EP64

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	130
Operating temperature	Min	°C	-200
	Max	°C	260
Coefficient of linear thermal expansion		10 ⁻⁶ /K	9
DRY			
Maximum sliding speed, U		m/s	10,0
Maximum pU factor		N/mm ² x m/s	10,0
Coefficient of friction, f			0,005 - 0,1
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HV	> 500

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:

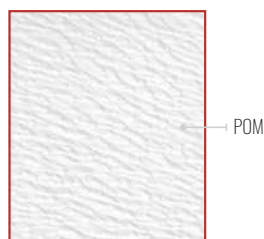
- Plain thrust washers

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



POM

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	N/mm ²	20
	Dynamic	N/mm ²	10
Operating temperature	Min	°C	-40
	Max	°C	80
GREASED			
Maximum sliding speed, U		m/s	1,5
Maximum pU 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	HB	> 200
	For longer service life	HB	> 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

MICROSECTION



POM +
Solid Lubricant
+ Fillers

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



AVAILABILITY

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

APPLICATIONS

Industrial: Linkages, seat suspensions

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	60
	Dynamic	N/mm ²	30
Operating temperature	Min	°C	-40
	Max	°C	80
	Momentary	°C	120
Coefficient of linear thermal expansion		10 ⁻⁶ /K	101
DRY			
Maximum sliding speed, U		m/s	1,5
Maximum pU 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	HB	> 200
	For longer service life	HB	> 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:

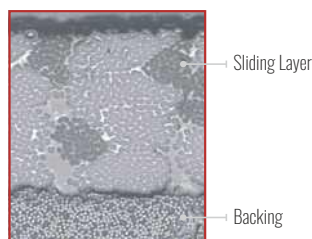
- Plain cylindrical bushes

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	N/mm ²	210
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	160
DRY			
Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² 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	HB	> 350
	For longer service life	HB	> 480

* Depending on operating conditions

GAR-FIL Bearing Material

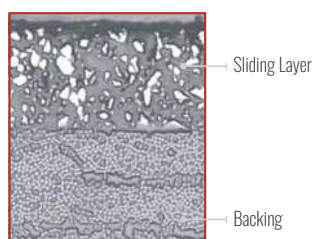


FIBER REINFORCED COMPOSITE BEARINGS WITH PTFE TAPE LINER

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

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



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

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	205
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² 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

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:

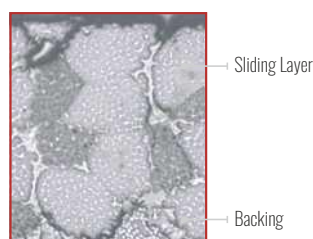
- Plain cylindrical bushes

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	Fair
Grease lubricated	Fair
Water lubricated	Fair
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	N/mm ²	415
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	160
DRY			
Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² 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	HB	> 350
	For longer service life	HB	> 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 misalignment resistance
- Excellent shock resistance
- Good friction and wear properties
- Good chemical resistance

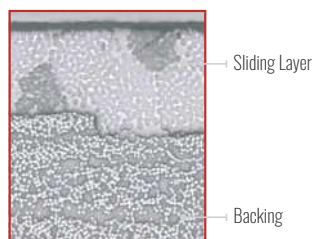
AVAILABILITY

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: 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

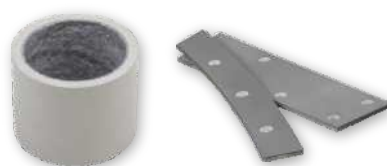
FOR SUPERIOR PERFORMANCE

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

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	210
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	160
DRY			
Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² 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:

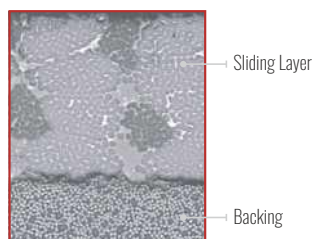
- Plain cylindrical bushes

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	N/mm ²	210
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	160
DRY			
Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² 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	HB	> 180
	For longer service life	HB	> 480

