

# GGB-SZ™, SY™ and SP™

Bimetal Bearing Solutions for Lubricated Applications



The Global Leader  
in High Performance Bearing Solutions



an EnPro Industries company

# GGB Bearing Technology

GGB's history as the global leader in plain bearing technologies dates back more than 115 years, beginning with the founding of Glacier Antifriction Metal Company in 1899. GGB introduced the industry-leading DU® bearing in 1965. Since that time, GGB has continued to create innovative technologies and solutions that improve safety, performance and profitability in a wide range of markets. Today, our products can be found everywhere – from scientific vessels at the bottom of the ocean to racecars

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 critically essential 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 in all positions and functional areas. Our world-class manufacturing plants are certified in quality and excellence in the industry according

to ISO 9001, TS 16949, ISO 14001, ISO 50001 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.

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## The GGB Advantage

With 10 manufacturing facilities around the world, including cutting edge R&D facilities, flexible production platforms and extensive customer support networks, GGB offers unmatched technical expertise combined with razor sharp responsiveness and customized solutions. Our global presence and local logistics networks ensure our customers receive only the highest quality bearing solutions, in a timely manner and with extensive engineering support. **We don't just make products, we build partnerships. That's the GGB Advantage.**

## Quality/Certification

Our world-class manufacturing plants in the United States, Brazil, China, Germany, France and Slovakia are **CERTIFIED IN QUALITY AND EXCELLENCE IN THE INDUSTRY** according to ISO 9001, TS 16949, ISO 14001, ISO 50001 and OHSAS 18001. This allows us to access the industry's best practices while aligning our quality management system with global standards.

For a complete listing of our certifications, please visit our website:

<http://www.ggbearings.com/en/company/certificates>

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## GGB-SZ™, SY™ and SP™ Bimetal Bearings

The more and more demanding specifications of today's high performance equipment and systems require that the bearings operate not only under severe working conditions with minimal or no maintenance but that they also offer increased reliability and durability with lower operating costs.

With more than 100 years of experience and expertise in tribology, GGB offers, along with the widest range of lubricated and self-lubricating bearing products, a comprehensive technical and application engineering knowledge.

In this respect, our Application Engineers can assist you in:

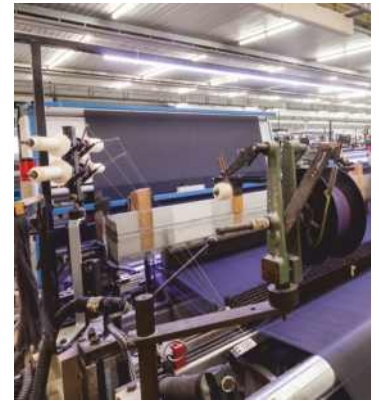
- Choosing the right type of plain bearing for your application
- Design of the bearing according to standard dimensions or to customer specific requirements
- Establishing a life time estimate
- Assembly and installation recommendations

Thanks to our global production and supply network, we are able to offer customers throughout the world the industry's most extensive range of self-lubricating and prelubricated plain bearings for literally thousands of applications in scores of industries.

As a reliable supplier with flexible manufacturing, we can respond quickly to customer needs with either standard or customized products.

Our advanced R&D and testing facilities help us deliver comprehensive solutions and assure their performance, reliability and cost-effectiveness.

Our high performance bearing specialists have the experience and expertise to provide innovative solutions to even the most challenging applications.



## Applications

GGB-SZ™, SY™ and SP™ bearings are perfectly suited to a wide range of applications.

### GGB-SZ™ and SY™

The bimetallic structure of GGB-SZ™ and SY™ bearings offers a bearing with very high mechanical strength, fatigue and wear resistance. GGB-SZ™ and SY™ bearings are particularly recommended for lubricated applications working under extreme loads including shock loads and low speed oscillating movements.

Typical applications include: agricultural machinery, earth-movers, textile machinery, pneumatic equipment, king pin bushes, brake caliper bushes, mechanical handling and lifting equipment, hydraulic cylinders, off-highway equipment etc.

### SP™

The specific overlay composition of SP™ bearings make them suitable for high speed lubricated applications for which good emergency running is required.

