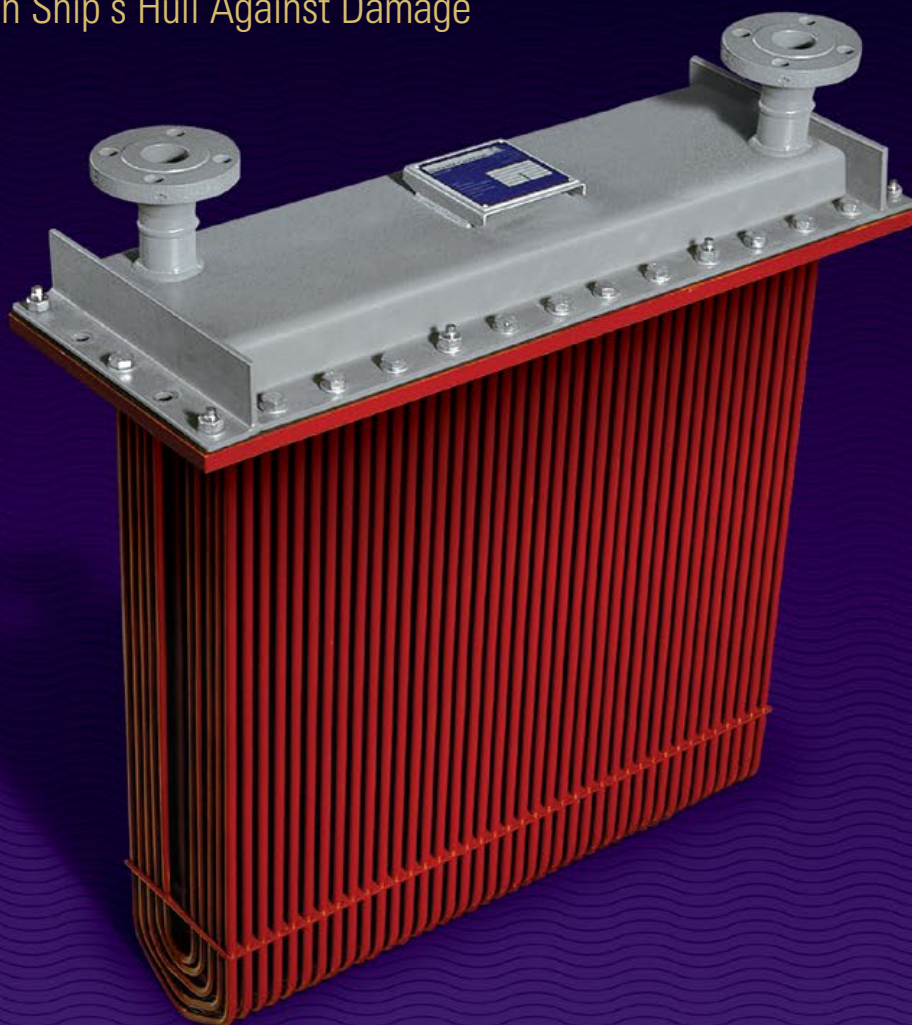


DURAMAX[®]

BoxCooler

- ▷ Large Cooling Capacity
- ▷ Protected In Ship's Hull Against Damage



PRODUCT INFORMATION AND SELECTION GUIDE

Duramax Marine[®] is an ISO 9001:2015 Certified Company

DURAMAX MARINE[®]



The Advantages of Duramax Marine® BoxCoolers.

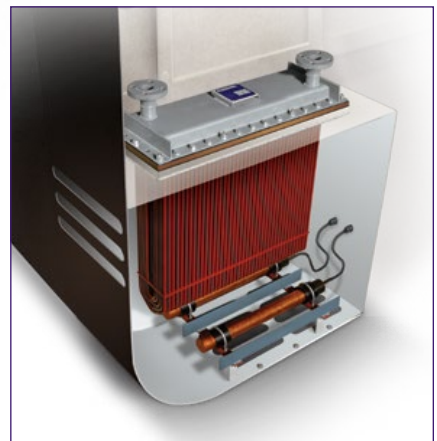
Duramax Marine® BoxCoolers provide you with superior protection, design flexibility and large cooling capacity. How? The BoxCooler operates in a sea chest within your vessel's hull - so it is completely protected against damage from underwater hazards. And, it's compact design and large cooling capacity allow for flexibility in sizing. This means that the BoxCooler can easily meet the specific cooling needs of your engine - as well as the cooling needs of multiple heat sources - while using less space in your vessel.