* Depending on operating conditions

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

AVAILABILITY

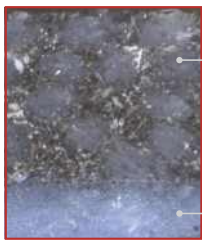
Bearing forms made-to-order: Finished cylindrical bushings, pre-machined cylindrical bushings, flanged cylindrical bushings (subject to design review)

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

- Excellent corrosion-resistance
- Dimensionally stable - very low water absorption, low swelling
- Environmentally friendly grease-free operation

MICROSECTION



Sliding Layer

Backing

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

GENERAL

BEARING PROPERTIES		UNITS	VALUE
Maximum load, p	Static	N/mm ²	210
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-196
	Max	°C	163
Coefficient of linear thermal expansion		10 ⁻⁶ /K	12,6

DRY

Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² 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	HB	> 180
	For longer service life	HB	> 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:

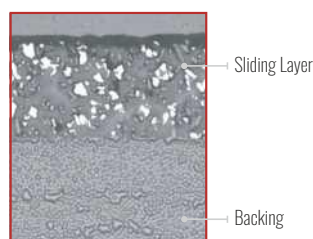
- Plain cylindrical bushes
- Sliding plates

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
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BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	140
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² 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	HB	> 180
	For longer service life	HB	> 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	N/mm ²	140
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-195
	Max	°C	175
DRY			
Maximum sliding speed, U		m/s	0,5
Maximum pU factor		N/mm ² 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	N/mm ²	70
	Dynamic	N/mm ²	35
Operating temperature	Min	°C	-200
	Max	°C	280
DRY			
Maximum sliding speed, U		m/s	2,5
Maximum pU 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 contaminants to offer extended service life
- Environmentally friendly and eliminates need for automated grease system and grease



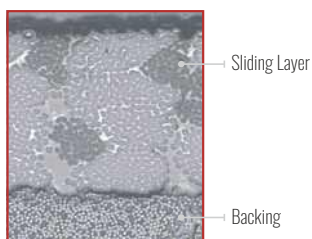
AVAILABILITY

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	N/mm ²	210
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	93
	Max	°C	104
DRY			
Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² x m/s	1,05
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness	Normal	HB	> 350
	For longer service life	HB	> 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 contaminants to offer extended service life
- Environmentally friendly and eliminates need for automated grease system and grease



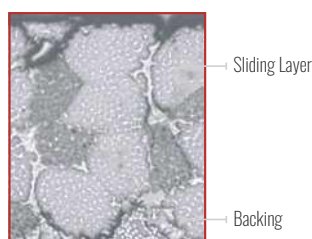
AVAILABILITY

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	N/mm ²	415
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	93
	Max	°C	104
DRY			
Maximum sliding speed, U		m/s	0,13
Maximum pU factor		N/mm ² x m/s	1,05
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,15 - 0,4
Shaft surface hardness	Normal	HB	> 350
	For longer service life	HB	> 480

PyroSlide™1100 Bearing Material

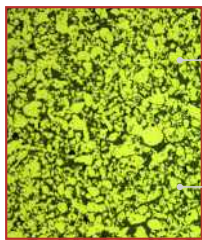


HIGH TEMPERATURE POWDER METAL BEARINGS

CHARACTERISTICS

- Powder metallurgical bearing material consisting of a solid lubricant homogeneously distributed in a metallic matrix
- Self-lubricating and maintenance-free by forming a solid lubricant film during the relative motion
- Excellent high-temperature resistance
- High wear resistance
- Low-friction properties
- Resistant to corrosive environments
- High load capacity
- High dimensional precision

MICROSECTION



Corrosion
Resistant
Metallic Matrix

High
Temperature
Solid Lubricant

OPERATING PERFORMANCE

Designed and intended for dry running applications operating at elevated temperatures



AVAILABILITY

Bearing forms made-to-order: According to customer design/drawing. Regardless of shape size or material, we can customize your shape. High volume production is feasible.

