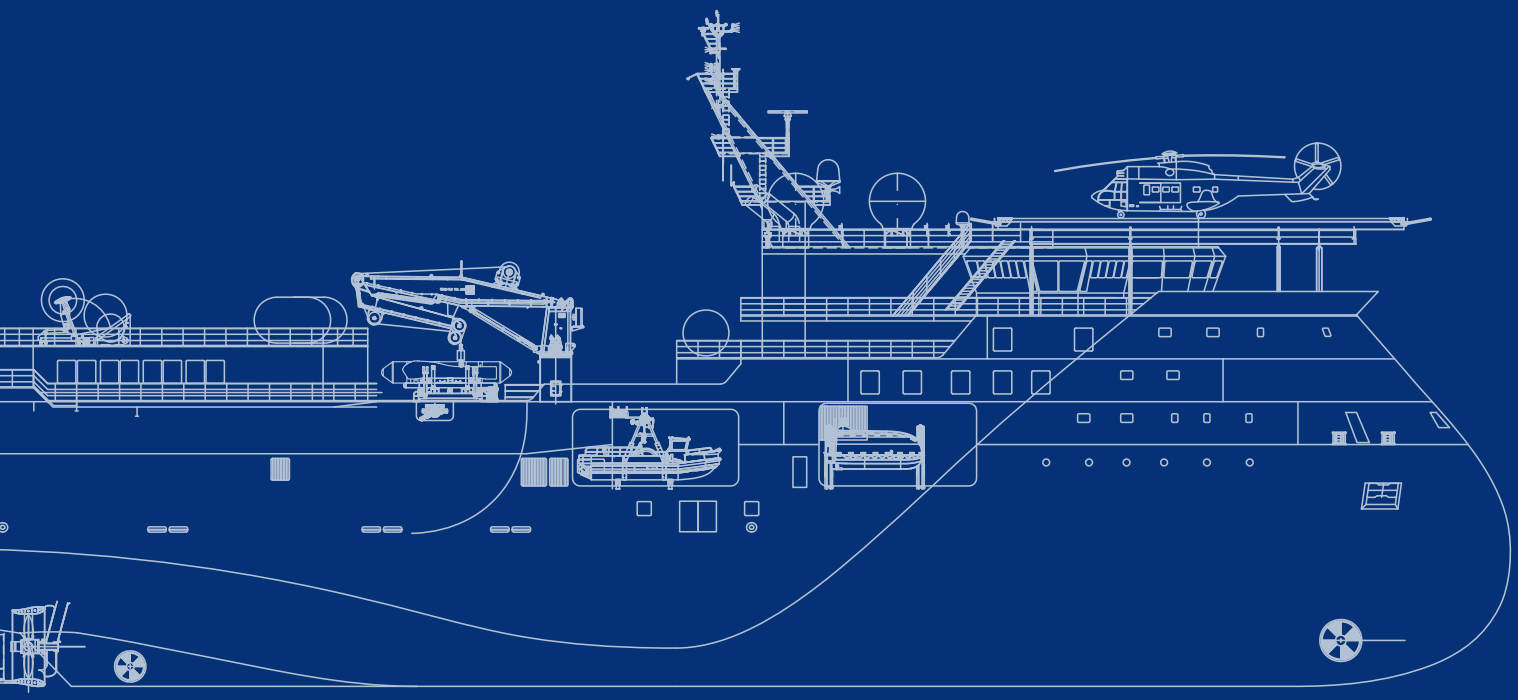
Danfoss SEMCO FIRE PROTECTION

Total Solution Provider of Certified Fixed Fire Fighting Systems

Offshore Supply Vessels

Danfoss Semco A/S

Total Solution Provider of Certified Fixed Fire Fighting Systems



Cover page: *Island Constructor – ship of the year in 2008 – fully protected with Danfoss Semco's SEM-SAFE® high-pressure water mist system.*

SEM-SAFE®

High-pressure water mist system

SEM-SAFE® in short

SEM-SAFE® is a high-pressure water based fire fighting system that uses micro droplets released through nozzles in protected areas. It comprises a high-pressure modular pump unit, section valves to activate designated areas, piping and water mist nozzles.

