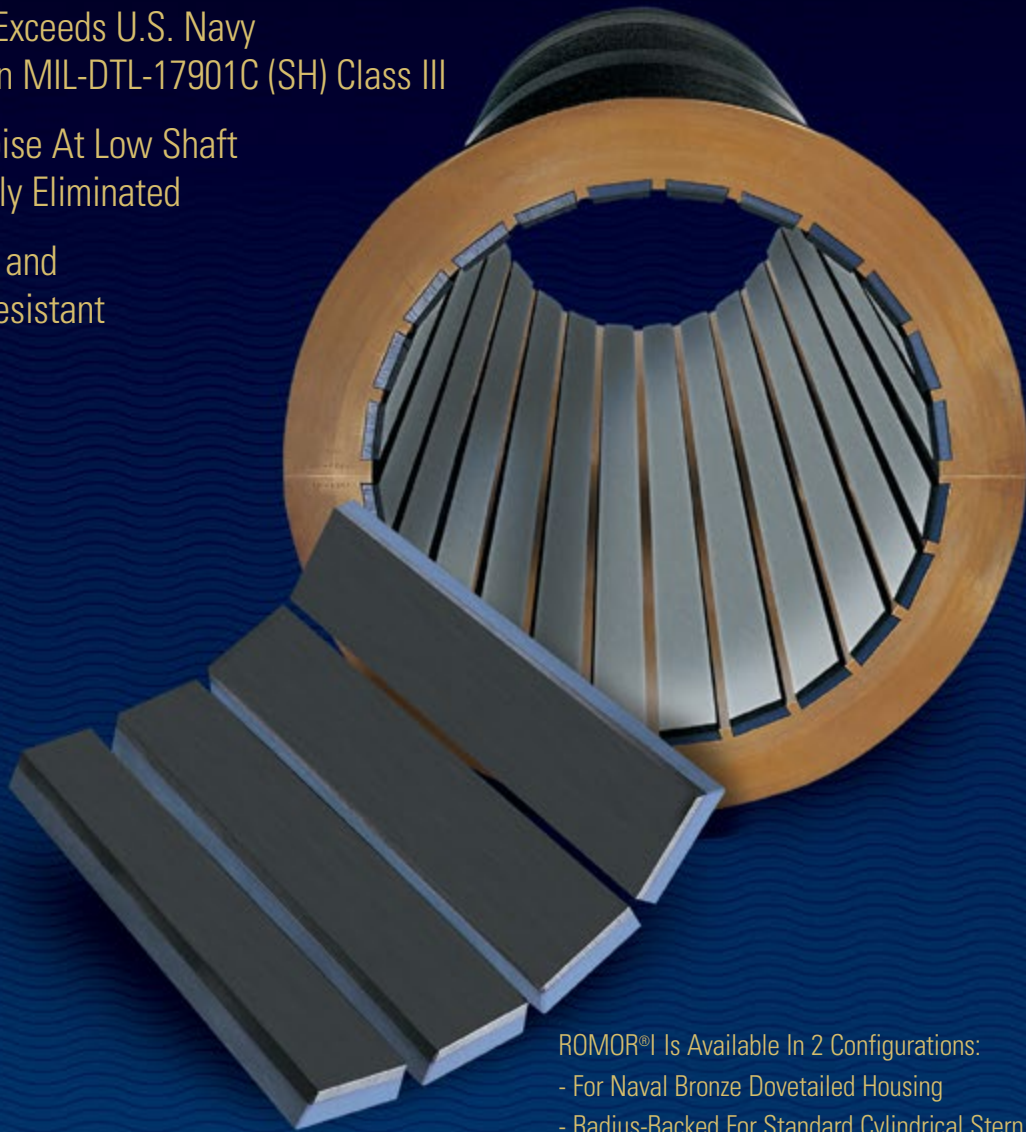


**DURAMAX®**

# ROMOR®I

- ▷ Meets and Exceeds U.S. Navy Specification MIL-DTL-17901C (SH) Class III
- ▷ Acoustic Noise At Low Shaft RPM Virtually Eliminated
- ▷ Lightweight and Corrosion Resistant



ROMOR®I Is Available In 2 Configurations:

- For Naval Bronze Dovetailed Housing
- Radius-Backed For Standard Cylindrical Stern Tubes