APPLICATIONS

Automotive: EGR valves, exhaust heat recovery systems (EHRS), exhaust throttle valves, exhaust brakes, turbocharger wastegate valves

Industrial: Industrial & domestic ovens and furnaces, natural gas/ petrochemical valves, exhaust or smoke flaps, high temperature valves, heavy-duty engines, applications with elevated temperatures & corrosion risk, industrial processing plant applications, gas and steam turbines

Aerospace: Engine turbo fans, engine guide vanes, engine pneumatic-bleed valves

- No requirement to operate against high cost special counter surface materials with specific hardness requirements, a standard stainless steel counter surface is appropriate

BEARING PROPERTIES		UNIT	VALUE
GENERAL			
Maximum load, p	Static (at 20°C/68°F)	MPa	200
	Dynamic (at 550°C/1022°F)	MPa	10
	Dynamic (at 750°C/1382°F)	MPa	2
Operating temperature		Min	°C / °F
		Max	°C / °F
Coefficient of linear thermal expansion		10 ⁻⁶ /K	16 - 18
DRY			
Maximum sliding speed, U		m/s	0,1
Maximum pU factor		MPa x m/s	0,6
Coefficient of friction, f			0,20 - 0,45
MATING MATERIAL			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness		HB	> 200

Actual values can vary depending on conditions of specific applications.

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

MICROSECTION

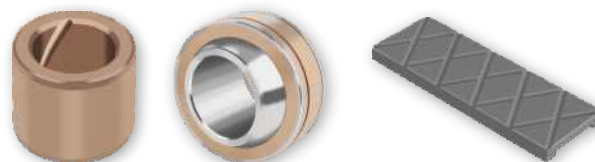


Solid Lubricant:
Graphite, MoS₂

Metallic Matrix:
Bronze, Nickel,
or Iron-based

OPERATING PERFORMANCE

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



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.

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	100 - 260
	Dynamic	N/mm ²	55 - 130
Operating temperature	Min	°C	-200
	Max	°C	600
Coefficient of linear thermal expansion		10 ⁻⁶ /K	13 - 18
DRY			
Maximum sliding speed, U		m/s	0,2 - 0,5
Maximum pU 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			0,08 - 0,18
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	0,2 - 0,8
Shaft surface hardness	HB		> 180
	HRC		> 45

Bearing properties and recommendations depending on GGB-CSM material grade

GGB-CBM[®] Bearing Material



THIN WALLED BIMETAL BEARINGS MADE BY METALLURGIC POWDER

CHARACTERISTICS

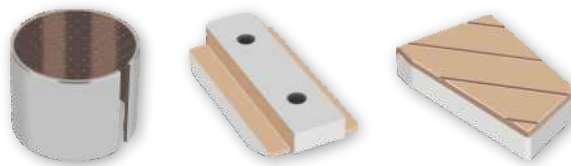
- Self-lubricating and maintenance-free with homogeneously distributed solid lubricant (graphite) in the sliding layer
- High load capacity and suited to temperatures from -150°C up to 280°C
- Different metallic backings are available: stainless steel, carbon steel or bronze
- Lead-free alloys are available

MICROSECTION



OPERATING PERFORMANCE

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



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.

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	260 - 280
	Dynamic	N/mm ²	80 - 150
Operating temperature	Min	°C	-150
	Max	°C	280
Coefficient of linear thermal expansion		10 ⁻⁶ /K	12 - 16
DRY			
Maximum sliding speed, U		m/s	0,3 - 0,5
Maximum pU factor		N/mm ² 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

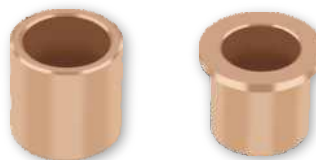
GGB-BP25 Bearing Material



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:

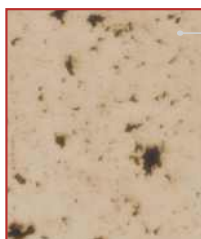
- Plain cylindrical bushes
- Plain flanged bushes

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

MICROSECTION



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

OPERATING PERFORMANCE

Dry	Good (PTFE / MoS ₂)
Oil lubricated	Good
Grease lubricated	Fair
Water lubricated	Not recommended
Process fluid lubricated	Not recommended

BEARING PROPERTIES

GENERAL

		UNITS	VALUE
Maximum load, p	Static	N/mm ²	20
	Dynamic	N/mm ²	10
Operating temperature	Min	°C	-180 / 0*
	Max	°C	90 / 300*
Minimum density		g/cm ³	6,2
Minimum apparent porosity		%	23

OIL IMPREGNATED

Maximum sliding speed, U	m/s	0,1 - 6,0*
Maximum pU factor	N/mm ² 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 (PTFE / MoS ₂)
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	N/mm ²	45
	Dynamic	N/mm ²	8,0 - 22,5
Operating temperature	Min	°C	-180 / -5*
	Max	°C	90 / 300*
Minimum density		g/cm ³	5,6
Minimum apparent porosity		%	20
OIL IMPREGNATED			
Maximum sliding speed, U		m/s	0,1 - 4,0*
Maximum pU factor		N/mm ² 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-S016 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



Cu 20 %
C 0,3 - 0,6 %
Other < 2%
Rest Fe

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

GENERAL

		UNITS	VALUE
Maximum load, p	Static	N/mm ²	120
	Dynamic	N/mm ²	60
Operating temperature	Min	°C	0
	Max	°C	105
Minimum density		g/cm ³	6
Minimum apparent porosity		%	16

OIL IMPREGNATED

Maximum sliding speed, U	m/s	0,3
Maximum pU factor	N/mm ² 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	N/mm ²	300
	Dynamic	N/mm ²	150
Tensile strength		N/mm ²	550
Operating temperature	Min	°C	150
Density			7,8
Coefficient of linear thermal expansion		%	12
GREASE LUBRICATED			
Maximum sliding speed, U		m/s	0,1
Maximum pU factor		N/mm ² x m/s	1,5
Coefficient of friction, f			0,2
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,8
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

MICROSECTION



OPERATING PERFORMANCE

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



AVAILABILITY

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

APPLICATIONS

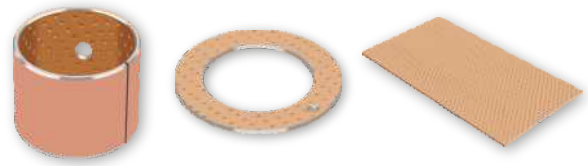
Automotive: Transmissions, king pin, truck brake caliper

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

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

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

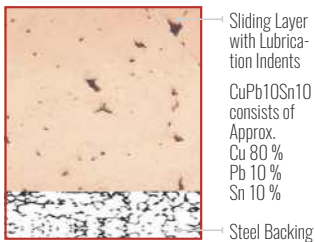
- Cylindrical bushes
- Thrust washers

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

GENERAL

Maximum load, p	Static	N/mm ²	300
	Dynamic	N/mm ²	140
Operating temperature	Min	°C	-40
	Max greased	°C	150
	Max oil lubricated	°C	250

OIL IMPREGNATED

Maximum sliding speed, U	m/s	2,5
Maximum pU factor	N/mm ² x m/s	2,8
Coefficient of friction, f	Greased	0,05 - 0,12
	Oil lubricated	0,04 - 0,12

RECOMMENDATIONS

Shaft surface roughness, Ra	µm	≤ 0,8
Shaft surface hardness	Normal	HB > 200
	For longer service life	HB > 350