The system is safe, efficient and environmentally friendly. With small pipe dimensions, large coverage, minimal water consumption, a compact skid unit and simple design, SEM-SAFE® high-pressure water mist is the perfect choice to protect supply vessels against fire, with reliability and cost-saving in mind.

This is how SEM-SAFE® works

When water is forced through nozzles at high-pressure, a super-fine mist is formed that has a twofold extinguishing effect – it rapidly cools the fire and starves the flames of oxygen to reduce damage and quell fires.

Benefits of SEM-SAFE® high-pressure water mist

Tackles fires swiftly and efficiently

- The system can be instantly activated without the need to seal off and/or evacuate the area
- Reduced extinguishing time thanks to rapid water discharge
- Immediately cools fires preventing reigniting
- Water mist is documented to be harmless to electrical installations (IP23)
- For total flooding and local application, the SEM-SAFE® high-pressure water mist system is ready for use immediately after a fire

In-house design and production

- Danfoss Semco is the only supplier with in-house design and production of all three key fire fighting components: nozzles, pumps and section valves. This is a prerequisite for top quality high-pressure water mist systems
- With 30% fewer components compared to most competing systems, the SEM-SAFE® system is lighter and more compact. This allows for easier installation, simplified maintenance and valuable space saving

Money-saving solutions

- With fewer nozzles required thanks to optimised spacing and the need for only one pump unit for all on-vessel applications, installation cost and time as well as required service interventions are considerably reduced
- The stainless steel pipes are extremely corrosion-proof and dirt resistant to prevent malfunctions, e.g. clogging that usually affects other types of pipes
- The high-pressure pumps are water-lubricated and hence virtually maintenance-free
- The small water droplets evaporate immediately during application. The result is minimal water damage to surrounding equipment and the environment, reducing operational downtime on board to a minimum

One system – one supplier

Total flooding

Danfoss Semco offers SEM-SAFE® as a key engine room protection solution that allows doors and ventilation to remain open during the extinguishing process.

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 1165.
Approved by DNV, Lloyds, ABS, BV.

Deep fat fryer and duct

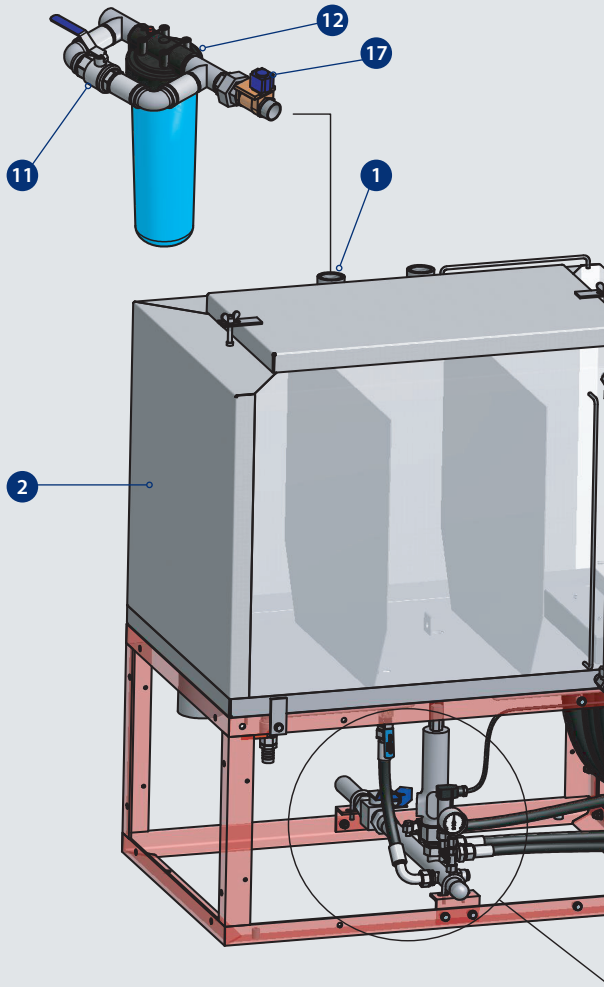
Protection against fire in deep-fat fryers and ducts is also possible via direct connection to the pump unit used for other areas. The deep-fat fryer and duct system enables super-fast extinguishing and subsequent cooling of oil to prevent re-ignition. The fine water mist evaporates before reaching the oil surface, thus eliminating the risk of hot oil splashes.

