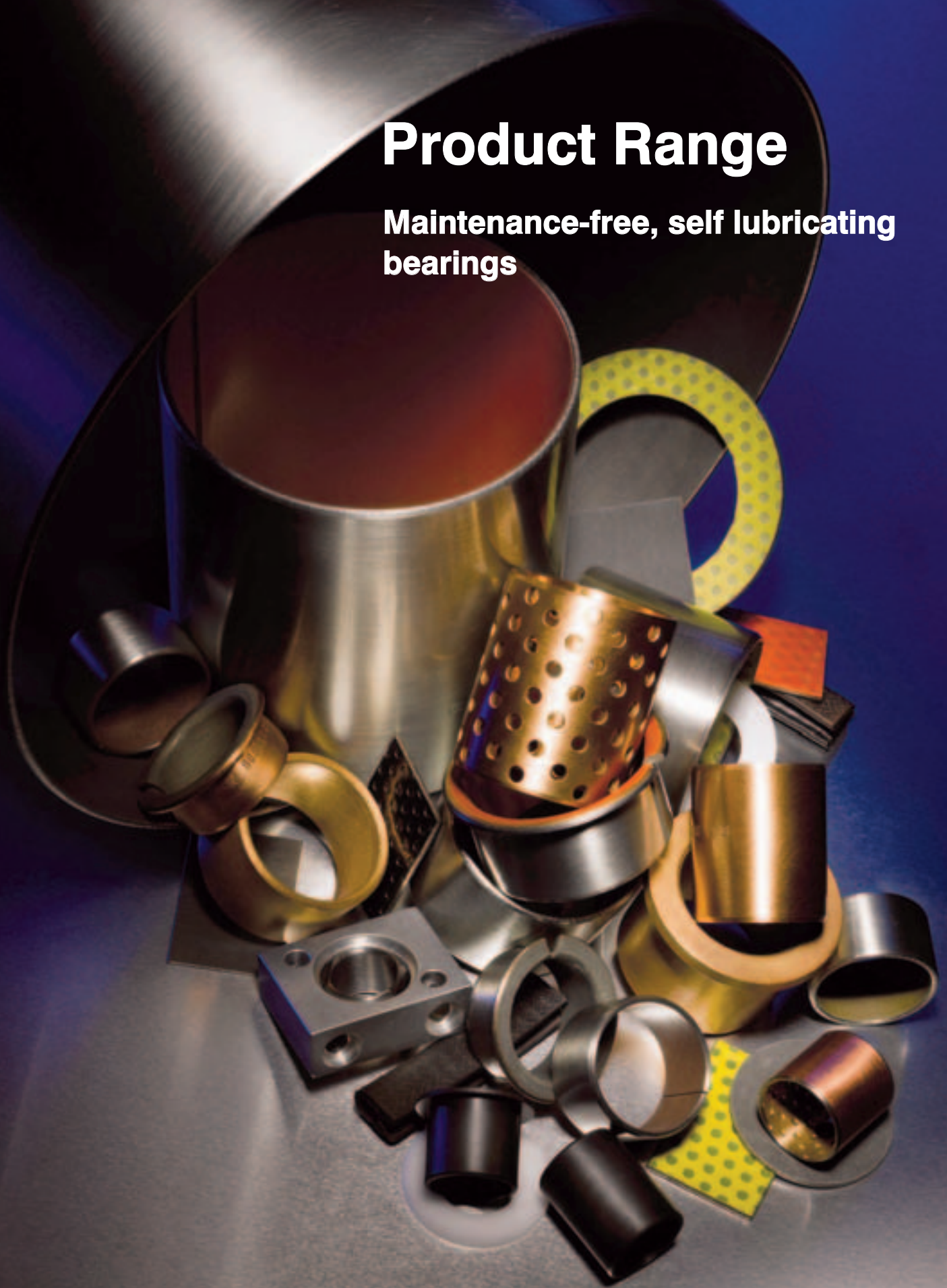


Product Range

Maintenance-free, self lubricating bearings

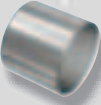
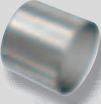
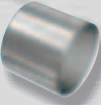
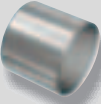
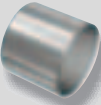
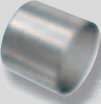


Technical Information

 **GGB**
BEARING TECHNOLOGY

an EnPro Industries company

Customer GGB Service

-  **Standard and special parts**
batch and small batch production according to DIN/ISO or customer drawings
-  **Bearing life calculations**
based on your application specifications
-  **Support service**
our field staff and bearing specialists are always available for you
-  **Continuous advancement**
we strive to improve our bearings and bearing materials to meet the increasing demands of our customers
-  **Worldwide distribution system**
Delivery within 24 hours for standard parts
-  **Comprehensive technical literature**
also available as PDF-files for downloading on our website www.ggbearings.com



Visit us on the internet:
www.ggbearings.com



EnPro Industries, Inc.

is a leading manufacturer of sealings, compressor systems and other applied products. EnPro Industries delivers products for high demanding applications to all industries worldwide.

Besides GGB, Quincy Compressor, Garlock Sealing Technologies, Stemco, Fairbanks Morse Engine, Haber/Sterling, Garlock Rubber Technologies and Plastomer Technologies are part of EnPro industries.

- Registered office in Charlotte, North Carolina
- Annual sales in 2006: 928 Million USD
- 4300 employees
- 29 production facilities
- more than 50,000 customers worldwide

www.enproindustries.com



These certificates are also available for download on our website www.ggbearings.com.

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.

Unless expressly declared in writing, GGB gives no warranty that the products described are suited to any particular purpose or specific operating circumstances. GGB accepts no liability for any losses, damages or costs however they may arise through direct or indirect use of these products.

GGB's sales and delivery terms and conditions, included as an integral part of quotations, stock and price lists, apply absolutely to all business conducted by GGB. Copies can be made available on request.

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

Edition 2007 (This edition replaces earlier editions which hereby lose their validity).

Declaration on the RoHS directive

On July the 1st 2006 the EU directive 2002/95/EG ("RoHS-directive, Restriction of Hazardous Substances") became effective. It forbids to place products into circulation that contain lead, cadmium, chrome(VI), mercury or PBB/PBDE containing flame retardants.

All products of GGB except DU and DUB comply with the EU directives 2002/96/EG (End of life directive on electric and

electronic devices) and 2002/95/EG (constraint of certain hazardous materials in electric and electronic devices).

As an environmentally conscious company, GGB with its company guidelines early worked on a conversion to environmental friendly materials. So today the entire product range is also available as lead-free version.

DU®, DU®B, DP4™, DP4B™, DP31™, DX®, HX™, SY™, SP™, DS™, EP™, EP12™, EP22™, EP43™, EP44™, EP63™, EP64™, EP73™, EP79™, Glacetal KA™, Multilube™, Multifil™, DB™, HSG™, MLG™, HPF™, HPM™, SBC™, MEGALIFE®, UNI™ and MINI™ are trademarks of GGB

GAR-MAX® and GAR-FIL® are trademarks of GGB, made by GGB

EXALIGN™ is a product of Cryptic Arvis Ltd., Leicester, UK

Product Range

Summary of bearing materials and products

Material name	Composition	Working conditions	Page
DU®	Metal-polymer-composite material St + porous bronze sinter + PTFE + Pb	self lubricating	8
DU®B	Metal-polymer-composite material Bz + porous bronze sinter + PTFE + Pb	self lubricating corrosion resistant	8
DP4™	Metal-polymer-composite material St + porous bronze sinter + PTFE modified	self lubricating low-maintenance	8
DP4B™ New! lead free	Metal-polymer-composite material Bz + porous bronze sinter + PTFE modified	self lubricating corrosion resistant	10
DP31™	Metal-polymer-composite material St + porous bronze sinter + PTFE + CaF ₂ + fluoropolymer + fillers	low-maintenance	10
DX®	Metal-polymer-composite material St + porous bronze sinter + POM with lubrication indents	low-maintenance	10
HX™	Metal-polymer-composite material St + porous bronze sinter + PEEK + PTFE + fillers	low-maintenance	12
DS™	Metal-polymer-composite material St + porous bronze sinter + POM modified	self lubricating low-maintenance	12
SY™	Steel-lead-bronze-compound material St + CuPb10Sn10 with lubrication indents	low-maintenance	12
SP™	Steel-lead-bronze-compound material St + CuPb26Sn2	low-maintenance	14
EP™	Injection moulded thermoplastic material PA6.6T + glass fibres + PTFE + graphite	self lubricating	14
EP12™ New!	Injection moulded thermoplastic dry bearing material POM + PTFE	self lubricating	14
EP22™ New!	Injection moulded thermoplastic dry bearing material PBT + PTFE	self lubricating	16
EP43™ New!	Injection moulded thermoplastic dry bearing material PPS + PTFE + Aramid	self lubricating	16
EP44™ New!	Injection moulded thermoplastic dry bearing material PPS + PTFE + Carbon fibres	self lubricating	16
EP63™ New!	Injection moulded thermoplastic dry bearing material PEEK + PTFE + Aramid	self lubricating	18
EP64™ New!	Injection moulded thermoplastic dry bearing material PEEK + PTFE + Graphite + Carbon fibres	self lubricating	18
EP73™	Injection moulded thermoplastic dry bearing material PAI + Graphite + PTFE	self lubricating	18
EP79™ New!	Injection moulded thermoplastic dry bearing material PAI + Carbon fibres + PTFE	self lubricating	20
Glacetal KA™	Polyacetal-Copolymer bearing material (POM)	self lubricating low-maintenance	20
Multilube®	Dry bearing material Proprietary injection molded engineering thermoplastic	self lubricating	20