Bearing properties depending on oil or solid lubricants

SP Bearing Material



BIMETAL PLAIN BEARINGS TO STANDARD SAE 792

CHARACTERISTICS

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

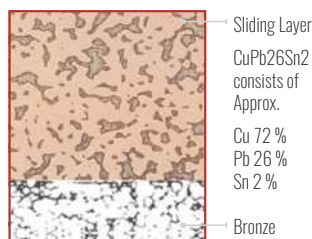
AVAILABILITY

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

Bearing properties depending on oil or solid lubricants

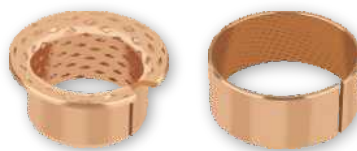
MBZ-B09 Bearing Material



BRONZE BEARINGS MADE OF CuSn8 WITH LUBRICATION INDENTS

CHARACTERISTICS

- Bearing material made of solid bronze strip with indents for lubrication
- Good wear resistance, suitable for rough conditions
- Optimum performance under relatively high loads and low speeds



AVAILABILITY

Bearing forms available in standard dimensions:

- Cylindrical bushes

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

APPLICATIONS

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

MICROSECTION



CuSn8 with
Composition
Sn 8 %
P < 0,05 %
Cu Rest

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	N/mm ²	120
	Dynamic	N/mm ²	40
Operating temperature	Min	°C	-40
	Max greased	°C	150
	Max oil lubricated	°C	250

GREASED / OIL LUBRICATED

Maximum sliding speed, U	m/s	2,5
Maximum pU factor	N/mm ² x m/s	2,8
Coefficient of friction, f		0,06 - 0,15

RECOMMENDATIONS

Shaft surface roughness, Ra		µm	≤ 0,8
Shaft surface hardness	Normal	HB	> 200
	For longer service life	HB	> 350

LD[®] Bearing Material



BRONZE BEARINGS MADE OF CuSn8 WITH GREASE RESERVOIRS

CHARACTERISTICS

- Wear resistant bearing made of solid bronze strip with perforation for lubricated applications
- Improved performance compared with MBZ-B09: larger grease reservoirs increase maintenance intervals, dirt and debris swept into perforations, thereby reducing wear
- Optimum performance under relatively high loads and low speeds

AVAILABILITY

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

APPLICATIONS

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

MICROSECTION



CuSn8 with
Composition
Sn 8 %
P < 0,05 %
Cu Rest

OPERATING PERFORMANCE

Dry	Poor
Oil lubricated	Fair
Grease lubricated	Good
Water lubricated	Poor
Process fluid lubricated	Poor

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	120
	Dynamic	N/mm ²	40
Operating temperature	Min	°C	-40
	Max greased	°C	150
GREASED / OIL LUBRICATED			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	2,8
Coefficient of friction, f			0,06 - 0,15
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,8
Shaft surface hardness	Normal	HB	> 200
	For longer service life	HB	> 350

LDD[®] Bearing Material



BRONZE BEARINGS MADE OF CuSn8 WITH GREASE RESERVOIRS

CHARACTERISTICS

- Wear resistant, perforated bronze bearing material with integrated seals for lubricated applications
- Integrated lip seals reduce installation space, protect the bearing from contamination and prolong service life after greasing
- Suitable for use with all standard greases
- Optimum performance under relatively high loads and low speeds

AVAILABILITY

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

APPLICATIONS

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

MICROSECTION



CuSn8 with
Composition
Sn 8 %
P < 0,05 %
Cu Rest

OPERATING PERFORMANCE

Dry	Not recommended
Oil lubricated	Fair
Grease lubricated	Good
Water lubricated	Poor
Process fluid lubricated	Poor

BEARING PROPERTIES		UNITS	VALUE
GENERAL			
Maximum load, p	Static	N/mm ²	120
	Dynamic	N/mm ²	40
Operating temperature	Min	°C	-40
	Max greased	°C	150
GREASED / OIL LUBRICATED			
Maximum sliding speed, U		m/s	2,5
Maximum pU factor		N/mm ² x m/s	2,8
Coefficient of friction, f			0,06 - 0,15
RECOMMENDATIONS			
Shaft surface roughness, Ra		µm	≤ 0,8
Shaft surface hardness	Normal	HB	> 200
	For longer service life	HB	> 350

