

DURAMAX®

DuraBlue® Composite Water-Lubricated Stern Tube Bearings

- ▶ Pollution Free
- ▶ Dimensionally Stable, Long Wear Life
- ▶ Ultra-Low Friction, High Load Capabilities



PRODUCT INFORMATION AND SELECTION GUIDE

Duramax Marine® is an ISO 9001:2015 Certified Company

DURAMAX MARINE®

DuraBlue® is a high performance stern tube bearing for blue water operation.

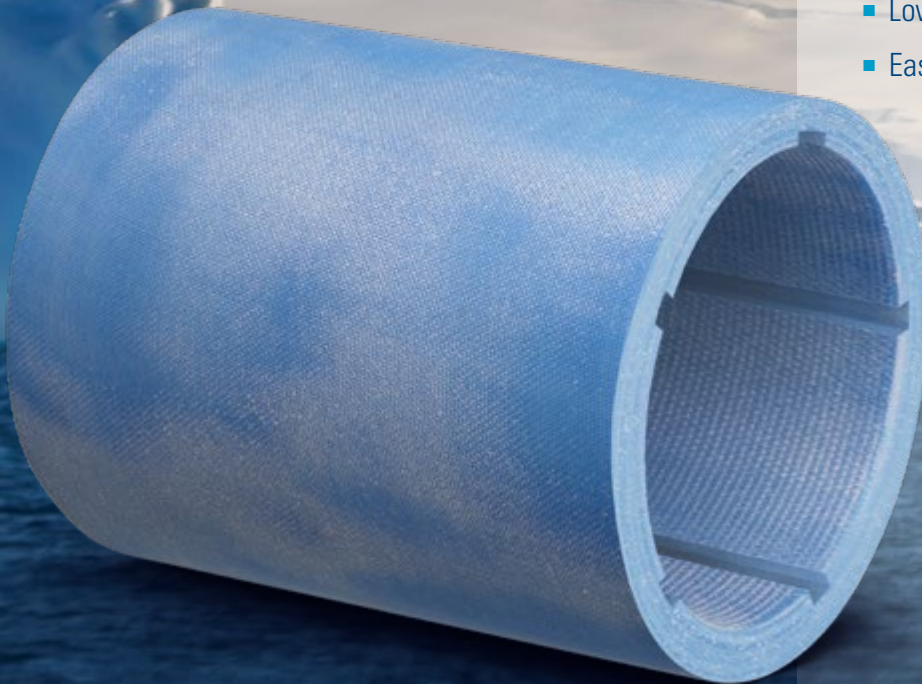
DuraBlue® water-lubricated stern tube bearings are manufactured using a unique synthetic reinforced composite that incorporates solid lubricants for superior operation and outstanding wear life in blue water applications. The composite resin matrix was designed to withstand the rigors of seawater operation and frictional heat generated when used in stern tube propulsion systems.

DuraBlue® is dimensionally stable, has a very low coefficient of expansion in extremely cold or tropical regions.

DuraBlue® is designed to tolerate edge loading and misalignment even with the heaviest loads. It is chemical and corrosion resistant and will not cause corrosion to housing.



- Approved for 2:1 L/d operation
- Ultra low friction propulsion bearing - COF 0.001
- High strength-to-weight ratio
- Internal lubricants for superior operation
- Proprietary fiber/resin matrix for extended wear life
- Low coefficient of thermal expansion
- Easy to machine and install



DuraBlue® is an engineered composite material with ABS type approval.

The DuraBlue® composite matrix was engineered and tested to provide superior performance in blue water stern tube applications. It has received full ABS type approval for use in propulsion bearings with length to diameter ratios L/d as low as 2:1.

DuraBlue® bearings meet the requirements for operation in propulsion systems by all other class societies.



DuraBlue® stands ahead of the competition.

Unlike unstable thermoplastic polyurethane elastomers, DuraBlue® has an engineered composite matrix that will not suffer from hysteresis failure or swelling from hydrolysis.

DuraBlue® has a much lower coefficient of thermal expansion than polyurethane elastomers and will never loosen or become dislodged in the stern tube.

DuraBlue® will never exhibit brittleness or chatter in extremely cold temperatures, or reach a melting point at high temperatures.



Duramax Marine® maintains a commitment to the environment.

Duramax Marine offers the most complete range of seawater-lubricated propulsion system bearings in the industry. Our bearing systems are used on more commercial and navy vessels than any other.

DuraBlue® is a cost-effective stern tube bearing solution for blue water use.

DuraBlue® Bearing is dimensionally stable and abrasion resistant.