Product Range

Summary of bearing materials and products

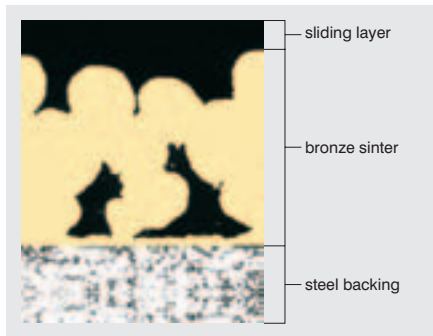
Material name	Composition	Working conditions	Page
Multifil™	Dry bearing material PTFE + proprietary filler system	self lubricating	22
DB™	Dry bearing material Cast bronze + solid lubricant inserts	self lubricating	22
GAR-MAX®	Composite material Backing: fibreglass encapsulated in epoxy resin Sliding layer: continuous wound PTFE and high strength fibres with graphite admixture in epoxy resin	self lubricating	22
HSG™ High Strength GAR-MAX®	Composite material Backing: fibreglass encapsulated in epoxy resin Sliding layer: continuous wound PTFE and high strength fibres in epoxy resin	self lubricating	24
GAR-FIL®	Composite material PTFE + proprietary filler system + glass fibre filament wound and impregnated with epoxy resin	self lubricating	24
MLG™	Composite material Continuous wound PTFE, high-strength fibers encapsulated in high temperature epoxy resin	self lubricating	24
HPF™	Composite material Proprietary filled PTFE tape liner, continuous woven glass fibre encapsulated in high temperature epoxy resin	self lubricating	26
HPM™	Composite material Proprietary filled PTFE tape liner, continuous woven glass fibre encapsulated in high temperature epoxy resin	self lubricating	26
MEGALIFE® XT	Composite material Backing: fibreglass encapsulated in epoxy resin Sliding layer: proprietary filled PTFE	self lubricating	26
SBC™ Sealed Bearing Cartridges	Composite material with sealing Backing: see GAR-MAX and HSG Sliding layer: see GAR-MAX and HSG	self lubricating low-maintenance	28
Sintered Bronze Bearings	Bronze sinter impregnated with oil similar to Sint A50, impregnation group 1	self lubricating (impregnated with oil)	28
Machined Bronze Bearings acc. to ISO 4379	Solid bronze alloy bearings	conventional lubrication	28
Other Products			
Bushing Blocks	Bushing blocks made from aluminium alloys for use with different GGB cylindrical bushes	depends on used bearing material	30
EXALIGN™-, UNI™- and MINI™- bearing housings	Self-aligning bearing housings	self lubricating initial lubrication	32
Information			
Special Parts			34
Data Sheet			35

Product Range

DU® Bearing Material

Structure

Metal-polymer-composite material
Steel + porous bronze sinter + PTFE + Pb



Features

- Dry bearing material with very good wear and friction performance over a wide range of loads, speeds and temperature conditions
- DU® also performs well with lubrication
- Available from stock in a wide range of standard sizes

Possible Applications

Industrial:

Lifting equipment, hydraulic pumps and motors, pneumatic equipment, medical equipment, textile machinery, agricultural equipment, scientific equipment, drying ovens, office equipment, etc.

Availability

Ex stock:

Standard cylindrical bushes, roll-formed bushes, flanged bushes, thrust washers, flanged washers, strip

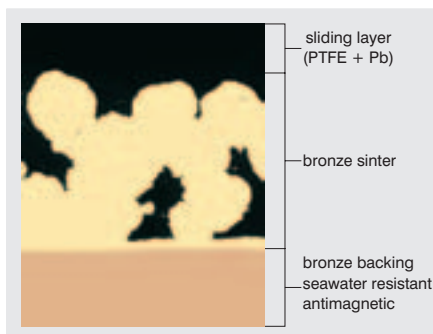
To order:

Non-standard parts

DU®B Bearing Material

Structure

Metal-polymer-composite material
Bronze + porous bronze sinter + PTFE + Pb



Features

- Dry bearing material with very good wear and friction performance over a wide range of load, speed and temperature conditions
- DU®B also performs well with lubrication
- Bronze backing provides improved corrosion resistance compared with DU®
- Available from stock in a wide range of standard sizes
- Antimagnetic

Possible Applications

Industrial:

see DU®

Others:

Applications in water, outdoor applications such as weir chains, marine hoist, wipers, data transmission systems, food industry, packaging industry, etc.

Availability

Ex stock:

Standard cylindrical bushes, flanged bushes and strip

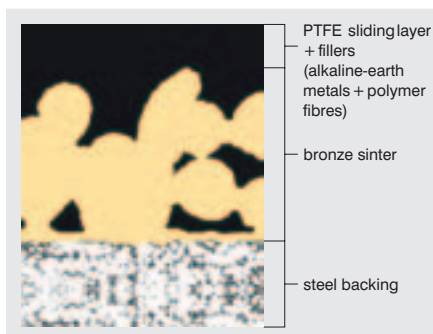
To order:

Thrust washers, flanged washers and non-standard parts

DP4™ Bearing Material

Structure

Metal-polymer-composite material
Steel + porous bronze sinter + PTFE modified



Features

- Lead-free [Compliance with the European Parliament's End of Life Vehicles directive (ref: 2000/53/EC) on the elimination of hazardous materials in the construction of passenger cars and light trucks]
- Lubricated bearing material with good wear and friction performance over a wide range of load, speed and temperature conditions
- Particularly suitable for intermittent operation (reciprocating or oscillating movements)
- DP4™ offers improved friction and wear performance along with good chemical resistance compared to DU in lubricated applications
- DP4™ also performs well dry under light duty applications
- Very good performance in oil lubricated heavy duty hydraulic applications
- DP4™ offers benefits in applications where corrosion of the lead in DU® may occur

Possible Applications

Automotive:

McPherson struts and shock absorbers, door, bonnet and tailgate hinges, steering columns, clutches, gearbox selector fork guides, wiper arms, power steering pumps, pedal bushes, ABS equipment, etc.

Industrial:

Lifting equipment, hydraulic pumps and motors, pneumatic equipment, medical equipment, textile machinery, agricultural equipment, scientific equipment, drying ovens, office equipment, etc.

Availability

Ex stock:

Cylindrical bushes, flanged bushes, thrust washers, flanged washers and strip

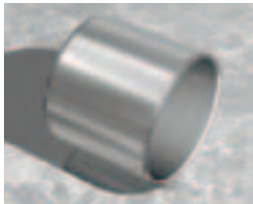
To order:

Non-standard parts

Bearing properties	Units	Value
Maximum load \bar{p}	- static	250
	- dynamic	140
Maximum sliding speed U	m/s	2.5
Maximum $\bar{p}U$ factor	- dry, continuous operation	1.8
	- dry, intermittent operation	3.5
Maximum temperature T_{max}	°C	+280
Minimum temperature T_{min}	°C	- 200
Coefficient of friction f	- dry	0.02 - 0.25
	- oil lubricated	0.02 - 0.12
Shaft surface finish Ra	μm	≤ 0.4
Shaft hardness	HB	hardened and un-hardened possible

Usage

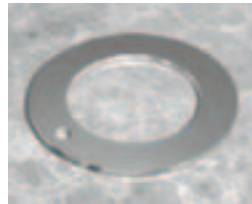
dry	very good
oil lubricated	good
grease lubricated	fair
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes



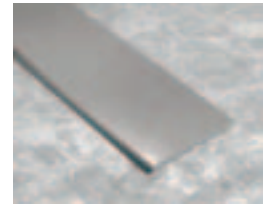
Flanged bushes



Thrust washers



Flanged washers



Strips

Bearing properties	Units	Value
Maximum load \bar{p}	- static	140
	- dynamic	140
Maximum sliding speed U	m/s	2.5
Maximum $\bar{p}U$ factor	- dry, continuous operation	1.8
	- dry, intermittent operation	3.5
Maximum temperature T_{max}	°C	+280
Minimum temperature T_{min}	°C	- 200
Coefficient of friction f	- dry	0.02 - 0.25
	- oil lubricated	0.02 - 0.12
Shaft surface finish Ra	μm	≤ 0.4
Shaft hardness	HB	hardened and un-hardened possible

Usage

dry	very good
oil lubricated	good
grease lubricated	fair
water lubricated	good
process fluid lubricated	fair



Cylindrical bushes



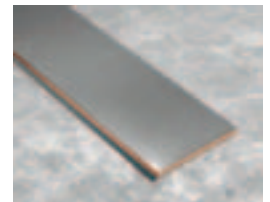
Flanged bushes



Thrust washers



Flanged washers

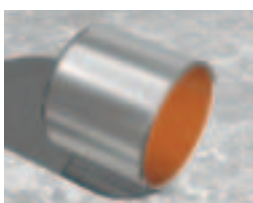


Strips

Bearing properties	Units	Value
Maximum load \bar{p}	- static	250
	- dynamic	140
Maximum sliding speed U	- dry	2.5
	- oil lubricated	5.0
Maximum $\bar{p}U$ factor	- dry	1.0
	- oil lubricated	10.0
Maximum temperature T_{max}	°C	+280
Minimum temperature T_{min}	°C	- 200
Coefficient of friction f	- dry	0.04 - 0.25
	- oil lubricated	0.02 - 0.08
Shaft surface finish Ra	μm	≤ 0.4
Shaft hardness	HB	>200

Usage

dry	good
oil lubricated	very good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good



Cylindrical bushes



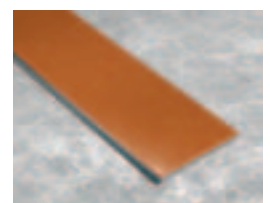
Flanged bushes



Thrust washers



Flanged washers



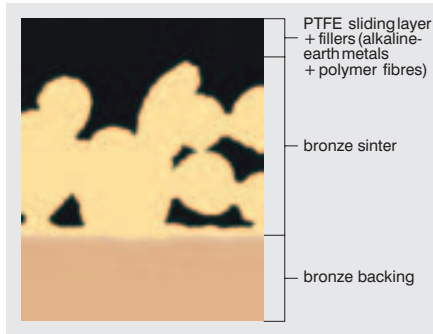
Strips

Product Range

DP4B™ Bearing Material

Structure

Metal-polymer-composite material
Bz + porous bronze sinter + PTFE modified



Features

- Dry bearing material with good wear and friction performance over a wide range of load, speed and temperature conditions
- DP4B™ also performs well with lubrication
- Bronze backing provides improved corrosion resistance compared with DP4™
- Antimagnetic
- Seawater resistant

Possible Applications

Industrial:
see DUB®

Others:

Applications in water, outdoor applications such as weir chains, marine hoist, wipers, data transmission systems, food industry, packaging industry, etc.