Typical applications include: oil pump bearings, gearbox bushes, steering gear, power steering, pedal bushes, king pin bushes, tailgate pivots, brake caliper bushes, machine slides, hydraulic cylinders, hydraulic motors, pneumatic equipment, medical equipment, textile machinery, etc.

# Material Structure



GGB-SZ™ copper bismuth on steel lead-free bearings with high load capacity and excellent wear resistance. Innovative bimetal bearing for harsh operating conditions.

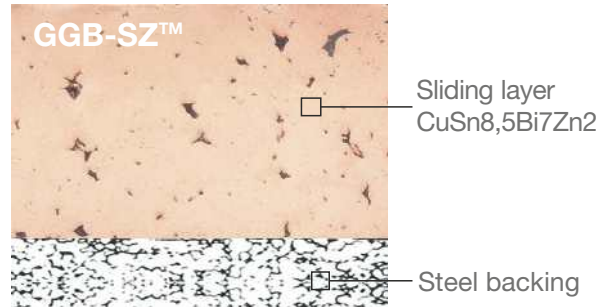


Fig. 1: GGB-SZ™ Microsection

SY™ and SP™ are bimetal plain bearing materials each consisting of a steel backing to which is sintered a lead bronze sliding layer.

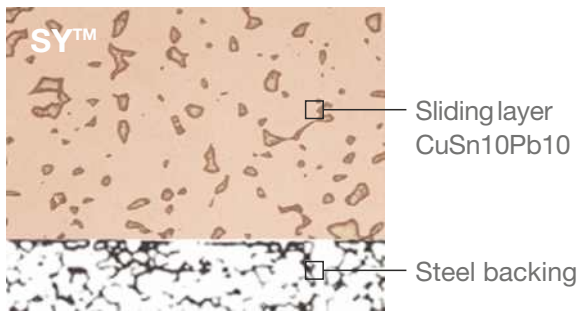


Fig. 2: SY™ Microsection

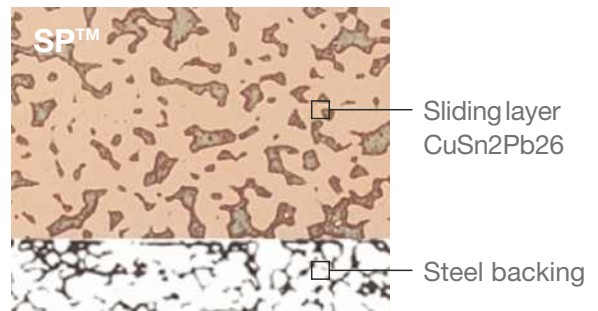


Fig. 3: SP™ Microsection



## Available Forms

SY™ is available as a standard range of cylindrical wrapped bushes and thrust washers in metric sizes.

Non standard parts, strip and special forms to order.

GGB-SZ™ and SP™ can be ordered as metric and inch bushes, strip and special forms.

# Characteristics

## GGB-SZ™ and SY™

- Capable of supporting high specific loads
- Excellent fatigue strength under dynamic and shock load conditions
- Suitable for oil and grease lubrication
- Superior performance under oscillating movement
- Steel backing provides strength and rigidity
- Thin wall construction permits compact bearing assembly
- Indents in the bearing surface provide a reservoir for grease and thus allow extended re-greasing intervals
- Tolerant of relatively poor mating surface finish

## SP™

- Bush bore may be bored, reamed, broached or ball burnished in situ to control the assembled bearing clearance
- Suitable for oil or grease lubrication
- Steel backing provides strength and rigidity
- Hardened shafts are not required
- Thin wall construction permits compact bearing assembly

# Physical and Mechanical Properties

Typical sliding layer and bearing properties for GGB-SZ™, SY™ and SP™ products.