## PRODUCT INFORMATION AND SELECTION GUIDE

Duramax Marine® is an ISO 9001:2015 Certified Company

# DURAMAX MARINE®



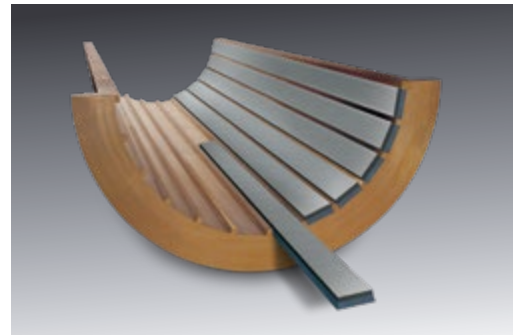
# ROMOR® I all-polymer bearing engineered for high-performance, low friction, and silent operation.

ROMOR® I water-lubricated bearing staves are manufactured with a proprietary nitrile rubber surface integrally bonded to a ultra-high molecular weight polyethylene backing. ROMOR® I is a landed bearing design engineered for high performance, extremely low coefficient of friction, and silent operation at low journal velocities.

ROMOR® I water-lubricated stave bearings were first to be qualified by the U.S. Navy to MIL-DTL-17901C (SH) Class III specifications. It's a bearing that has proven itself in aggressive working environments, meeting or exceeding the stringent operational expectations of both military and commercial marine customers.

**ROMOR® I is available in both dovetailed stave design for naval bronze housings and radius-backed for standard cylindrical stern tubes.**

ROMOR® I Dovetailed Design  
For Naval Bronze Housing.



## **Glass-smooth wear surface delivers unbelievably low coefficient of friction of 0.001**

ROMOR® I is a proprietary nitrile rubber formula, engineered to a controlled thickness, with a 15 to 20 micro-inch glass-smooth finish and 80 durometer, Shore A, hardness.

- Greatly reduces initial friction
- Reduces total system wear, increasing journal life
- Accelerates break-in or run-in period
- Eliminates stick-slip at extremely low journal velocity
- Reduces low speed noise
- Elastomeric characteristics protect shaft in gritty environments



## **Proprietary integral bonding method that is not a parting line.**

- The integral bond acts as a shock absorber and reduces vibration
- It has never failed in an adhesion pull test

## **UHMW-PE backing is tough, light-weight and unbreakable.**

Can be machined to adjust bearing clearance and compensate for shaft/liner wear.

- Resists corrosion
- Eliminates dezincification
- Absorbs impacts



The U.S. Navy Trusts ROMOR® I to keep their vessels operating at peak performance.

ROMOR® I was subjected to the U.S. Navy's demanding tests and was the first water-lubricated stave bearings to qualify to MIL-DTL-17901C (SH) Class III specifications.

Since then, Duramax® staves have proven themselves in some of the toughest military operating environments. The stave's low coefficient of friction that greatly extends journal life, less break-in running time, vibration dampening and silent operation is why ROMOR® I dovetail bearings are used on more U.S. Navy surface ships and submarines than any other bearing.



## 71 U.S. Navy Submarines

- 42 SSN-688 "Los Angeles" Class Attack Subs
- 18 "Ohio" Class Strategic Missile Subs
- 2 SSN "Sea Wolf" Class Attack Subs
- 9 SSN-774 "Virginia" Class Attack Subs

## 285 U.S. Navy Surface Vessels

- DDG Arleigh Burke Class Destroyer
- LPD Austin Class Amphib transport
- MCM Avenger Class Mine Countermeasures
- AGER Banner Class Research Ship
- LCC Blue Ridge Class Command Ship
- PC Cyclone Class Patrol Boat
- AS Emory S. Land Class Sub Tender
- CVN Enterprise Class Aircraft Carrier
- LCS Freedom Class Littoral Combat Ship
- LSD Harpers Ferry Class Landing Ship
- LCS Independence Class Littoral Combat Ship
- CVN Nimitz Class Aircraft Carrier
- FFG Oliver Hazard Perry Class Frigate
- LPD San Antonio Class Amphib transport
- LHA Tarawa Amphib Assault Ship
- CG Ticonderoga Class Cruiser
- AFSB Trenton Class Staging Ship
- LHD Wasp Class Amphib Assault Ship
- LSD Whidbey Island Class Landing Ship