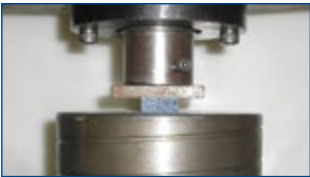
Swelling in sea water is virtually eliminated with our proprietary composite resin matrix. DuraBlue® thermoset polymer matrix is reinforced with synthetic fibers, and contain no organic fibers that can swell in sea water. It has an absorption rate $\leq 0.09\%$.

DuraBlue® meets the Duramax Marine® highest level of industry standards.

DuraBlue® stern tube bearings have been tested in Duramax® in-house lab and meet the highest level of marine industry standards. They are manufactured to meet ISO 9001 standards and are approved for commercial blue water marine use by ABS.

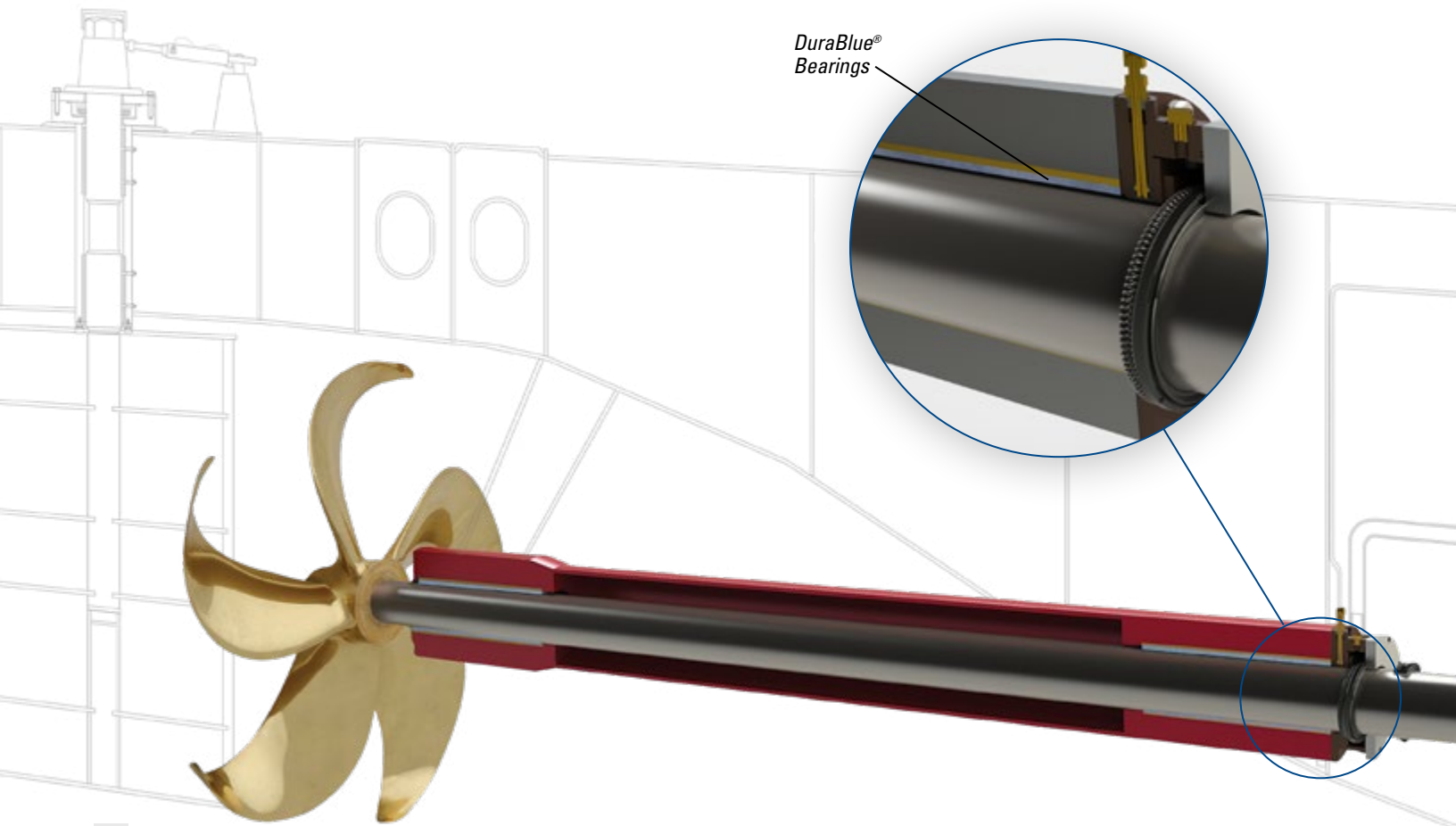
Duramax® DuraBlue® compression test.