BEARING PROPERTIES	SYMBOL	VALUE	UNIT		
			GGB-SZ™	SY™	SP™
Maximum sliding speed	$U_{max}$	m/s	2.5	2.5	2.5
Maximum $\bar{p}U$ factor. grease /oil lubrication	$\bar{p}U$	N/mm <sup>2</sup> x m/s	2.8	2.8	2.8
Coefficient of friction	f	-	0.05 - 0.12	0.05 - 0.12	0.05 - 0.12
			0.04 - 0.12	0.04 - 0.12	0.04 - 0.12
Max. temperature	$T_{max}$	°C	150	150	150
			250	250	250
Min. temperature	$T_{min}$	°C	- 40	- 40	- 50
Maximum load	$\bar{p}$	N/mm <sup>2</sup>	300	300	250
			140	140	120
Shaft surface finish Ra	Ra	µm	≤ 0.8	≤ 0.8	≤ 0.4
Shaft hardness	HB	-	> 200	> 200	> 200
			> 350	> 350	> 350

Table 1: Physical and Mechanical Properties of GGB-SZ™, SY™ and SP™

# Installation

GGB-SZ™, SY™ and SP™ bushes should be inserted into the bearing housing with the aid of a stepped mandrel. Care must be taken to insert the bush squarely into the housing to avoid damage to the bearing lining material. A slight lead-in chamfer should be machined in the housing and a smear of oil applied to the outside surface of the bush to assist the fitting operation. Recommended mandrel and chamfer dimensions are given in figure 4.

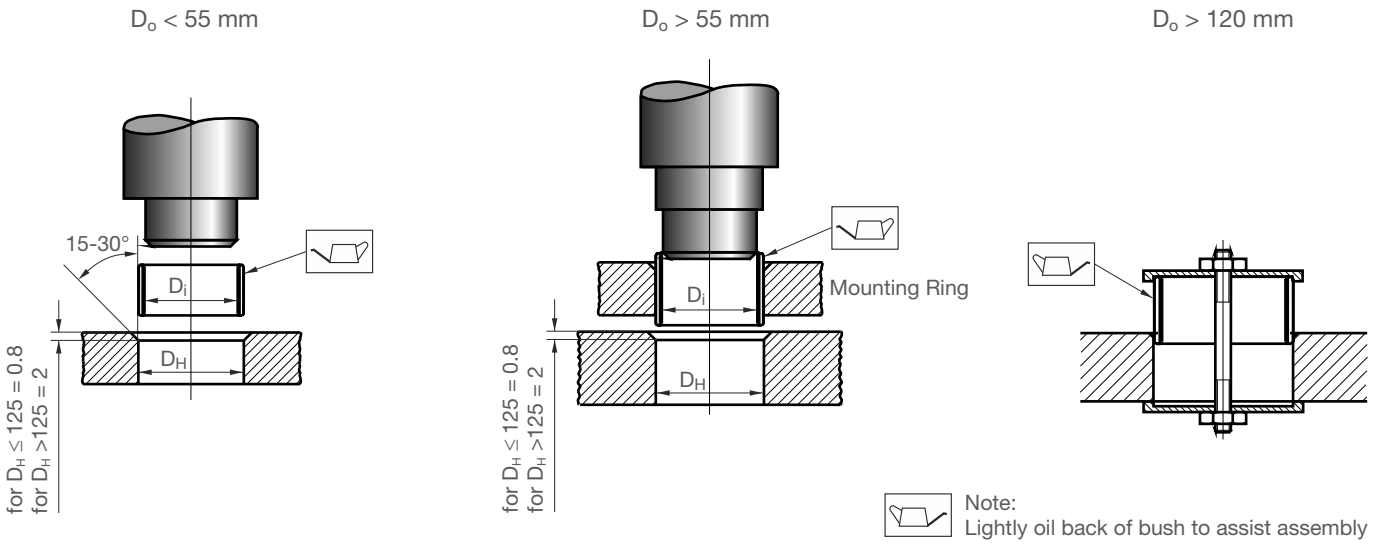


Figure 4: Fitting of cylindrical bushes

# Lubrication

GGB-SZ™, SY™ and SP™ bearings must be lubricated. Care should be taken at temperatures above 100 °C to avoid attack of the bearing lining by any acidic degradation products from the lubricant.

Unlike polymer composite bearing materials these materials are suitable for use with lubricants containing MoS<sub>2</sub> or graphite.

## GGB-SZ™ and SY™

Suitable for use with oil or grease lubrication. For use with grease lubrication, the bearing surface is manufactured with a uniform pattern of indents which form a reservoir for the lubricant and provide the optimum distribution within the loaded area of the bearing.

## SP™

Suitable for use with oil or grease lubrication. Particularly suitable for high speed applications with oil lubrication.