# How ROMOR® I stave bearing system minimizes bearing and journal wear.

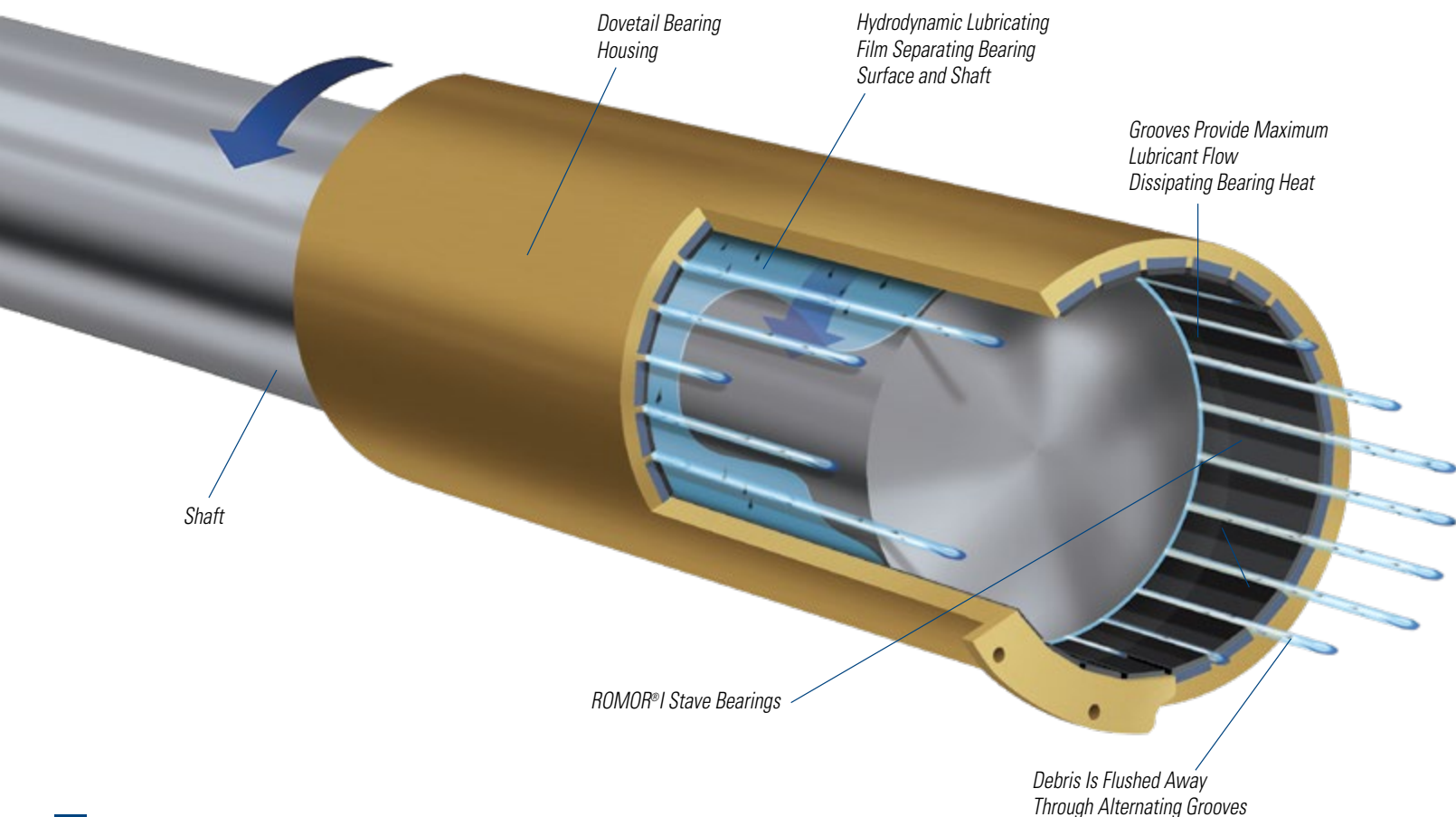
Duramax® ROMOR® I all-polymer stave nitrile rubber formulation and UHMW-PE backing have been designed to optimize vessel performance when operating in gritty, dirty working environments.