Availability

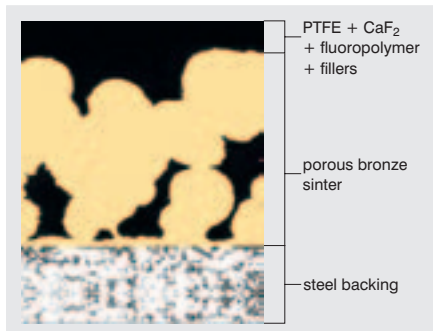
Ex stock:
Standard cylindrical bushes, flanged bushes and strip partly

To order:
Thrust washers, flanged washers and non-standard parts

DP31™ Bearing Material

Structure

Metal-polymer-composite material
Steel + porous bronze sinter + PTFE + CaF₂ + fluoropolymer + fillers



Features

- Lead-free [Compliance with the European Parliament's End of Life Vehicles directive (ref: 2000/53/EC) on the elimination of hazardous materials in the construction of passenger cars and light trucks]
- Excellent wear resistance in lubricated hydraulic applications
- Excellent chemical resistance
- Excellent cavitation and flow erosion resistance
- Low friction coefficient
- Good fatigue strength

Possible Applications

Automotive:

McPherson struts and shock absorbers, door, bonnet and tailgate hinges, steering columns, clutches, gearbox selector fork guides, wiper arms, power steering pumps, pedal bushes, ABS equipment, etc.

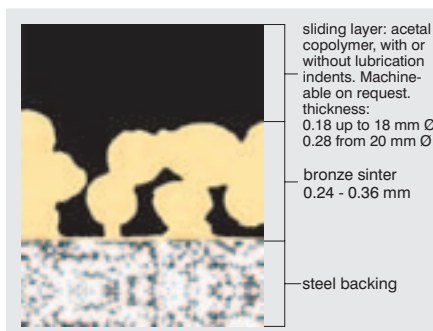
Availability

To order:
Cylindrical bushes, flanged bushes, thrust washers, flanged washers, strip, non-standard parts

DX® Bearing Material

Structure

Metal-polymer-composite material
Steel + porous bronze sinter + POM with lubrication indents



Features

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

Possible 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.

Availability

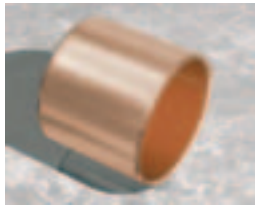
Ex stock:
Cylindrical standard bushes, roll-formed bushes, thrust washers and strip

To order:
Non-standard parts

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic	MPa	140
Maximum sliding speed U	- dry	m/s	2.5
	- oil lubricated		5.0
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.0
	- oil lubricated		10.0
Maximum temperature T_{max}		°C	+280
Minimum temperature T_{min}		°C	- 200
Coefficient of friction f	- dry	-	0.04 - 0.25
	- oil lubricated	-	0.02 - 0.08
Shaft surface finish Ra		µm	≤ 0.4
Shaft hardness		HB	>200

Usage

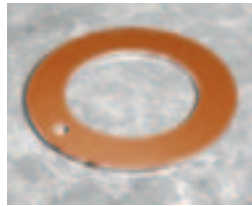
dry	good
oil lubricated	very good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good



Cylindrical bushes



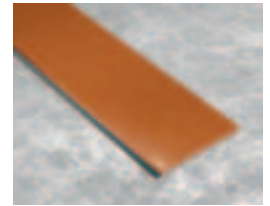
Flanged bushes



Thrust washers



Flanged washers

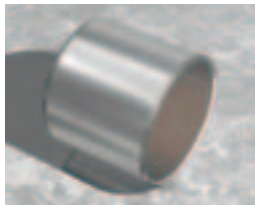


Strips

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	250
	- dynamic	MPa	140
Maximum sliding speed U	- oil lubricated	m/s	10
Maximum $\bar{p}U$ factor	- oil lubricated	MPa x m/s	10
Maximum temperature T_{max}		°C	+280
Minimum temperature T_{min}		°C	- 200
Coefficient of friction f	- oil lubricated	-	0.01 - 0.05
Shaft surface finish Ra		µm	≤ 0.4
Shaft hardness		HB	>200

Usage

dry	fair
oil lubricated	very good
grease lubricated	fair
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes



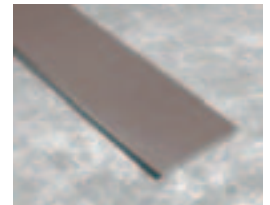
Flanged bushes



Thrust washers



Flanged washers

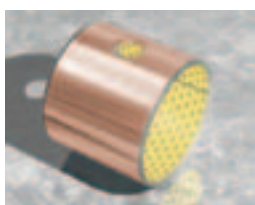


Strips

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic	MPa	70
Maximum sliding speed U	- greased	m/s	2.5
Maximum $\bar{p}U$ factor	- greased	MPa x m/s	2.8
Maximum temperature T_{max}		°C	+130
Minimum temperature T_{min}		°C	- 40
Coefficient of friction f	- greased	-	0.06 - 0.12
Shaft surface finish Ra		µm	≤ 0.4
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

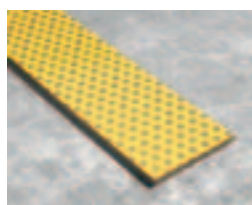
dry	poor
oil lubricated	good
grease lubricated	very good
water lubricated	poor
process fluid lubricated	poor



Cylindrical bushes



Thrust washers



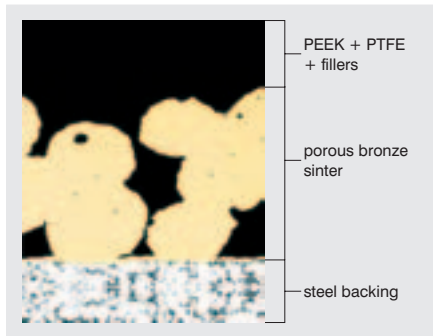
Strips

Product Range

HX™ Bearing Material

Structure

Metal-polymer-composite material
Steel + porous bronze sinter + PEEK + PTFE + fillers



Features

- Marginally lubricated bearing material with good wear resistance under thin lubrication film conditions
- For hydrodynamic applications also available with plain sliding layer
- Suitable for use with low viscosity fluids
- Suitable for use at temperatures up to 250°C
- Bearing polymer lining has good chemical resistance

Possible Applications

Automotive:

Diesel fuel pumps, gear pumps, ABS equipment

Industrial:

Hydraulic motors and pumps, agricultural equipment, wind energy equipment, yaw and teeter bearings

Availability

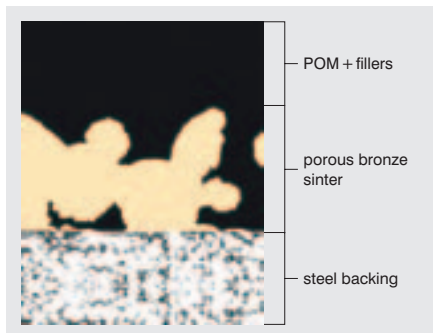
To order:

Cylindrical bushes, thrust washers, strip and non-standard parts

DS™ Bearing Material

Structure

Metal-polymer-composite material
Steel + porous bronze sinter + POM modified



Features

- Self-lubricating bearing material for operation in mixed film lubrication conditions
- Suitable for marginally lubricated and dry operating conditions
- The sliding layer is machinable (ca. 0.4 mm above bronze sinter layer)
- DS™ does not cause fretting corrosion damage to the shaft under low amplitude oscillating movements
- Performance is similar to DX® but with lower friction

Possible 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.

Availability

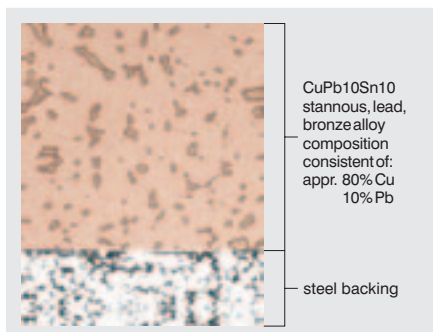
To order:

Cylindrical bushes, thrust washers, strip and non-standard parts (all forms also available with lubrication indents)

SY™ Bearing Material

Structure

Steel-lead-bronze-compound material
St + CuPb10Sn10 with indents



Features

- Steel-lead-bronze-compound with indents as reservoir for the grease
- High load capacity, very good resistance to fatigue strength at higher temperatures
- Applicable in rough operation conditions
- Particularly suitable for high specific loads with oscillating motion and low frequency

Possible Applications

Industrial:

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

Availability

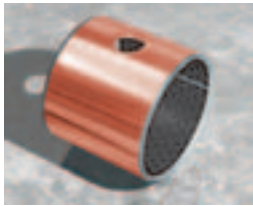
To order:

Cylindrical bushes, thrust washers, strip and special parts

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic	MPa	100
Maximum sliding speed U	- greased	m/s	2.5
	- oil lubricated	m/s	10.0
Maximum $\bar{p}U$ factor	- greased	MPa x m/s	2.8
Maximum temperature T_{max}		°C	+250
Minimum temperature T_{min}		°C	- 150
Coefficient of friction f	- greased / oil lubricated	-	0.08-0.12 / 0.03-0.08
Shaft surface finish Ra		µm	≤0.4
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

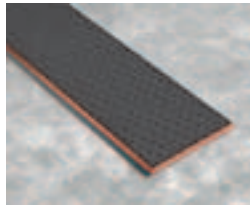
dry	fair
oil lubricated	good
grease lubricated	very good
water lubricated	good
process fluid lubricated	good



Cylindrical bushes



Thrust washers



Strips

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	110
	- dynamic	MPa	45
Maximum sliding speed U	- dry	m/s	1.5
	- greased / oil lubricated	m/s	2.5 / 10
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.4
	- greased / oil lubricated	MPa x m/s	2.8 / 10.0
Maximum temperature T_{max}		°C	+130
Minimum temperature T_{min}		°C	- 60
Coefficient of friction f	- dry	-	0.15 - 0.30
	- greased / oil lubricated	-	0.05-0.10 / 0.03-0.08
Shaft surface finish Ra		µm	≤0.4
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

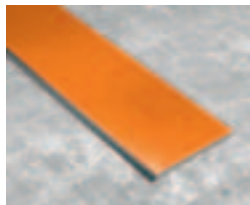
dry	good
oil lubricated	very good
grease lubricated	very good
water lubricated	poor
process fluid lubricated	poor