# Cutting and Machining

## GGB-SZ™ and SY™

GGB-SZ™ and SY™ bushes do not normally require sizing after assembly.

Should machining of the bearing lining be required then care should be taken to avoid any burrs around the edges of the indents in the bearing surface.

A diamond tipped boring tool should be used with a fine feed of 0,1 mm/rev. and a cutting speed of 2 - 3 m/s.

## SP™

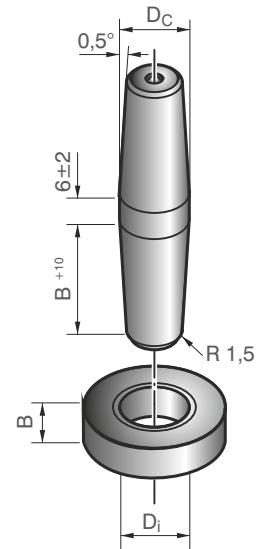
The bushes must be finish sized after assembly. This may be done by burnishing, broaching or boring as described below.

For many applications burnishing with a hardened sphere or spherically ended or ribbed tool will give adequate bore size. The required diameter ( $d_1$ ) of the burnishing tool is as shown on the right to allow for recovery of the bearing bore after sizing.

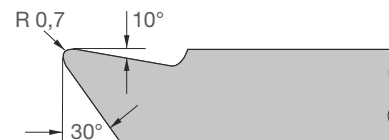
If boring is carried out, care must be taken to maintain good concentricity with the housing. It is advisable to use H6 limits and work towards the maximum bore size.

The cutting tool should have a small point radius, approximately 0,7 mm, an approach angle of 30°, primary angle of 10° and a cutting speed of 2 - 3 m/s, with a fine speed of 0.1 mm/rev.

$$d_1 \text{ calibration tool} = D_i + 0.0015 \text{ mm}$$



Cutting tool-geometry



Cutting speed 2 - 3 m/s

## Product Information

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

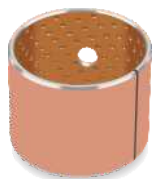
GGB's sales and delivery terms and conditions, included as an integral part of quotations, stock and price lists, apply absolutely to all business conducted by GGB. Copies can be made available on request.

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

Edition 2015 (This edition replaces earlier editions which hereby lose their validity).

