

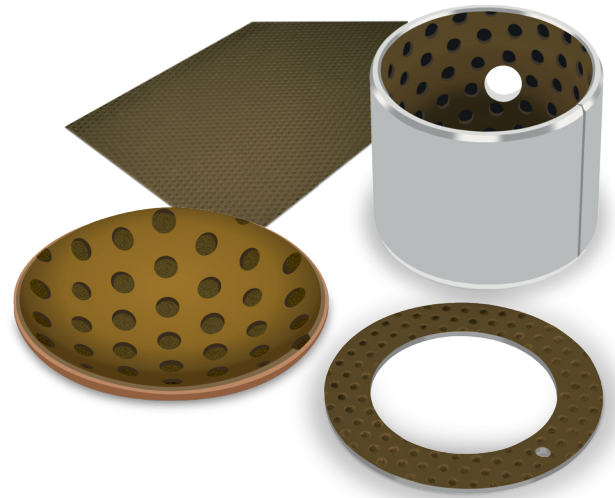
GGB DX[®]10

**MAINTENANCE-FREE, METAL-POLYMER TRIBOLOGICAL
SOLUTIONS FOR HIGH-DEMAND ENVIRONMENTS**

INTRODUCTION

DX[®]10

DX[®]10 is a value-engineered, steel-backed solution with a tough, abrasion-resistant polymer surface, designed for heavy-duty applications and harsh environments where high loads, shock, heat and abrasive contamination are present. DX[®]10 leads the way to lower maintenance and lower operational costs. In existing designs, DX[®]10 can replace troublesome bronze, bimetallic and roller bearings for a longer service life.



DX[®]10 IS NOW AVAILABLE IN PLAIN BORE, UNINDENTED FORM.

DX[®]10 is now available in plain bore, unindented form, which performs well in highly loaded, oil-lubricated applications that require:



High-temperature capability



High fatigue strength



Erosion resistance



Good wear resistance



Excellent chemical resistance



Lead Free

CHARACTERISTICS

- High load capacity
- High pU capability
- Excellent abrasion resistance
- Good temperature resistance
- Very good performance with grease and oil lubrication
- Available with pin-indented surfaces for better lubricant retention, or unindented for oil-lubricated applications
- Available in bushings, washers and special shaped parts
- Machinability: DX[®]10 is a machinable product (consult our Applications Engineering Department for guidelines)

RECOMMENDED MARKET APPLICATIONS*

GGB DX®10 is intended for greased or oil-lubricated, heavy-duty applications with high load, elevated temperature and potential for abrasive contamination:

- Kingpins for trucks and off-highway equipment
- Truck and automotive suspensions
- Construction equipment
- Lift equipment
- Cranes
- Automotive oil pumps
- Small reciprocating bushings
- Mechanical handling and lifting equipment
- Recreational equipment
- Industrial machinery

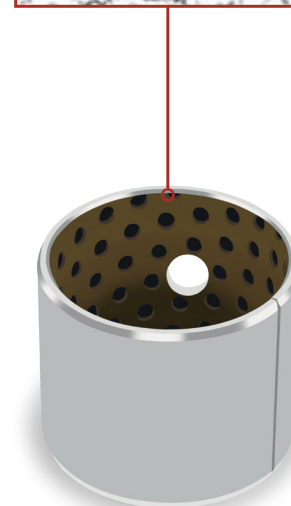
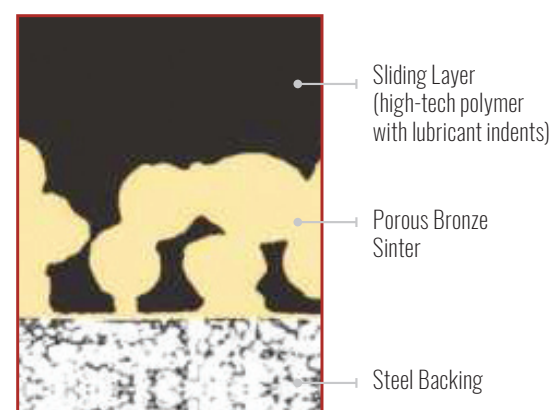
*Inquire with GGB Applications Engineering Team for other possible applications.