Cylindrical bushes



Thrust washers



Strips

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	300
	- dynamic	MPa	140
Maximum sliding speed U	- greased	m/s	2.5
Maximum $\bar{p}U$ factor	- greased	MPa x m/s	2.8
Max. temperature T_{max}	- greased /oil lubricated	°C	+ 150 / +250
Minimum temperature T_{min}		°C	- 40
Coefficient of friction f	- greased /oil lubricated	-	0.05-0.12 / 0.04-0.12
Shaft surface finish Ra		µm	≤0.8
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

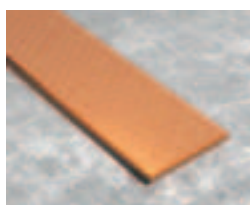
dry	poor
oil lubricated	good
grease lubricated	good
water lubricated	poor
process fluid lubricated	poor



Cylindrical bushes



Thrust washers



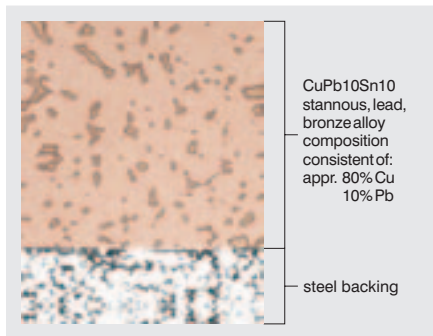
Strips

Product Range

SY™ Bearing Material

Structure

Steel-lead-bronze-compound material
St + CuPb10Sn10 with indents



Features

- Steel-lead-bronze-compound with indents as reservoir for the grease
- High load capacity, very good resistance to fatigue strength at higher temperatures
- Applicable in rough operation conditions
- Particularly suitable for high specific loads with oscillating motion and low frequency

Possible Applications

Industrial:

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

Availability

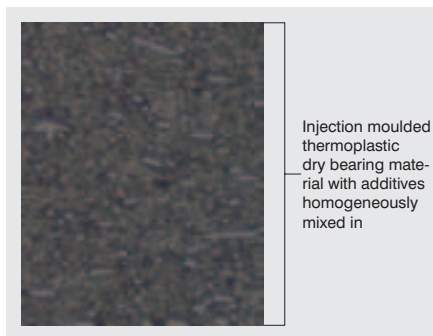
To order:

Cylindrical bushes, thrust washers, strip and special parts

EP™ Bearing Material

Structure

Injection moulded thermoplastic material
PA6.6T + glass fibres + PTFE + graphite



Features

- Injection moulded reinforced polyamide 6.6T based and modified bearing material
- Good bearing performance in the range of simple / medium working conditions
- The EP™ standard programme is interchangeable with roll-formed bushes according to ISO3547
- Recommended tolerances for fitted bushes: housing h7, shaft h7 - h9
- Colour: black

Possible Applications

Industrial:

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

Availability

Ex stock:

Cylindrical bushes and flanged bushes

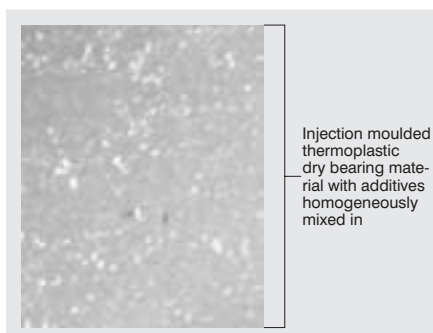
To order:

Non-standard parts

EP12™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
POM + PTFE



Features

- Injection moulded polyoxymethylene based and modified bearing material.
- Colour: white

Possible Applications

Generally applicable within the limits of the material properties.

Industrial:

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

Availability

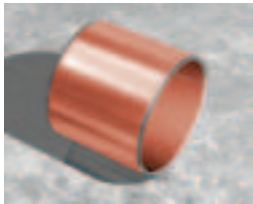
To order:

Bushes, special dimensions and shapes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	250
	- dynamic	MPa	120
Maximum sliding speed U	- greased	m/s	2.5
Maximum $\bar{p}U$ factor	- greased	MPa x m/s	2.8
Max. temperature T_{max}	- greased /oil lubricated	°C	+150 / +250
Minimum temperature T_{min}		°C	- 50
Coefficient of friction f	- greased /oil lubricated	-	0.05-0.12 / 0.04-0.12
Shaft surface finish Ra		µm	≤0.4
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

dry	poor
oil lubricated	good
grease lubricated	good
water lubricated	poor
process fluid lubricated	poor



Cylindrical bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	80
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$	MPa x m/s	0.06
	- for $A_H/A_C = 10$		0.24
	- for $A_H/A_C = 20$		1.0
Maximum temperature T_{max}		°C	+140
Minimum temperature T_{min}		°C	- 40
Coefficient of friction f	- dry	-	0.15 - 0.30
Shaft surface finish Ra		µm	0.5 ± 0.3
Shaft hardness		HV	>200

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio



Cylindrical bushes



Flanged bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	65
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$	MPa x m/s	0.04
	- for $A_H/A_C = 10$		0.09
	- for $A_H/A_C = 20$		0.18
Maximum temperature T_{max}		°C	+125
Minimum temperature T_{min}		°C	- 40
Coefficient of friction f	- dry	-	0.18 - 0.30
Shaft surface finish Ra		µm	0.3 ± 0.2
Shaft hardness		HV	>200

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

New!



Cylindrical bushes



Flanged bushes



Thrust washers



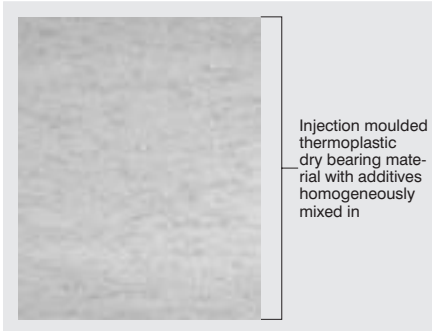
Special parts

Product Range

EP22™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PBT + PTFE



Features

- Injection moulded polybutylterephthalate based and modified bearing material.
- Good price/performance ratio
- Colour: white

Possible Applications

Generally applicable within the limits of the material properties.

Industrial

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

Availability

To order:

Bushes, special dimensions and shapes, rod stock

EP43™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PPS + PTFE + Aramid



Features

- Injection moulded reinforced polyphenylensulfide based and modified bearing material.
- Good chemical and hydrolysis resistance
- Very low friction, optimised for dry running conditions
- High dimensional stability
- Colour: brown

Possible Applications

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

Availability

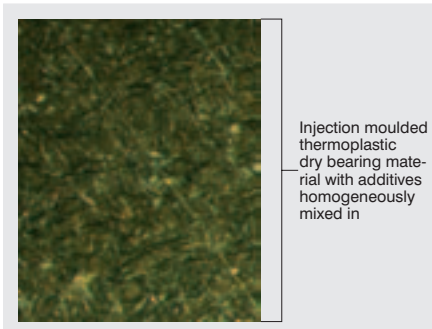
To order:

Bushes, special dimensions and shapes, rod stock

EP44™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PPS + PTFE + carbon fibres



Features

- Injection moulded reinforced polyphenylensulfide based and modified bearing material.
- Good chemical and hydrolysis resistance
- Excellent in lubricated applications
- High dimensional stability
- Colour: black

Possible Applications

Generally applicable within the limits of the material properties.

Industrial

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

Availability

To order:

Bushes, special dimensions and shapes

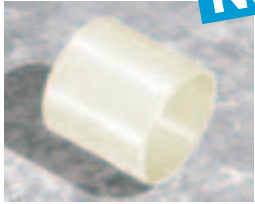
Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	50
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$ - for $A_H/A_C = 10$ - for $A_H/A_C = 20$	MPa x m/s	0.05 0.10 0.20
Maximum temperature T_{max}		°C	+170
Minimum temperature T_{min}		°C	-50
Coefficient of friction f	- dry	-	0.22 - 0.37
Shaft surface finish Ra		µm	0.3 ± 0.2
Shaft hardness		HV	>200

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	very good
process fluid lubricated	good after resistance testing

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

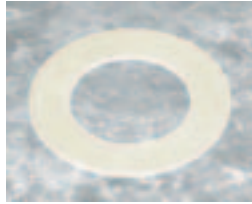
New!



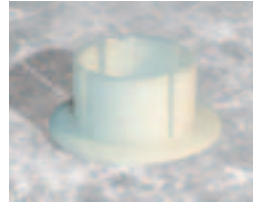
Cylindrical bushes



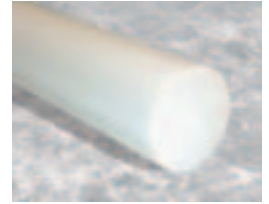
Flanged bushes



Thrust washers



Special parts



Rod stock

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	83
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$ - for $A_H/A_C = 10$ - for $A_H/A_C = 20$	MPa x m/s	0.22 0.90 3.59
Maximum temperature T_{max}		°C	+240
Minimum temperature T_{min}		°C	-40
Coefficient of friction f	- dry	-	0.11 - 0.20
Shaft surface finish Ra		µm	0.5 ± 0.3
Shaft hardness		HV	>200

Usage

dry	very good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

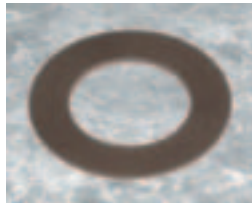
New!



Cylindrical bushes



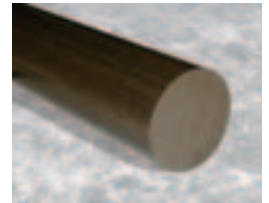
Flanged bushes



Thrust washers



Special parts



Rod stock

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	95
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$ - for $A_H/A_C = 10$ - for $A_H/A_C = 20$	MPa x m/s	0.11 0.42 1.69
Maximum temperature T_{max}		°C	+240
Minimum temperature T_{min}		°C	-40
Coefficient of friction f	- dry	-	0.16 - 0.26
Shaft surface finish Ra		µm	0.5 ± 0.3
Shaft hardness		HV	>450

Usage

dry	very good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

New!