The Ultimate BoxCooler System

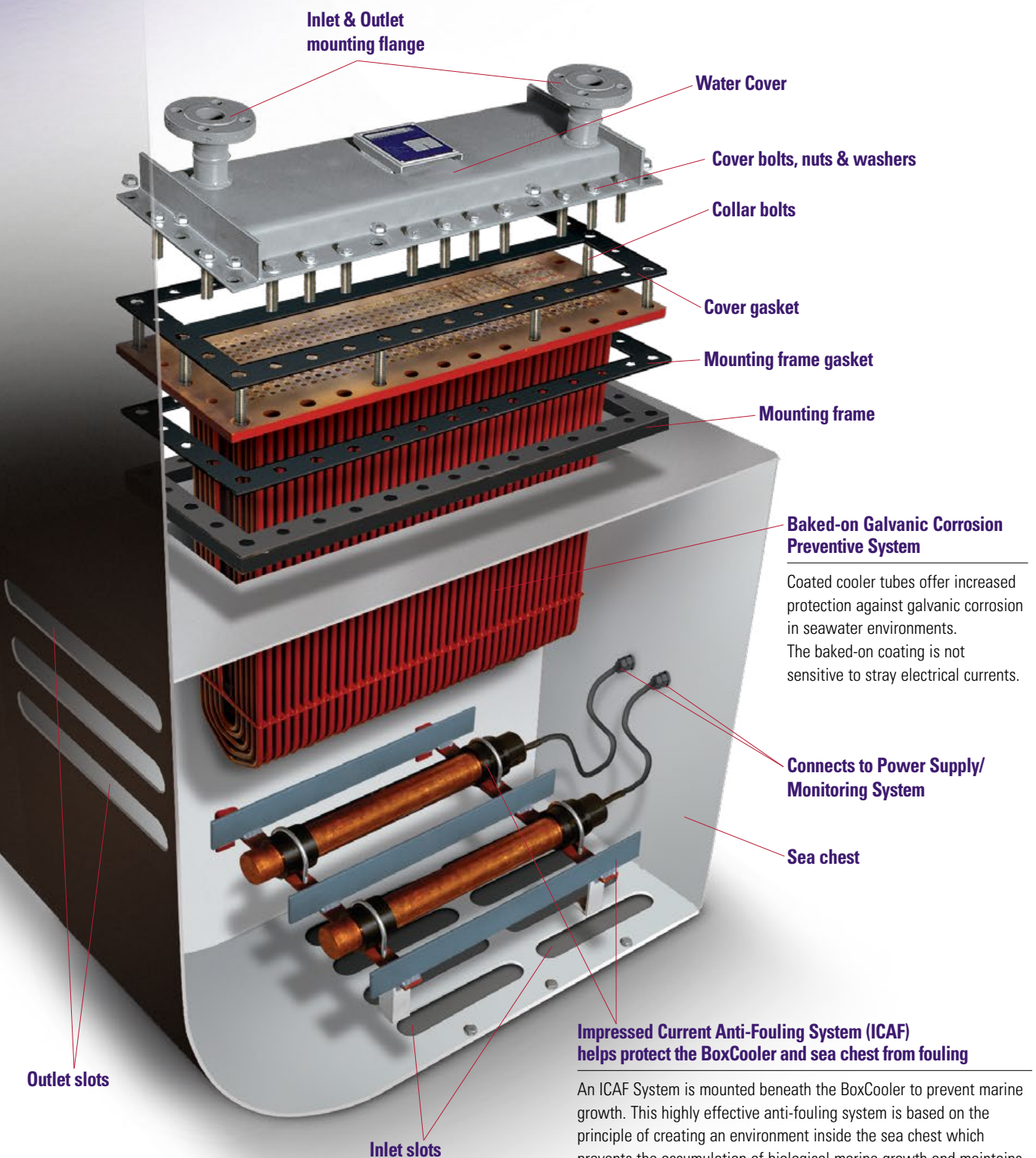
With this unique Duramax Marine® BoxCooler, you get all the design advantages of standard BoxCoolers; in-hull protection, design flexibility, large cooling capacity and anti-fouling prevention systems. The cooler tubes are coated with a heat-cured synthetic coating which protects the unit from galvanic corrosion. This coating is also resistant to saltwater, polluted water, floating debris and chemicals.

