Box Cooler







GEA Heat Exchangers / **GEA Bloksma B.V.**



GEA Bloksma B.V. is part of the GEA Heat Exchangers segment of the GEA Group and specialises in designing and manufacturing box coolers.

The benefits of the GEA Group:

- You benefit from the innovative strength of a strong group
- We use the expertise of all company areas when working on your projects
- You utilize the synergies from all GEA segments

[GEA Bloksma B.V. – background]

Member of an excellent group

GEA Bloksma B.V. is part of the global GEA Group, which operates in more than 50 countries worldwide. It focuses on the two basic engineering processes of heat exchange and mass transfer and continues to advance the market for these key technologies.

By focusing all heat-exchanger activities in one single Heat Exchangers segment, GEA now highlights its position as world leader on the market of heat exchangers. Concentration of business in this new segment will further improve the proximity to our customers and, at the same time, the access to the product portfolio of GEA. It will likewise vigorously promote high GEA quality standards, in conjunction with the customized solutions of GEA as a leading technology group.

GEA Heat Exchangers covers numerous application areas, from air conditioning systems to cooling towers and therefore probably provides the widest range of product portfolio of heat exchangers worldwide. Finned-tube heat exchangers, single-tube heat exchangers, Heller systems, air-cooled condensers, wet cooling towers, plate heat exchangers, HVAC systems and all kinds of shell-and-tube heat exchangers: for all feasible applications, the new GEA segment Heat Exchangers offers from one source the best possible solutions. And it powerfully supports planning efforts in all areas of heat transfer.

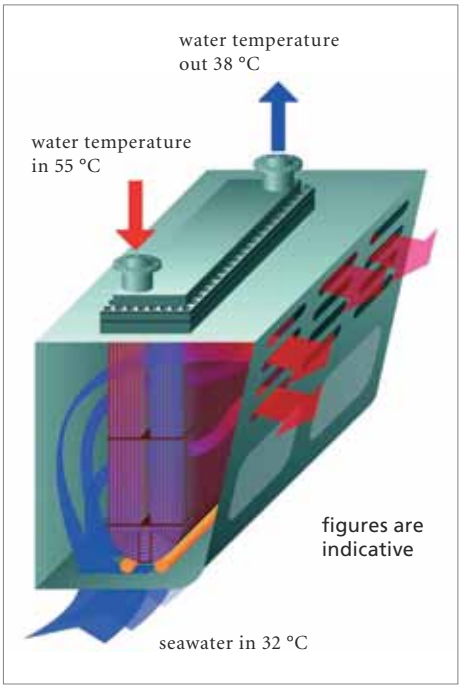
[Innovative technologies]

Optimized to your ship design

GEA Bloksma has a long experience in designing and manufacturing box coolers. Over 20000 box coolers have been supplied and are operating successfully.

Due to this long experience GEA Bloksma can evaluate every situation and can advise on installation. GEA Bloksma has a wide variety of standard types and options. This allows a flexible design, based on the operating conditions, taking in account dimensional limitations on board.

- Decades of experience in box coolers
- Proven cooler concept
- Global presence
- Strong focus and ongoing research and development work
- Box coolers that are optimized to your ship design



[Box cooler principle]

What is a box cooler?

A box cooler is a cooling system which finds growing application both for inland and sea going ships.

The unique principle of boxcooling: Cooling water is forced through a U-tube-bundle, which is placed in a sea-chest having inlet- and outlet grids. Cooling effect is reached by natural circulation of the outboard water in the sea-chest or by a circulation due to the speed of the vessel. The outboard water is heated and rises by its lower density, thus causing a natural upward circulation.

GEA Bloksma box coolers are available in a round version for small capacities and a rectangular version for larger capacities. It is possible to connect more coolers in series or parallel in case one cooler does not have enough cooling surface.



Rectangular box cooler

Advantages

The latest generation of box coolers is the sum of all our experience and innovation. The result is low-maintenance, box coolers boasting long service lives and high availability which wins customers all over the world.

- Elimination of complete outboard water circuit on board. When using box coolers there is no need for seawater inlet pumps, filters, valves, pipelines etc., parts made of seawater resistant material (expensive) and sensitive for maintenance.
- Box coolers are virtually maintenance free, operational costs therefore are much lower than for any other cooling system.
- Space saving in machine room.
- The box cooler is not susceptible to corrosion and less sensitive for fouling.
- Box coolers are ideally suited for operation in icy, sandy, shallow and silt polluted water.
- Box coolers require less piping length and no electrical energy for seawater pumps.







[Great flexibility]

Applications of GEA Box coolers

GEA Bloksma box cooler can be used for a wide variety of applications where cooling is required.

- Main (propulsion) engines
- Auxilary engines (generator sets)
- Bow thrusters
- Airco systems
- Hydraulics

Ice conditions

Compared with other systems, GEA Bloksma box coolers are very suitable for sailing under ice conditions. In general there is no danger for damage due to freezing water. The so feared snow-ice is not a problem for box cooling, unless ice-layers are extremly thick. Shortly after starting the engines the ice will melt in the sea-chest.

Operational lifetime

GEA Bloksma designs and manufactures its products to the highest standards to ensure a long operational lifetime and durability under all conditions.