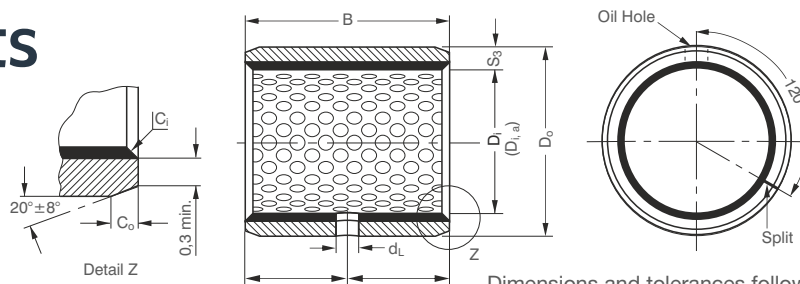


# Standard Products



**SY™**

GGB-SZ™ cylindrical bearings are available on order



Dimensions and tolerances follow ISO 3547 and GGB specifications

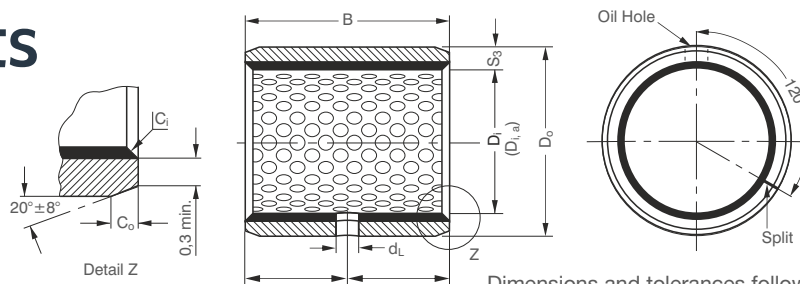
Part No. GGB	Nominal Diameter		Wall Thickness S <sub>3</sub> max. min.	Width B	Shaft-Ø D <sub>J</sub> , h8 max. min.	Housing- Ø D <sub>H</sub> , H7 max. min.	Bush-Ø D <sub>i,a</sub> Ass. in H7 housing max. min.	Clearance C <sub>D</sub> max. min.	Oil Hole Ø d <sub>L</sub>							
	D <sub>i</sub>	D <sub>o</sub>														
PM2015SY	20	23	1.490 1.430	15	20.000 19.967	23.021 23.000	+ 0.161 + 0.020	0.194 0.020	4							
PM2025SY	20	23														
PM2030SY	20	23														
PM2215SY	22	25		15	22.000 21.967	25.021 25.000				+ 0.161 + 0.020	0.194 0.020	4				
PM2220SY	22	25														
PM2225SY	22	25														
PM2230SY	22	25		30	25.000 24.967	28.021 28.000							+ 0.161 + 0.020	0.194 0.020	4	
PM2515SY	25	28														
PM2520SY	25	28														
PM2525SY	25	28														
PM2530SY	25	28														
PM2815SY	28	32	15	28.000 27.967		32.025 32.000	+ 0.185 + 0.040	0.218 0.040	6							
PM2820SY	28	32														
PM2825SY	28	32														
PM2830SY	28	32														
PM3015SY	30	34	15	30.000 29.967	34.025 34.000	+ 0.185 + 0.040				0.218 0.040	6					
PM3020SY	30	34														
PM3025SY	30	34														
PM3030SY	30	34														
PM3040SY	30	34	40	32.000 31.961	36.025 36.000							+ 0.185 + 0.040	0.218 0.040	6		
PM3230SY	32	36														
PM3240SY	32	36														
PM3515SY	35	39	15												35.000 34.961	39.025 39.000
PM3520SY	35	39														
PM3525SY	35	39														
PM3530SY	35	39														
PM3535SY	35	39														
PM3540SY	35	39														
PM3545SY	35	39	45	40.000 39.961	44.025 44.000	+ 0.185 + 0.040	0.218 0.040	6								
PM3550SY	35	39														
PM4020SY	40	44	20						40.000 39.961	44.025 44.000	+ 0.185 + 0.040				0.218 0.040	6
PM4030SY	40	44														
PM4040SY	40	44														
PM4050SY	40	44														
PM4060SY	40	44														
PM4530SY	45	50	30									45.000 44.961	50.025 50.000	+ 0.225 + 0.080		
PM4540SY	45	50														
PM4550SY	45	50														
PM4560SY	45	50														
PM5020SY	50	55	20	50.000 49.961	55.030 55.000				+ 0.225 + 0.080	0.264 0.080		8				
PM5030SY	50	55														
PM5040SY	50	55														
PM5050SY	50	55														
PM5060SY	50	55														
PM5535SY	55	60	35			55.000 54.954	60.030 60.000	+ 0.230 + 0.080			0.269 0.080		8			
PM5540SY	55	60														
PM5555SY	55	60														
PM5560SY	55	60														
PM6030SY	60	65	30	60.000 59.954	65.030 65.000	+ 0.230 + 0.080	0.269 0.080							8		
PM6040SY	60	65														
PM6060SY	60	65														
PM6070SY	60	65														
PM6540SY	65	70	40	65.000 64.954	70.030 70.000				+ 0.230 + 0.080	0.276 0.080		8				
PM6550SY	65	70														
PM6560SY	65	70														
PM6570SY	65	70														

# Standard Products



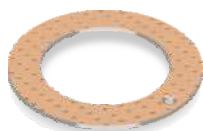
**SY™**

GGB-SZ™ cylindrical bearings are available on order



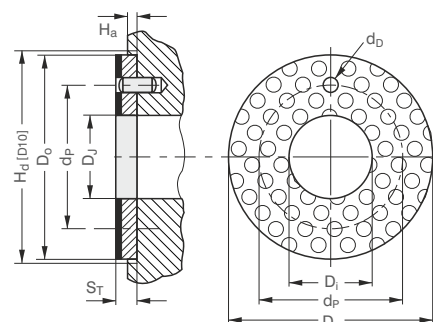
Dimensions and tolerances follow ISO 3547 and GGB specifications

