

ENGINEERING
TOMORROW

Danfoss

Cruise ships

Reliable fire fighting for cruise ships with **SEM-SAFE®** high-pressure water mist system

Danfoss Fire Safety A/S



**Safe
return
to port**

www.semsafe.danfoss.com

SEM-SAFE®



Making **cruise ships safer**

The cruise ship industry is rapidly expanding, with more and more people choosing cruises as a preferred way to spend their holiday.

Cruise ships with capacity for thousands of passengers resemble floating cities which must function safely and efficiently both in harbour and at sea.

Ensuring passenger safety and the operation of the ship in case of a fire

is a focus area for cruise ships, owners and operators. Dozens of fires occurred on cruise ships in the last 25 years. This places great demands on efficient fire fighting equipment as well as a well-trained crew.

There is a lot of advanced technology operating behind the scenes to ensure everything runs flawlessly.

Danfoss is constantly pushing boundaries for innovation in the pursuit of technological developments that make cruise ships safe, sustainable and competitive.

A safer tomorrow starts with **SEM-SAFE®**

The **SEM-SAFE®** high-pressure water mist fire fighting system from Danfoss uses micro droplets released through nozzles into protected areas.

It comprises a modular pump unit, valves, stainless steel piping and water mist nozzles.

SEM-SAFE® high-pressure water mist nozzles will activate immediately upon detecting a fire to ensure the best possible fire protection for passengers and crew on board the ship. Having a fixed high-pressure water mist system installed in the cruise ship will make the fight against fire more efficient with the ultimate goal of saving lives and limiting property damage.

The intelligent use of water for fire fighting on cruise ships

High-pressure water mist technology for fire fighting is one of the most effective means of handling fire on a cruise ship, whether it is in an engine room or a passenger cabin.

Through continuous research and development, Danfoss has pioneered the use of water for fire fighting and developed the **SEM-SAFE®** high-pressure water mist system for fire fighting on cruise ships.



The power behind **SEM-SAFE®** high-pressure water mist

For a fire to survive, it relies on the presence of the three elements of the 'fire triangle': oxygen, heat and combustible material. The removal of any one of these elements will extinguish a fire.

The **SEM-SAFE®** high-pressure water mist system goes further. It attacks two elements of the fire triangle: oxygen and heat. The uniqueness of high-pressure water mist is that it combines the suppression effect of gas and sprinkler systems.

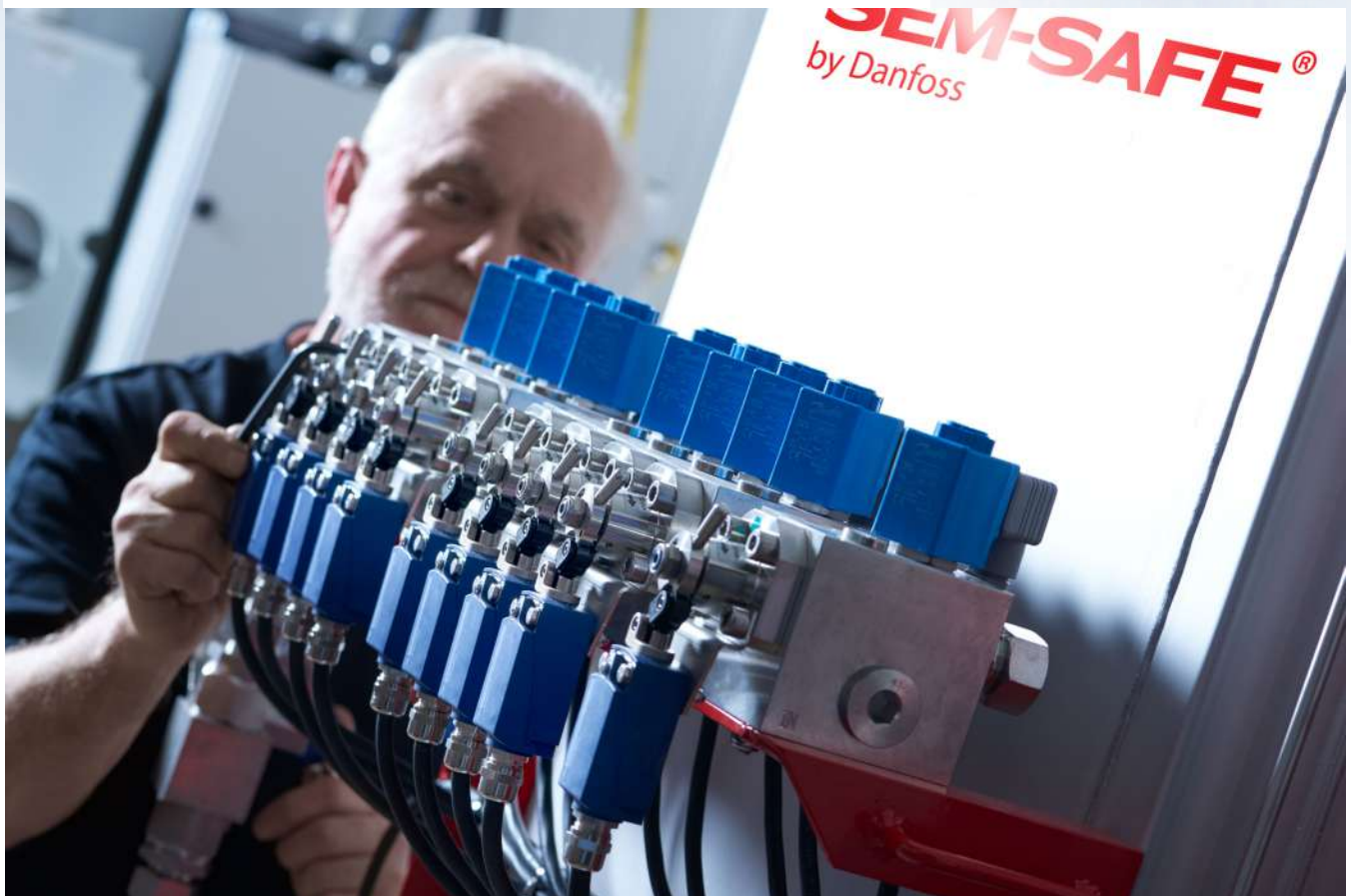
As well as removing the oxygen like a gas fire suppression system, it simultaneously cools the fire like a traditional sprinkler. The cooling effect additionally lowers the risk of re-ignition.



