



# MARINE

## CATALOG & SERVICES

5<sup>TH</sup> EDITION

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## A BIT OF HISTORY...

IN 1959 NRF WAS TASKED WITH FINDING A SIMPLE SOLUTION IN ORDER TO KEEP THE ENGINES OF RIVER BOATS, WHICH WERE COOLED WITH SURFACE WATER, FREE OF FOULING. THAT IS HOW NRF CAME UP WITH THE BOX COOLER. DUE TO THE SUCCESS OF THIS PRODUCT, MORE AND MORE VESSELS CHANGED OVER TO THIS TYPE OF COOLING.

### WHAT IS A BOX COOLER

The box cooler is an efficient cooling system, designed for efficient installation on small and medium sized vessels. The box cooler consists out of a U-shaped tube bundle that is fitted in the sea chest of the ship. The compact design ensures an efficient and effective form of heat exchange. Box coolers come in different shapes and adaptations to fit any vessel.

The sea chest is provided with inlet and outlet openings (grids) in the hull. The water enters through these grids and is forced through the tube bundle. The cooling effect is obtained by natural and forced circulation of the seawater in the sea chest. The seawater in contact with the tube bundle is warmed up and rises by its lower density, and cool water lowers thus causing a natural upward circulation.







## NRF BOX COOLERS

NRF box coolers can be modified to adapt to different space and cooling requirements. Multiple sizes are available upon request.

Box coolers have many cooling capabilities. Different types of vessels could benefit from using a box cooler, for example: dredgers, ferries, still standing generators, tugboats, fishing boats, takers, cargo freighters, etc.

## MANUFACTURING MATERIALS AND COATINGS

Cover : Carbon Steel

Gaskets : CR/SBR; (CR $\geq$ 20%)

Weldingframe : Carbon Steel

Tubesheet : Muntz metal

Tube bundle:

- Aluminium Brass  $\varnothing 11 \times 0.8$  or 1 mm tube bundle made out of Aluminium/Brass are often used on river applications. The weather conditions on inland waterways are most of the time stable and justifies the use cheaper and non-corrosive material.
- Aluminium Brass  $\varnothing 11 \times 0.8$  or 1 mm Epoxy coated. This application is generally used for vessels that sail in blue- or brackish water. The coating is to protect the ship's hull against galvanic corrosion.

## INSTALLATIONS

NRF offers two in ways of installation, Bottom Build and Top Build. The Top Build, the cooler is mounted downwards through the top deck into the sea chest. Bottom Build applies where there is insufficient space in the machine room above the cooler. In this case the box cooler is mounted through hatches in the sea chest from the underside of the hull. With the purchase of your box cooler, you will receive an installation manual guided step by step.