Part No. GGB	Nominal Diameter		Wall Thickness S <sub>3</sub> max. min.	Width B	Shaft-Ø D <sub>J</sub> , h8 max. min.	Housing- Ø D <sub>H</sub> , H7 max. min.	Bush-Ø D <sub>i,a</sub> Ass. in H7 housing max. min.	Clearance C <sub>D</sub> max. min.	Oil Hole Ø d <sub>L</sub>			
	D <sub>i</sub>	D <sub>o</sub>										
PM7030SY	70	75	2.460 2.400	30	70.000 69.954	75.030 75.000	+ 0.230 + 0.080	0.276 0.080	8			
PM7040SY	70	75		40								
PM7045SY	70	75		45								
PM7050SY	70	75		50								
PM7065SY	70	75		65								
PM7080SY	70	75		80								
PM7540SY	75	80		40	75.000 74.954	80.030 80.000	+ 0.235 + 0.080	0.281 0.080	9.5			
PM7560SY	75	80		60								
PM7580SY	75	80		80								
PM8040SY	80	85		40	80.000 79.954	85.035 85.000						
PM8060SY	80	85		60								
PM8075SY	80	85		75								
PM8080SY	80	85		80								
PM8560SY	85	90		60	85.000 85.946	90.035 90.000						
PM9040SY	90	95		40								
PM9070SY	90	95		70	90.000 89.946	95.035 95.000						
PM9090SY	90	95		90								
PM10040SY	100	105		40						100.000 99.946	105.035 105.000	
PM10050SY	100	105		50								
PM10060SY	100	105		60								
PM10080SY	100	105		80								
PM10095SY	100	105		95								
PM12050SY	120	125		50	120.000 119.946	125.040 125.000				+ 0.240 + 0.080	0.294 0.080	
PM13560SY	135	140		60								



**SY™**

GGB-SZ™ thrust washers are available on order



Part No. GGB	Inside Ø D <sub>i</sub>	Outside Ø D <sub>o</sub>	Thickness S <sub>T</sub>	Dowel Hole Ø d <sub>D</sub>	Pitch Circle Ø d <sub>p</sub>	Recess Depth H <sub>a</sub>
	max. min.	max. min.	max. min.	max. min.	max. min.	max. min.
WC30SY	32.00 32.25	54.00 53.75	1.45 1.41	4.125 4.375	43.12 42.88	0.95 1.20
WC35SY	38.00 38.25	62.00 61.75			50.12 49.88	
WC40SY	42.00 42.25	66.00 65.75			54.12 53.88	
WC45SY	48.00 48.25	74.00 73.75	1.95 1.92		61.12 60.88	1.45 1.70
WC50SY	52.00 52.25	78.00 77.75			65.12 64.88	

# Bearing Application Data Sheet

Not sure which GGB part fits your application requirements? Go to [ggbpartinder.com](http://ggbpartinder.com) to complete a Bearing Application Data Sheet online, and one of our GGB bearing specialists will reach out to you with recommended options that meet your application requirements. You can also complete the form below and share it with your GGB sales person or distributor representative.

## 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
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 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	j [°]
Oscillating freq.	$N_{OSZ}$ [1/min]

### MATING SURFACE

Material	
Hardness	HB/HRC
Surface finish	Ra [mm]

### FITS & 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	$\eta$

### SERVICE HOURS PER DAY

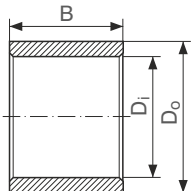
Continuous operation	
Intermittent operation	
Operating time	
Days per year	

### SERVICE LIFE

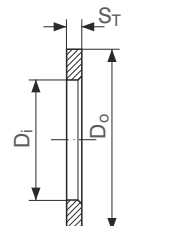
Required service life	$L_H$ [h]
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### BEARING TYPE:

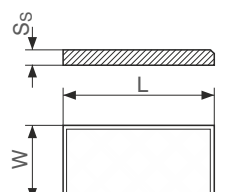
Cylindrical bushing



Thrust washer



Slideplate



Special parts (sketch)

- Rotational movement
- Steady load
- Rotating load
- Oscillating movement
- Linear movement

### CUSTOMER INFORMATION

Company .....

Street .....

City / Post Code .....

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

Name .....

Date / Signature .....



an EnPro Industries company

The Global Leader in High Performance Bearing Solutions

## GGB Heilbronn GmbH

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