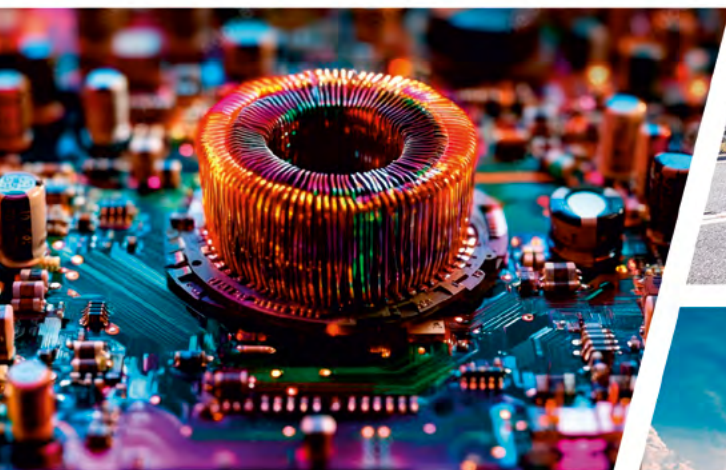




 **GGB**
BY TIMKEN



DTS10®
**METAL-POLYMER BEARING SOLUTIONS
FOR LUBRICATED APPLICATIONS**



Who we are

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

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



Aerospace



Agriculture



Automotive



Construction



E-Mobility



Energy



Exoskeletons



Fluid Power



Industrial



Medical



Mining



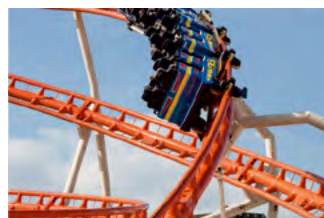
Oil & Gas



Primary Metals



Railway



Recreation



Robotics & Automation

The GGB Advantage



MAINTENANCE-FREE

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



LOW FRICTION, HIGH WEAR RESISTANCE

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



NVH (NOISE, VIBRATION, HARSHNESS)

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



LOWER SYSTEM COST

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



REDUCED CO₂ FOOTPRINT

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



PARTNER SUPPORT

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



The Highest Standards in Fabrication

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

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

ggbearings.com/en/certificates

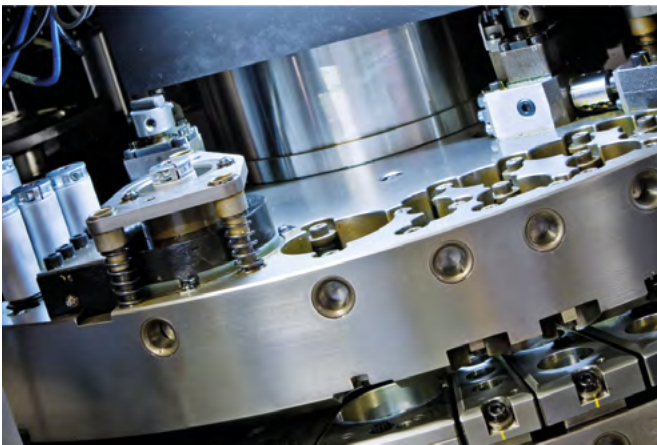


Table of Contents

1	Introduction	5	6	Machining	10
2	Structure and Composition	5	6.1	Machining Guidelines	10
2.1	Available Forms	5	6.2	Boring	11
3	Applications	6	6.3	Milling	11
4	Properties	7	6.4	Reaming	11
4.1	Lubricated Bearing Properties	7	7	Bearing Application Data Sheet	12
5	Bearing Performance	8	8	Product Information	13
5.1	Relative Lubricated Wear Resistance	8		Declaration on the RoHS directive	13
5.2	Relative Cavitation Resistance	8		Health Hazard - Warning	13
5.3	Relative Hydrofatigue Resistance	9		Trademarks	13
5.4	Relative Friction and Seizure Resistance	9			

1 Introduction

Customers with high expectations turn to GGB for innovative and application-specific plain bearing technology and solutions. The recent development of DTS10® metal-polymer bearings illustrates GGB's commitment to advancing the technology of metal-polymer PTFE bearings for hydrodynamic lubricated applications. DTS10® bearings deliver superior friction and wear properties, providing customers with advanced solutions that precisely meet their unique needs.