A unique fire fighting system

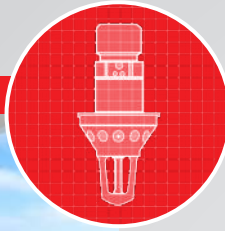
The **SEM-SAFE®** high-pressure water mist system is a unique fire fighting system. When water is forced through nozzles at high-pressure, a super-fine mist is formed that has a two-fold extinguishing effect. As well as cooling the fire like a traditional sprinkler, it simultaneously starves the fire of oxygen like gas fire suppression systems.

When the mist comes into contact with flames, it evaporates and expands a minimum of 1,700 times. The dense vapour created displaces the flames and quickly extinguishes the fire.

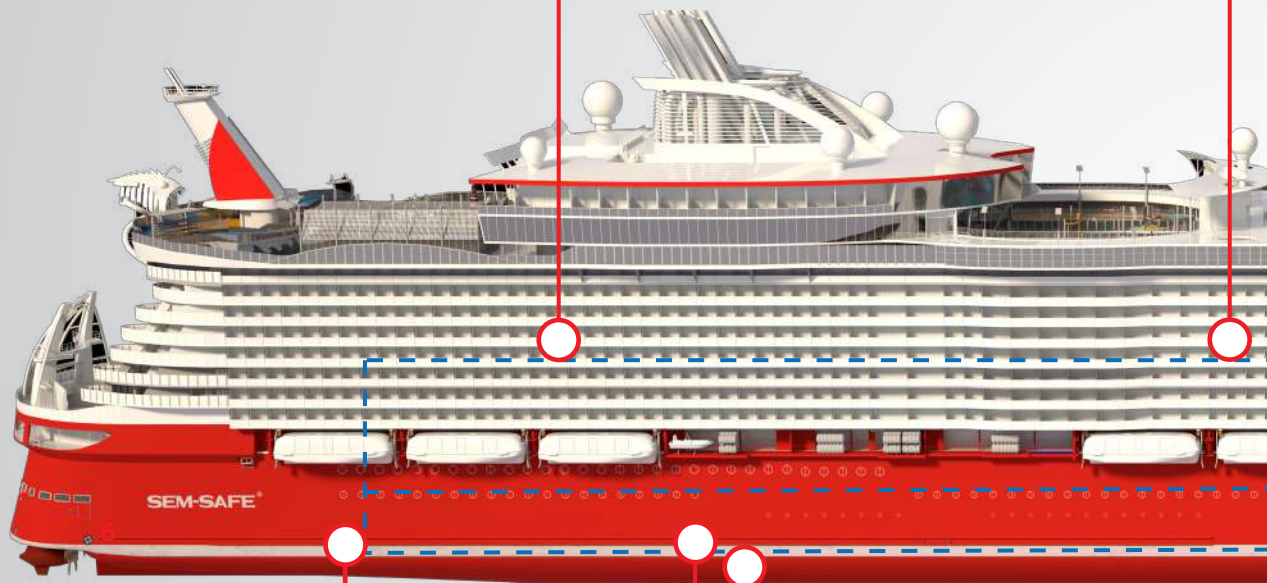


Total solution provider of fixed fire fighting system

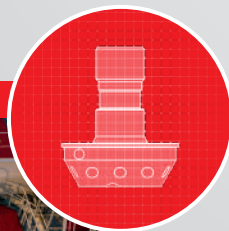
Balcony



Accommodation



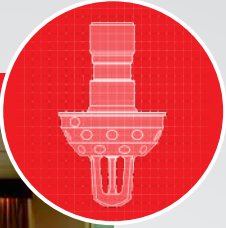
Engine room



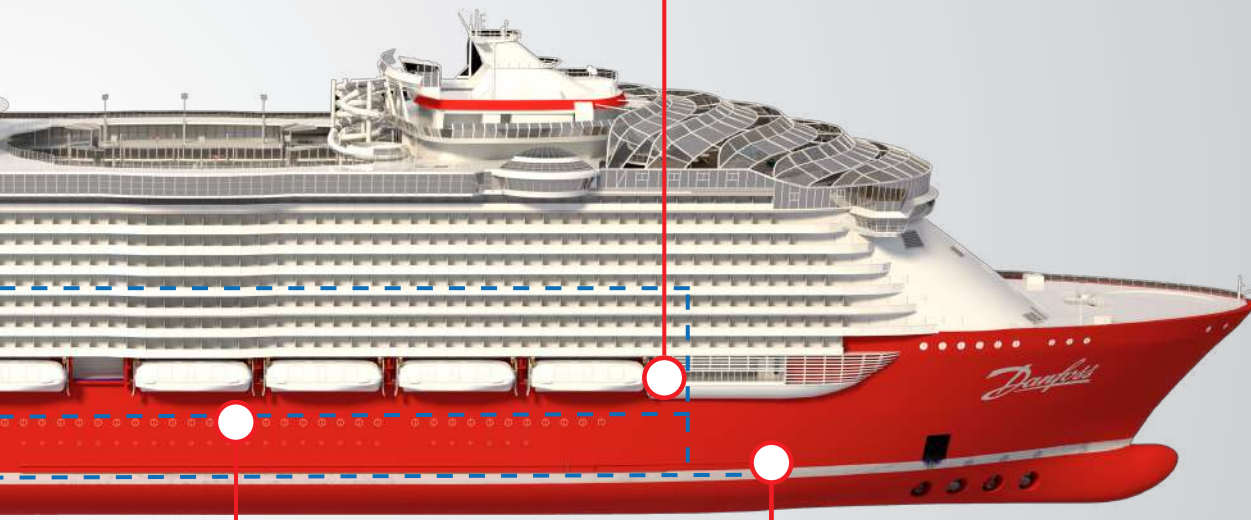
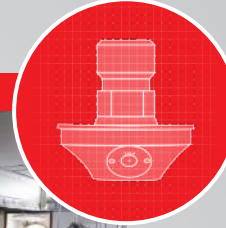
Bilge



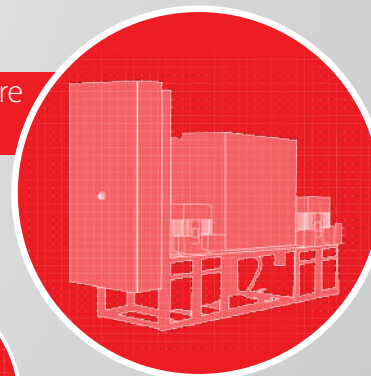
for cruise ships



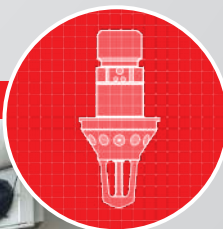
Deep fat fryer & duct



SEM-SAFE® high-pressure water mist pump units



Cold store (pre-action system)



One fire fighting technology

Total flooding

Danfoss offers **SEM-SAFE**® high-pressure water mist as a key engine room protection solution that allows doors.

The total flooding system is dimensioned with one section per fire zone and can be manually activated for both remote and local activation. Remotely activated, the system is operated from the valve operation panel outside the engine room, while local activation involves dedicated push-button operation, from outside the engine room.

The system releases water at high-pressure to cool hot metal surfaces. The water evaporates before reaching the hot surfaces, thus reducing the risk of shock cooling.

Tested in accordance with:

IMO MSC.1/Circ. 1165

Approved by:



Accommodation

