ENGINEERING TOMORROW

Danfoss

Case story | SEM-SAFE® high-pressure water mist system

CitizenM London Shoreditch Hotel

An innovative hotel offering its guests affordable luxury – all protected with SEM-SAFE® high-pressure water mist for fire fighting

Danfoss Fire Safety A/S

The hotel has a great location in Shoreditch, East London, England, in a lively area that is becoming more and more known for fashion and vibrant cultural events. In line with the transformation of the area, CitizenM London Shoreditch promotes the philosophy of affordable luxury.

The hotel was built on the location of a former railway viaduct. The former steel structure had a significant impact on the hotel's structure. As a result, CitizenM was built to the exact proportions of the old viaduct. The lobby has a unique balcony that overlooks the tube train situated on top of the building from across the street.

Building description

CitizenM London Shoreditch is an 11-storey hotel. The 14,000-square-metre, mixed-use area comprises 216 bedroom pods and 24 ironing/linen rooms that are stacked above a concrete deck and, in themselves, the pods form the main structure of the building. The lobby is created to give the impression of a very open space, with a comfortable lounge area and bar, designed in a modern and colorful fashion. All is protected with SEM-SAFE® high-pressure water mist for fire fighting from Danfoss.

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SEM-SAFE® high-pressure water mist system
Danfoss and Fireworks Fire Protection Ltd (official Danfoss business Partner in the UK) have worked closely together to provide the prestigious CitizenM Shoreditch project with the right fire fighting solution for for OH1 hazards. A SEM-SAFE® high-pressure water mist pump unit with CEN approved nozzles was chosen. The CEN nozzle allows for 5.5 metre spacing and can protect rooms with up to 3 meter ceiling height. A total of 441 CEN nozzles were installed. The SEM-SAFE® high-pressure water mist system offered by Fireworks Fire Protection Ltd was approved by MLM building control.

Pods form the main structure of the building and as part of the modular structure and to ease the installation, Fireworks Fire Protection Ltd prefabricated the pipes to be installed in the Pods in Poland. When the pods are then lifted into place, the pipes from the pod ties in with the network of pipes installed throughout all other areas of the hotel and saves valuable time and money.

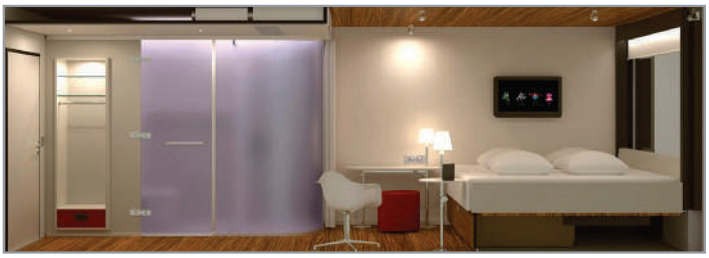
The SEM-SAFE® high-pressure water mist system offers fast and effective control and suppression of a fire. It offers a quick return to operation in the event of a fire, with minimal post-fire damage and small amounts of water used during operation. The installation by Fireworks is made easy due to the small bore stainless steel grade 316 pipe, which offers superior life over the other pipe materials offered.

The dynamic and strikingly urban lobby area protected with SEM-SAFE® high-pressure water mist system from Danfoss.

The customer chose Danfoss because of its long history of designing and delivering innovative products for this market. Furthermore, our UK partner Fireworks, has 20 years' experience supplying and installing high-pressure water mist in the UK. The customer found that the product was of high quality, with all relevant certification and test data readily available to present to the authorities having jurisdiction.

The main contractor states:
"When looking for fire suppression for the new Citizen M Hotel in Shoreditch, following extensive market research, the Danfoss SEM-SAFE® water mist system was chosen for a number of reasons; the quality of the expertise and installation offered from the UK partner Fireworks Fire Protection Ltd, good coverage from nozzles meaning less nozzles to install, aesthetically pleasing nozzles and only small pumps / tanks required."

The SEM-SAFE® high-pressure water mist nozzles fits perfectly with the modern interior of CitizenM Shoreditch Hotel.



Pod protected with SEM-SAFE® high-pressure water mist.

SEM-SAFE®

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ENGINEERING TOMORROW

Case story | SEM-SAFE® high-pressure water mist system

Alsik Hotel in Denmark: modern high-rise building protected by SEM-SAFE® high-pressure water mist fire safety system

Danfoss Fire Safety A/S

Green building all the way
Alsik Hotel, Spa and Conference opened in the spring of 2019 in the heart of Sønderborg, a beautiful harbour city in southern Denmark. Right from the concept stage, the Alsik high-rise building played a special role in a city that has made a commitment to becoming one of the most environmentally-friendly places in Denmark. This is known as ProjectZero, and Alsik Hotel has fully embraced the legacy this project represents for the local community: sustainable growth and a carbon free future.