Featuring a uniquely engineered PTFE overlay, the DTS10® bearing is the first polymer-lined material for lubricated conditions to not allow for metal exposure after machining. Providing low friction and excellent wear and fatigue resistance, DTS10® improves the overall energy efficiency and increases the service life of high precision assemblies. DTS10® provides the precision of a bimetallic bearing and the high performance of an engineered metal-polymer bearing. Here are some of the benefits of the DTS10® bearing:

- Excellent fatigue resistance
- Low friction
- Machinable to obtain almost perfect bearing form
- High resistance against cavitation & flow erosion
- High load capacity
- RoHS compliant (lead-free)
- Excellent chemical resistance
- Promotes elastohydrodynamic performance benefits
- Good wear resistance
- Good temperature range

2 Structure and Composition

The DTS10® metal-polymer bearing contains three layers. The sliding layer is a thick (0.1 mm) PTFE and filler overlay, which is impregnated into a porous bronze inner structure. The bronze center layer is sintered to a steel backing for mechanical strength.

2.1 AVAILABLE FORMS

Available as cylindrical bushes, thrust washers, flanged washers, slide plates, half bearings and special shapes obtained by stamping, bearings with locating notches, lubricant holes and machined grooves, customized bearing designs.

Cylindrical bushes are available in sizes ranging from 8 mm up to 300 mm. All formats are considered made to order items.

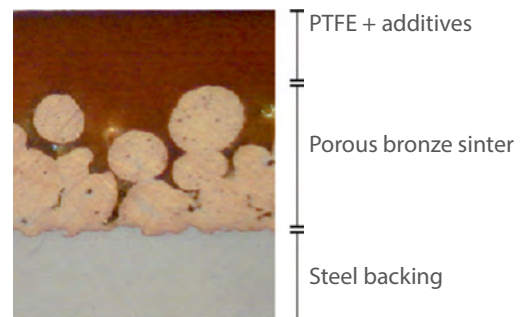


Figure 1: DTS10 microsection



Figure 2: DTS10 available forms

3 Applications

The DTS10® is a PTFE-based metal-polymer bearing that is excellent for mixed-film and hydrodynamic lubricated applications. It is the first such bearing designed to be machined for tight tolerance control. Featuring excellent wear resistance and low friction as well as strong chemical, cavitation and flow erosion resistance, the DTS10® is well suited for demanding applications. With all its great attributes, the DTS10® bearing provides additional user benefits such as greater tolerance toward foreign particulates and reduced noise and vibration.

Below are a few of the of the recommended applications:

- External gear pump and motors
- Scroll compressors
- Radial piston motors
- Oil pumps
- Powertrain and industrial gearboxes
- Semi-hermetic and hermetic reciprocating compressors
- Hydraulic cylinders
- Small engines



4 Properties

4.1 LUBRICATED BEARING PROPERTIES

BEARING PROPERTIES		IMPERIAL UNITS	IMPERIAL VALUE	METRIC UNITS	METRIC VALUE
General					
Maximum load, P	Static	psi	20 000	N/mm²	140
Operating temperature	Min.	°F	-328	°C	-200
	Max.		536		280
Fluid Lubricated					
Maximum sliding speed, V		fpm	2 000*	m/s	10*
Maximum PV factor		psi x fpm	2 860 000*	N/mm²	100*
Coefficient of friction, f		-	0.01 - 0.08	-	0.01 - 0.08
Recommendations					
Shaft surface roughness, R _a		µin	< 2 - 8*	µm	< 0.05 - 0.2*
Shaft surface hardness		HB	> 200	HB	> 200

Table 1: Lubricated bearing properties

*Depending on hydrodynamic conditions



5 Bearing Performance

5.1 RELATIVE LUBRICATED WEAR RESISTANCE

Composed of a combination of PTFE and fillers, the unique sliding layer composition of DTS10® enhances its wear resistance over a wide range of operating conditions. The chart below summarizes the relative lubricated wear resistance of DTS10® in comparison with GGB's DP4 and DP31 products.