Accommodation areas can also be protected with the same **SEM-SAFE**® high-pressure water mist pump unit installed for total flooding and local application, making this a simple and cost-effective fire protection system. The **SEM-SAFE**® high-pressure water mist system can be easily installed in any accommodation area, such as public spaces, storages, corridors and cabins and even outdoor balconies. In standby, the system maintains a nozzle pressure of 10 -15 bar.

The **SEM-SAFE**® high-pressure water mist nozzles used in accommodation areas are usually the closed type with a glass bulb that breaks at a set temperature, e.g. 57°C.

If this happens, the high-pressure pump unit is automatically activated and water is forced through the nozzle at high-pressure and distributed as a fine mist.

Only nozzles with broken bulbs are activated, and as a result only overheated areas will be actively sprayed.

Tested in accordance with:

IMO MSC.265

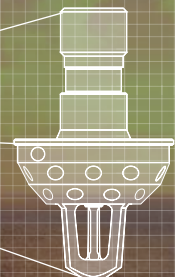
Approved by:



Pre-action system for added safety

The **SEM-SAFE**® high-pressure water mist system is very suitable for the protection of electronic rooms, switchboard rooms, computer rooms and other rooms with sensitive electronic installations.

Normally a double knock pre-action system is used for protecting electronic rooms against fires. This provides you with added safety for your electronics in the unlikely event of accidental release. The piping system is dry and nozzles are closed. When a fire is detected and confirmed by the fire alarm system, the section valve of the **SEM-SAFE**® system opens and water flows into the actual section pipes. Only nozzles with busted bulbs are activated. This means that only the areas affected by fire will be actively sprayed.



One fire fighting supplier

Local application

The **SEM-SAFE**® high-pressure water mist system for local application protects high-risk areas such as main and auxiliary engines, boiler fronts, oil separators and incinerators.