ROMOR® I naval bronze dovetail housing system is designed to deliver maximum water flow through grooves that run the length of the bearing. Incoming water dissipates bearing heat. Outgoing water expels potentially damaging grit and marine contaminants, minimizing wear to bearing stave and journal. The Duramax® ROMOR® I stave system is engineered for best balance between bearing and journal wear.

ROMOR® I Naval Bronze Dovetail Housing System.

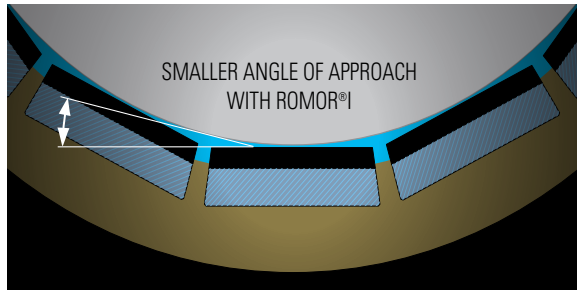


Engineered water-lubricated system designed to dissipate bearing heat, reduce friction and expel grit and marine contaminants extending life of bearings and journal.



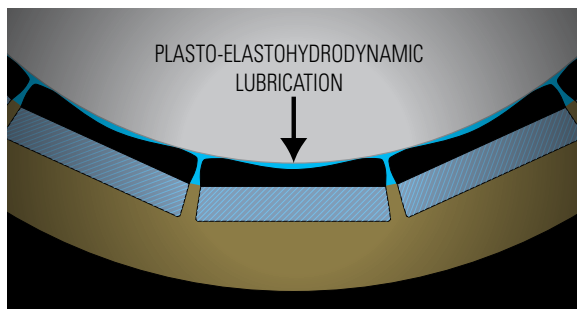


## How ROMOR® I Staves Deliver Low Coefficient of Friction Under 0.001.



### Flat profile of bearing reduces initial friction.

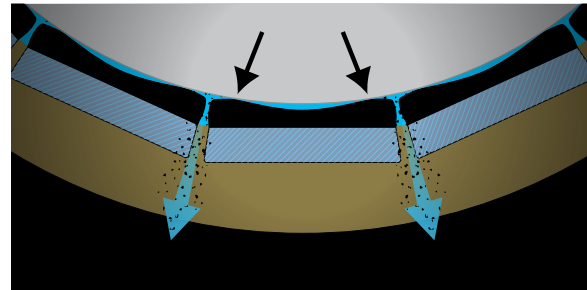
- Flat design of land reduces the journal contact wear area.
- Low angle of approach reduces friction, noise and vibration.



### Elastic deflection of the rubber allows the formation of a permanent lubrication pocket.

- During operation, hydrodynamic pumping pressure deforms the rubber, forming a non-contact hydrodynamic pocket in the bearing surface.
- Hydrodynamic pressure builds within the pocket enhancing and extending bearing life.
- Operational coefficient of friction is common at 0.001.

## "Elastic Hydrodynamic Grit Rejection" Helps Extend Journal Life.



- During operation, the leading and trailing ends of the hydrodynamic pocket are sealed and pressure within the pocket helps repel grit from reaching the bearing surface.
- Grit particles that are trapped in the pocket are elastically depressed into the rubber bearing surface, protecting the shaft from damage.
- Hydrodynamic pumping action, combined with the ability for the rubber to deform and rebound, causes the grit to be flushed into lubricating grooves away from shaft.



## “Total System Wear” is the real measure of bearing performance.

Duramax® ROMOR® I all polymer staves deliver performance competitors can only promise. Hard surface bearing manufacturers make all kinds of claims about having a longer bearing life than rubber bearings. But if hard surface bearings wear the journal at an accelerated rate the effects of long bearing life are negated.

Duramax® water-lubricated advanced rubber bearing technology takes into account the real measure of bearing performance, reducing both bearing and journal wear – called “Total System Wear”.

Duramax® engineered rubber bearings are still setting unbelievable performance records.

Since its discovery, the use of rubber as a water-lubricated bearing has baffled scientists, engineers and tribology experts. Duramax has been a leader in the research and development of rubber bearing technology for the marine industry. Our bearings experts understand the tribology science that have allowed them to engineer some of today's high performance marine bearings. Bearings like ROMOR® I, that have set performance records that competitor's bearings are still trying to reach.