These added features provide unmatched protection for your vessel and significantly extend the service life of your BoxCooler - making it the ultimate BoxCooler.



The Ultimate BoxCooler Construction

Duramax® BoxCoolers are constructed from aluminum brass alloy (CuZn20Al) as standard. The tube bundle and parts that are exposed to raw water are protected by our proprietary heat-cured synthetic coating. The coating is resistant to chemicals, salt water and polluted water and protects the unit and your vessel from galvanic corrosion. We further extend service life with an Impressed Current Anti-Fouling (ICAF) System to prevent marine growth on the BoxCooler.

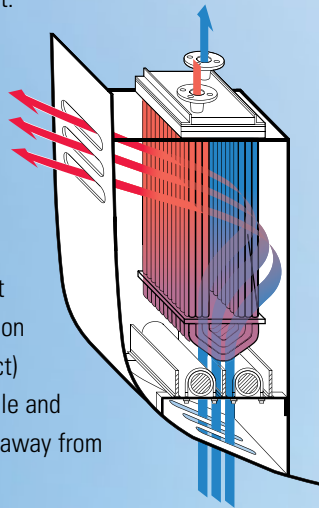


The Ultimate BoxCooler Design

The working principle of the BoxCoolers.

The BoxCooler works on the principle of Thermal Siphoning. This is the movement of heated water due to convective currents. The fact that hot water will rise and cold (denser) water will fall, results in a natural movement of water or circulation through the sea chest.

In a BoxCooler, the engine's cooling water is pumped through a highly efficient aluminum brass (CuZn20Al) tube bundle which is suspended in a sea chest. Openings at the top and bottom of the sea chest permit the creation of a convection current (thermal siphoning effect) which flows over the tube bundle and transfers heat into the sea and away from the vessels' engine.



Design and maintenance flexibility

- ▷ Larger cooling capacity than external cooling systems
- ▷ Can cool engines from 0-10,000+ HP
- ▷ No spare parts required
- ▷ Maintenance and repairs can be made without dry-docking.
- ▷ No need to overhaul raw water pumps and piping every 5 years

Ideal for most vessel types

Type of vessel	Heat sources
Tug boats	Main engines
Supply vessels	Auxiliary engines
Ice breakers	Bow thrusters
Dredgers	Air-conditioning systems
Fishing vessels	Hydraulic systems
Cargo ships	
Barges	
Ferries	



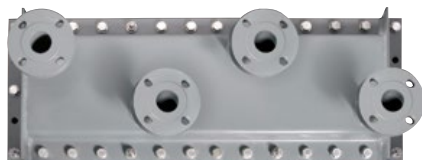


BoxCooler Design Options

Can be engineered to cool multiple heat sources on one cooler



Single heat source = single circuit



2 heat sources = 2 circuits on one BoxCooler

Secondary raw water cooling system unnecessary

- ▷ Raw water pump is not required - this means raw sea water is not being pumped into the vessel
- ▷ Eliminates the need for sea water strainers or filters

Nautical classification

Duramax® BoxCoolers meet or exceed specification requirements of the following classification societies:

ABS	American Bureau of Shipping
BV	Bureau Veritas
CCS	Chinese Classification Society
DNV	Det Norske Veritas
GL	Germanischer Lloyd
LRS	Lloyds Register of Shipping
MROS	Maritime Register of Shipping
PRS	Polski Rejestr Statkow
RINA	Registro Italiano Navale



Uncoated 90/10 Copper-Nickel BoxCooler

In freshwater applications and upon request, we can manufacture units with tube bundles constructed with a bare 90/10 copper-nickel alloy – and without our protective coating.

WE DO NOT RECOMMEND the use of an uncoated 90/10 copper-nickel BoxCooler in seawater applications. **This is due to the significant potential for galvanic corrosion.**

This situation, unique to BoxCooler applications, is created by placing a significant amount of uncoated 90/10 copper-nickel tubes in a sea chest which is in close proximity to the ships hull.