The deep-fat fryer and duct system is designed for manual push-button activation, however, an auto release option with heat sensors is also available. As soon as the fire signal is sent, the system immediately shuts down the heating element and ventilation system to prevent the fire from spreading.

The SEM-SAFE® system for deep-fat fryers is also available as a stand-alone version with 2 × 8 litre cylinders, containing nitrogen and water respectively.

Another alternative for protecting deep-fat fryers is the fully independent K5 system that can be activated manually or automatically when connected to a heat sensor. Upon receiving a fire signal, the system immediately shuts off the power supply to the protected appliance(s) and simultaneously releases extinguishing liquid onto the fire. With a simple compact design in high quality stainless steel, the K5 systems are easy to maintain and integrate within the galley environment.

Tested in accordance with ISO 15371.
Approved by Lloyds, DNV.



1 INLET CONNECTION
Fresh water or seawater supply to the buffer tank

2 BUFFER TANK
Minimum capacity of one minute operation at max. required flow

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 system pressure (100-140 bar). Discharge line back to tank

5 HIGH-PRESSURE MANIFOLD
Connects the 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)

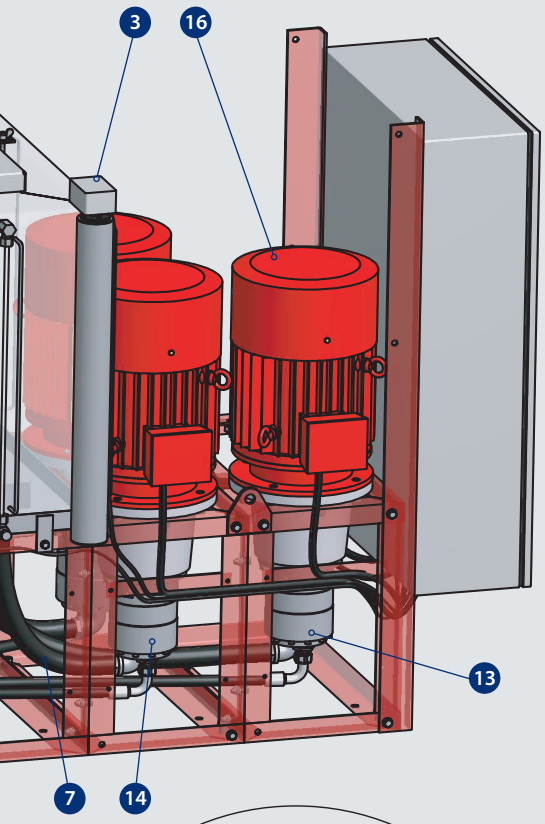
7 INLET HOSE
Supplies the pumps with water from the buffer tank