BEARING PROPERTIES

BEARING PROPERTIES	IMPERIAL VALUE	METRIC VALUE
GENERAL		
Maximum Load, p - Static	36,000 psi	250 N/mm ²
Maximum Load, p - Dynamic	29,000 psi	200 N/mm ²
Operating Temperature - Min	-40°F	-40°C
Operating Temperature - Max	350°F	175°C
GREASE LUBRICATED		
Maximum Sliding Speed, U	500 fpm	2.5 m/s
Maximum pU Factor	80,000 psi x fpm	2.8 N/mm ² x m/s
Coefficient of Friction f	0.01 - 0.10	0.01 - 0.10
OIL LUBRICATED		
Maximum Sliding Speed, U	2,000 fpm	10.0 m/s
Maximum pU Factor	80,000 psi x fpm	2.8 N/mm ² x m/s
Coefficient of Friction f	0.01 - 0.06	0.01 - 0.06
RECOMMENDATIONS		
Shaft Surface Roughness, Ra	≤ 16 μin	≤ 0.4 μm
Shaft Surface Hardness - Normal	HB > 200	
Shaft Surface Hardness, For longer service life	HB > 350	

MICROSECTION



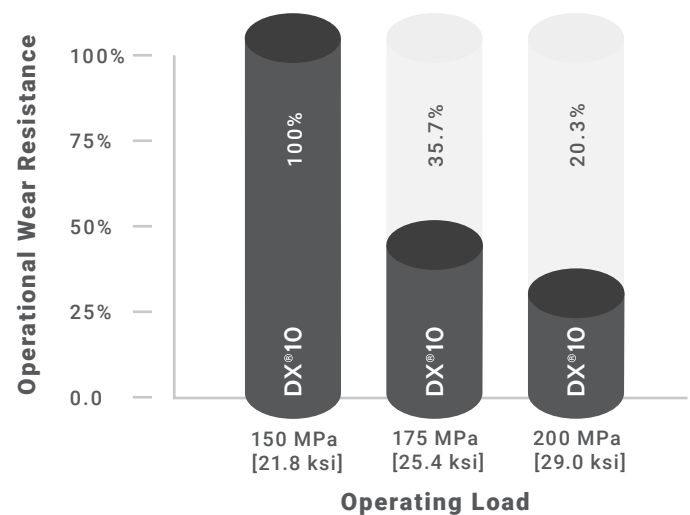
Bearing Performance

WEAR RESISTANCE – EXTREME LOADS

DX®10 produces maximum wear resistance under a greased oscillation from low loads to the extreme load of 150 MPa. DuraStrong™ technology works by developing a solid lubricant between the polymer liner system and the metallic interface, which prevents excess wear of the liner and significantly decreases the frictional response. The self-lubricating system is proven to be effective at maintaining an operational wear resistance at loads as high as 200 MPa.

OPERATIONAL WEAR TEST

Oscillation	±30° at 15cpm
Temperature	22°C [72°F]
Shaft Diameter	25.4mm [0.9998 inch]
Shaft Hardness	55 HRC
Grease Mixture	Zinc based grease greased once upon installation
Test Duration	50 hours

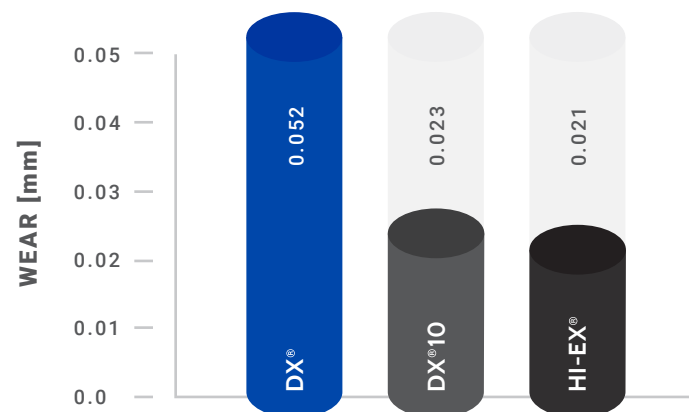


ABRASION RESISTANCE

To confirm DX®10's superb abrasion wear resistance, DX®10 was compared against DX® and HI-EX®. Each thrust washer was pin-indented. The grease was contaminated with 50% by weight Arizona road dust. Testing indicated that DX®10 abrasive wear resistance was better than GGB standard product DX® and on par with GGB premium product HI-EX®.