Cylindrical bushes



Flanged bushes



Thrust washers



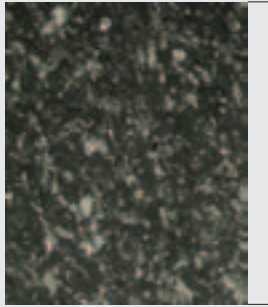
Special parts

Product Range

EP63™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PEEK + PTFE + Aramid



Injection moulded thermoplastic dry bearing material with additives homogeneously mixed in

Features

- Injection moulded reinforced polyetheretherketone based and modified bearing material
- High temperature material with low thermal expansion for demanding components
- Optimized for dry running conditions
- High viscosity and mechanical strength
- High wear resistance in oscillating movements
- Good chemical and hydrolysis resistance
- Colour: black

Possible Applications

Generally applicable within the limits of the material properties.

Industrial

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

Availability

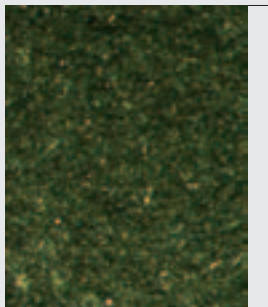
To order:

Bushes, special dimensions and shapes, rod stock

EP64™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PEEK + PTFE + graphite + carbon fibres



Injection moulded thermoplastic dry bearing material with additives homogeneously mixed in

Features

- Injection moulded reinforced polyetheretherketone based and modified bearing material
- High temperature material with low thermal expansion for demanding components
- Good chemical and hydrolysis resistance
- Excellent in lubricated applications
- High viscosity and mechanical strength
- High wear resistance in oscillating movements
- Colour: black

Possible Applications

Generally applicable within the limits of the material properties.

Industrial

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

Availability

To order:

Bushes, special dimensions and shapes

EP73™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PAI + graphite + PTFE



Injection moulded thermoplastic dry bearing material consisting of PAI + Graphite + PTFE

Features

- Injection moulded polyamidimide based and modified bearing material.
- Irreversible cross-linked by thermal treatment
- High temperature material with low thermal expansion for demanding components
- High viscosity and mechanical strength
- Good chemical resistance
- High wear resistance in oscillating movements
- Colour: black

Possible Applications

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

Other:

Aerospace: Weight saving by replacement of aluminium or metal alloys, while providing superior stability and viscosity.

Applicable in extreme high and low temperatures e.g. turbojet engine compressor blade.

Availability

To order: Bushes, special dimensions and shapes

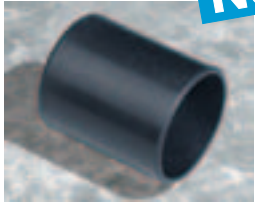
Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	90
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$	MPa x m/s	0.16
	- for $A_H/A_C = 10$		0.66
	- for $A_H/A_C = 20$		2.63
Maximum temperature T_{max}		°C	+290
Minimum temperature T_{min}		°C	-100
Coefficient of friction f	- dry	-	0.12 - 0.21
Shaft surface finish Ra		µm	0.3 ± 0.2
Shaft hardness		HV	>200

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing

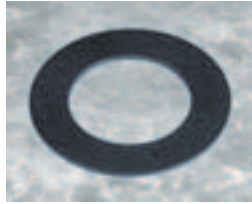
New!



Cylindrical bushes



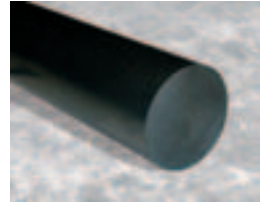
Flanged bushes



Thrust washers



Special parts



Rod stock

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	125
Maximum sliding speed U	- dry	m/s	1.0
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$	MPa x m/s	0.09
	- for $A_H/A_C = 10$		0.35
	- for $A_H/A_C = 20$		1.40
Maximum temperature T_{max}		°C	+290
Minimum temperature T_{min}		°C	-100
Coefficient of friction f	- dry	-	0.3 - 0.5
Shaft surface finish Ra		µm	0.3 ± 0.2
Shaft hardness		HV	>450

* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

Usage

dry	fair
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing

New!



Cylindrical bushes



Flanged bushes



Thrust washers



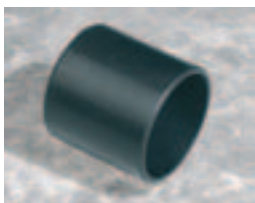
Special parts

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	105
Maximum sliding speed U	- dry	m/s	2.5
	- lubricated		5
Maximum $\bar{p}U$ factor*	- for $A_H/A_C = 5$	MPa x m/s	0.10
	- for $A_H/A_C = 10$		0.39
	- for $A_H/A_C = 20$		1.57
Maximum temperature T_{max}		°C	+260
Minimum temperature T_{min}		°C	-200
Coefficient of friction f	- dry	-	0.19 - 0.31
Shaft surface finish Ra		µm	0.5 ± 0.3
Shaft hardness		HV	>200

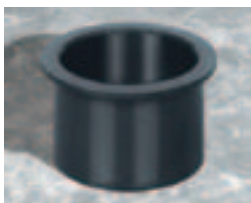
* the $\bar{p}U$ limit is depending on the heat dissipating surface to contact area ratio

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	good after resistance testing



Cylindrical bushes



Flanged bushes



Thrust washers



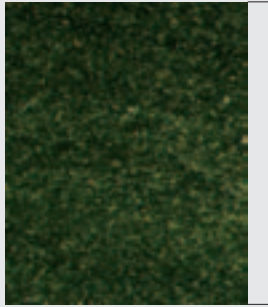
Special parts

Product Range

EP79™ Bearing Material

Structure

Injection moulded thermoplastic dry bearing material
PAI + carbon fibres + PTFE



Injection moulded thermoplastic dry bearing material with additives homogeneously mixed in

Features

- Injection moulded polyamidimide based and modified bearing material
- Irreversible cross-linked by thermal treatment
- High temperature material with low thermal expansion for demanding components
- High viscosity and mechanical strength
- Good chemical resistance
- High wear resistance in oscillating movements
- Colour: black

Possible Applications

Generally applicable within the limits of the material properties.

Automotive:
Automatic gears

Industrial:

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

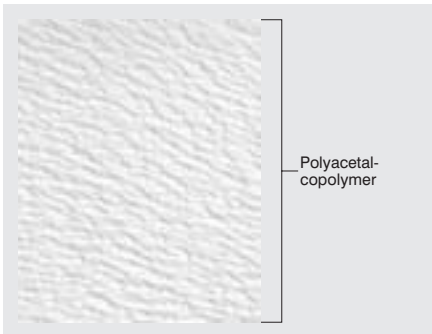
Availability

To order:
Bushes, special dimensions and shapes

Glacetal KA™ Bearing Material

Structure

Polyacetal-copolymer bearing material (POM)



Polyacetal-copolymer

Features

- Suitable for light duty applications only
- Suitable for use dry or oil grease lubrication
- Prevents metal to metal contact between assembly parts

Possible 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

Availability

Ex stock:
Thrust washers

Multilube® Bearing Material

Structure

Proprietary injection moulded engineering thermoplastic



Injection moulded thermoplastic dry bearing material with additives homogeneously mixed in

Features

- Low friction coefficient
- Optimum performance under light-duty conditions
- Injection moulded dry bearing material
- Manufactured by precision injection moulding

Possible Applications

Industrial:

Linkages, seat suspensions

Availability

To order:
Injection moulding allows for a diverse range of shapes and sizes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	130
Maximum sliding speed U	- lubricated	m/s	10
Maximum $\bar{p}U$ factor	- lubricated	MPa x m/s	10
Maximum temperature T_{max}		°C	+260
Minimum temperature T_{min}		°C	-200
Coefficient of friction f	- lubricated	-	0.005 - 0.1
Shaft surface finish Ra		µm	0.5 ± 0.3
Shaft hardness		HV	>500

Usage

dry	not suitable
oil lubricated	very good
grease lubricated	very good
water lubricated	fair
process fluid lubricated	good after resistance testing

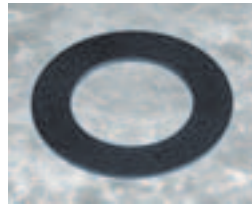
New!



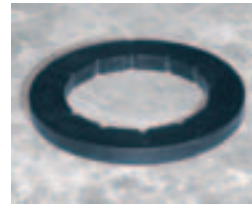
Cylindrical bushes



Flanged bushes



Thrust washers



Special parts

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	20
	- dynamic	MPa	10
Maximum sliding speed U	- greased	m/s	1.5
Maximum $\bar{p}U$ factor	- greased	MPa x m/s	0.35
Max. temperature T_{max}		°C	+80
Minimum temperature T_{min}		°C	-40
Coefficient of friction f	- greased	-	0.08 - 0.12
Shaft surface finish Ra		µm	≤0.4
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

dry	fair
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	fair

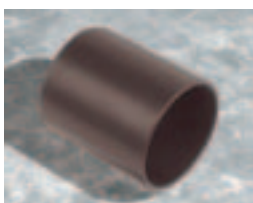


Thrust washers

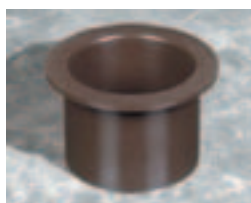
Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	60
	- dynamic	MPa	30
Maximum sliding speed U	- dry	m/s	1.5
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	0.6
Maximum temperature T_{max} / T_{max} momentary		°C	+80 / +140
Minimum temperature T_{min}		°C	-40
Coefficient of friction f	- dry	-	0.1 - 0.2
Shaft surface finish Ra		µm	0.2 - 0.8
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours	HB	>350

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes



Flanged bushes



Special parts

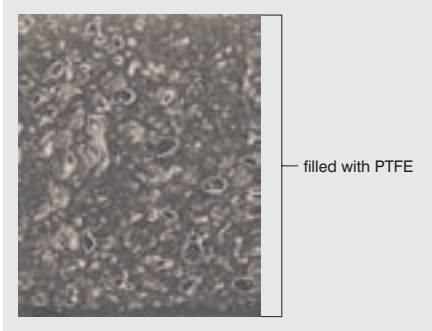


Product Range

Multifil™ Tape Bearing Material

Structure

PTFE + Proprietary filler system



Features

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

Possible Applications

Industrial:

Machine tool ways, gibs and other sliding applications

Availability

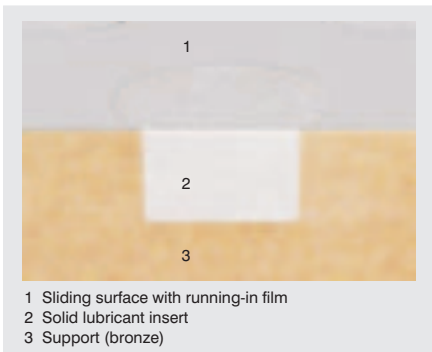
Ex stock:

Tapes of 0.015 - 0.125 thickness by 12 inches width

DB™ Bearing Material

Structure

Cast bronze + solid lubricant inserts



Features

- Maintenance-free bearing material for heavy duty applications
- Excellent performance under high loads and intermittent operation
- Graphite-free with solid lubricants
- Long life time due to lower wear rate of solid lubricants compared to graphite

Possible 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.

