

ENGINEERING  
TOMORROW

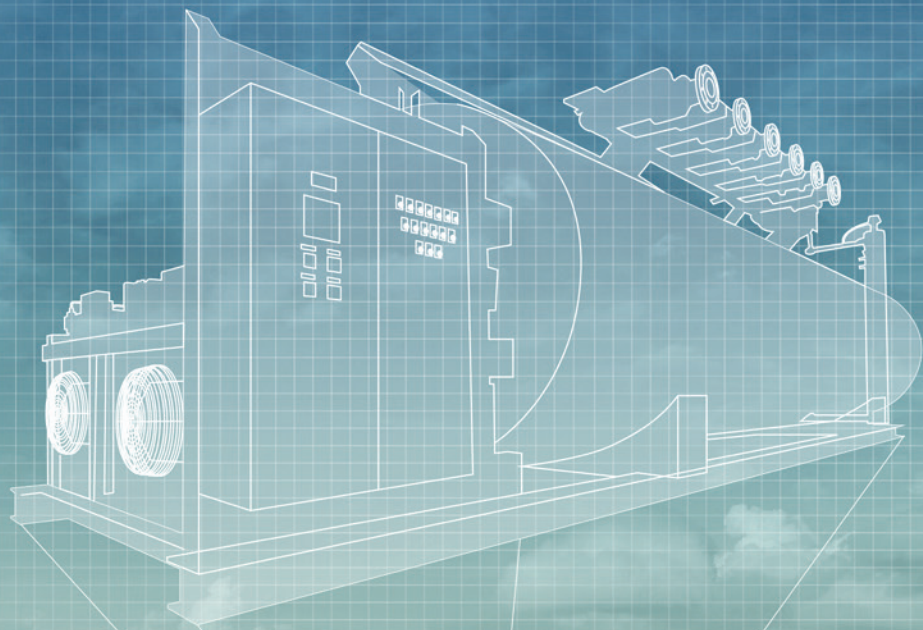


Marine & Offshore

# SEM-SAFE<sup>®</sup> low-pressure CO<sub>2</sub> fire safety system

Danfoss Fire Safety A/S

Easy  
installation  
and low  
maintenance  
cost



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**SEM-SAFE<sup>®</sup>**

# SEM-SAFE® low-pressure CO<sub>2</sub> fire safety system

The SEM-SAFE® low-pressure CO<sub>2</sub> systems are intended for use where large machinery and cargo spaces require protection with carbon dioxide. The advantage of the low-pressure system is that one single tank replaces a large number high-pressure CO<sub>2</sub> cylinders with an approximate saving of 50% in weight. The tank, main valves, distribution valves, refrigerators, cooling unit and associated controls are supplied prewired and ready assembled on a common steel frame.

The quantity of carbon dioxide is shown directly by an electronic gauge indicating the actual tons of CO<sub>2</sub> in the tank. The gauge unit is fitted with alarm contacts for warning of low CO<sub>2</sub> contents in the tank. Recharging after use is done directly from a truck.

For large vessels the installation cost of a low-pressure CO<sub>2</sub> system is considerably lower compared to the installation costs of a high-pressure CO<sub>2</sub> system.

The system is designed to meet the requirements of the appropriate classification societies to which the vessel is being built.