# TOP-BUILD

## STANDARD TOP-DOWN BOX COOLER

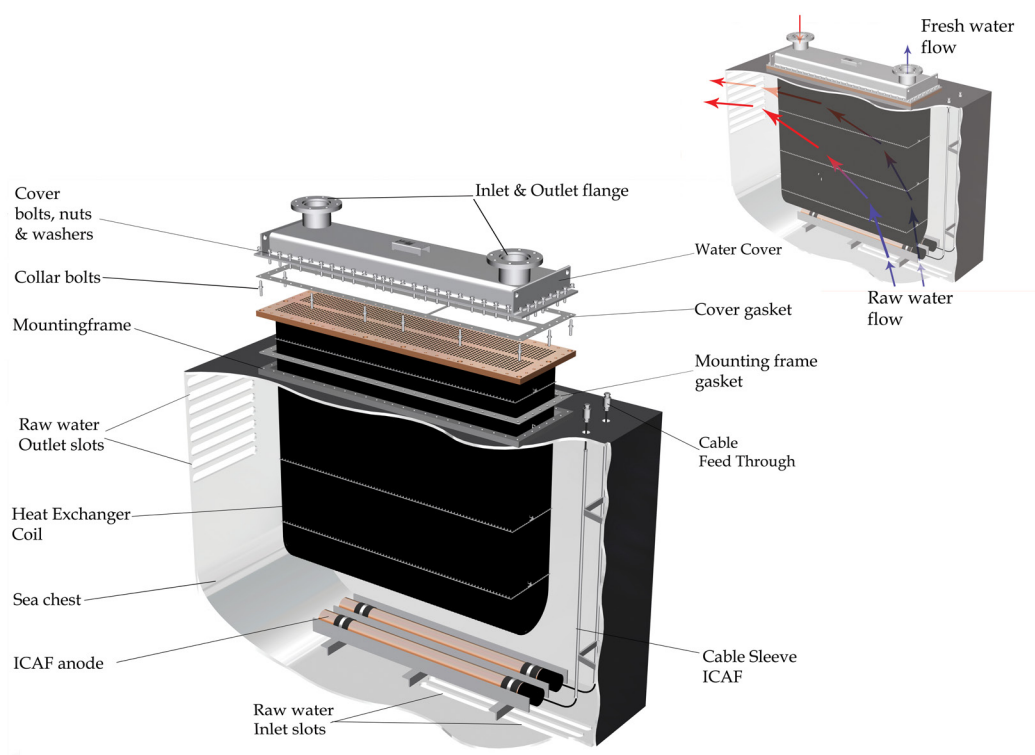


The “Top-Down” installation of the box cooler is the most common application and our best seller.

Top-down design is the original based installation from the inside of the engine room. It is mounted downwards through the top deck into the sea chest. NRF offers a coated version (for sea water application) and bare versions (for river going or inland application).

For seagoing use, NRF can complete this box cooler with an ICAF (impressed current anti fouling) system. This anti fouling system prevents fouling in between the docking periods.

## INSTALLATION AND COMPONENTS



# BOTTOM-BUILD

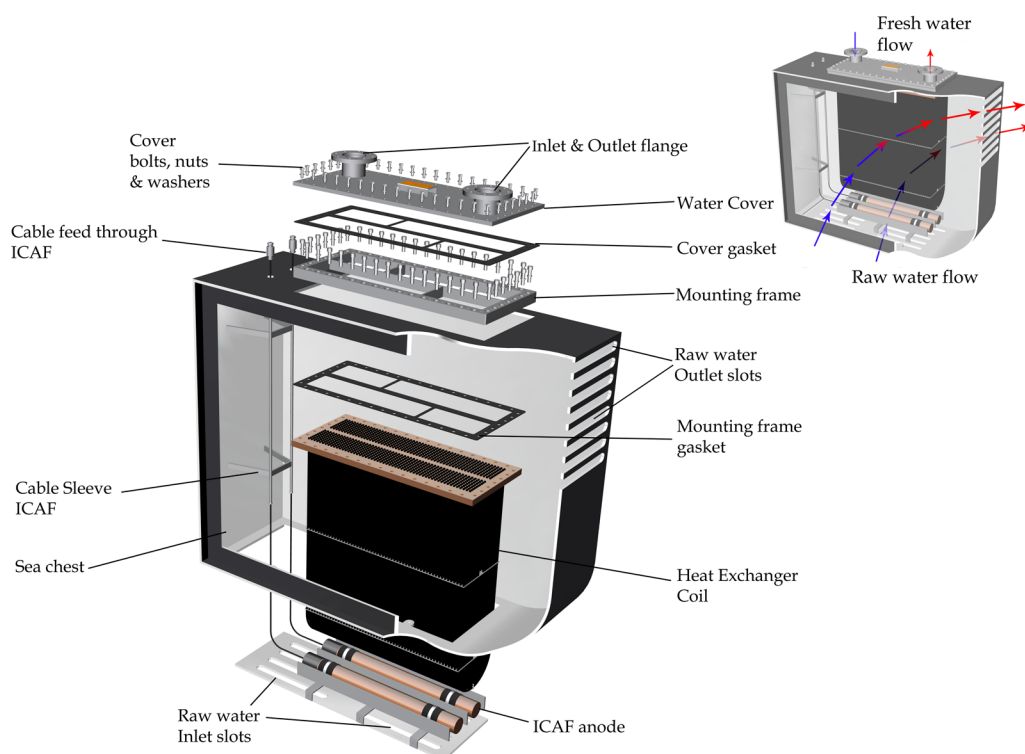
## OUTSIDE MOUNTING BOX COOLER



Depending on the ship, a larger box cooler might be needed which brings up the need of an assembly form where the cooler is not installed from within the engine room but from outside of the hull. The Bottom-Build box cooler is the best solution for fully equipped engine rooms where transport of these coolers inside the engine room is not a viable option.