Availability

To order:

Cylindrical bushes, flanged bushes, thrust washers, self-aligning bearings, sliding plates

GAR-MAX® Bearing Material

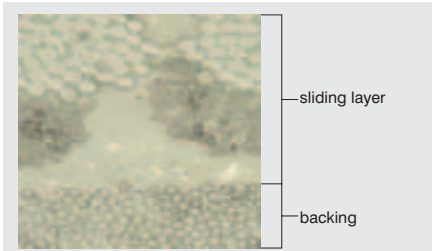
Structure

Composite material Sliding Layer

Continuous wound PTFE and high-strength fibres encapsulated in an internally lubricated, high temperature filled epoxy resin.

Backing

Continuous wound fiberglass encapsulated in a high temperature epoxy resin.



Features

- High Load Capacity
- Excellent shock resistance
- Excellent contamination resistance
- Excellent misalignment resistance
- Very good friction and wear properties
- Good chemical resistance

Possible 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.

Availability

Ex stock:

Cylindrical standard bushes partly available

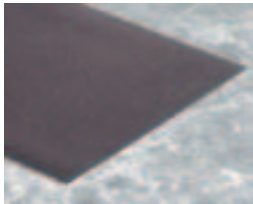
To order:

Non-standard lengths (short-term), non-standard wall thickness (on request)

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	70
	- dynamic		35
Maximum sliding speed U	- dry	m/s	2.5
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	0.32
	- lubricated		1.25
Maximum temperature T_{max}		°C	+280
Minimum temperature T_{min}		°C	-200
Coefficient of friction f	- dry	-	1.25
	- lubricated		0.05
Shaft surface finish Ra		µm	0.2 - 0.4
Shaft hardness	- normal	HB	>200

Usage

dry	very good
oil lubricated	very good
grease lubricated	very good
water lubricated	good
process fluid lubricated	good

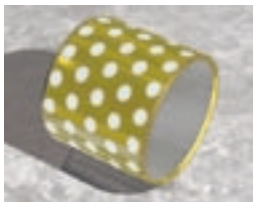


Tape

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	200
	- dynamic		100
Maximum sliding speed U	- dry	m/s	0.5
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.5
Maximum temperature T_{max}		°C	+350
Minimum temperature T_{min}		°C	-50
Coefficient of friction f	- dry	-	0.05 - 0.18
Shaft surface finish Ra		µm	0.2 - 0.8
Shaft hardness		HB	>200

Usage

dry	good
oil lubricated	good
grease lubricated	good
water lubricated	good
process fluid lubricated	fair



Cylindrical bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	210
	- dynamic		140
Maximum sliding speed U	- dry	m/s	0.13
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.05
Maximum temperature T_{max}		°C	+160
Minimum temperature T_{min}		°C	-195
Coefficient of friction f	- dry	-	0.05 - 0.30
Shaft surface finish Ra		µm	0.15 - 0.40
Shaft hardness	- normal	HB	>350
	- for service life >2000 hours		>480

Usage

dry	very good
oil lubricated	fair
grease lubricated	fair
water lubricated	fair
process fluid lubricated	poor



Cylindrical bushes

Product Range

HSG™ Bearing Material

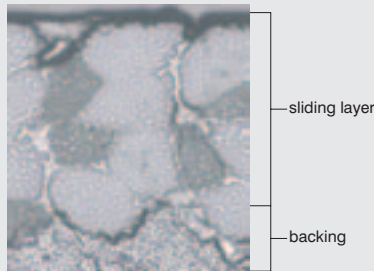
Structure

Composite material Sliding Layer

Continuous wound PTFE and high-strength fibres encapsulated in an internally lubricated, high temperature filled epoxy resin.

Backing

Continuous wound fiberglass encapsulated in a high temperature epoxy resin.



Features

- High Static load capacity - twice as high as standard GAR-MAX®
- Excellent shock and misalignment resistance - better than standard GAR-MAX®
- Excellent contamination resistance
- Very good friction and wear properties
- Good chemical resistance

Possible 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.

Availability

To order

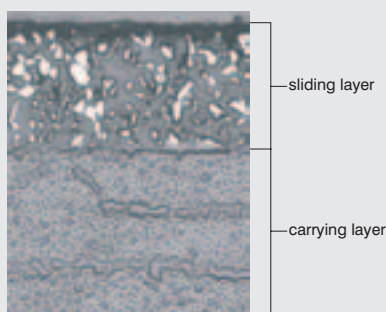
Cylindrical standard bushes and special parts, for material recommendations please contact your local GGB representative

GAR-FIL® Bearing Material

Structure

Composite material

PTFE + proprietary filler system + glass fibre filament wound and impregnated with epoxy resin



Features

- Filament wound fibre lined dry bearing material
- High load capacity
- Outside and inside diameters can be machined
- Good friction and wear properties under slow speed oscillating movements
- Good chemical resistance

Possible Applications

Industrial:

Toggle linkages, earthmoving equipment, valves

Availability

Ex stock:

Cylindrical bushes

MLG™ Bearing Material

Structure

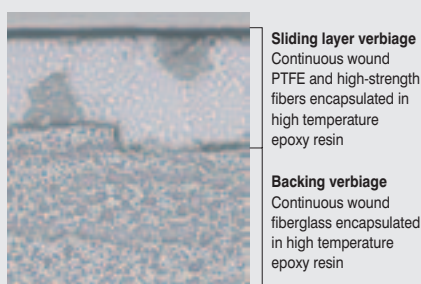
Composite material

Sliding layer verbiage

Continuous wound PTFE and high-strength fibers encapsulated in high temperature epoxy resin

Backing verbiage

Continuous wound fiberglass encapsulated in high temperature epoxy resin



Features

- 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

Possible Applications

Industrial:

Construction and earth moving equipment, conveyers, cranes, hoists, hydraulic cylinder pivots, etc.

Availability

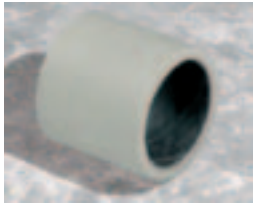
To order:

Cylindrical bearings: ID Range: 12 to 150 mm, metric series; .5 to 6 inch, inch series. Special order bearing diameters to 500 mm (20 inches); flanged bearings; hex and square bores; liner on OD

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	415
	- dynamic		140
Maximum sliding speed U	- dry	m/s	0.13
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.05
Maximum temperature T_{max}		°C	+160
Minimum temperature T_{min}		°C	-195
Coefficient of friction f	- dry	-	-
Shaft surface finish Ra		µm	0.2 - 0.8
Shaft hardness	- normal	HB	>200
	- for service life >2000 hours		>350

Usage

dry	very good
oil lubricated	fair
grease lubricated	fair
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic		140
Maximum sliding speed U	- dry	m/s	2.5
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.25
Maximum temperature T_{max}		°C	+205
Minimum temperature T_{min}		°C	-195

Usage

dry	very good
oil lubricated	very good
grease lubricated	fair
water lubricated	fair
process fluid lubricated	very good

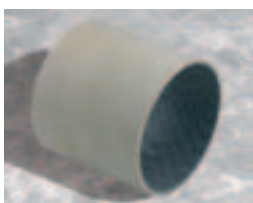


Cylindrical bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	210
	- dynamic	MPa	140
Maximum sliding speed U	- dry	m/s	0.13
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.05
Maximum temperature T_{max}		°C	+160
Minimum temperature T_{min}		°C	-195

Usage

dry	very good
oil lubricated	good
grease lubricated	poor
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes

Product Range

HPF™ Bearing Material

Structure

Composite material

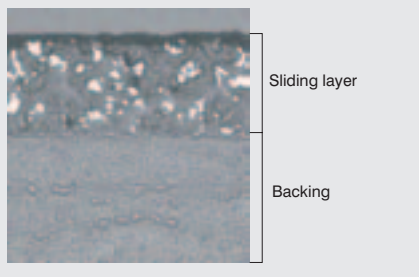
Sliding layer

Proprietary filled PTFE tape liner

Backing

Flat material: Continuous woven fiberglass cloth laminate impregnated and cured with epoxy resin

Cylindrical bearings: Continuous wound fiberglass encapsulated in a high temperature epoxy resin



Features

- Specifically developed for hydropower applications
- High load capacity
- Excellent shock and edge loading capacity
- Low friction, superior wear rating and bearing life
- Excellent corrosion resistance
- Dimensional stability low water absorption, no swelling
- Environmentally friendly

Possible Applications

Industrial:

Sliding segments, linkages, bearings

Availability

To order:

Cylindrical bearings diameters up to 500 mm (20 inches); thrust bearings and wear plates

HPM™ Bearing Material

Structure

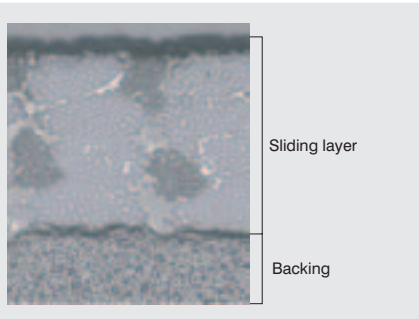
Composite material

Sliding layer

Continuous wound PTFE and high-strength fibers encapsulated in a self-lubricating, high temperature epoxy resin

Backing

Continuous wound fiberglass encapsulated in a high temperature epoxy resin



Features

- Specifically developed for hydropower applications
- High load capacity
- Excellent shock and edge loading capacity
- Low friction, superior wear rating and bearing life
- Excellent corrosion resistance
- Dimensional stability low water absorption, no swelling
- Environmentally friendly

Possible Applications

Industrial:

Sliding segments, linkages, bearings

Availability

To order:

Cylindrical bearings to 500 mm (20 inches)

MEGALIFE® XT Bearing Material

Structure

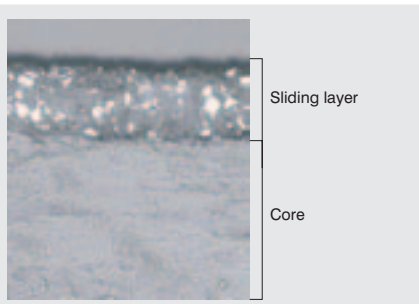
Composite material

Sliding layer

Proprietary filled PTFE tape liner on both sides

Core

Continuously woven layer of filament fiberglass encapsulated in a high temperature epoxy resin



Features

- 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

Possible Applications

Industrial:

Construction and earth moving equipment, gear and pulley spacers, steering links, valve actuator linkages, lifts, cranes, etc.