Natural Scandinavian design
Designed by one of Denmark's leading architectural firms, Henning Larsen, the 19-storey aluminium and glass high-rise hotel completes world-renowned Frank Gehry's waterfront masterplan for Sønderborg and Flensborg Fjord.
Alsik Hotel has an impressive surface area of 24,800 m^2.
The building includes 190 rooms, 9 conference rooms, a spa, wellness treatments, fitness studio and 2 restaurants. Both the interior and exterior design draw inspiration from Nordic wildlife and its unique light.

Alsik Hotel was thus built with sustainability in mind in order to optimize the supply and use of energy, water and materials during the construction stage, but also to ensure that running the hotel is as environmentally-friendly as possible. All these elements have a big influence on the building's lifetime cost.

Reliable fire safety
To comply with the sustainability vision of the building and the city, the suppliers for this building were carefully selected and only the most mature and energy-efficient ones were considered. Danfoss Fire Safety is extremely proud to have been chosen as the supplier of the fire protection system for Alsik and to be part of a construction project that makes a real statement in terms of expertise in clean-tech solutions. Our SEM-SAFE® high-pressure water mist fire safety system covers all areas in the building.

100% environmentally-friendly fire fighting technology
The SEM-SAFE® system uses water as the extinguishing agent, which is a sustainable fire safety technology. It is harmless to people and environmentally friendly. Thus, we aim at contributing to better and more eco-friendlier solutions for the buildings and cities of tomorrow.

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The intelligent use of water for fire fighting applications

The SEM-SAFE® high-pressure water system uses water micro-droplets released through the nozzle into protected areas. An ultra fine mist is formed, with a two-fold extinguishing effect. In addition to cooling the fire, it simultaneously starves the fire of oxygen. The cooling effect also lowers the risk of re-ignition. This makes high-pressure water mist highly effective in the fight against fire and protects against heat damage.

SEM-SAFE® in short

The SEM-SAFE® system comprises of a high-pressure modular pump unit, section valves, piping and water mist nozzles. With small pipe dimensions, large coverage, minimal water consumption, a compact pump unit and simple design, the SEM-SAFE® system is the perfect choice to protect hotel buildings against fire, with reliability and cost-saving in mind.
A total of 2,500 SEM-SAFE® high-pressure water mist nozzles have been installed in Alsik, covering OH1, OH3 and OH4 applications such as offices, hotel rooms, restaurants, meeting rooms, atrium and storages. In addition, we have supplied 37 section valves. The entire Alsik hotel is covered by two SEM-SAFE® high-pressure water mist pump units.

Fire protection for people and assets

The goal is to save lives and limit damage to the equipment and the hotel building. In case of a fire, the SEM-SAFE® system will activate immediately in the areas where a fire is detected.
High-pressure water mist has excellent properties in capturing the smoke particles, thus increasing the chances for a safe evacuation of guests and staff.
The SEM-SAFE® high-pressure water mist system uses very little water compared to other technologies on the market. In addition, water damage is kept to a minimum.

Maintenance-free Danfoss pumps

The SEM-SAFE® high-pressure water mist system uses Danfoss PAH high-pressure pumps, which are lubricated by water, making them virtually maintenance-free.

Tested and approved system

The design of the SEM-SAFE® high-pressure water mist is based on full scale fire tests. The system chosen for the Alsik project has been tested in accordance with CEN/TS 14972 and approved by the Danish Institute of Fire and Security Technology to comply with the European standard for water mist systems prEN 14972 for Ordinary Hazard Groups OH1, OH3 and OH4.

Best choice for window cooling

The windows of the building go from floor to ceiling, allowing light to project further into the room. The excellent cooling features of the SEM-SAFE® high-pressure water mist technology make it the perfect choice for protecting glass facades.
SEM-SAFE® has passed the EN-1364-1 fire resistance test for non-load bearing elements, thus allowing for lighter glass in the building facade. Savings can be obtained by using our technology, as there is no need for expensive fire-resistant glass.

"We chose high-pressure water mist as it requires less installation in the building, and thus saves space.

For us, the advantage of the SEM-SAFE® high-pressure water mist fire safety system is, that it is a very safe system for people staying in a hotel environment while also incurring limited damage to interiors and technical installations in case of a fire.
The system itself has a low water consumption, which releases space in the building that otherwise would have been needed for a big water reservoir, for example.

We are very happy with the product and the installation.
We will definitely recommend Danfoss Fire Safety to others."

John Knudsen
Project Director at Bitten og Mads Clausens Fond

Best fire safety solution for high-rise buildings

The SEM-SAFE® high-pressure water mist system is the ideal choice for the Alsik high-rise hotel:

- ✓ It does not require large water reservoirs
- ✓ Pipes are thin for added flexibility in installation
- ✓ There is no need for sprinkler units on every floor to prevent pressure loss

SEM-SAFE®

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ENGINEERING TOMORROW

Case story | SEM-SAFE® high-pressure water mist system

Pirkka 6 in Finland

Student housing unit protected with SEM-SAFE® high-pressure water mist system for fire fighting

Danfoss Fire Safety A/S

Pirkka 6 is a 16-storey high-rise building constructed in Tampere, Finland, in 2011. The building was built using cast concrete and steel elements and serves as one of the new landmarks at the entrance of Hervanta Township, the home of Tampere University of Technology, the Police Academy, VTT Laboratories and various academic institutions.