The **SEM-SAFE**® high-pressure water mist nozzles are dimensioned in sections, and all nozzles in the activated zone are released in the event of a fire. In standby mode, the system has dry piping, and section valves are remotely operated for each object requiring protection.

The local application system can be activated as follows:

- Automatically via the vessel's main fire detection system or by sensors connected to the valve operation panel
- Remotely from the valve operation panel situated outside the engine room
- Locally by pushing one of the dedicated push-buttons outside the protected area

Tested in accordance with:

IMO MSC.1/Circ.1387

Approved by:



BV



CCS



RINA



RMRS



USCG



Bilge

Danfoss has developed a dedicated **SEM-SAFE**® high-pressure water mist nozzle for protection of bilge areas of an engine room. This means that foam is replaced by high-pressure water mist, thus giving the ship owner and ship yard the great advantage of having to use only one fire fighting technology to protect engine rooms including bilge.

With a minimum water consumption and superior spacing, the **SEM-SAFE**® bilge nozzle has one of the best performances on the market. The bilge nozzle has been designed in accordance with guidelines described in IMO MSC.1/Circ.1165.

The innovative Danfoss bilge nozzle can protect bilge areas that are up to 1.5 m in height, which currently is the highest on the market.

The bilge system uses **SEM-SAFE**® high-pressure water mist nozzles of type BT that operate at minimum 60 bar. When activated, the pressurized water is discharged through the nozzle and forms a homogeneous water mist.

No additives are needed.

Tested in accordance with:

IMO MSC.1/Circ.1165

Approved by:



BV



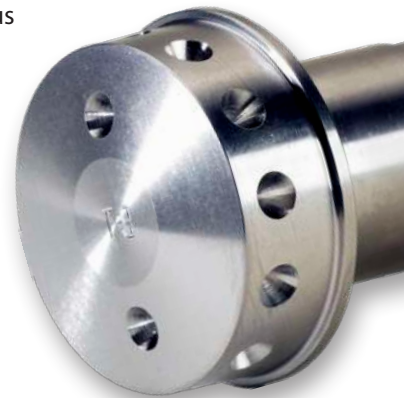
CCS



RINA



RMRS



Did you know that ...

The Danfoss **SEM-SAFE**® high-pressure water mist system is the best fire fighting solution for special areas on board cruise ships.

Below we list a few of the special applications that can be covered by the Danfoss **SEM-SAFE**® high-pressure water mist system:

- Cable trays
- Suspended ceiling
- Atriums
- Cinemas
- Winches
- Mooring deck
- Passenger cooling areas
- Glass protection



High quality fire fighting components

As one of the acknowledged pioneers of high-pressure water mist technology, Danfoss operates in-house research, development and manufacturing facilities of all critical components: nozzles, pumps and valves.

This puts Danfoss in a unique position to maintain technological leadership in the future. All products are made of first-class materials and in a comprehensively tested design.

Danfoss high-pressure water mist nozzles

- High nozzle spacing for lower installation cost
- Aesthetic nozzle design to perfectly blend with the interior room design
- 100% tested for guaranteed nozzle performance