Our Bottom-Build box cooler is designed for easy removing out of the sea chests in case of maintenance and inspection. This can be done whilst the ship is still afloat.

## INSTALLATION AND COMPONENTS



# ADAPTED TO YOUR SPACE

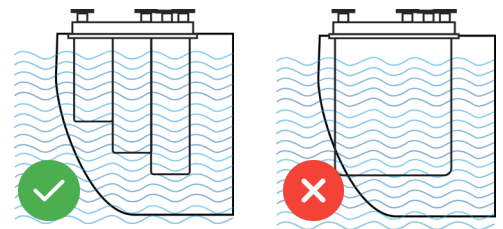
## STEPPED BOX COOLER



To maximize the possible cooling surface of a box cooler in a sea chest, the bundle must follow the shape of the hull as close as possible. This can be done by dividing the bundle in several sections, each with different length.

### ADVANTAGES:

- ✓ Available in Bottom-Build and Top-Build installations.
- ✓ Adapted to the exact shape of the sea chest.
- ✓ Ideal for sea chests with limited space.
- ✓ Can be adapted for multiple circuits with different heat exchange requirements.



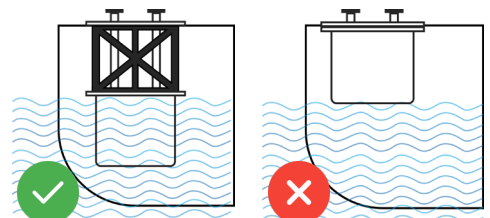
## EXTENDED BOX COOLER



To maximize the possible cooling surface of a box cooler in a sea chest, the bundle must come fully in contact with the water. This can be done by extending the sea chest.

### ADVANTAGES:

- ✓ Adapted to the exact shape of the sea chest.
- ✓ Ideal for dredgers that need to clean their coolers frequently.
- ✓ Can be pulled whilst vessel is afloat for maintenance.





# ADAPTED TO YOUR NEEDS

## MULTI CIRCUIT BOX COOLER



For cooling separate water circuits, normally two or more box coolers are required. When the coolers are not too big, it is possible to combine the different circuits into one box cooler. This limits the space requirement of the box cooler. Extra measures have been taken into the construction to prevent intermixing of the different circuit.

### ADVANTAGES:

- |   |  |
|---|--|
| ✓ | Available in Bottom-Build and Top-Build installations.             |
| ✓ | Space saving solution.   |
| ✓ | Lower cost.  |
| ✓ | Eliminated the need for two or more coolers in certain situations. |

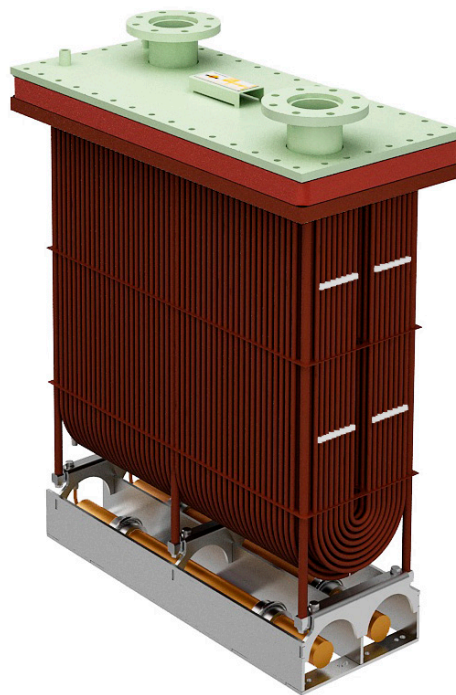
# **ANTIFOULING SYSTEMS FOR YOUR BOX COOLER**