History

The new housing unit was commissioned by TOAS (Tampere Student Housing Foundation) due to the increasing shortage of student housing in the area. The project was managed by the project owner YH Länsi Oy, a company specializing in commissioning senior care facilities and student housing units. The construction work was completed in 2011.

Building description

The housing unit consists of a single sixteen-storey residential tower, each floor having several apartments served by a lift and two staircases. The construction was based on cast concrete and steel elements. The total floor area of the building is approximately 8,000 m^2.

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SEM-SAFE® high-pressure water mist system
The building was fitted with a SEM-SAFE® high-pressure water mist fire fighting system from Danfoss. The installation work commenced in December 2010 and was completed in September 2011. The installation was timed to coincide with the main construction work schedule.

The system consists of the SEM-SAFE® electric pump unit, 3,800 m pipes and 722 nozzle heads.

Approving authority
The system design was approved by Alarm Control Alco Oy Ab, one of the three inspection companies accredited by the Finnish Safety Technology Authority. The design was then inspected by the Pirkanmaa Provincial Fire Department. The final installation was tested and inspected by Alarm Control Alco Oy Ab. The fire test criteria were not needed due to a prior acceptance of the system's components.

The main contractor and the commissioner of the building explain:
- Water mist was chosen over conventional sprinklers due to:
  - Minimized water damage upon system activation
  - Aesthetic appearance compared to a sprinkler system
- The investment cost was lower than anticipated, and viewed to be within an acceptable range compared to a conventional sprinkler system.
- The same pump unit also suplies water to the neighboring 6-storey senior care service home, also fitted with a SEM-SAFE® high-pressure water mist system.

SEM-SAFE® nozzles:
- *Architecturally attractive*
- *Aesthetic design*
- *Short installation time*
- *Efficient cooling*

The SEM-SAFE® system for high-rise buildings offers several advantages:
- *No need to place a large resorvoir*
- *No need for large water supply resorvoir*
- *No risk of pressure loss.*

SEM-SAFE®

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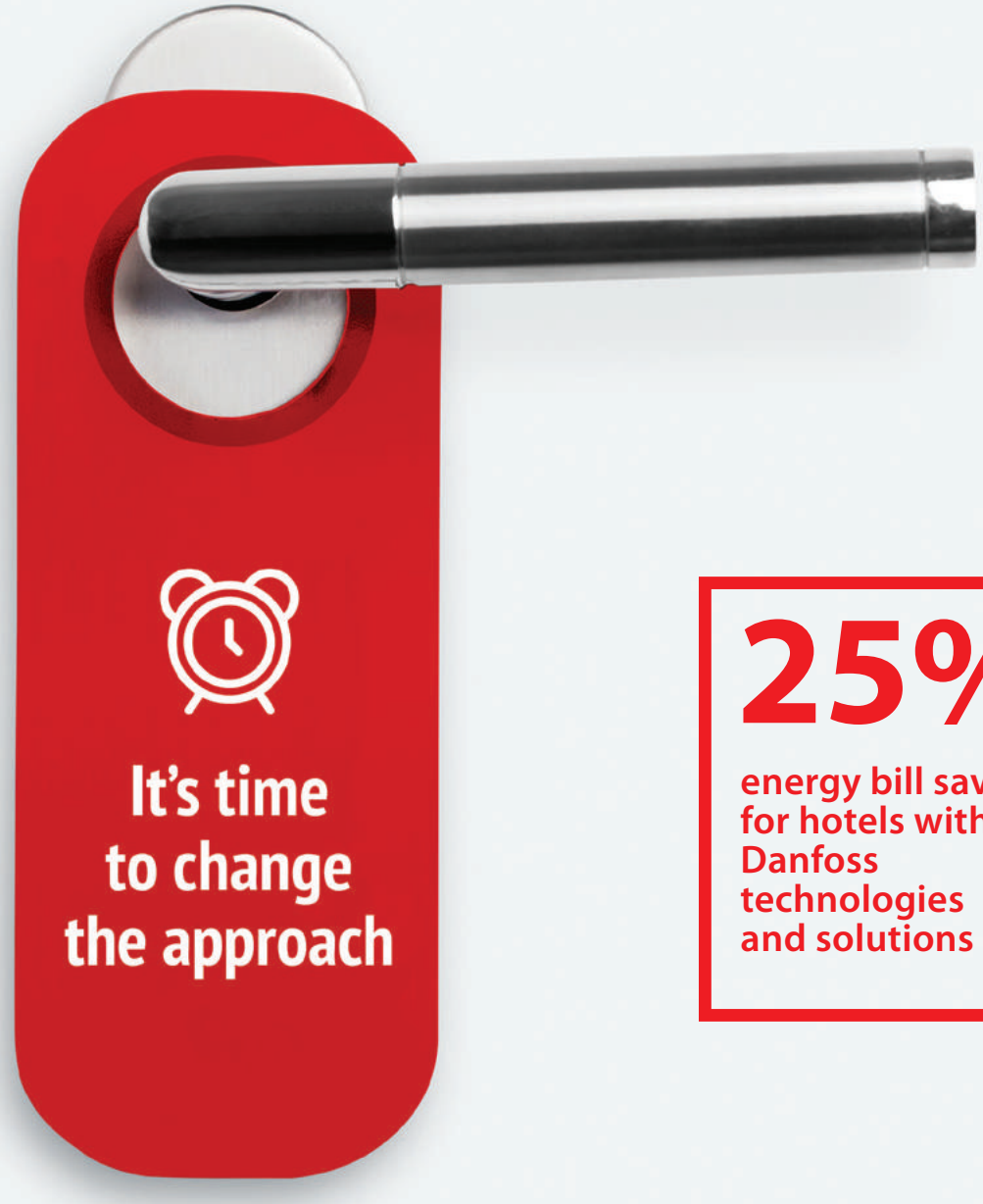
Enhancing **Energy Efficiency** and **Indoor Comfort** in Hotels