TEST CONDITIONS	
Bearing Diameter	20 mm
Bearing Length	15 mm
Mean Diametral Clearance	0.07 mm
Speed	0.11 m/s
Lubricant	ISO VG 46 hydraulic oil
Temperature	ambient

Table 2: Test conditions - Relative lubricated wear resistance

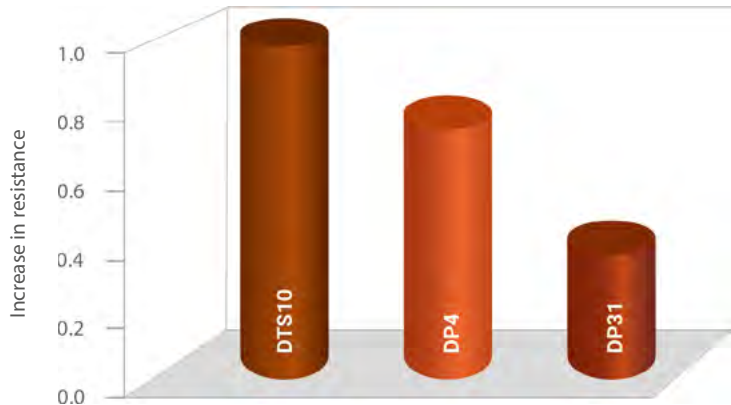


Figure 3: Relative lubricated wear resistance

5.2 RELATIVE CAVITATION RESISTANCE

As a result of its proprietary manufacturing process, the DTS10® sliding layer far exceeds industry standards of cavitation resistance, making it an excellent choice for fluid power applications such as high-power pumps and motors.

TEST CONDITIONS	
Amplitude	0.047 mm
Frequency	20 kHz
Test duration	6 minutes
Coupling medium	water
Temperature	ambient

Table 3: Test conditions - Relative cavitation resistance

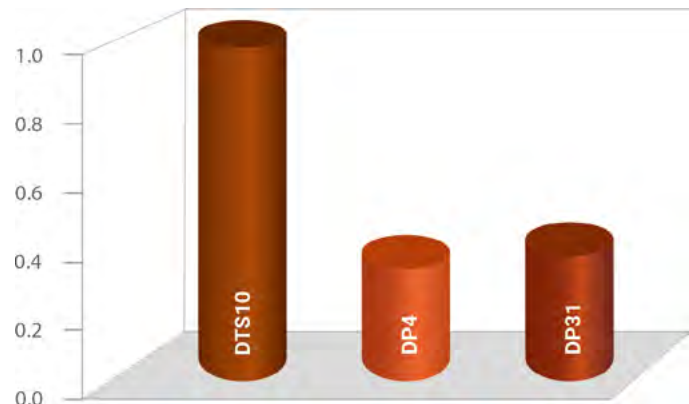


Figure 4: Relative cavitation resistance

5.3 RELATIVE HYDROFATIGUE RESISTANCE

The excellent hydrofatigue resistance of DTS10® products makes them an ideal choice for applications with cyclic or rotating loads.