Type of Vessels

- Tug boats
- Barges
- Fishing boats
- Carriers
- Dredgers
- Supply vessels
- Ferries
- Ice breakers
- Cargo freighters
- Tankers
- Reefers

[Coolers for minimal space]

Construction & shapes

Basically the box cooler is an U-shaped bundle mounted with a header to guide the water flow.

The standard shapes are round for small coolers and rectangular for bigger coolers. However if space is limited the design can be adapted to match the hull shape. This is a so-called stepped cooler and is unique and matches the curvature of the ship's hull.

To fix the bundle to the hull, a solid mounting flange is provided that can be welded on the top plate of the sea-chest. GEA Bloksma offers 2 systems, the classic Top Pull and the innovative Bottom Pull, that can be used if a classic system is not possible.

The GEA Bloksma construction makes it possible to remove the header for inspection while the bundle is still fixed to the hull by means of extra internal hexagon socket head screws.



Rectangular box cooler



Round box cooler



Stepped box cooler

[Seawater resistance]

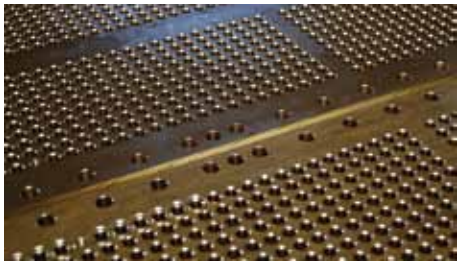
Materials & Coating

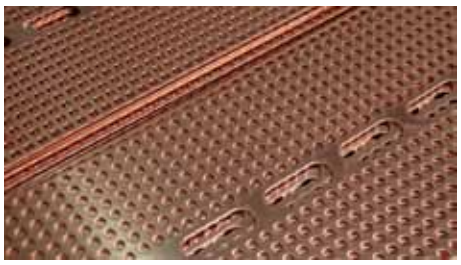
All of the materials of the box cooler, which are in contact with seawater, are from seawater resistant materials, so corrosion of the box cooler will not occur.

The bundle with tubes of Aluminium Brass (CuZn20Al2) has been designed with several layers of a hot cured phenolic resin based coating on all surfaces in contact with the outboard water.

This to ensure:

- A reliable galvanic insulation that protects the sea-chest against corrosion.
- A dampening bond between the U-tubes, support baffles and anti-vibration-strips that makes scuffing and rattling of the tubes impossible.
- No risk of "under deposit" corrosion.







Fouling

Biological fouling

In general the box cooler system is a maintenance free system for most applications. However, depending on the area of sailing and on several operational conditions, bio-fouling must be considered. The implementation of local and international control measures for prevention of pollution has resulted in a substantial increase in problems associated with fouling. This is due to the reduced toxic effluent from industry and marine traffic, which has greatly encouraged organic growth in rivers, estuaries and coastal waters.

Principles of biological fouling

The type of organisms responsible for bio-fouling of box coolers are:

- crustacean (e.g. barnacles)
- molluscs (e.g. mussels)
- seaweed, algae, bacteria, grasses etc.

Especially the first group – the crustacean – can be a problem. When some bio-fouling has settled on the box cooler, the negative effect on the thermal performance is hardly noticeable. Only when the box cooler is totally covered with bio-fouling, causing a blockage of the flow between the tubes, the thermal performance will be influenced. Due to the external coating on the tubes of the box cooler, biofouling and other deposits cannot cause the so feared “under deposit” corrosion.

The GEA Bloksma ICAF (Impressed Current Anti Fouling) system

Anodes of pure copper are mounted under the box cooler in the sea-chest. A constant current is applied between the anodes and the cathode plates, which causes copper to dissolve in the seawater. These Cu-Ions create a continuous toxic environment for biological growth, preventing the attachment and growth of marine organisms. The toxicity is only active during a limited time as the Cu+ fools back to Cu++. So there are hardly any consequences for the environment. This ICAF system is based on the same principle as the marine anti-fouling paints, where copper pigments are used for the creation of a toxic medium. Anti fouling paints are active only where the leaching rates of copper exceed 10 ppb per cm2 per day. Similar rates are active in the ICAF system. There are two methods of anode placement: The anodes are mounted separately under the box cooler and integrated in the box cooler design. This integrated system is recommended by GEA Bloksma.



Separate (Traditional)

Anodes integrated into the box cooler design

Anodes – 2 pieces – are mounted into an anode assembly (anode rack), which is fixed with tie-rods to the bottom of the box cooler. So the anode assembly is an integral part of the box cooler. The anode rack fits within the outer dimensions of the tube bundle, so the box cooler can be fitted through the mounting flange in the sea-chest with the anode rack fixed to the box cooler.

The integrated anodes contstruction has many advantages. There is no installation required to mount the anodes, cabling and cable-feed-through in the sea-chest. Also the space required for the anodes is very limited.



Integrated (unique GEA Bloksma)

GEA Bloksma complies with the following classification societies:

ABS	American Bureau of Shipping	USA
BV	Bureau Veritas	France
CCS	China Classification Society	China
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
KR	Korean Register of Shipping	Korea
LRS	Lloyds Register of Shipping	UK
MROS	Maritime Register of Shipping	Russia
NK	Nippon Kaiji Kyokai	Japan
RINA	Registro Italiano Navale	Italy

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