25%

energy bill savings for hotels with Danfoss technologies and solutions

New tourism trends **transform** your hotel business

The growing trends in tourism include sustainability, eco-certification, building automation and water stress. These trends require a change of approach for hotels to be competitive and profitable, while delivering exceptional guest experience.

As one of the fastest growing economic sectors, tourism is a high priority sector for UN sustainable development goals.
Nowadays, sustainability certification is becoming a mainstream requirement for hotels the world over.

The challenge is to achieve a long-term reduction in energy consumption while continuing to provide guests with the highest levels of comfort.

Energy costs may represent up to **10%** of operating costs

The **2nd** item after personnel costs

About **60%** of energy costs are related to heating, cooling and hot water production

How can hotels meet environmental regulations with smart investments? As an expert in energy efficient solutions, our answer is simple: look to the future and rethink the energy performance of your hotel.

It's **time to change** the approach!

Danfoss already has proven technologies to make hotels efficient, by managing heating, cooling and ventilation and control everything that's happening inside a hotel in terms of its environment.

Danfoss solutions make hotels performance remarkable – proactively managing energy usage and maintaining a healthy, comfortable and productive living environment.

Danfoss can help you **save energy** in your new-build or renovation project

We deliver our hotel expertise through the most advanced and efficient technologies to support smarter use of electricity and water, reduce running costs and environmental impact, and deliver superior comfort to guests.

HVAC

By using Danfoss solutions it is possible to reduce up to 45% of energy consumption of climate-control systems while ensuring the best comfort for guests. This is also building your hotel's green credentials.

Domestic hot sanitary water

Save at least 15% of hot water costs.
Reduce water waste, and reach temperature quickly.

Refrigeration systems

Our market-leading expertise in building sustainable and efficient cold rooms with accurate temperature control, meeting HACCP regulations, reduces the energy consumption by up to 30% with better food preservation.

Fire fighting systems

With our solutions, water consumption can be reduced by up to 80% compared to traditional sprinklers.

Elevators and lifting

High-reliability and high-efficiency drives guarantee more then 50% energy savings when modernizing a hydraulic elevator

Fresh water

Deliver high-quality service at lower costs with up to 65% less energy consumption.

Delivering **superior** indoor **experiences** and guest **satisfaction**

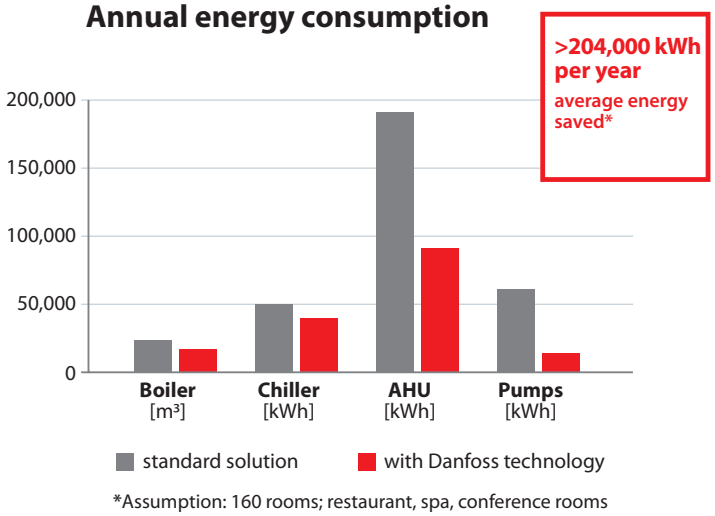
Offer your guests the best indoor experience by providing increased levels of comfort, thanks to perfectly balanced and variable HVAC flow systems

Emotions play an important role in guest satisfaction and loyalty. At Danfoss we know how important it is for you to deliver a reliable and consistent guest experience. We know how critical it is to meet guest preferences and expectations, while optimizing hotel performance to minimize costs and maximize profitability.

HVAC systems represent the highest energy operating cost in the hospitality industry (30-35%).