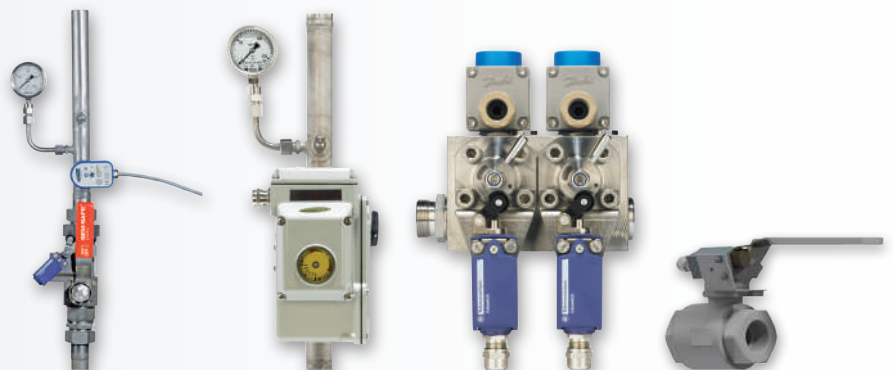


Danfoss high-pressure pumps

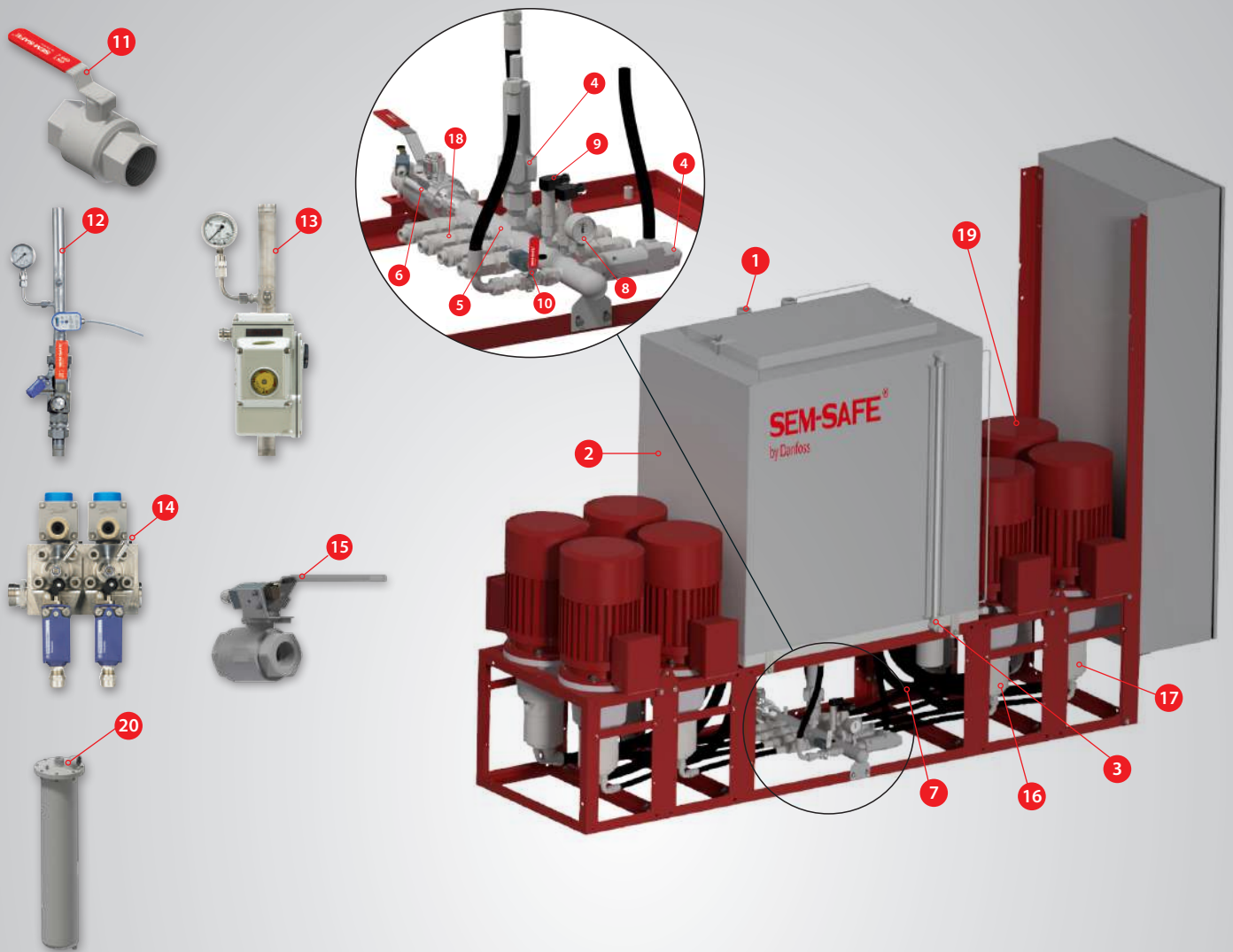
- Lubricated by water, making the pump maintenance free
- World's lightest and most compact design
- 95% energy efficient and very low pulsation to reduce noise

Danfoss valves

- Compact valves for easy installation and operation
- Dirt resistant, making the maintenance easier
- High-corrosion proof for longer product life time



SEM-SAFE[®] by Danfoss – System design



1 INLET CONNECTION

Fresh water or seawater supply to the buffer tank

2 PUMP UNIT TANK

Protects against dry-running

3 LEVEL SWITCH

Controls fresh water and seawater inlet, low level alarm and pump shutdown to avoid dry-running

4 PRESSURE RELIEF VALVE

Controls the high-pressure pumps in the system

5 HIGH-PRESSURE MANIFOLD

Connects high-pressure pumps and the pilot pump in the system

6 MAIN VALVE

Can be closed for test purposes (no high-pressure/ water in system pipes)

7 INLET HOSE

Supplies the pumps with water from the pump unit tank

8 PRESSURE GAUGE

Indicates the operating pressure

9 PRESSURE TRANSMITTER

For accommodation only: Controls the standby pressure and start-up of high-pressure pumps when system pressure drops and the system is activated

For total flooding and accommodation only: The pressure transmitter also controls the start-up of additional pumps until system pressure is reached

10 TEST VALVE

For simulating system activation and running the pump unit without pressure/water in the system pipes (main valve closed)

11 BYPASS VALVE

Only used if filter becomes contaminated during fire fighting

12 SECTION VALVE ACCOMMODATION

13 SECTION VALVE TOTAL FLOODING

14 SECTION VALVE LOCAL APPLICATION

15 ISOLATION VALVE

16 REDUNDANT PUMP

For total flooding and accommodation only: Standby pump for redundancy in case an additional pump is required

17 HIGH-PRESSURE PUMP

Supplies the required flow and pressure for the system

18 NON-RETURN VALVES

Supplied when multiple pumps are required

19 ELECTRIC MOTOR

Drives the high-pressure pumps (10-33 kW each)

20 FILTER

10 micron rated inlet filter

Simplicity & aesthetic design

Scandinavian philosophy for design

- Beautiful nozzle design
- Freedom to choose any nozzle colour

Sustainability

- Environmentally friendly
- Harmless to people

Efficiency & modularity

- Plug & play
- Easy installation & servicing

High-performance

- Effective cooling
- Rapid local activation

Cost-saving solution

- Fewer nozzles due to optimized spacing
- Corrosion-proof stainless steel pipes
- Maintenance-free pump
- Minimum downtime



Danfoss **SEM-SAFE**[®] high-pressure water mist nozzle for fire fighting





Service experts - high level of service on Danfoss systems over mainstream competition

Servicing cruise ships in a smart way

The Danfoss Service department provides service, spare parts and technical support for cruise ship owners and vessels worldwide. We are an after-sales service provider approved by several classification societies and we provide valuable and cost-saving overviews at multiple levels.