TEST CONDITIONS	
Load	18 N/mm²
Speed	1.05 m/s
Lubricant	oil ISO 680
Temperature	+ 120°C

Table 4: Test conditions - Relative hydrofatigue resistance

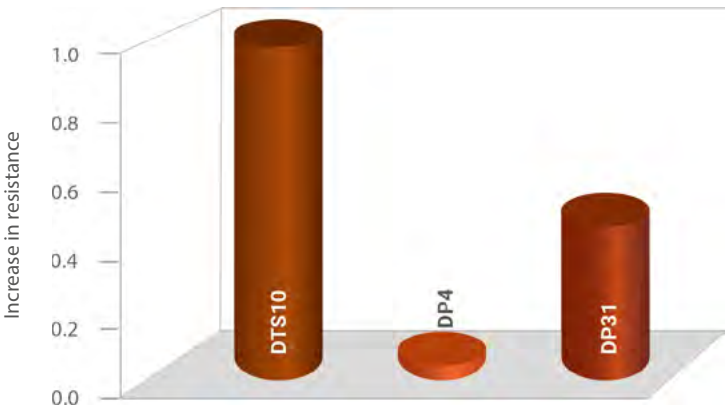
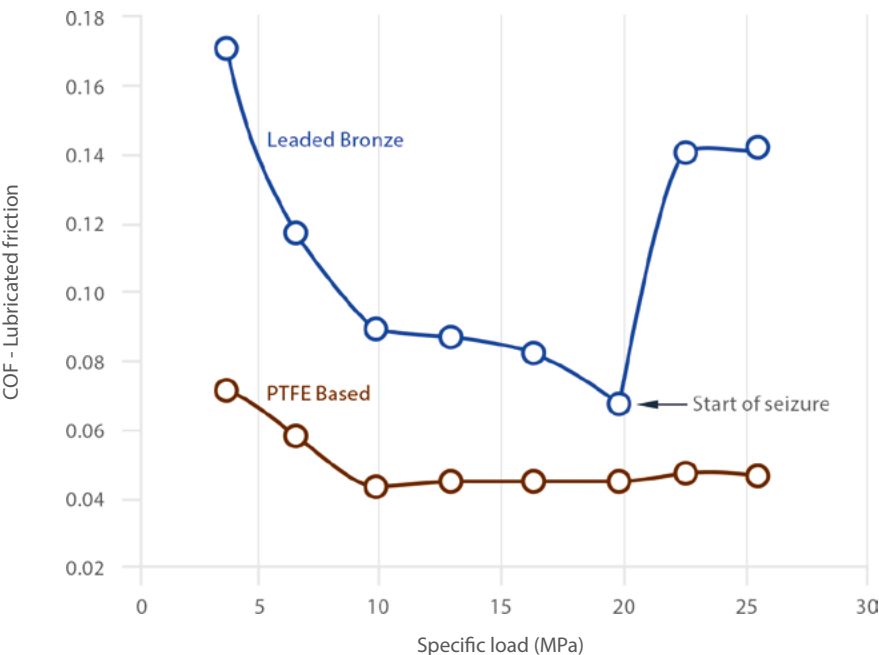


Figure 5: Relative hydrofatigue resistance

5.4 RELATIVE FRICTION AND SEIZURE RESISTANCE

As demonstrated in a friction and load test, DTS10 bearings offer an excellent alternative to bimetallic bearings. The chart below compares the performance of PTFE-based metal-polymer materials against leaded bronze, commonly used as the sliding layer in bimetal bearings.

In this incremental test, the load is increased with time and the friction and wear are recorded. As seen below, PTFE-based metal-polymer materials produce significantly lower friction over the entire range of loads, exhibiting excellent seizure resistance well past the point at which the leaded bronze product seized.



6 Machining

The PTFE copolymer lining of DTS10® has excellent machinability characteristics, making it an ideal material for high precision applications. The benefit of machining the DTS10® liner is that a controlled or precisely designed oil clearance can be achieved, producing an almost perfect bearing form, which reduces inner diameter tolerances, initial bearing wear and noise. Dimensionally, the machined bore meets tolerance class 7 specifications with a surface finish in the range of 1.6 µm R_a max, with geometric roundness below 10 µm.