By using Danfoss solutions it is possible to reduce the energy consumption of climate-control systems by up to 45%, while ensuring the best comfort for guests. This also enhances your hotel's green credentials.

Annual energy consumption



*Assumption: 160 rooms; restaurant, spa, conference rooms

By choosing technical installations with variable flow rates and perfectly dynamically balanced HVAC systems, you can guarantee the best indoor comfort experience for your guests, thanks to the greater scope for personalized adjustment of each room. The economic advantages of energy savings are also considerable, thanks to the ability to optimize energy consumption.

Heating

The Danfoss heating solutions portfolio covers substations, hydronic balancing, controls and much more. **The NovoCon® S** digital actuator is a real game-changer in hydronic balancing and control. It is designed specifically for our market-leading **AB-QM**, a pressure independent balancing and control valve.

Ventilation

Efficient fan control is the most crucial aspect in ventilation applications. Our entire portfolio is supported by AC drives specifically designed for energy-efficient HVAC applications. To get optimal performance from your pump and fan applications, you can rely on our dedicated **VLT® HVAC Drive FC 102**.

Air conditioning

When you need to cool down, Danfoss offers the widest set of technologies for efficient air conditioning.
Achieving cool comfort requires a wide range of chiller components including heat exchangers, compressors, drives and valves. Our unique **Turbocor® oil-free** compressors and inverter scrolls offer the highest full- and part-load efficiency in the industry.

Modernization
with minimal disruption

45%
average total energy savings with Danfoss HVAC technologies

53% average reduction of electrical energy consumption

30% average reduction of gas consumption

220€ average savings/per room with Danfoss variable flow and perfectly dynamically balanced hydronic systems

Danfoss is the perfect solution, not only for new installation but for retrofit too. It is generally possible to carry out work without closing down the whole hotel, by intervening on single floors or rooms for example, alongside other maintenance or modernization work.
This improves comfort dramatically for staff and guests alike.

Domestic hot sanitary water

Delivering better **indoor experience**

An efficient hot water production system reduces costs and water waste while delivering superior comfort to guests, ensuring better experience and eliminating safety risks

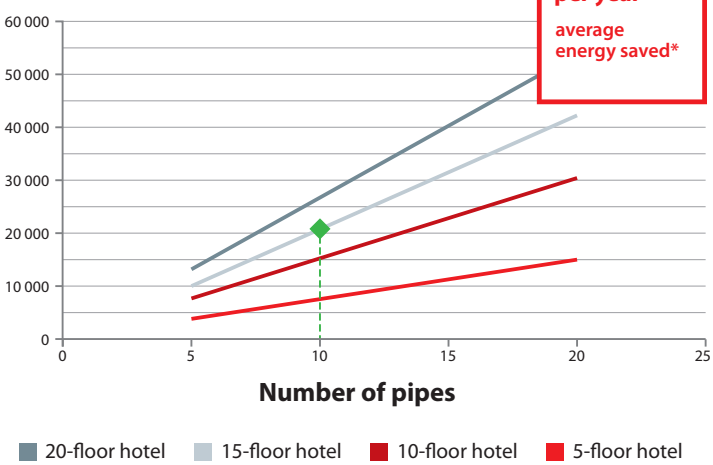
There are various challenges hotels meet in their daily operations when it comes to domestic hot sanitary water, namely: demand for high performance, guest comfort, superior hygiene and a resource-efficient operation. It's no wonder then, that domestic hot sanitary water is the second-largest expense for hotels after HVAC.

Usually, traditional systems will operate at constant flow resulting in huge energy consumption and significant waste of water. By using a smarter Danfoss solution based on the thermal balance of the system which maintains a constant temperature in the plant itself and limits the flow rate in the recirculation pipes to the minimum required level, hotels can ensure the lowest possible consumption while maintaining the best plant performance.

Danfoss supports your hotel with delivering best service to your guests at lowest costs. We offer a complete domestic hot water solution that includes water heaters, storage and charge systems, the hot water valves and temperature controllers. When used together, these meet key challenges including high performance, comfort, hygiene and resource-efficient operation.

Annual energy savings for pumping

>20,000 kWh per year
average energy saved*



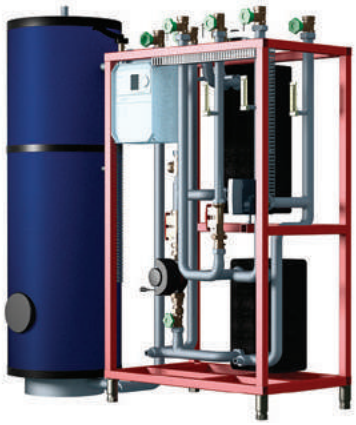
*Assumption: 15 floors; 10-pipe system

Reliable hot water supply for superior comfort

Legionella prevention and temperature control

Danfoss lead-free multi-function thermostatic balancing valves ensure a proper hydronic balance that avoids long waiting times, whilst reduces energy consumption and water waste.