Availability

Standard:

Thrust bearings, standard sizes ½ x 1 inch to 3 x 4 ½ inches; 12 x 24 mm to 75 x 115 mm

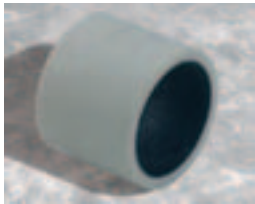
To order:

For special sizes contact GGB

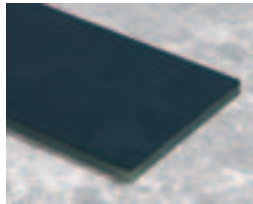
Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic		140
Maximum sliding speed U	- dry	m/s	2.5
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.23
Maximum temperature T_{max}	- cylindrical / flat	°C	+205 / +140
Minimum temperature T_{min}		°C	-195

Usage

dry	very good
oil lubricated	very good
grease lubricated	poor
water lubricated	very good
process fluid lubricated	good



Cylindrical bushes



Strips

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic		140
Maximum sliding speed U	- dry	m/s	0.13
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.23
Maximum temperature T_{max}		°C	+160
Minimum temperature T_{min}		°C	-195

Usage

dry	very good
oil lubricated	fair
grease lubricated	poor
water lubricated	very good
process fluid lubricated	fair



Cylindrical bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static	MPa	140
	- dynamic		140
Maximum sliding speed U	- dry	m/s	0.5
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.23
Maximum temperature T_{max}		°C	+175
Minimum temperature T_{min}		°C	-195

Usage

dry	very good
oil lubricated	fair
grease lubricated	poor
water lubricated	very good
process fluid lubricated	fair



Thrust washers

Product Range

SBC™ Sealed Bearing Cartridges

Structure

Composite material with sealing

SBC bearings are available with GAR-MAX and HSG and are sealed to exclude contaminants. SBC are optionally available with a steel outer shell.

Features

- Self-lubricating
- High static load capability
- Excellent tolerance to shock loading and misalignment
- Contamination resistant
- Very good friction and wear properties
- Good chemical resistance
- Sealed to exclude contaminants, therefore extended service life
- No grease required
 - therefore environmental friendly
 - cost savings by elimination of automated grease system and grease

Possible 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.

Availability

To order:

Cylindrical bushes, optionally available in a steel outer shell

Sintered Bronze Bearings

Structure

Bronze sinter impregnated with oil, similar to SINT A 50, impregnation group 1



BP25:
8 to 10.5% Sn
others <2%
rest Cu, impregnation group 1
(up to +80°C)

Features

- 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
- Wide range of parts available from stock

Possible Applications

Industrial:

FHP motor bearings, domestic appliances and hand tools

Availability

Ex Stock

Cylindrical and flanged bushes in a variety of dimensions

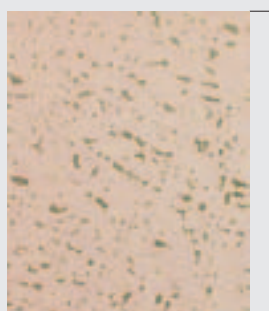
To order

Non-standard parts

Machined Bronze Bearings according to ISO 4379

Structure

Bearings made of copper alloys



CuSn12

Features

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

Possible Applications

Industrial:

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

Availability

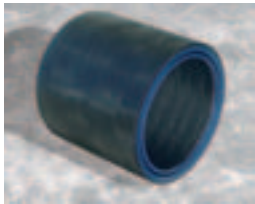
To order:

Cylindrical bushes, flanged bushes, special parts according to DIN ISO or customer design, special alloys available

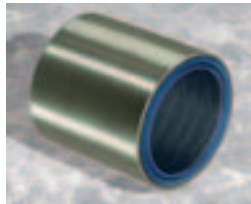
Bearing properties		Units	Value GAR-MAX	Value HSG
Maximum load \bar{p}	- static - dynamic	MPa	210 140	415 140
Maximum sliding speed U	- dry	m/s	0.13	0.13
Maximum $\bar{p}U$ factor	- dry	MPa x m/s	1.05	1.05
Maximum temperature T_{max}		°C	+160	+160
Minimum temperature T_{min}		°C	-195	-195
Shaft surface finish Ra		μm	0.15 - 0.40	0.2 - 0.8
Shaft hardness	- normal - for service life >2000 hours	HB HB	>350 >480	>200 >350

Usage

dry	very good
oil lubricated	fair
grease lubricated	fair
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes

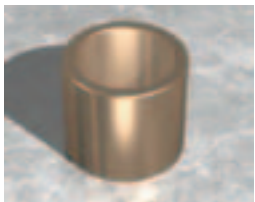


Cylindrical bushes with steel sleeves

Bearing properties		Units	Value
Maximum load \bar{p}	- static - dynamic	MPa	10 5
Maximum sliding speed U	- oil impregnated	m/s	10
Maximum $\bar{p}U$ factor	- oil impregnated	MPa x m/s	10
Maximum temperature T_{max}		°C	+90
Minimum temperature T_{min}		°C	-5
Coefficient of friction f	- oil impregnated	-	0.08 - 0.12
Shaft surface finish Ra		μm	≤ 0.2
Shaft hardness		HB	>350

Usage

dry	good
oil lubricated	good
grease lubricated	fair
water lubricated	fair
process fluid lubricated	fair



Cylindrical bushes



Flanged bushes

Bearing properties		Units	Value
Maximum load \bar{p}	- static - dynamic	MPa MPa	200 100
Maximum sliding speed U	- greased	m/s	2.5
Maximum $\bar{p}U$ factor	- greased	MPa x m/s	2.8
Maximum temperature T_{max}		°C	+140
Minimum temperature T_{min}		°C	-40
Coefficient of friction f	- greased	-	0.09 - 0.15
Shaft surface finish Ra		μm	0.2 - 0.8
Shaft hardness		HB	>350

Usage

dry	not suitable
oil lubricated	good
grease lubricated	good
water lubricated	not suitable
process fluid lubricated	not suitable



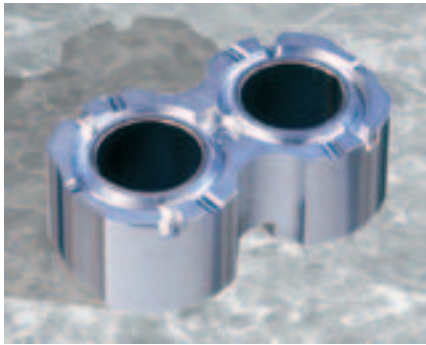
Cylindrical bushes

Product Range

Bushing Blocks

Structure

Housing material: Aluminium alloy
Assembled bearings see table on the right



Features

- Bearing housing with very good friction and wear performance
- Pre-installed GGB plain bearings

Possible Applications

Industrial and Automotive:
External gear pumps and motors

Availability

To order:
Customer design size and special shapes

Bushing Block Material Composition

	Sical 6	Sical 3	Sical 3D
Sn	5 - 7 %	3 - 4 %	3 - 3.5 %
Cu	1.2 - 1.8 %	3 - 4 %	4.2 - 4.6 %
Si	-	<0.6 %	<0.6 %
Fe	-	<0.7 %	<0.7 %
Other	<1.5 %	<1.6 %	<1.6 %
Al	balance	balance	balance

Assembled Bearing Options

Material	Bearing Lining
DU	PTFE + Pb
DP4	PTFE + CaF ₂ + aramid fibre
DP31	PTFE + fluoropolymer + fillers
DTS10	PBT
DX	POM
HX	PEEK + PTFE + fillers

Mechanical Properties

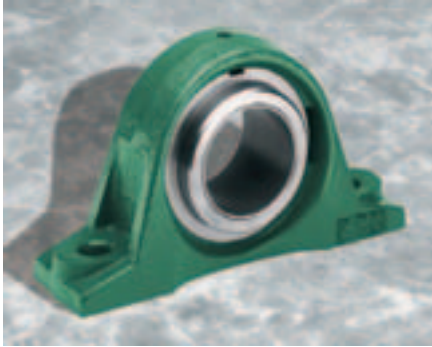
Property	Units	Sical 6	Sical 3	Sical 3D
Tensile strength	MPa	90	265	300
Ultimate tensile strength	MPa	160	335	350
Elongation	%	24	10	8
Brinell hardness	HB	45 - 70	85 - 110	100 - 135

Product Range

EXALIGN™ Self-aligning Bearing Housings

Structure

Housing material: Cast iron
Spherical material: Cast iron
Corrosion-free and corrosion resistant models possible



Features

- 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 programme are applicable

Possible 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

Availability

To order:
Order-related production

UNI™ Self-aligning Bearing Housings

Structure

Housing material: GGG40
Spherical material: 16MnCr5
Corrosion resistant material possible



Features

- 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 programme are applicable

Possible 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

Availability

To order:
Order-related production

MINI™ Self-aligning Bearing Housings

Structure

Housing material: AlMgSi12
Ball material: 9SMn28K
Stainless and other materials possible



Features

- 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 programme are applicable

Possible Applications

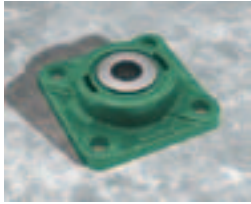
Industrial:

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

Availability

To order:
Order-related production

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	4250	3750
2	20 - 25	7700	5900
3	30	9500	8000
4	35 - 40	17000	11000
5	45	23000	12000
6	50	25000	14500
7	55 - 60	30000	16000
8	70 - 75	38000	17000
9	80 - 85	45500	27000
10	90 - 100	74500	30500



PB pedestal bearing housing FL flange bearing housing DF flange bearing housing

Load limit values for radial forces

Size	bush ID	max. pressure load [N] (housing)	max. tensile load [N] (bolt)	maximum shear off load [N] (bolt)
1	10 - 25	20000	10000	1000
2	28 - 40	30000	15000	1500
3	45 - 60	50000	25000	2500
4	65 - 80	90000	45000	4500
5	85 - 100	125000	62500	6000

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.