An independent laboratory static compression test on the DuraBlue® composite material showed it exceeded 51,000 PSI.



PROPERTY	UNIT		VALUE	
Compressive Strength (ASTM D695)	MPa	Psi	> 207	> 35,000
Shear Strength (ASTM D2344)	MPa	Psi	> 13.8	> 2,000
Modulus of Elasticity (ASTM D638)	MPa	Psi	> 3,102	> 450,000
Hardness (ASTM D785)	Rockwell "R"		> 110	
Density (ASTM D792)	10 ³ kg/m ³	lb/in ³	1.25	0.045
Water Absorption (ASTM D570)	%		< 0.5	
Coefficient of Thermal Expansion (ASTM D696)	10 ⁻⁶ /°C	10 ⁻⁶ /°F	43	24
Chemical Resistance	NA		Good	
Color	NA		Blue	
Maximum Temperature (ASTM D648)	°C	°F	100	212
Minimum Temperature	°C	°F	< -200	< -328
Advised Maximum Working Temperature	°C	°F	80	176
Coefficient of Friction - Steady State	Tested dry operation at 15N/mm ²		0.1 – 0.2	
	Tested wet at 80 npsi		0.001 - 0.003	
General Wear Resistance	NA		Very Good	
Resistance Against Abrasive Wear	NA		Good	
Deflection*	in		< 0.010	

*after 24 hour at 15 N/mm²



DuraBlue® is ideal for conversion of oil to water-lubricated propulsion systems.

Duramax Marine® Engineers can design a complete conversion of your oil lubricated propulsion system to a water-lubricated system.

Seawater lubrication - The ideal lubricant.

Seawater is the ideal lubricant for use in modern propulsion systems. It offers the obvious advantages of being nonpolluting and environmentally friendly. It is plentiful and a cost effective and superior alternative to oil lubricated propulsion systems. Our engineering team can design a water-lubricated propulsion system that eliminates oil pollution and keeps our oceans clean.

Ultra low friction and wear.

Wear and friction are more important considerations with water-lubricated bearings than with oil lubricated bearings. This is because of the very low viscosity of water and the resulting thin film thickness. DuraBlue® is designed to operate hydrodynamically and support water film development at very low shaft speeds. The material matrix is also extremely resistant to wear by third body abrasion.

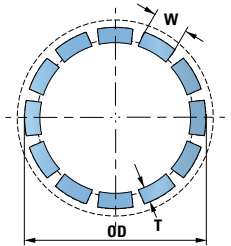


Special designs.

Special bearings for naval application that incorporate partial arc segmental bearings mounted in split bronze housings are also available. All bearings can be manufactured as full or split bearings.

Stave Bearing design.

Staves can be machined using sheet stock and is an easy and more economical solution when removing worn staves and keeper strips for replacing staves in the bronze carrier.



Fitting methods for DuraBlue® Bearings.

DuraBlue® can be easily installed using one of these recommended installation techniques:

- Press Fit
- Freeze Fit
- Liquid Nitrogen (*Vapor Method*)
- Liquid Nitrogen (*Immersion Method*)
- Dry Ice and Alcohol Method



See the DuraBlue® installation brochure for more information.



DuraBlue® Bearings, custom fit to match your application.

DuraBlue® Bearings can be easily machined.



As a general guide DuraBlue® Bearing is machinable using standard conventional machine shop techniques. Methods used for brass, aluminum or lignum vitae will apply for DuraBlue®. It is preferable to use tungsten carbide turning tools with cutting speeds of 5.5 m/s (19ft/s). Must be machined dry, without use of coolant.

For more information on machining, drilling and grooving of bearings see DuraBlue® Bearing Installation Brochure.

DuraBlue® bearings are available in any size.

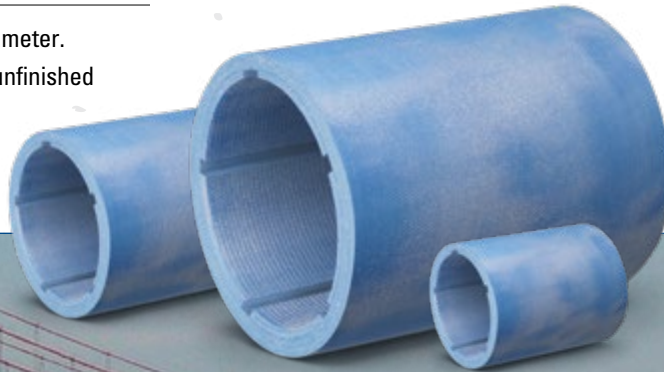
DuraBlue® Bearings are available for any shaft diameter. The bearings can be supplied from our factory in unfinished tubes or we can supply fully machined ready for service.