Ø RANGE	TOLERANCE	TOLERANCE CLASS
> 6.0 ≤ 10.0	+ 0.015	H7
	0	
> 10.0 ≤ 18.0	+ 0.018	
	0	
> 18.0 ≤ 30.0	+ 0.021	
	0	
> 30.0 ≤ 50.0	+ 0.025	
	0	
> 50.0 ≤ 80.0	+ 0.030	
	0	
> 80.0 ≤ 120.0	+ 0.035	
	0	

Units [mm]

6.1 MACHINING GUIDELINES

The DTS10® liner can be machined using three recommended methods: boring, milling and reaming. When machining DTS10®, it is recommended that no more than 0.05 mm is removed from the lining thickness in order to ensure an ideal overlay anti-friction layer. Precise machine set-up and careful tool alignment are essential in obtaining good assembled roundness and cylindricity after machining.

- To avoid overheating and excessive wear on the tooling, lubrication is essential.
- Use a system to ensure that burrs/swarf will be removed (e.g. brush, air).
- Use polycrystalline diamond (PCD) or coated carbide (K20) tool material

Please contact the GGB Application Engineering department, should you have a specific need.

6.2 BORING

It is recommended to use inserts with wiper technology. The essential characteristics required in the single point turning tool are a nose radius of 0.2 mm - 0.4 mm, combined with a rake angle no greater than 15 degrees. Optimal cutting speeds are between 200 - 500 m/min. The feed rate should be in the range of 0.05 - 0.5 mm/rev. Satisfactory finishes can be obtained using PCD or coated carbide tool materials.

BORING CONDITIONS

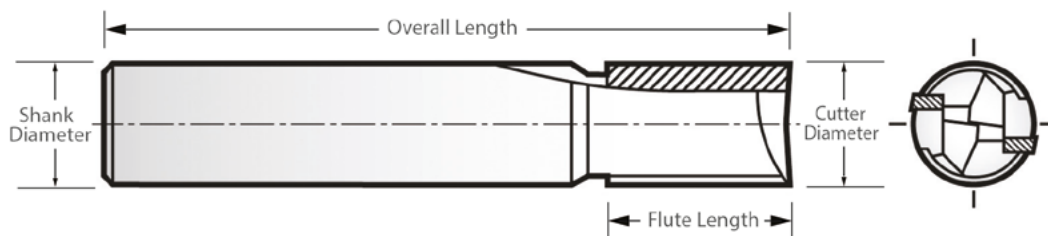
Clearance Angle	5 - 10°
Rake Angle	0 - 15°
Nose Angle	35 - 55°
Nose Radius (ISO types DC and VC)	R = 0.20 - 0.40 mm
Speed	200 - 500 m/min
Feed Rate	0.05 - 0.50 mm/rev

6.3 MILLING

For milling, it is recommended to use two edge millers. The characteristic required in the milling tool is a clearance angle of 5 - 10 degrees. The rake angle should be no greater than 15 degrees. Optimal cutting speeds are between 200 - 500 m/min. The feed rate should be in the range of 0.05 - 0.1 mm/tooth.

MILLING CONDITIONS

Clearance Angle	5 - 10°
Rake Angle	0 - 15°
Speed	200 - 500 m/min
Feed Rate	0.05 - 0.1 mm/tooth

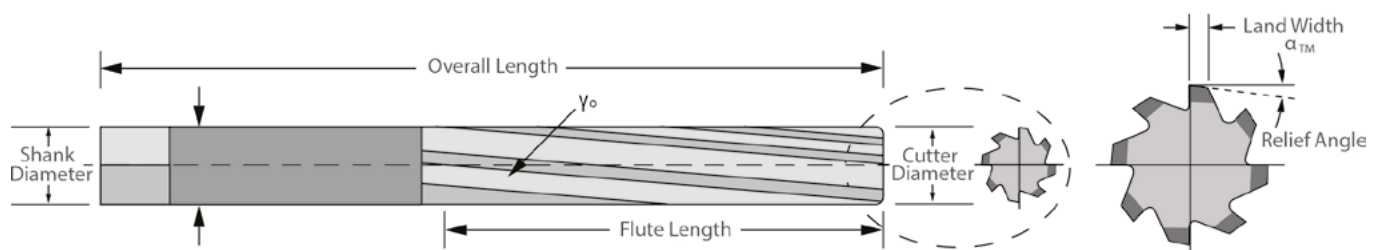


6.4 REAMING

The reaming process utilizes multiple cutting edges and is an ideal method for enlarging or sizing the inner diameter of DTS10® bushings. The essential characteristics required in the reaming tool are a 10-degree clearance or relief angle, and a tooling groove angle of 10 degrees. The benefits of reaming produce hole geometry and finish as close to perfection as theoretically possible.