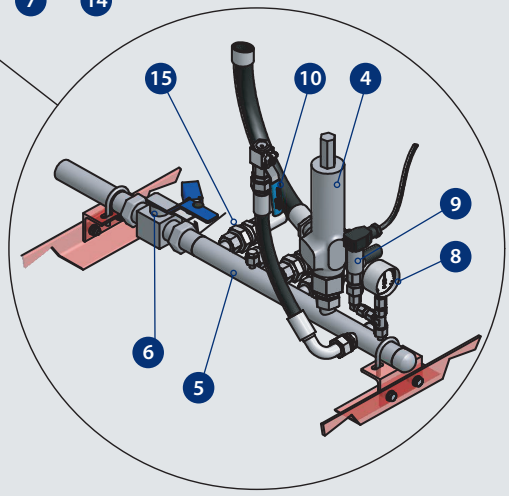
8 PRESSURE GAUGE
Indicates the operating pressure

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 FILTER
10 micron rated inlet filter

13 REDUNDANT PUMP
For total flooding and accommodation only: Standby pump for redundancy in case one of the other pumps malfunctions

14 HIGH-PRESSURE PUMP
Supplies the required flow and pressure for the system

15 NON-RETURN VALVES
Supplied when multiple pumps are required

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

17 INLET VALVE
Controlled by the level switch (position 3)

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 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 913.
Approved by Lloyds, ABS, GL, BV, RINA, RMRS, US Coast Guard, DNV, CCS.

Accommodation

Although optional, accommodation areas can also be protected with the same pump unit installed for total flooding and local application, making this a simple and cost-effective fire protection solution. The system can be easily installed in any accommodation area, such as public spaces, storages, corridors and cabins.

In standby, the system maintains a nozzle pressure of 10-15 bar. The 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 should happen, the high-pressure pump unit is automatically activated and water is forced through the nozzle at very 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 A800.
Approved by DNV, BV, ABS, Lloyds.

Argonite® system

Foam system

Argonite® used in Danfoss Semco fire protection systems is a non-toxic, non-corrosive, non-fogging, environmentally friendly extinguishing medium. In sealed spaces, the gas will extinguish almost any fire when the oxygen concentration falls below 15%. Argonite has been used since 1992 as an alternative to Halon 1301.

The Argonite® system has the following characteristics:

- Suitable for extinguishing fires in sealed spaces, such as engine rooms, machinery spaces, switchboard rooms, control rooms, and computer rooms. It is particularly suited for high-value risks
- The fire is put out rapidly and no residue is left after use. Downtime after a fire is reduced to a minimum. It is safe for personnel at design concentrations
- Suitable for extinguishing fires of combustible liquids, gases and electrical equipment and for extinguishing smouldering fires in wood, paper, textiles, etc.
- Installed as a total flooding central bank system, including multiple distribution points or in the protected room subject to approval by authorities
- Usually installed with pneumatic release, but can also be supplied with electric or manual release
- Argonite is a mixture of 50% argon and 50% nitrogen for easy refilling anywhere in the world

Helicopter deck

Danfoss Semco also provides complete helideck fire fighting systems in accordance with class and flag rules as well as civil aviation and related codes like CAA, ICS and CAP 437.

The system can be delivered as a complete skid unit with all equipment integrated on a common steel frame or separate components for individual placement and connection.

All systems consist of a GRP (Glass-Fibre Reinforced Plastic) or SS 304/316 (Stainless Steel) foam liquid storage tank, a 1-3% mixture proportioning device, a foam liquid pump and a number of monitors and nozzles as well as handheld foam branches depending on the size of the helideck to be protected or applicable rules.

All systems are delivered with certified AFFF or protein type foam liquid.

Cargo deck

For storage of low flammable liquid (LFL) on board sea vessels, Danfoss Semco provides a deck foam system to protect the deck area above the storage tanks.

The system includes a foam liquid storage tank (GRP or SS 304/316), a proportioning unit, foam pump and a sufficient number of monitors supplied in compliance with the latest IMO, class and flag notifications for LFL.

Argonite® is a registered trademark of Ginge-Kerr.