Our competition would have you believe that rubber is an antiquated and inferior technology. This simply is untrue. We are continually updating and improving our rubber polymers and our bearing's superior performance speaks for itself.



### ROMOR® I nitrile rubber staves proven to have a low-coefficient of friction.

The ROMOR® I elastomeric wear area and proprietary nitrile rubber formulation have been custom engineered to provide reduced friction at all shaft speeds. (See Fig 1)

- ROMOR® I 15 to 20 micro-inch glass-smooth finish and 80 durometer, Shore A hardness reduce initial friction at low journal velocity.
- During operation, hydrodynamic pressure creates a permanent lubrication pocket in the landing surface totally separating the bearing and shaft surfaces with a thin film of water that reduces and controls friction and wear.
- Thickness of the nitrile rubber layer and the UHMW-PE backing has been engineered to enhance bearing performance, reduce vibration and absorb impacts.

### ROMOR® I all-polymer construction exceptionally durable in gritty, dirty water.

The elastic properties of the nitrile rubber allows grit to press into its face, until it's washed away, reducing damage to the shaft. Unlike hard surface bearings that cause grit to wear and score the shaft.

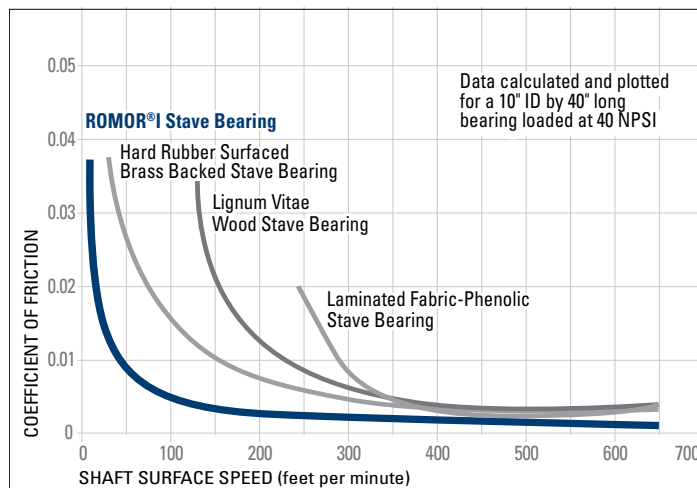
ROMOR® I staves with the UHMW-PE backing are non-corroding, have extremely high impact resistance, and is not subject to cracking or breaking under normal usage in aggressive waters. They outlast Lignum Vitae, hard rubber and polyurethane alloys. And outlast phenolic laminates nearly 18 to 1. (See Fig 2 and Fig 3).



### Duramax Marine® has fully-equipped in-house test facility.

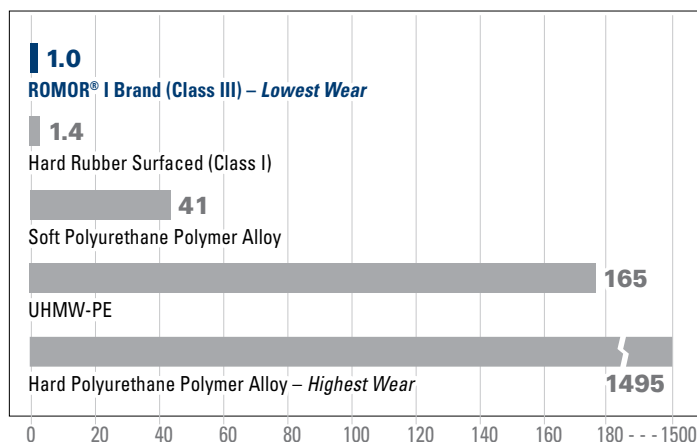
Our bearing specialists are constantly looking for ways to improve vessel performance. Multiple test beds are operated on a full-time basis. We perform both screening and advanced testing in both clean and abrasive water conditions. The marine industry knows, if there was a better bearing, we would have developed it.