GGB-DB® Bearing Material

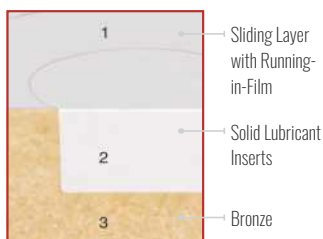


CAST BRONZE BEARINGS WITH SOLID LUBRICANT INSERTS

CHARACTERISTICS

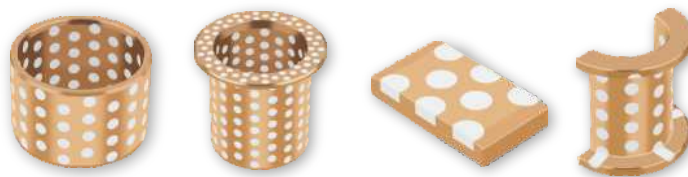
- Maintenance-free bearing material for heavy duty applications
- Excellent performance under high loads and intermittent operation
- Also available with graphite inserts for temperatures above 250°C

MICROSECTION



OPERATING PERFORMANCE

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



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.

BEARING PROPERTIES

GENERAL

Maximum load, p	Static	N/mm ²	200
	Dynamic	N/mm ²	100
Operating temperature	Min	°C	-50
	Max greased	°C	350

DRY

Maximum sliding speed, U	m/s	0,5
Maximum pU factor	N/mm ² 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

Solid Bronze Bearing Material



SOLID BRONZE ALLOY BEARINGS ACCORDING TO ISO 4379

CHARACTERISTICS

- Conventional bearing material for lubricated applications in general engineering applications
- Suitable for oil and grease lubrication



AVAILABILITY

Bearing forms made-to-order: Cylindrical bushes with bronze alloy according to ISO 4379, special parts according to ISO, DIN or customer design, special alloys

APPLICATIONS

Industrial: Mechanical handling and lifting equipment, general and special engineering, agricultural equipment, textile machinery, automotive engineering, etc.

MICROSECTION



CuSn12

OPERATING PERFORMANCE

Dry	Not recommended
Oil lubricated	Good
Grease lubricated	Good
Water lubricated	Not recommended
Process fluid lubricated	Not recommended

BEARING PROPERTIES

UNITS

VALUE

GENERAL

Maximum load, p	Static	N/mm ²	200
	Dynamic	N/mm ²	100
Operating temperature	Min	°C	-40
	Max greased	°C	140

GREASE LUBRICATED

Maximum sliding speed, U	m/s	2,5
Maximum pU factor	N/mm ² x m/s	2,8
Coefficient of friction, f		0,09 - 0,15

RECOMMENDATIONS

Shaft surface roughness, Ra	μm	0,2 - 0,8
Shaft surface hardness	Normal	HB > 350

SICAL®3 / SICAL®3D Bearing Material



PUMP BEARINGS AND BUSHING BLOCKS

CHARACTERISTICS

- Aluminium bearing alloy widely used in external gear pumps and motors
- High strength aluminium alloy with anti-friction and wear resistance properties
- Suitable for use with oil lubrication
- High load capacity
- Good fatigue and wear resistance
- High mechanical strength
- Good friction
- Excellent machinability

MICROSECTION



OPERATING PERFORMANCE

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



AVAILABILITY

Bearing forms made-to-order: High performance engineered solutions and designs with or without assembled bearings according to customers' requirements

APPLICATIONS

Industrial & Automotive: Hydraulic external gear pumps and motors

PICAL[®]2 / PICAL[®]3 Bearing Material



PUMP BEARINGS AND BUSHING BLOCKS

CHARACTERISTICS

- Aluminium bearing alloy widely used in external gear pumps and motors
- High strength aluminium alloy with anti-friction and wear resistance properties
- Suitable for use with oil lubrication
- High load capacity
- High mechanical strength
- Good friction
- Excellent machinability

MICROSECTION



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

AVAILABILITY

Bearing forms made-to-order: High performance engineered solutions and designs with or without assembled bearings according to customers' requirements

APPLICATIONS

Industrial & Automotive: Hydraulic external gear pumps and motors

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 $\pm 5^\circ$
- 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 $\pm 5^\circ$
- 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: 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)
0	8 - 15	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 diection.