High-pressure CO_2 system

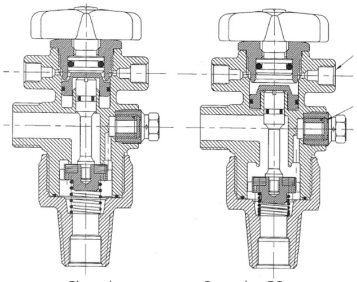
Our high-pressure CO_2 systems have been designed and manufactured in-house with the following characteristics:

- Suitable for extinguishing fires in sealed spaces, such as engine rooms, auxiliary rooms, cargo holds, etc.
- Extinguish fires within a short time, leaving no residue after extinguishing to reduce shutdown time after a fire to a minimum
- Suitable for extinguishing fires involving combustible liquids, gases and electrical equipment, and for smouldering fires in wood, paper, textiles, etc.
- Installed as a total flooding central bank system with the required number of distribution points
- Usually installed with pneumatic release, but electric or manual release also available

Danfoss Semco's high-pressure CO_2 system, Argonite® system and foam system have been approved by IMO, LRS, DNV, BV, PRS, CCS, ABS, GL, RMRS, NK and IRS.

Unique pressure-operated cylinder valve

- Always kept closed by CO_2 pressure
- No adjustment necessary to avoid leakage
- After release test, the valves can be closed automatically via the release cabinet
- The cylinder valve can be closed automatically if a leak develops in the main valve, hoses, etc.
- Meets current DMA standards and similar regulations



Closed *Open by CO_2 pressure*

Unique worldwide after sales concept

Danfoss Semco is a after sales service provider approved by several classification societies and provides valuable and cost-saving overviews at multiple levels. We track ships due for annual service, so clients need not use their own resources. We highly recommend leaving periodical check-ups to our own technical supervisors.

Danfoss Semco's 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.

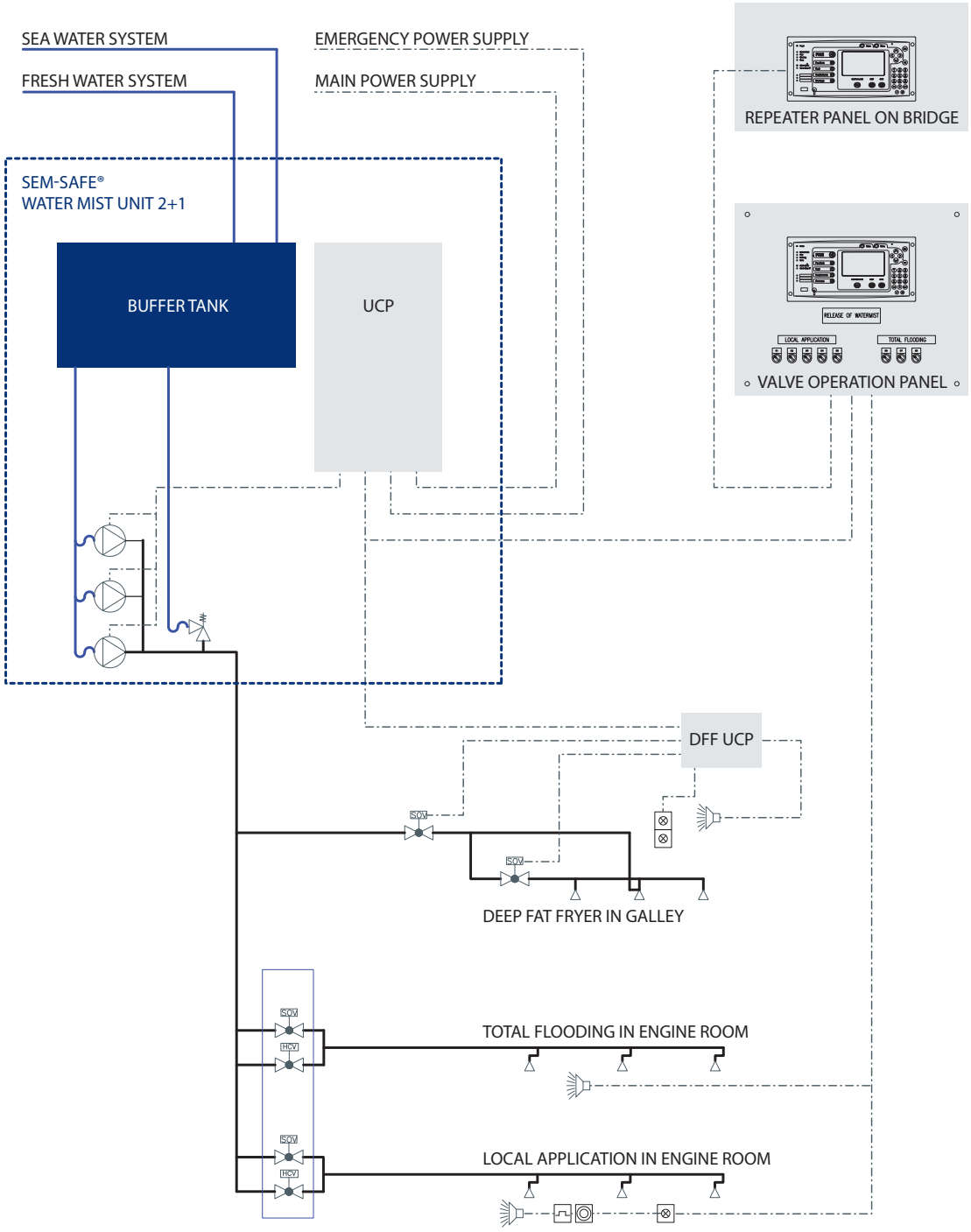
Danfoss Semco offers you professional services on board vessels anywhere in the world.