Our highly skilled and trained engineers provide you with detailed reports that present the complete status of the fire fighting system for

each vessel area. We provide unique, comprehensive documentation accessible at any given moment. No matter where the ship is in the world, we are always close by via our network of service hubs.

We always perform our services in accordance with SOLAS, class, flag and our own manufacturing regulations.

All service interventions are thoroughly documented to facilitate the controlling task for the superintendent.

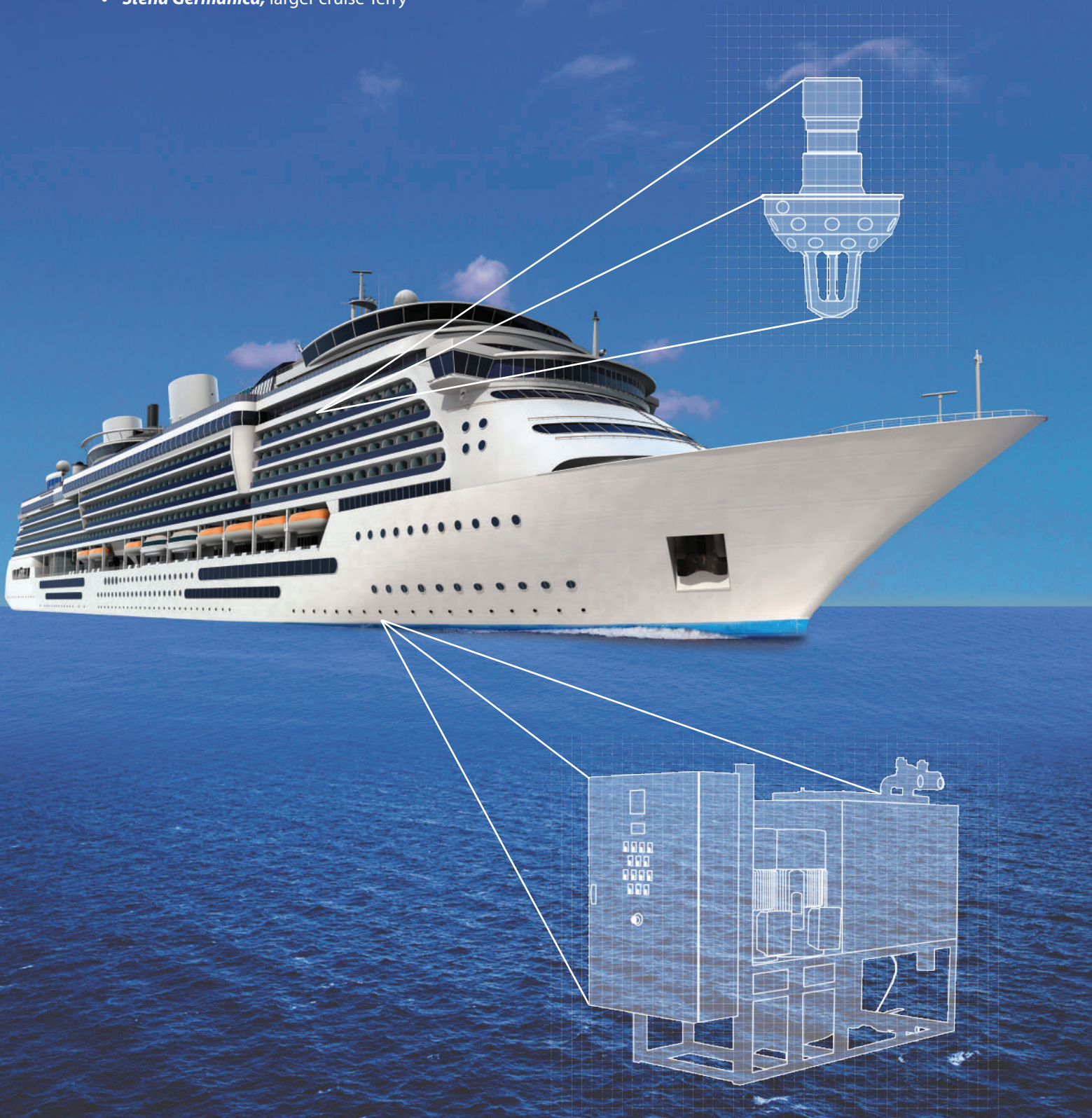
By relying on Danfoss service department, you also benefit from direct access to original spare parts. Moreover, our training facility can provide training for ship crews in the use of our fire fighting systems.