Load limit values for radial forces

Size	Bush ID	max. pressure load [N] (housing)	max. tensile load [N] (bolt)	maximum shear off load [N] (bolt)
0	8 - 15	10000	5000	500
1	10 - 25	20000	10000	1000
2	28 - 40	30000	15000	1500
3	45 - 60	50000	25000	2500
4	65 - 80	90000	45000	4500
5	85 - 100	125000	62500	6000

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

Special Parts

GGB special parts manufactured to customers' requirements

Due to the constant dialogue with you our customers we found out that many of you have the impression of the bearings in our standard price list being a fixed and inflexible programme.

Our flexibility seemed restricted and limited except the option of splitting and shortening the standard parts to meet the dimensional adjustments of your requirements. Some might even have searched for a different solution.

An other obstacle was built by the opinion that when ordering special parts, one has to face

- extended delivery times
- increased prices
- considerable proportion of the tool costs

and therefore has to order a higher number of pieces. In counselling interviews

on our special parts production the remark

"this is also possible?"

often led to future-oriented successful technical solutions.

The manufacturing possibilities of GGB were expanded systematically, parallel to the standard bearing products. That means, we manufacture parts for your specific requirements that are non-standard parts in small amounts / even only one piece if required at interesting prices short-term.

Many times a technically optimised and even efficient solution can be found deviating from our standard programme. Machining techniques well proven in manufacturing thin walled bimetallic strips are primarily applied, such as stamping and water jet cutting for particular shapes. However also other material related machining procedures

such as deep drawing and injection moulding are implemented. As a matter of course the special parts manufacturing is valid for the entire GGB product range (metal-polymer, thermo-plastic compounds, mono-metallic) and even turned parts.

Therefore you should get in contact with us whenever you need something special in the range of maintenance free and low maintenance plain bearings. We are pleased to support you.

Our products are manufactured under DIN/ISO 14001 und ISO/TS 16949 quality management systems. We also deliver safety parts with factory certifications and test reports for initial samples according to your specifications. GGB is consequently able to detailed advise you on special parts and develop a customised solution.

Fully finished special strip e.g. with countersinks



Shoe mounting guide



Special half bearing



Special washer



Slot bush with flange



Ball half bearings



Bushing block

Bushing blocks are also available in different sizes (e.g. 150 mm x 100 mm, rectangular) Bushing blocks are planar adjusted



Gauge guide, deep-drawn, sliding layer outside

Data Sheet

Data for bearing design calculation

Application: _____

Project / No.: _____

Quantity: _____ New Design Existing Design

Dimensions [mm]	
Inside diameter	D_i
Outside diameter	D_o
Length	B
Outer ring length	B_F
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	
<input type="checkbox"/> Radial load F	
- static	[N] _____
- dynamic	[N] _____
<input type="checkbox"/> Axial load F	
- static	[N] _____
- dynamic	[N] _____
<input type="checkbox"/> Specific load \bar{p}	
- radial	[MPa] _____
- axial	[MPa] _____

Movement	
Rotational speed	N [1/min] _____
Speed	U [ms] _____
Length of stroke	L_s [mm] _____
Frequency of stroke	[1/min] _____
Oscillating cycle	φ [°] _____
Oscillating freq.	N_{osz} [1/min] _____

Mating Surface	
Material	_____
Hardness	HB/HRC _____
Surface finish	Ra [μm] _____

Customer Information	
Company _____	

Street _____	
City / Post Code _____	
Name _____	
Tel. _____	Fax _____
Date / Signature _____	

Fits and Tolerances	
Shaft	D_J
Bearing housing	D_H

Operating Environment	
Ambient temperature T_{amb} [°] _____	
<input type="checkbox"/>	Housing with good heating transfer properties
<input type="checkbox"/>	Light pressing or insulated housing with poor heat transfer properties
<input type="checkbox"/>	Non metal housing with poor heat transfer properties
<input type="checkbox"/>	Alternate operation in water and dry

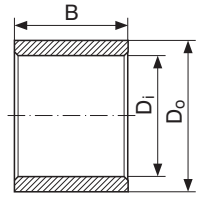
Lubrication	
<input type="checkbox"/>	Dry
<input type="checkbox"/>	Continuous lubrication
<input type="checkbox"/>	Process fluid lubrication
<input type="checkbox"/>	Initial lubrication only
<input type="checkbox"/>	Hydrodynamic conditions
Process fluid	_____
Lubricant	_____
Dynamic viscosity	η _____

Service Hours per Day	
<input type="checkbox"/>	Continuous operation
<input type="checkbox"/>	Intermittent operation
<input type="checkbox"/>	Operating time
<input type="checkbox"/>	Days per year

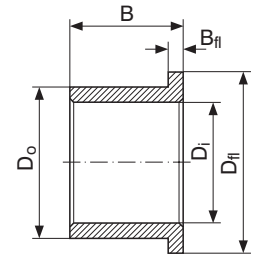
Service Life	
Required service life	L_H [h] _____

Bearing Type:

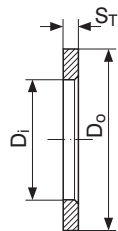
Cylindrical bushing



Flanged bushing

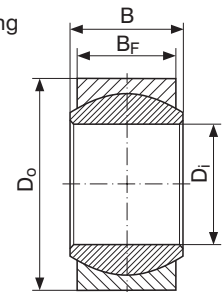


Thrust washer

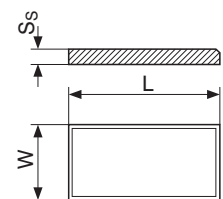


Spherical bearing

Steady load
 Rotating load

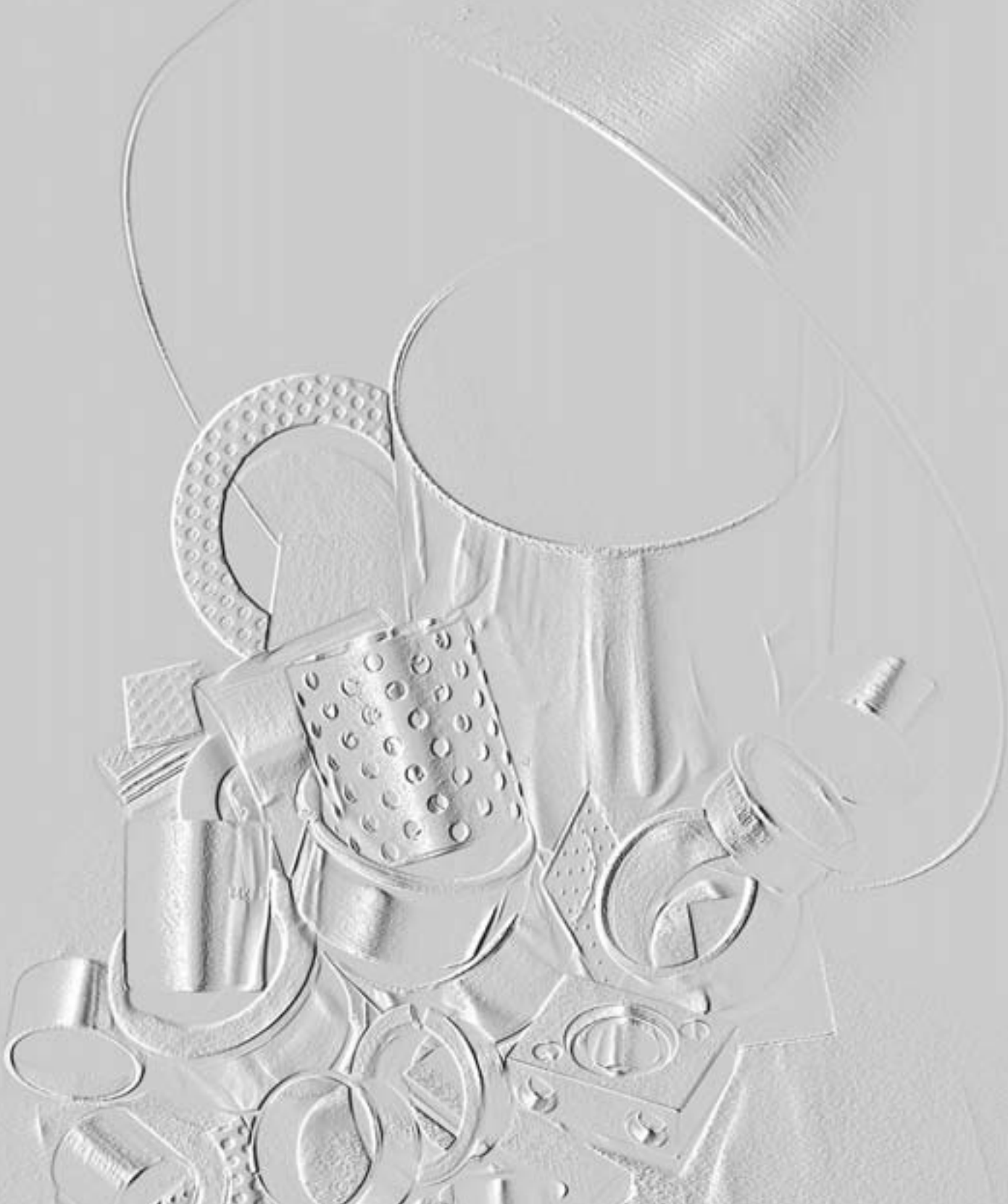


Slideplate



Special parts (sketch)

Rotational movement
 Steady load
 Rotating load
 Oscillating movement
 Linear movement



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