The valves can be equipped with a thermal or electronic disinfection module, and connected to a simple yet advanced electronic controller designed to optimize the electronic disinfection of DHW systems, thus monitoring all the temperatures and initiating an electronic disinfection cycle when needed.



Storage Charging System

Water heaters with storage charging systems guarantee hot water availability even at peak loads and ensure low return temperatures in the total operating sequence of a storage recharge, resulting thereby in a lower required volume flow rate.

By choosing Danfoss you can count on a reliable partner with high knowledge and expertise, giving your business the best performance and energy efficiency, the highest comfort and hygiene services, while reducing risk of legionella contamination.

15%
minimum cost savings for hot water

Danfoss offers a complete Domestic Hot Water solution including water heaters that can be connected to multiple tanks as well as storage and charge systems, hot water valves that prevent legionella and temperature controllers. When used together, these combine the demand for high performance, comfort, hygiene and resource efficient operation.

HYGIENE address risks like legionella with automatic legionella systems

COMFORT achieve desired water temperature across all rooms even during peak loads

Ensuring **quality** and **peace of mind** with cold room solutions

Quality of food and guest satisfaction both have significant impact on the image and reputation of a hotel

On average, over 30% of all wastage is due to a poor cold chain. This represents a huge impact on operation costs. Correct management of food storage guarantees higher quality foods and much less waste.

The kitchen zone impacts, on average, at least 10-11% on total hotel energy cost, including food storage and conservation. Historically, Danfoss experience with cold food chain management and our reliable solutions has helped deliver better-tasting food. Our solutions also improve energy efficiency, whilst reducing operating and maintenance costs by up to 30%.

The extremely accurate and precise temperature control ensures high food quality meeting HACCP regulation. In addition, monitoring and reporting systems that can be integrated in any BMS systems, and better management systems, prevent food waste and put you firmly in control.

The cold room is **business critical**

We provide unmatched application knowledge and proven reliability, making Danfoss a trusted business partner within commercial refrigeration operations.

Energy consumption assuming a 9kW cooling capacity cold room where meat is stored

UNIT	Danfoss	Market
SEPR	3.84	2.50
USAGE	~ 14 000 kWh	~ 21 600 kWh

* Assuming condensing unit with R407F refrigerant

7,600 kWh
annual energy saved by using Danfoss OP+ inverter corresponding to more than 1500€/year

We support compliance with leading global standards in food safety and energy conservation.

Hazard Analysis Critical Control Point · UL · United States Environmental Protection Agency · Energy Star · CE Marking · Ecodesign

Optyma™ Plus INVERTER
Capacity modulation in a simple and adaptive package

Quick and safe installation and service
Preset parameters and Modbus communication makes start-up and maintenance of the condensing unit effortlessly quick and easy.

High SEPR: 3.84 - certified by ASERCOM
All models in the range are highly efficient and well above EcoDesign 2018 thresholds, contributing to a reduction in energy costs.

Accurate temperature control
Danfoss cooling solutions ensure accurate and precise temperature control. This preserves food quality meeting HACCP regulation. Thanks to better monitoring systems, it is possible to have full control of your cold rooms and act in case of failure or alarm, in order to prevent food waste or safety concerns due to refrigerant leakage.
All models in the range are highly efficient, extremely quiet, reliable and environmentally-friendly thanks to lower GWP refrigerants and compliance with F-Gas regulation. You can rely on solutions well above the EcoDesign 2018 trends, reducing energy costs of your hotel.

Modernization with minimal disruption

30%
energy consumption savings with variable speed condensing unit

Best
better food preservation and less waste thanks to precise temperature control and connected monitoring system

169€
annual saving per kW of cooling capacity of your cold rooms

Through a continuous and correct monitoring of temperatures and of alarms, correct management of cold food is obtained, which translates into a guarantee of high-quality food and less waste. The high quality and reliability of Danfoss reduces maintenance costs to a minimum.

Danfoss elevators and lifting solutions

Elevate **guest comfort** and **safety** to new heights

Increase application performance and streamline processes with energy efficient, adaptive motor control

If you own or manage a hotel and want to ensure your elevators are up to modern standards, check the elevator drive solution you operate.

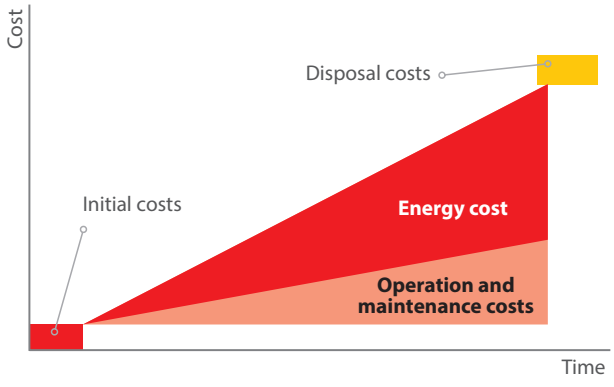
Smooth movements reduce acoustic noises, eliminate rollback, improve lifetime and secure high level of guest comfort – this is what a Danfoss drive solution guarantees.