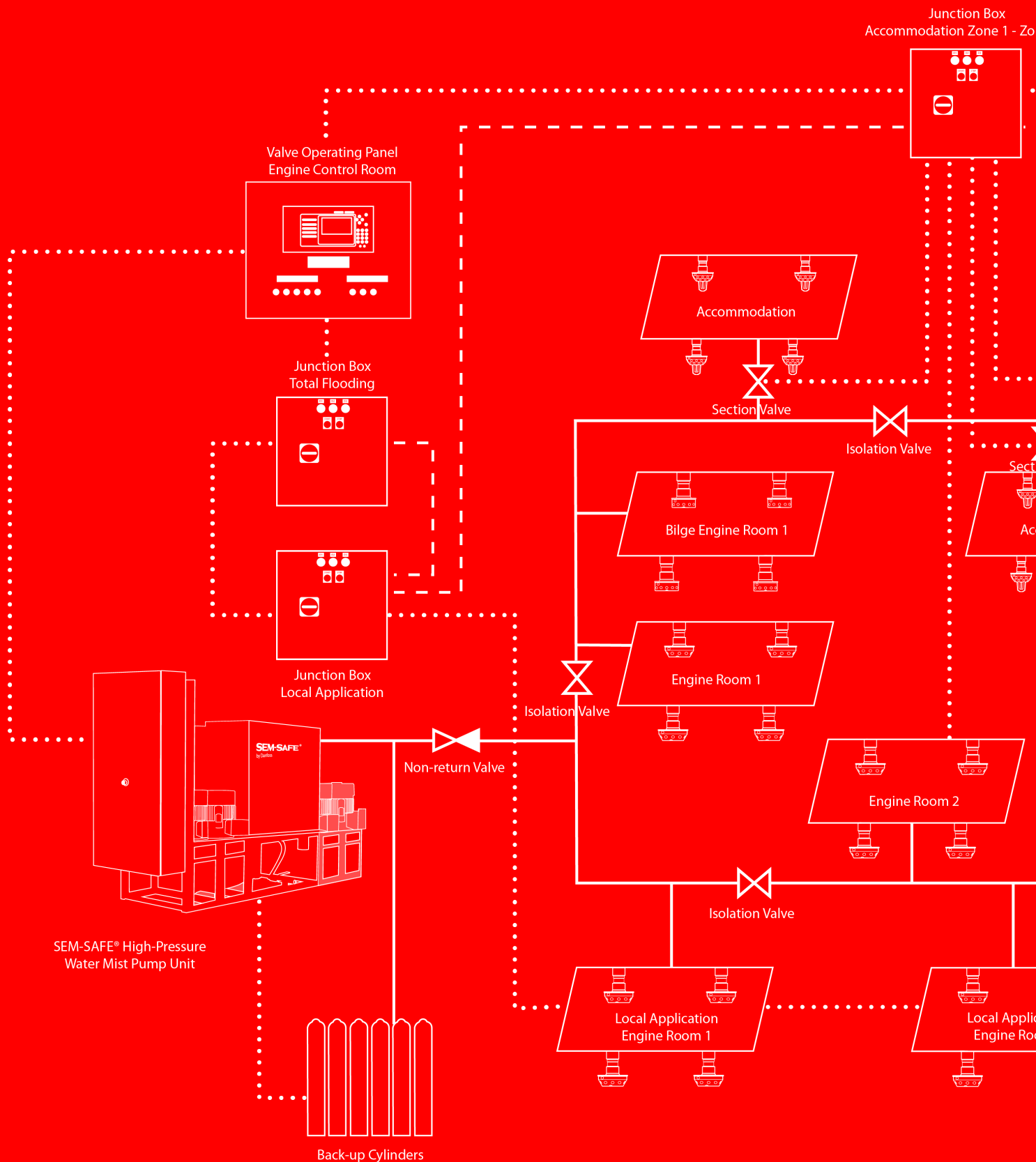
Proven experience

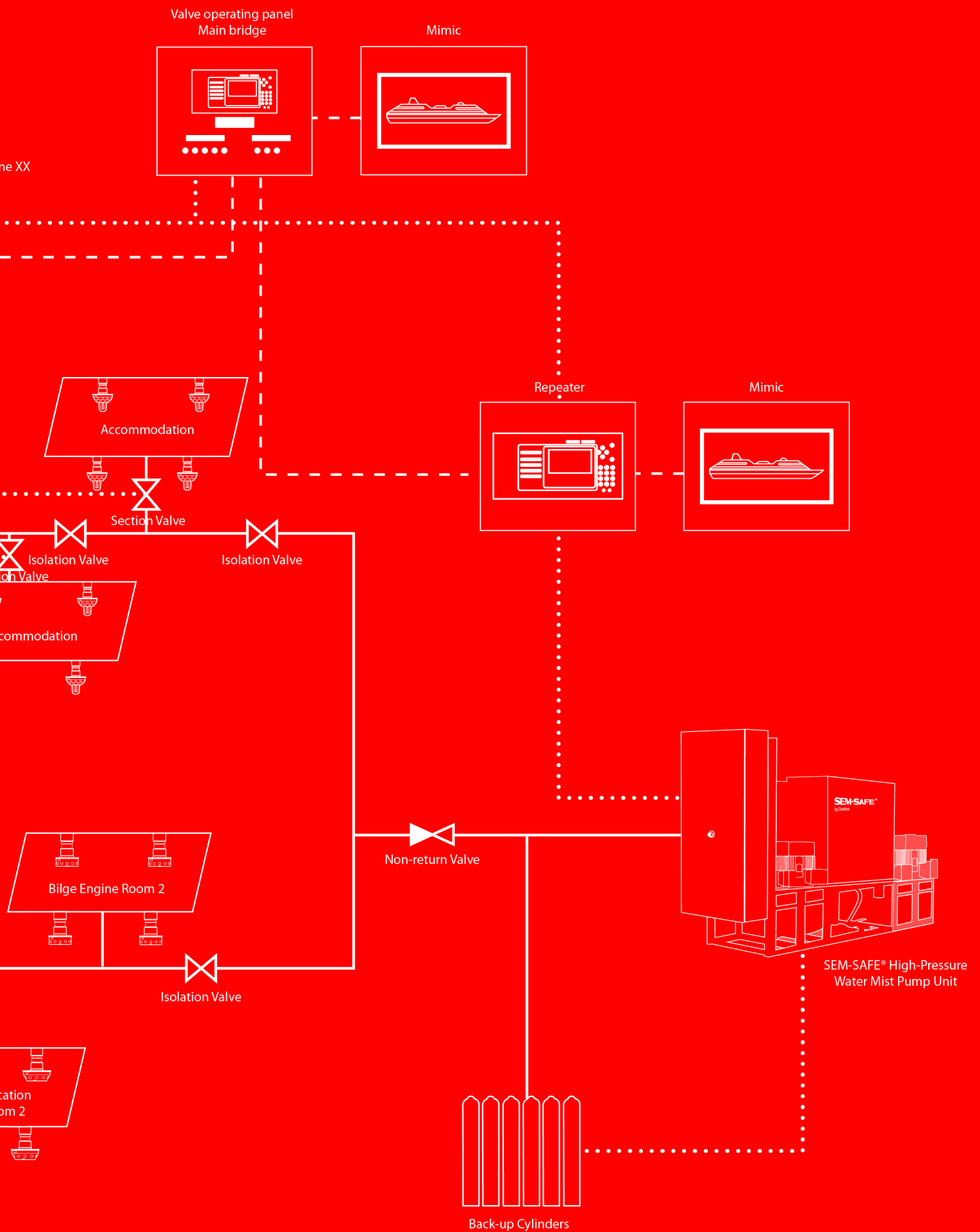
Danfoss has an extensive reference list within the marine sector, covering passenger, cruise, container, bulk carrier, tankers, Ro-Pax, Ro-Ro, PCTC, navy, patrol, supply and offshore. We have supplied fire fighting systems to more than 1,500 vessels, including world class ships such as:

- **Allure of the Seas** and **Oasis of the Seas**, largest cruise liners
- **DFDS King Seaways**, busy passenger and cargo carrying vessel
- **HSC Fjord Cat**, one of the world's fastest passenger vessels
- **Le Grand Bleu**, one of the world's biggest yachts
- **Global Mercy**, state-of-the-art hospital ship
- **Stena Germanica**, larger cruise-ferry



Safe return to port





Total Solution Provider of Certified Fixed Fire Fighting Systems

Danfoss Fire Safety A/S, an integral member of the Danfoss Group, is a global leader in the sale, development, production and service/commissioning of certified fixed fire fighting systems under the brand name SEM-SAFE®.

We offer you an unparalleled competitive edge through quality and reliable products, uncompromising performance and cost-effective fire fighting systems.

Innovation is our approach

We have been engineering and pioneering SEM-SAFE® fire fighting systems for decades. This gives us the experience and technological knowledge to provide a complete range of SEM-SAFE® fire fighting systems based on two key technologies: high-pressure water mist and low-pressure CO₂.

Engineering a safer tomorrow

SEM-SAFE® high-pressure water mist is the optimum fire fighting solution for any building and ship type.