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 $\pm 5^\circ$
- 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

Bearing Application Data Sheet



Please complete the form below and share it with your GGB sales engineer or send it to:

germany@ggbearings.com

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]

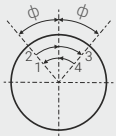
Inside diameter	D_i	
Outside diameter	D_o	
Length	B	
Flange Diameter	D_{fl}	
Flange thickness	B_{fl}	
Wall thickness	S_T	
Length of slideplate	L	
Width of slideplate	W	
Thickness of slideplate	S_s	

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. frequency	N_{osz} [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

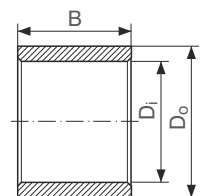
Continuous operation	
Intermittent operation	
Operating time	
Days per year	

SERVICE LIFE

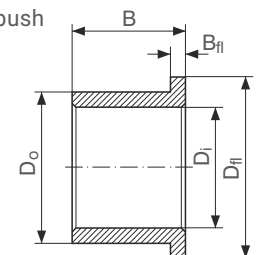
Required service life	L_H [h]	
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BEARING TYPE

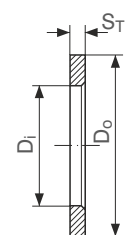
- ☐ Cylindrical bush



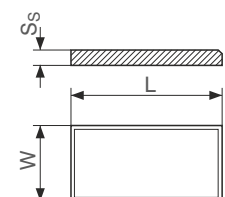
- ☐ Flanged bush



- ☐ Thrust washer



- ☐ Slideplate



- ☐ Special parts (sketch)

CUSTOMER INFORMATION

Company _____

Street _____

City / State / Province / Post Code _____

Telephone _____ Fax _____

Name _____

Email Address _____ Date _____

Product Information

GGB gives an assurance that the products described in this document have no manufacturing errors or material deficiencies.

The details set out in this document are registered to assist in assessing the material's suitability for the intended use. They have been developed from our own investigations as well as from generally accessible publications. They do not represent any assurance for the properties themselves.

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Edition 2019 (This edition replaces earlier editions which hereby lose their validity).

STATEMENT REGARDING LEAD CONTENT IN GGB PRODUCTS & EU DIRECTIVE COMPLIANCE

For shipments to or within the EU: All products with this part number contain lead (CAS no: 7439-92-1) at a concentration greater than 0,1% (w/w). There are no necessary actions at this time, as these products are not expected to be of concern under normal safe usage providing customary workplace safety and hygiene practices are followed, including but not limited to wearing protective gloves to avoid skin contact and always washing your hands after handling these products, especially before eating, drinking, or smoking. When cutting, machining, or thermal operations (e.g. laser cutting, thermal processing, etc.) are performed on this material or components, additional precautions and safety practices must be followed. These additional precautions include but are not limited to: utilization of proper respiratory protection, avoidance of ingestion and inhalation, prolonged skin and eye contact, and proper handling, storage, and disposal of the products. In case you have further questions, please do not hesitate to contact us. Always follow local legal requirements.

FABRICATION

At temperatures up to 250°C the polytetrafluoroethylene (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.

GGB®, 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, SICAL®3, SICAL®3D, PICAL®2, PICAL®3, GGB-CSM®, GGB-CBM®, GGB-BP25, GGB-FP20, GGB-SHB®, GGB-SO16, AuGlide™, SY, SP, GGB-DB®, Solid Bronze, UNI, MINI and EXALIGN® are registered trademarks or trademarks, as the case may be, of GGB and its affiliates.

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