The Duramax® Edge: unmatched quality.

Every person at Duramax Marine® is focused on delivering the highest, most consistent quality of product and technical support in the marine industry. Quality that has set performance records unmatched by any other products in the industry around the world.

Worldwide reach.

Duramax Marine® has a long history of delivering engineered product solutions for maintenance problems, earning the trust of marine professionals around the world. Our global technical support team and distributor network of product experts are always available for customers wherever they are needed.



Duramax® products complete your water-lubricated propulsion and steering systems.

Duramax Marine® also manufactures DryMax® Shaft Seal. It is a robust, long-life shaft seal designed for optimal sealing performance.

Duramax Marine® stocks DryMax® Stern Tube Seals to help you complete the conversion to water for your propulsion system.

The DryMax® Shaft Seal is a reliable system that uses no grease or oil and is easy to install and maintain. It is a great addition to a full line of proven and reliable marine products developed by Duramax Marine® and engineered to protect the environment.



DryMax® Rudder Sealing System also available.

For propulsion shafts from 3.5" to 36" (89-900mm)

DuraBlue® is also designed to be used as a rudder bushing, thrust washer and wear pad.

DuraBlue® Rudder Bushings and washers are available in an engineered dimensionally stable, high performance, pollution free, self-lubricating product that delivers extremely long life. DuraBlue® has been fully tested at 15N/mm² and delivers an with ultra-low steady state friction value of 0.1 to 0.2.

DuraBlue® Bushings can be supplied both finished and unfinished and are available to ship within 24 hours in a full range of stock sizes quickly and economically.

DuraBlue® Stern Tube Bearings, Rudder Bushings, pintles and thrust washers can be custom machined to fit your exact needs in 1" to 42" diameters, or from 31 inch x 48 inch flat stock. We will use your engineered drawings to fit your specific application and delivered to meet the time agreed to.



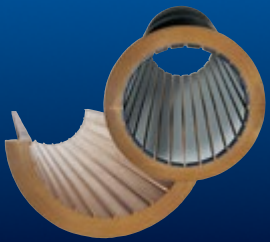
INNOVATION.
EXPERIENCE.
RESULTS.

Duramax Marine® is committed to providing excellence in every product we manufacture. Our Johnson Cutless® marine and industrial bearings, heat exchangers, impact protection systems and sealing systems are known worldwide for their engineered quality and dependable performance. Please contact the factory for information on any of the following Duramax Marine® products:



JOHNSON CUTLESS® WATER-LUBRICATED BEARING SYSTEMS

Johnson Cutless® Sleeve and Flanged Bearings
DX 490 Rudder Bushings



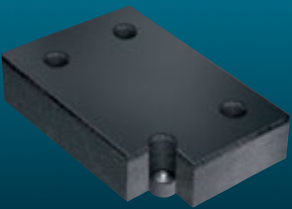
DURAMAX® ADVANCED WATER-LUBRICATED BEARING SYSTEMS

Johnson® Demountable Stave Bearings
ROMOR® I Stave Bearings and Segmental Housings
ROMOR® C- Partial Arc Bearings
DMX® Polymer Alloy Bearings
DuraBlue® Bearings, Rudder & Pintle Bushings, Thrust Washers, and Wear Pads
Industrial Pump Bearing Systems



DURAMAX® HEAT EXCHANGE SYSTEMS

DuraCooler® Keel Coolers
Duramax® Demountable Keel Coolers
Duramax® BoxCoolers
Duramax® Plate Heat Exchangers



DURAMAX® IMPACT PROTECTION SYSTEMS

Johnson® Commercial Dock Bumpers, Fenders & Tow Knees
Weatherstrip Door Gaskets, Window Channel and Hatch Cover Gaskets
LINERITE® Composite Batterboard Systems



DURAMAX® SHAFT SEALING SYSTEMS

DryMax® Shaft Seal & Rudder Seal
Duramax® Mechanical Shaft Seal
Johnson® Heavy-Duty Air Seal Stuffing Boxes
Duramax® Ultra-X® High Performance Compression Packing
Johnson® Strong Boy Stern Castings and Stuffing Boxes

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17990 Great Lakes Parkway
Hiram, Ohio 44234 U.S.A.
PHONE 440.834.5400
FAX 800.497.9283 USA & Canada
or 440.834.4950
info@DuramaxMarine.com
www.DuramaxMarine.com

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