The breakthrough that high-pressure water mist represents is to use the same method as traditional sprinklers, but to add the effect of converting the water into steam.

This means that the cooling effect is up to seven times higher than for

traditional sprinklers. Combined with the oxygen displacement effect, this can reduce water consumption significantly compared to traditional sprinklers.

Besides a proven track record in buildings, we install SEM-SAFE® fire fighting systems in a wide range of vessels. Safety on board ships is critical, and this places great demands on fire fighting systems.

Whether the journey means transporting goods across oceans on a mega container ship, or a vacation trip to a beautiful island on a luxurious cruise, SEM-SAFE® fire fighting is the perfect choice to protect the vessel and passengers against fire, with reliability and cost-effectiveness in mind.

For the marine sector we offer the SEM-SAFE® high-pressure water mist

system for fire fighting and the SEM-SAFE® low-pressure CO₂ system for fire fighting.

Reaching even higher

Simplicity in design, obtained by using the most advanced technologies, results in the highest operation reliability. All our products are made of first-class materials and in a comprehensively tested design.

Danfoss is close by

Danfoss and its associates, regional offices and agents constitute a worldwide network that provides comprehensive technical support, installation, commissioning and repair services.

This network ensures that our reputation for fire fighting excellence is maintained and enhanced.

**>50
years**

of pioneering
research & testing
in fire fighting

SEM-SAFE®

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