# ICAF SYSTEM

## IMPRESSED CURRENT ANTI FOULING SYSTEM

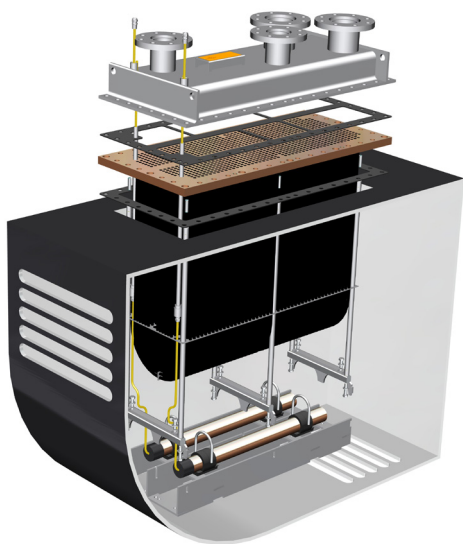


TOP-BUILD WITH ICAF SYSTEM



BOTTOM-BUILD WITH ICAF SYSTEM

The ICAF System is a highly effective anti-fouling system that can be installed on the box cooler. Highly reduces biological fouling thanks to the copper anodes mounted under the box cooler that slowly dissolve by receiving an electrical current from a power supply. This creates an environment in which biological marine growth will not develop and will just be flushed out back into the sea. The copper ridden environment is only active during a limited time as these ions fall back to the stable  $\text{Cu}^{++}$  which doesn't harm the environment.



### ADVANTAGES:

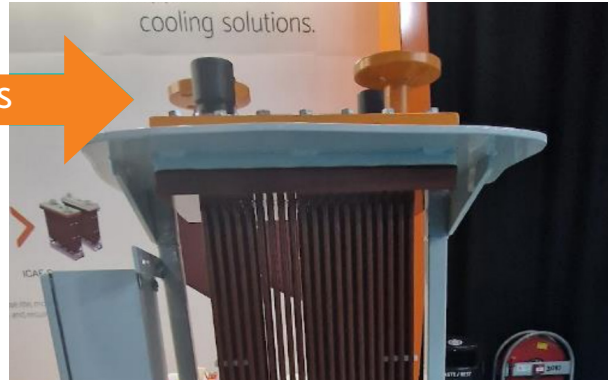
- ✓ Perfect for extreme biological fouling can be expected.
- ✓ Control functions to ensure the release of the minimum necessary copper particles.
- ✓ Lifetime of copper anodes adjusted to the ship's docking period.
- ✓ Special seawater resistant 3m cable.
- ✓ Power supply unit 50/60Hz and 1 or 3 phase.
- ✓ Cable feed trough ships hull.
- ✓ Junction box



# ULTRASONIC ANTIFOULING



TRANSDUCERS



The Ultrasonic system offers an effective solution for addressing marine biofouling, preventing potential overheating of ship engines that could lead to expensive emergency dry dockings. Its continuous operation eliminates the need for frequent inspections both onboard and underwater, thanks to the monitoring system.

The working principle of ultrasonic marine growth prevention is straightforward: any object submerged in seawater that vibrates within the ultrasonic frequency range, with sufficient sound pressure, remains unfouled. Larvae of fouling organisms do not settle on objects undergoing ultrasonic vibration.

The proven track record of this system demonstrates high effectiveness. Additionally, the patented monitoring software promptly notifies the chief engineer of any transducer malfunctions, allowing for timely intervention from the Engine control room.

## ADVANTAGES:

✓	One time, simple installation
✓	Plug and play commissioning
✓	Dry installation
✓	Maintenance free
✓	Reduce fouling costs
✓	Less down time
✓	Environmentally friendly

# NRF AGENTS

Take a look at our agents around the world. They can provide you with spare parts and new build NRF certified box coolers. We are always close to you.

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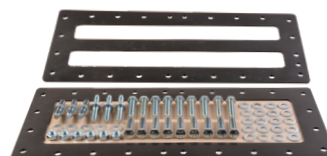
# MAINTENANCE AND REPAIR PARTS

In general, NRF box coolers are a maintenance free system. However, considering their long lifespan and given the different sailing areas and operating conditions, biofouling must be considered. The implementation of local and international control measures preventing pollution has resulted in a substantial reduction of toxic effluent from industry and marine traffic. This has greatly encouraged organic growth in rivers, estuaries and coastal waters, resulting in an increased trend of biofouling.