Impressed Current Anti-Fouling System (ICAF)*

While Duramax® BoxCoolers require very little maintenance, the tube bundle is exposed to seawater and can potentially become fouled from algae, mussels, barnacles and other shellfish. The rate of heat transfer can be adversely affected by this build-up of biological marine growth. The ICAF system works to prevent fouling caused by biological sea growth.

*Sometimes referred to as a **MGPS** (marine growth prevention system).

How the ICAF System works.

The system uses an artificially triggered voltage differential between the copper anodes and the cathodes. A small electrical current causes the copper anodes to dissolve. The copper ions that are formed in this way mix with the seawater in the sea chest, creating an environment that prevents the build up of marine growth. The size of the copper anodes are based on the dry docking cycle of the vessel.

Anodes typically are sized for 3 to 5 year dry docking cycles.

The steel frame carrying the copper anodes and the cathode plates is welded in place inside the sea chest, while the cables from each anode are connected to the power supply unit.

System can be monitored during operation.

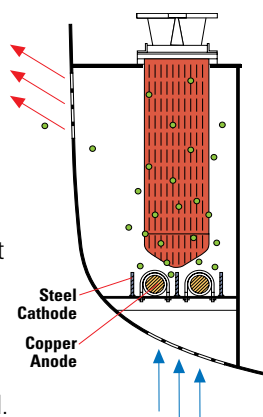
The ICAF System is equipped with a control panel that can be monitored to ensure the system's operation.



This control and power supply unit will:

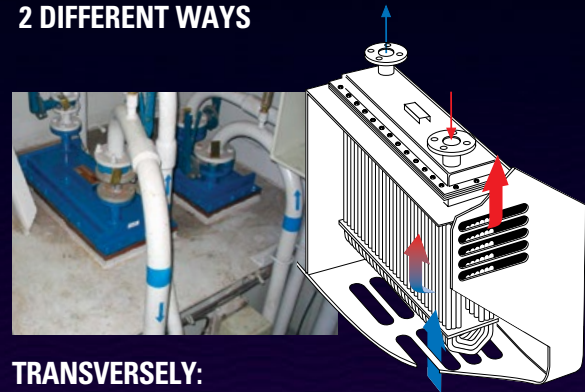
- ▷ Monitor the life of copper anodes
- ▷ Log data that can be downloaded for diagnostics
- ▷ Sound an alarm in the event of a malfunction

ICAF SYSTEM INSTALLED



Duramax® BoxCooler Installation and Positioning

THE BOXCOOLER CAN BE INSTALLED IN 2 DIFFERENT WAYS



TRANSVERSELY:

This is the most common way to install a BoxCooler. The BoxCooler is installed between the existing frames of the vessel.



LONGITUDINALLY:

This method of installation is less popular as the frames of the vessel must be cut open to allow the sea chest to be installed.

Sea Chest Openings

Regardless of installation method, the sea chest requires inlet and outlet slots to allow uninterrupted water flow over the cooler tubes.

The inlet slots are situated in the base of the sea chest and positioned transversely. The outlet slots are situated in the outer wall of the hull and positioned longitudinally directly under the top surface of the sea chest and must remain below the water line when the vessel is empty.

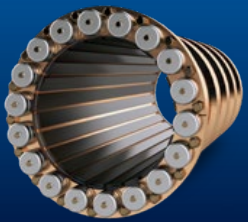
INNOVATION.
EXPERIENCE.
RESULTS.

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



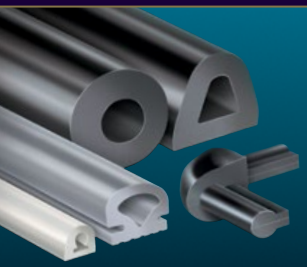
DURAMAX® ADVANCED WATER-LUBRICATED BEARING SYSTEMS

Johnson® Demountable Stave Bearings
ROMOR® 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® IMPACT PROTECTION SYSTEMS

Johnson® Commercial Dock Bumpers, Fenders & Tow Knees
LINERITE® Composite Batterboard Systems



DURAMAX® SHAFT SEALING SYSTEMS

DryMax® Shaft Seal
Duramax® Mechanical Shaft Seal
Johnson® Heavy-Duty Air Seal Stuffing Boxes
Duramax® Ultra-X® High Performance Compression Packing

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