FIG 1: COEFFICIENT OF FRICTION VS. SHAFT SPEED FOR ROMOR® I STAVES\*



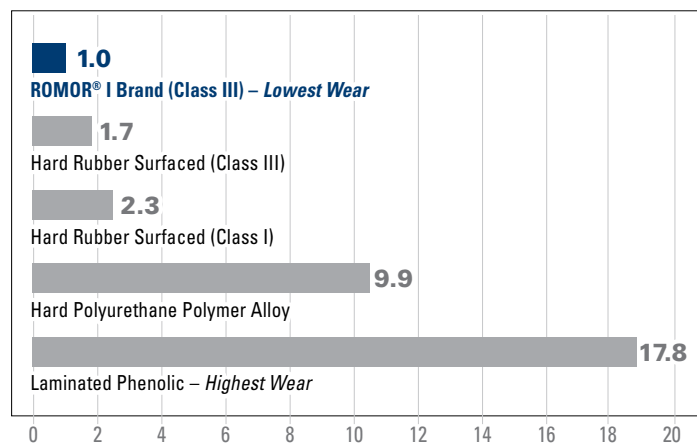
\*Note low ROMOR® I stave friction values at slow shaft speeds which reduces stick-slip problems.

FIG 2: STAVE WEAR TEST IN CLEAN WATER\*



\*Normalized data based on measurement as dry weight loss in grams per hour x 10<sup>4</sup> at 210 NPSI. Laboratory testing under accelerated load in clean water

FIG 3: STAVE WEAR TEST IN GRITTY WATER\*



\*Normalized data based on measurement of wear. Independent laboratory test in gritty water.

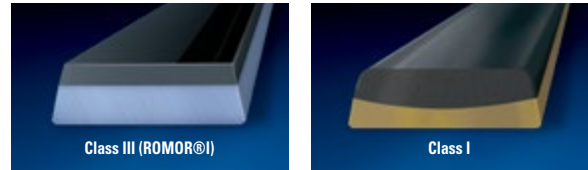


# Delivering ecological water-lubricated bearing solutions for an ever-changing world.

Marine professionals know we are constantly researching new ways to increase their vessel's performance and cut maintenance costs for the ever-changing demands of a clean new world. ROMOR® I is a perfect example. Duramax® ROMOR® I Staves were developed as a light-weight, high-performance replacement for brass-backed staves used by the U.S. Navy in a naval bronze housing. Now ROMOR® I is a high-performance bearing solution used around the world in a variety of other marine bearing applications.

**And, it's only available from the bearings experts at Duramax Marine.®**

ROMOR® I staves all-polymer construction are light-weight and corrosion resistant.



These dovetail staves are a high-performance replacement for brass-backed bearings and fit easily into existing Class I bearing slots. Because they are light-weight, installation time is greatly reduced. And, because they are corrosion resistant, wear life is extended, cutting maintenance time and replacement costs. ROMOR® I is manufactured to the highest quality standards and each staff is checked for tight tolerances and optimal performance.







### ROMOR® I staves are available in standard and custom sizes.

ROMOR® I staves are manufactured to naval ship systems command (NAVSEA) specification drawing 1385664. Staves are available in 10 standard widths that are machined to a 10° side angle stave thickness and generally finished in 1/16 inch and 1/8 inch increments. They can be machined to a non-standard thickness to accommodate shaft or journal wear. Staves are available in lengths up to 66 inches.

### Duramax Marine® outstanding and unmatched customer support.

Customers know we manufacture the highest quality products in the marine industry and every bearing is backed by a team of experts. No one has more experience than the bearings experts at Duramax Marine®. They are always available to help solve your maintenance problems, by phone, or on site. It's how we've earned the trust of the marine industry.

STANDARD SIZE CHART FOR ROMOR® I STAVES					
STAVE	THICKNESS	WIDTH	STAVE	THICKNESS	WIDTH
1	0.670"	1.680"	6	0.733"	2.305"
2	0.670"	1.805"	7	0.857"	2.743"
3	0.733"	1.930"	8	0.857"	2.930"
4	0.733"	2.055"	9	0.981"	3.055"
5	0.733"	2.180"	10	0.981"	3.180"