## Tank

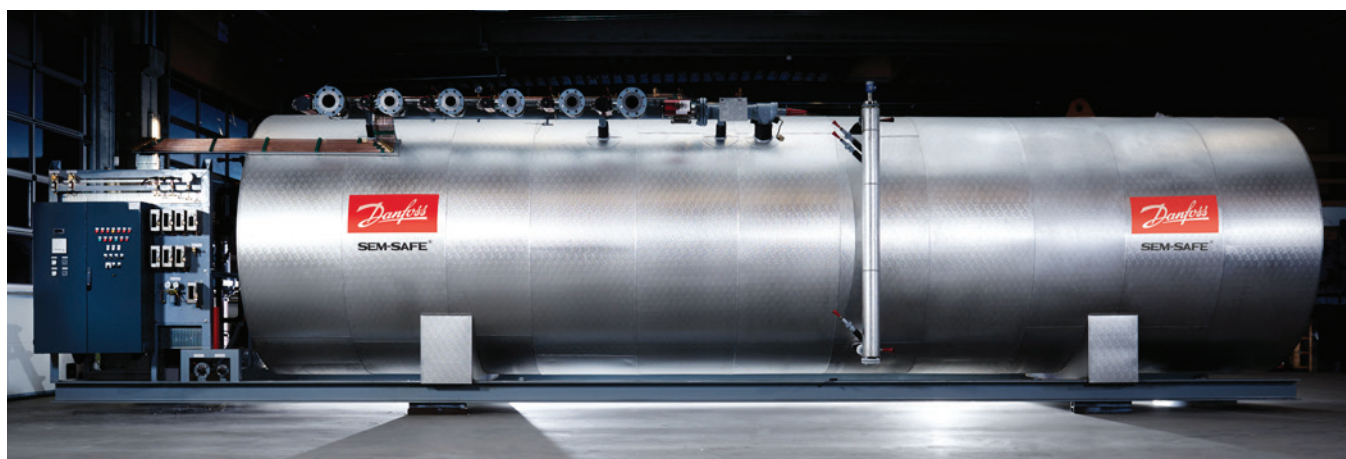
The tank is constructed as a steel pressure vessel in accordance with the classification society requirements. The tank is equipped with two safety valves, which are fitted to a three way changeover valve, thus one safety valve is connected to the vessel if the other one is out of operation. The tank unit is supplied complete and ready for use, installed on a rectangular steel framework and held in position by thermally insulated supports. The tank is insulated with non-flammable polyurethane foam protected by an aluminium cover.

## Cooling units

The cooling units are installed at the end of the tank on the support frame and are completely duplicated both mechanically and electrically. The refrigerant is environmentally friendly and the cooling circuits on the compressors and condensers are suitable for either seawater, fresh water or air-cooling. CO<sub>2</sub> is maintained at a temperature of -18°C, which is equivalent to a CO<sub>2</sub> storage pressure of 2.1 MPa.

## CO<sub>2</sub> level indication

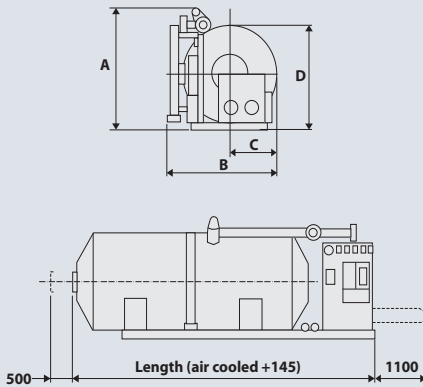
An electrical capacitance type liquid gauge is fitted and the meter is calibrated. The indicator has an accuracy of +/- 2% and is fitted with an alarm switch indicating minimum filling level.



## Benefits

There are many benefits of the SEM-SAFE® low-pressure CO<sub>2</sub> system for fire safety compared to high-pressure CO<sub>2</sub> cylinders:

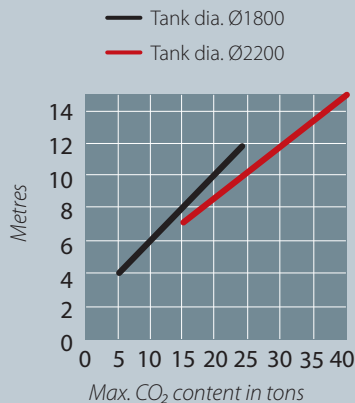
- Compact system with low complexity: one ready assembled and tested low-pressure CO<sub>2</sub> unit instead of hundreds of high-pressure CO<sub>2</sub> cylinders.
- "Plug & Play" installation.
- Low-maintenance cost: checking the content annually is done quickly and easy with low-pressure CO<sub>2</sub> unit as only one instrument needs to be read; high-pressure CO<sub>2</sub> requires time-consuming weighing of every cylinder and for many level indicators to be inspected.
- Lower system weight.
- Less space required: only 60m<sup>2</sup> for SEM-SAFE® low-pressure CO<sub>2</sub> unit compared to 150-300m<sup>2</sup> for high-pressure CO<sub>2</sub> cylinders.
- Easy installation and savings: between 100 and 200 man hours are required for the installation of the low-pressure CO<sub>2</sub> unit; installing high-pressure CO<sub>2</sub> cylinder can take between 400 and 1000 man hours.
- Fast re-filling after release: 12 man hours are needed for refilling a low-pressure CO<sub>2</sub> unit compared to 2,500 man hours required for high-pressure CO<sub>2</sub> cylinders.
- No need for pressure test after ten years.