Our prime service implies that 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 Semco's after sales 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.

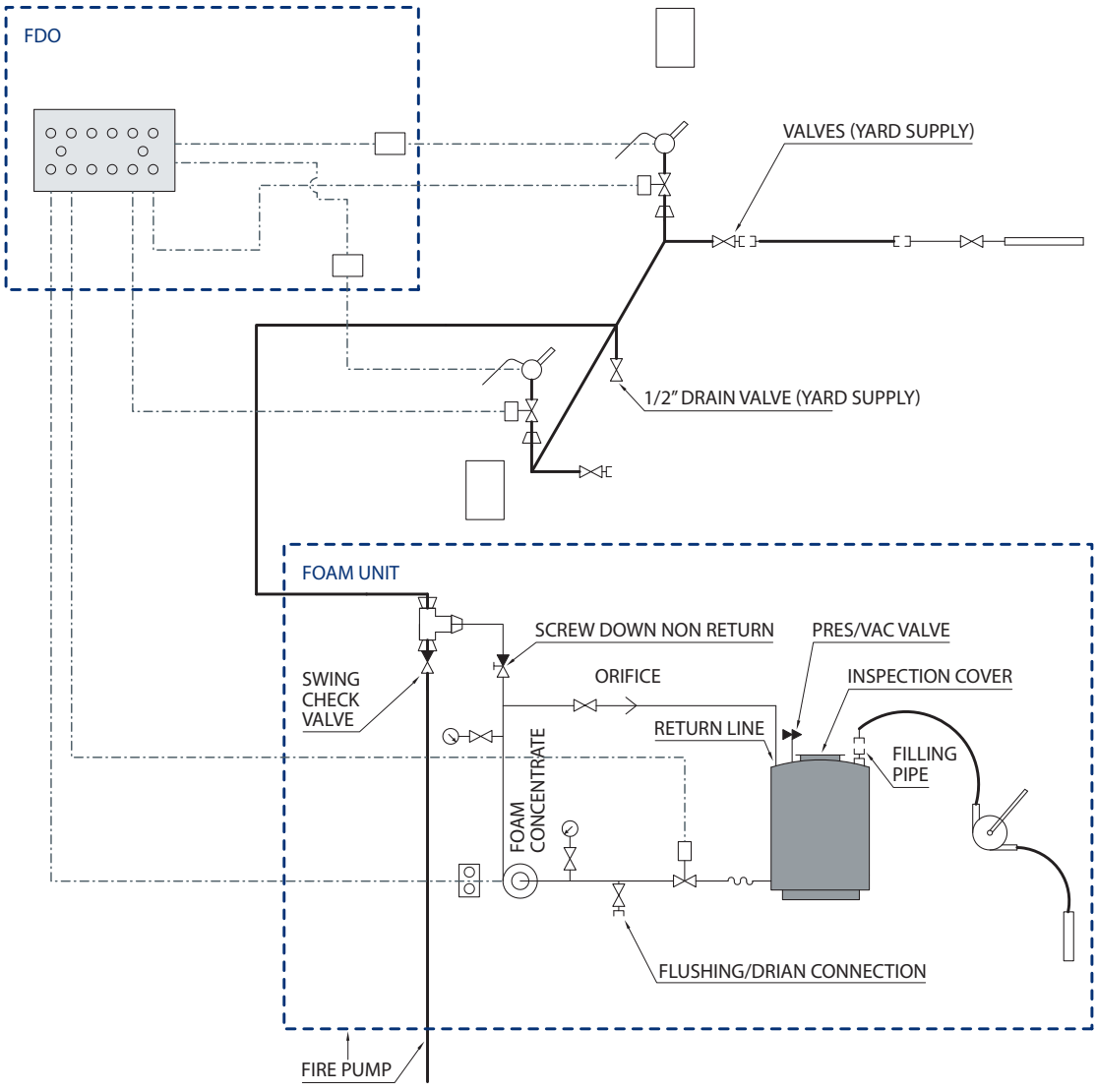
Schematic diagram

For SEM-SAFE® high-pressure water mist system



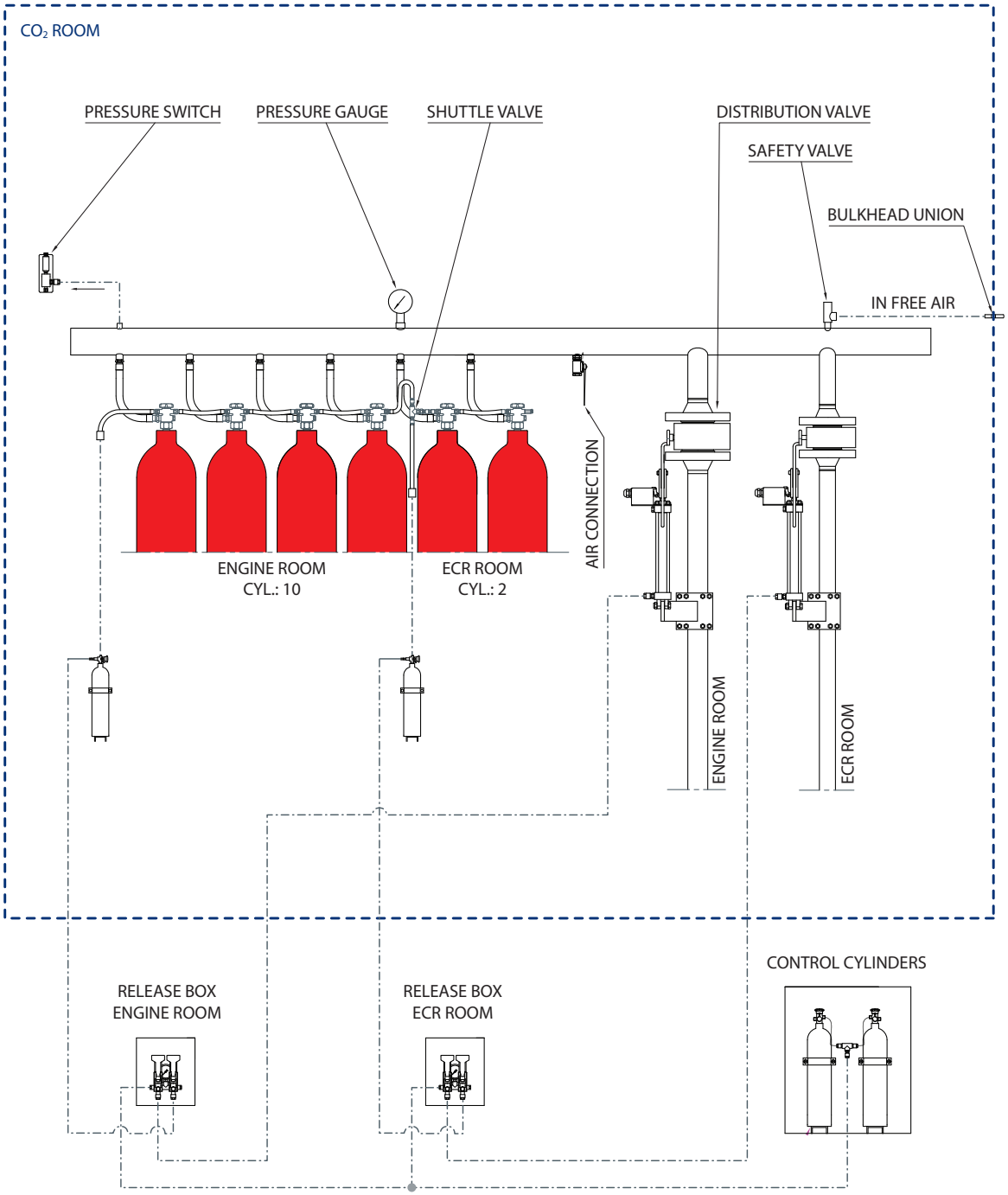
Schematic diagram

For helideck foam system



Schematic diagram

For high-pressure CO_2 system



Danfoss Semco A/S

History

Danfoss Semco A/S is a global leader in the sale, development, production and service/commissioning of certified fixed fire fighting systems. In 2006, two leading firms in the field, Danfoss A/S and Semco Maritime A/S, joined forces to form the present company, with Semco Maritime boasting over half a century of expertise in designing and installing fixed fire fighting systems. All the while, Danfoss has developed and delivered key components for the high-tech systems.