THRUST WASHER TEST

Applied Load	13.8 MPa [2000 psi]
Speed	0.15 m/s [30 fpm]
Temperature	105°C [221° F]
Grease Mixture	50% Lithium grease + 50% Arizona road dust; % by weight
Test Duration	12 hours

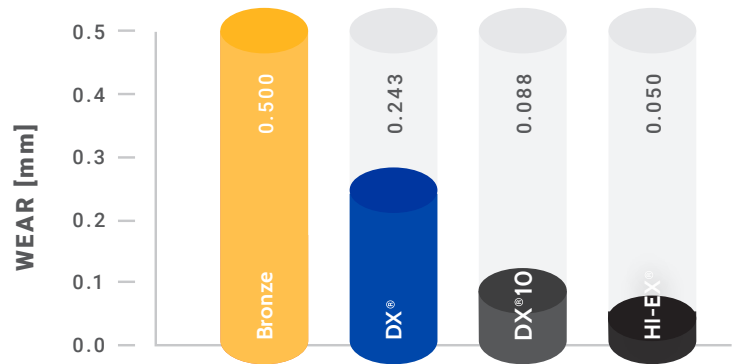


OSCILLATION WITH GREASE

To prove the durability of DX®10 in oscillation, DX®10 was compared with DX®, HI-EX® and bronze alloy (90% Cu, 10% Sn) in greased oscillation tests. Each bearing was pin-indented. The graph below shows the superior performance of DX®10. Testing indicated that DX®10 greased oscillation wear resistance was substantially better than bronze; better than GGB standard product DX®. GGB premium product HI-EX® was better than DX®10.

OSCILLATION TEST

Applied Load	70 MPa [10,000 psi]
Oscillation	±30° at 15 cpm
Temperature	22°C [72°F]
Shaft Diameter	25 mm [0.984 inch]
Shaft Hardness	60 Rc
Grease Mixture	Lithium grease, greased once at startup
Test Duration	250,000 cycles [278 hours]

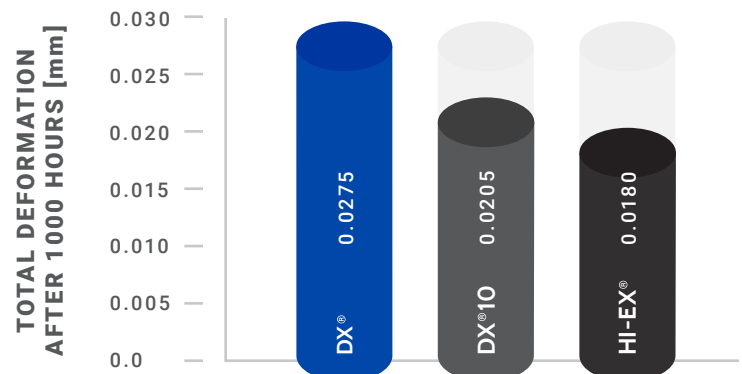


THERMAL DIMENSIONAL STABILITY

To demonstrate the long-term thermal dimensional stability of GGB tape products, creep resistance tests were performed at 100°C comparing DX®, HI-EX® and DX®10. The test data indicated that DX®10 was significantly better than DX® and on par with GGB premium product HI-EX®.

THERMAL DIMENSIONAL

Load	36 MPa [5220 psi]
Material Thickness	1.5 mm [0.059 inch]
Temperature	100°C [212° F]
Test Duration	1000 hours



MOVING FORWARD

GGB Tribological Solutions

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

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

Today, our products can be found everywhere—from scientific vessels at the bottom of the ocean to 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 critical at all levels of business in order to achieve our goal of having the safest employees in the industry.

EXCELLENCE

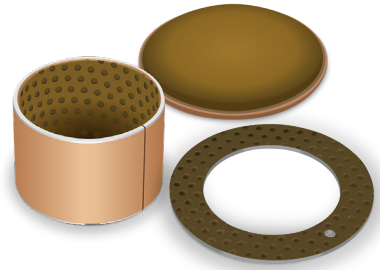
A world-class organization is built by fostering excellence throughout the company, across all roles. Our world-class manufacturing plants are certified in quality and excellence in the industry according to ISO 9001, TS 16949, ISO 14001, ISO 50001 and OHSAS 18001, allowing us to access the industry's 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.



THE TRIBOLOGICAL SOLUTION PROVIDER FOR INDUSTRIAL
PROGRESS, REGARDLESS OF SHAPE OR MATERIAL



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