## SPARE PARTS

NRF is the place to get box cooler parts. Besides the complete coolers, NRF supplies a wide range of gaskets, drain plugs, bolt, nuts and mounting kits. The parts are produced custom made and within 24 hours. When you are in need of a new build or a spare part around the globe you can also reach any of our competent partners and they will happily help you.





You can count on our network of service partners to complete a swift maintenance of your NRF box cooler with original parts and the quality that NRF delivers. Our trained and skilled service partners are happy to support you with cleaning, re-coating and minor repairs of the NRF box coolers with original spare parts.



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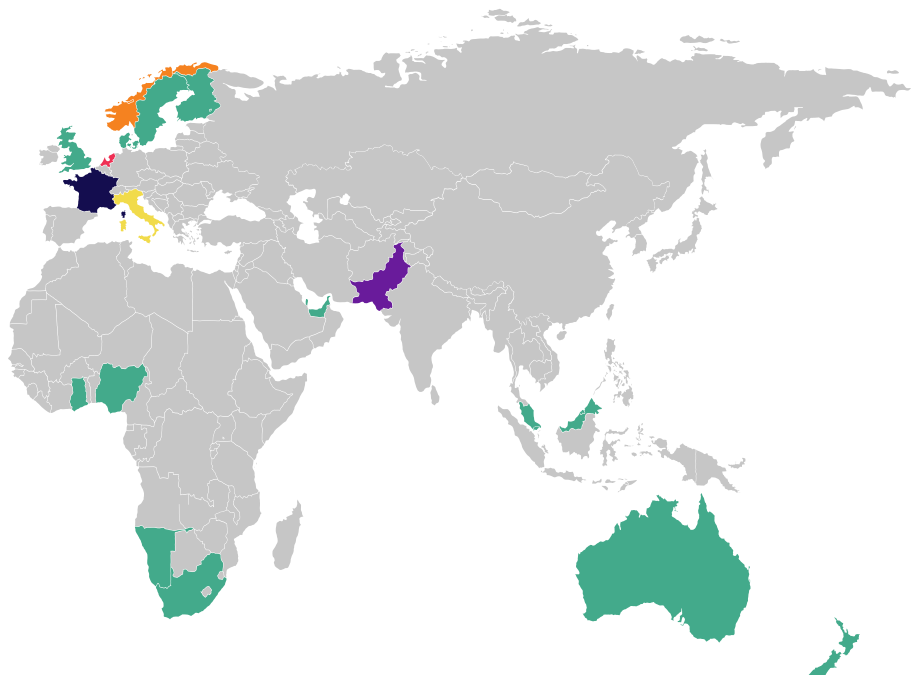


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Take a look at the different hotspots our partners cover.



## CLASSIFICATION SOCIETIES

NRF box coolers can be delivered with all required classification certificates:

➤ Belgium	Belgische Zeevaart Inspectie (BZI)
➤ Bulgaria	Bulgarski Koraben Registr. (BKR)
➤ China	China Classification Society (CCS)
➤ Croatia	Croatian Register of Shipping (CRS)
➤ France	Bureau Veritas (BV)
➤ Germany	Germanischer Lloyd (GL)
➤ Greece	Hellenic Register of Shipping (HR)
➤ India	Indian Register of Shipping (IRS)
➤ Indonesia	Biro Klasifikasi Indonesia (BKI)
➤ Italy	Registro Italiano Navale (RINA)
➤ Japan	Nippon Kaiji Kyokai (NK)
➤ Korea	Korean Register of Shipping (KR)
➤ Netherlands	Nederlandse Scheepvaart Inspectie (NSI)
➤ Norway	Det Norske Veritas (DNV)
➤ Poland	Polski Rejestr Statkow (PRS)
➤ Romania	Registrul Naaval Roman (RNR)
➤ Taiwan	China Corporation Register (CR)
➤ Turkiye	Turk Loydu (TL)
➤ United Kingdom	Lloyds Register of Shipping (LRS)
➤ USA	American Bureau of Shipping (ABS)
➤ USA	United States Coast Guard (USCG)
➤ USSR	Maritime Register of Shipping (MROS)

✓ Contact us for any other specific requirements



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