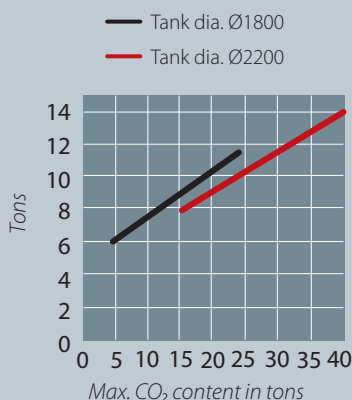
	TANK Ø1800	TANK Ø1900	TANK Ø2200	TANK Ø2400
<b>A</b>	2600 mm	2800 mm	3000 mm	3200 mm
<b>B</b>	2415 mm	2460 mm	2805 mm	3000 mm
<b>C</b>	1025 mm	1080 mm	1225 mm	1340 mm
<b>D</b>	2270 mm	2420 mm	2695 mm	2900 mm

Example of tank sizes

### Length excl. air cooling



### Weight empty



### Controls

A pre-wired operating panel is installed at the end of the tank on the support frame, at which are grouped all controls and overload relays for the cooling units, tank pressure, level indicators, and various indicators and warning lamps. The panel is completely watertight and fitted with cable glands.

### Valves and filling connections

The automatically operated main valve and distribution valves are ball valves fitted with manual override. The valves are sized so that the appropriate quantity of carbon dioxide will be discharged in accordance with the class requirements. To prevent ice formation on the valves, the main outlet pipe from the tank is located at the top of the tank as a continuation of the tank dip tube. The tank is filled by a truck through twin filling and balancing lines led from the tank to deck level port and/or starboard. Isolation valves and hose connections are fitted to these lines.

### Release of carbon dioxide

Remote release of the required quantity of gas to a particular space is done from the release cabinets located as required. The release system utilises the CO<sub>2</sub> pressure from the tank to actuate the main valve and the distribution valve via a pressure-controlled valve, and these valves are arranged for remote operation from the release cabinets. When the appropriate quantity of carbon dioxide has been discharged, the main valve is closed automatically.

### Distribution system

The distribution valve is connected to a computer-calculated piping system within the protected space and to which the CO<sub>2</sub> nozzles are connected. The piping is dimensioned so that the required quantity of gas will be discharged within the prescribed time and at no point in the piping system will the pressure fall below 10 bar which would cause freezing at the nozzles.

All designs and sizes are available on request.

### Quality assurance

Danfoss HSE&Q system is in accordance with DS/EN ISO 9001:2015, DS/EN 14001:2015, and DS/OHSAS 18001:2008 and is certified by DNV-GL.

Our ongoing internal training programs make our employees – naval architects, sales engineers, project managers, service engineers etc. – fully qualified to handle our fire fighting systems for the marine industry. An important element is the use of an approved computer program for hydraulic calculations, which secures a quick and precise system design.

# 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 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 CO<sub>2</sub>.

## Engineering a safer tomorrow

From a modern high-rise building to a state-of-the-art university, from a wooden church to a super hospital and busy international airport, SEM-SAFE® high-pressure water mist is the optimum fire fighting solution for any building 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 if 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 demanding marine sector we offer

two fire fighting technologies: SEM-SAFE® high-pressure water mist and SEM-SAFE® low-pressure CO<sub>2</sub>.

## 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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