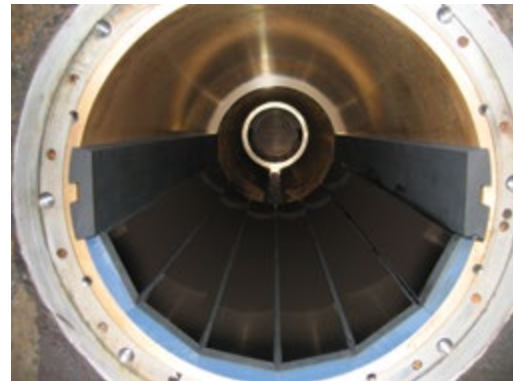
\*Also available in oversize thickness of +1/16" or 1/8"

# Same military-grade ROMOR® I engineered for round-bore stern tubes.

ROMOR® I technology developed for the military is available in a radius-backed locking stave design for use in commercial marine round-bore stern tubes.

This high-tech water-lubricated bearing technology that has proven itself in U. S. Navy surface ships and submarines is now reaching performance records in the commercial marine industry, unmatched by any other bearing in the industry. It's the ecological answer that will help you meet the marine industries' requirements for a clean new world, while dramatically cutting maintenance time and costs.

## ROMOR® I Radius-Backed Bearings In Locking Stave Design.



### **ROMOR® I low coefficient of friction of 0.001 reduces your vessel's maintenance costs.**

Less friction means longer bearing life and more protection for journal from damage and wear. It will drastically cut replacement costs and extend life between bearing change outs. ROMOR® I is energy efficient, reduces noise and vibration and protects the shaft from excessive wear.

### **ROMOR® I is exceptionally durable.**

ROMOR® I is tough and corrosion resistant, greatly extending wear life in the most aggressive working environments. ROMOR® I staves outlast brittle materials such as: Lignum Vitae, Hard Rubber, Polyurethane Alloys, and Phenolic Laminates 18 to 1.

**Glass-smooth 15 to 20 Micro-inch finish, and 80 durometer, Shore A, hardness.**



**Proprietary integral bonding method that is not a parting line.**

**UHMW-PE backing is tough, light-weight and unbreakable.**



ROMOR® I Radius-backed staves are designed for ease of installation.

All-polymer light-weight staves are easy to handle, cutting installation time and maintenance costs.

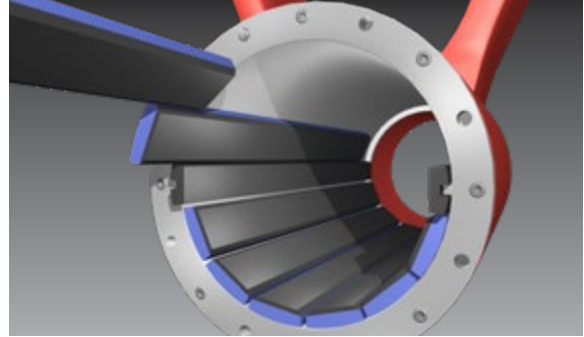
ROMOR® I staves come in standard sizes, or can be manufactured to exact thickness and side angles to meet your specifications for ease of installation in any standard round-bore stern tube.



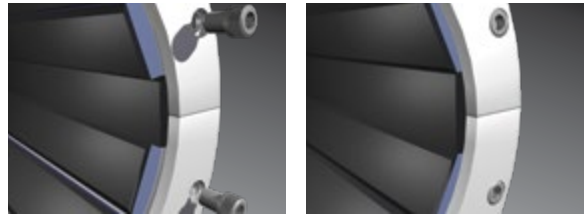
Many times staves can be installed without removing the shaft, saving time and money.

#### Easy installation method

- Staves all placed directly into round bore tube
- Slightly longer all-rubber locking staves placed next ROMOR® I staves



- Alloy compression head is bolted to stern tube compressing locking ROMOR® I staves in place.





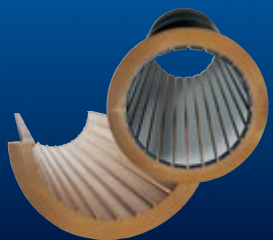
INNOVATION.  
EXPERIENCE.  
RESULTS.

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



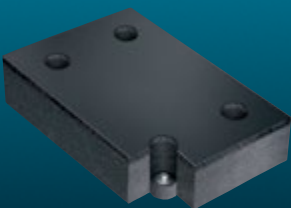
## DURAMAX® ADVANCED WATER-LUBRICATED BEARING SYSTEMS

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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