In truth, you have probably experienced our solutions already: Danfoss building automation solutions are found in many of the commercial buildings or factories you've ever been to. Thanks to our wide range of elevator and lift drives, we can meet your hotel's individual requirements.

A second life for your elevator
The modernization of an existing hydraulic elevator is a fast, clean and very cost-effective solution, by comparison with an investment in a new elevator. Typically the conversion achieves energy savings of more than 50 percent, and also results in reduced wear and maintenance costs. At the same time, the modernization reduces acoustic noise and results in improved elevator reliability.

The right drive for your elevator
Danfoss drives are dedicated to elevators in areas where acoustic noise matters.

- quiet, for elevated comfort
- compact, without compromising on acoustic noise
- reliable, with independently confirmed lifetime of 2.1 million cycles when operating at 45°C ambient temperature
- easy to program, with set-up wizard specifically tailored to elevator applications



Refrigeration systems

Danfoss drives are known as some of the most innovative and reliable drives worldwide.
The outstanding quality standards and performance of our drives has been proven over more than 50 years.

Accurate control provides high comfort

Smooth movements reduce acoustic noises, eliminate rollback and improves lifetime.

Quick commissioning

Reduced costs – Modernization of an existing elevator to use Danfoss drives can be done in a matter of hours.

Retrofit

Easy to integrate Danfoss drives into a new elevator series or to modernize existing installations.

Easy integration

All Danfoss drives can be equipped with the most common communication fieldbuses (Modbus, BACnet, Lonworks, PROFINET, DeviceNet) making integration to BMS easy and fast.
Our drives support all commonly used motor types and development is ongoing.

An investment that **pays off**

Minimal
energy costs with variable speed control of electrical motors

Speed-controlled hydraulic elevators offer a reliable, silent and extremely energy-efficient operation.
Formerly known as maintenance-intensive and prone to failure as soon as journey frequency increased, when equipped with AC drives hydraulic elevators are now quiet, clean and offer frequency-controlled design which enables safe, highly reliable and energy-efficient operation.

Reduce total cost of ownership

10% the initial cost of danfoss drives only amounts to 10% of the total cost of ownership

90% the remaining 90% covers energy consumption, service and maintenance

Delivering **safety** and **security** to your guests and staff

Danfoss fire fighting systems put out the fire in seconds, with minimal consumption of water and less water damage, giving you the best possible protection

Danfoss fire fighting solutions
The SEM-SAFE® fire fighting system from Danfoss is the optimum and reliable solution for ensuring fire safety for hotel guests and working personnel, but also for keeping to a minimum the structural and asset damage caused by a fire.

Special attention should be given to critical areas where many people are present: guest rooms, restaurants, kitchens, meeting rooms, garages, etc. Fire safety is a long-term investment that must be carefully planned to ensure the continued success of a hotel.

The goals of a fixed fire fighting system are to efficiently protect lives in case of a fire situation, and to minimize material damage, operational interruptions and the consequent loss of business.

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 hotels against fire**, with reliability and cost-saving in mind. The SEM-SAFE® system is safe, efficient and environmentally friendly.

Danfoss cost saving solution

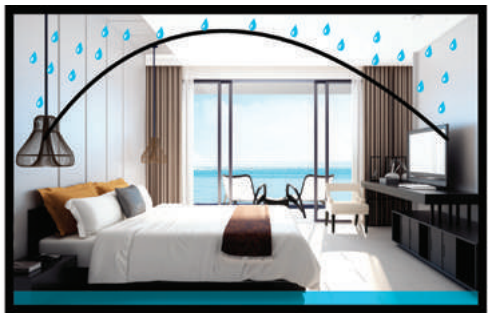
- With less components compared to other competing systems, the SEM-SAFE® system is lighter and more compact. This allows for simplified maintenance and valuable space saving.
- The excellent cooling properties of the SEM-SAFE® high-pressure water mist technology for fire fighting, make it the perfect choice for window cooling. Building investors make significant savings by using a thinner class of glass.
- With fewer nozzles required thanks to optimized spacing and very small pipe dimension, the installation of the system is significantly simplified.
- Our high-pressure pumps are water-lubricated and hence virtually maintenance-free.
- No need for other fire fighting technologies. SEM-SAFE® is the perfect solution for fire protection of more sensitive areas such as server rooms and archives.

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 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.

Danfoss solution



Standard solution

Danfoss intelligent **use of water and space**

Up to 80%
less water used compared to traditional sprinklers

The SEM-SAFE® system by Danfoss provides effective fire protection. It activates fast in the areas where a fire is detected, by cooling the temperature and absorbing smoke particles. This controls the fire and prevents it from spreading.

The SEM-SAFE® high-pressure water mist system is easy to install in modern hotels, but also easy to retrofit in existing hotels where the system will blend well with the surroundings and not disrupt any of the original architectural features. SEM-SAFE® is perfect for renovation of historic buildings.