REAMING CONDITIONS

Clearance / Relief Angle	10°
Rake Angle	0°
Helix Angle	10°
Speed	200 - 500 m/min
Feed Rate	0.05 - 0.1 mm/tooth



7 Bearing Application Data Sheet



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

DATA FOR BEARING DESIGN CALCULATION

Application: _____

Project/No.: _____

Quantity: _____

☐ New Design

☐ Existing Design

☐ Steady Load

☐ Rotating Load

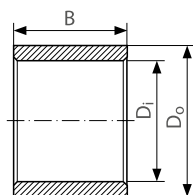
☐ Rotational Movement

☐ Oscillating Movement

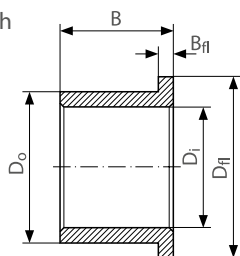
☐ Linear Movement

BEARING TYPE

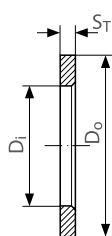
☐ Cylindrical bush



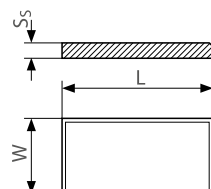
☐ Flanged bush



☐ Thrust washer



☐ Slide plate



☐ Special parts
(sketch)

DIMENSIONS [MM]

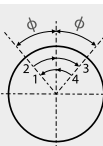
Inside diameter	D_i	
Outside diameter	D_o	
Length	B	
Flange diameter	D_f	
Flange thickness	B_f	
Wall thickness	S_T	
Length of slideplate	L	
Width of slideplate	W	
Thickness of slideplate	S_s	

LOAD

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

MOVEMENT

Rotational speed	N [1/min]	
Speed	V [m/s]	
Length of stroke	L_s [mm]	
Frequency of stroke	[1/min]	
Oscillating cycle	ϕ [°]	
Osc. frequency	N_{osz} [1/min]	



MATING SURFACE

Material	
Hardness	HB/HRC
Surface finish	R_a [μm]

CUSTOMER INFORMATION

Company _____

Street _____

City / State / Province / Post Code _____

Telephone _____ Fax _____

Name _____

Email Address _____ Date _____

FITS & TOLERANCES

Shaft	D_j	
Bearing housing	D_H	

OPERATING ENVIRONMENT

Ambient temperature T_{amb} [°]	
Bearing housing material	
☐ Housing with good heating transfer properties	
☐ Light pressing or insulated housing with poor heat transfer properties	
☐ Non metal housing with poor heat transfer properties	
☐ Alternate operation in water and dry	

OPERATING ENVIRONMENT

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

SERVICE HOURS PER DAY

Continuous operation	
Intermittent operation	
Operating time	
Days per year	

SERVICE LIFE

Required service life L_H [h]	
---------------------------------	--

8 Product Information

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

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

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

DOCUMENT INFORMATION

Edition 2026. This edition replaces earlier editions which hereby lose their validity.

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

HEALTH AND SAFETY

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

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

A detailed explanation of our commitment to REACH and RoHS directives can be found at ggbearings.com/en/reach-rohs.

HEALTH HAZARD - WARNING

Fabrication

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

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

Such fumes can arise from PTFE particles picked up on the end of a cigarette. Therefore smoking should be prohibited where DP4 is being machined.

TRADEMARKS

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Stronger.Together.



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IN137ENG05-26USA

GGB is part of The Timken Company's portfolio of engineered bearings and industrial motion products.