Today Danfoss Semco is an integral part of the Danfoss Group, Denmark's largest industrial manufacturing company with a daily output of more than 250,000 finished components. With more than 24,000 employees worldwide, Danfoss is truly a global company.

Business areas

Our company is located in Odense, Denmark, and operates three main business areas.

Our water mist division comprises two business areas: the marine division and the industrial and commercial division. The former has pushed the boundaries for development and design to offer a wide range of solutions for numerous application areas on almost any type of vessel.

Within the industrial and commercial area, Danfoss Semco has a successful track record with different applications, ranging from complex fire fighting systems for museums and heritage sites to industrial applications, office buildings and universities.

Our gas and foam division is the world's largest low-pressure CO_2 based fire fighting systems supplier for the marine industry. This division supplies gas, foam and dry chemical powder systems worldwide.

In-house manufacturing of key components

Danfoss Semco operates in-house research, development and manufacturing facilities of all critical components to ensure uncompromising performance and cost-effective systems. This puts us in a unique position to maintain our technological leadership in the future.

Proven experience

Danfoss Semco has 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*, the world's largest cruise liners
- *Mærsk Mc-Kinney Møller*, the world's largest container ship
- *HSC Fjord Cat*, the world's fastest passenger vessel and holder of the record for the fastest transatlantic voyage
- *Island Constructor*, ship of the year in 2008
- *Le Grand Bleu*, one of the world's biggest yachts

The standby safety vessel "Esvagt Bergen" is equipped with a SEM-SAFE® high-pressure water mist fire fighting system.

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