ONE single SEM-SAFE® high-pressure water mist system from Danfoss can protect all area in the hotel

30% reduction in the number of nozzle, pipes and fittings will make installation faster, thus reducing total costs

Danfoss fresh water solutions

Meeting hotels' **fresh water** demand with **unique** and widest **energy efficient** product portfolio

Fresh water resources are becoming increasingly scarce the world over. Many hotels are located on the coast or islands where fresh water is scarce, or where it is simply impractical to extend mains water pipe networks.

The principal challenge with the desalination of water is that it requires a lot of energy. Salt dissolves into water with relative ease, where it forms strong chemical bonds that are difficult to break. This is why experience, technology and innovation are central to any unique value proposition for desalination.

Combine the need for fresh water with energy efficiency, and the benefit of working with single provider for the whole desalination plant system becomes obvious.

In fact, by combining the right mix of optimized technologies by Danfoss, up to 65% more energy efficiency can be delivered. There are four core technologies: drives, pumps, energy recovery system and flow control devices.

Desalination growing demand

Desalination is in demand as it allows hotels in water-deprived areas to have their own fresh water source

1%

Today, only 1% of the world's population receives water from desalination and this is expected to increase

57%

The past five years have seen a 57% increase in desalination plant capacity

14.4%

Frost & Sullivan expects the global mobile treatment market to grow at a compound annual growth rate (CAGR) of 14.4% by 2020

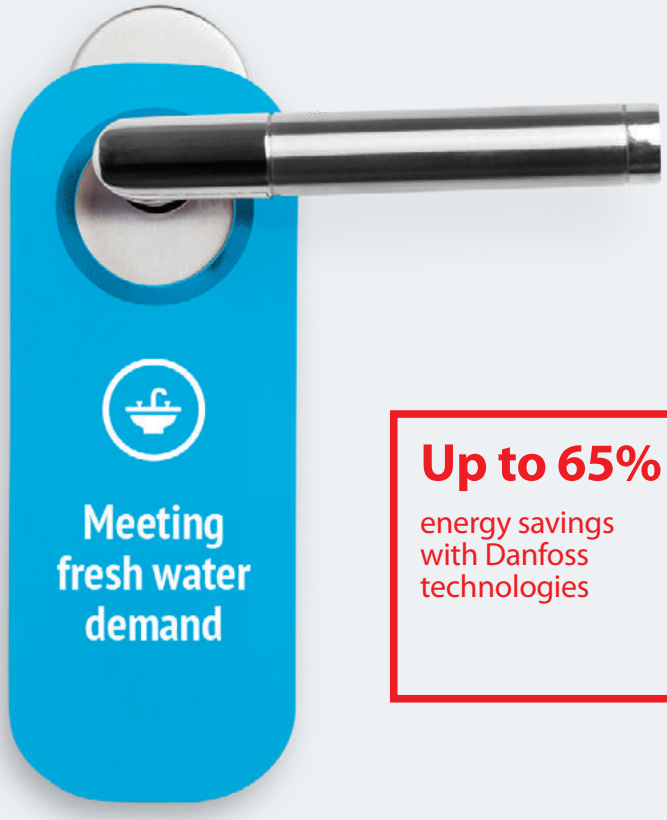
High Pressure Pumps
High-power axial piston pumps offer precise and energy-efficient operation, even at partial load. As they are easy to maintain and extremely compact, these pumps are driving more and more small to large-sized SWRO plants around the world. The largest pumps have outputs of up to 88 m³ /hour.

Energy Recovery Devices
The latest Danfoss iSave energy recovery devices (pressure exchanger and booster pump) provide up to 94% efficiency. Flexible and compact, these devices are as easy to install as they are to operate. Outputs of up to 70 m³/hour are available.

Drives
In the harsh operating environment of a desalination plant, drives must be capable of precise and optimized operation. Flexibility is another key characteristic, offering the ability to drive all kinds of motors, pumps and cooling systems. Drives must also compensate for peaks and troughs in the power supply, as well as harmonic distortion.

Pressure and fluid control devices
Proven and reliable pressure and fluid control devices can be adapted to harsh environments such as SWRO plants.

Danfoss – your **partner** for **desalination**



Up to 65%
energy savings with Danfoss technologies

Danfoss is ideally positioned to support its customers with optimized, cost-effective and energy-efficient desalination. In addition to its full range of products

25% **Up to 15-25% of energy savings:**
Desalination system with Danfoss high-pressure pumps and Danfoss drives

60% **Up to 60% of energy savings:**
Desalination system with Danfoss energy recovery devices (iSave) and Danfoss drives

65% **Up to 65% of energy savings:**
Desalination system with Danfoss high-pressure pumps, Danfoss drives and Danfoss energy recovery devices (iSave)

ENGINEERING
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Danfoss
Your Hotel Sector Partner

We deliver our hotel expertise through the most advanced and efficient technologies to support smarter use of electricity and water, reduce running costs, improve environmental impact and deliver superior guest comfort.

- **HVAC**
- **Domestic hot sanitary water**
- **Refrigeration systems**
- **Fire fighting systems**
- **Elevators and lifting**
- **Fresh water**

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ENGINEERING
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Hotels

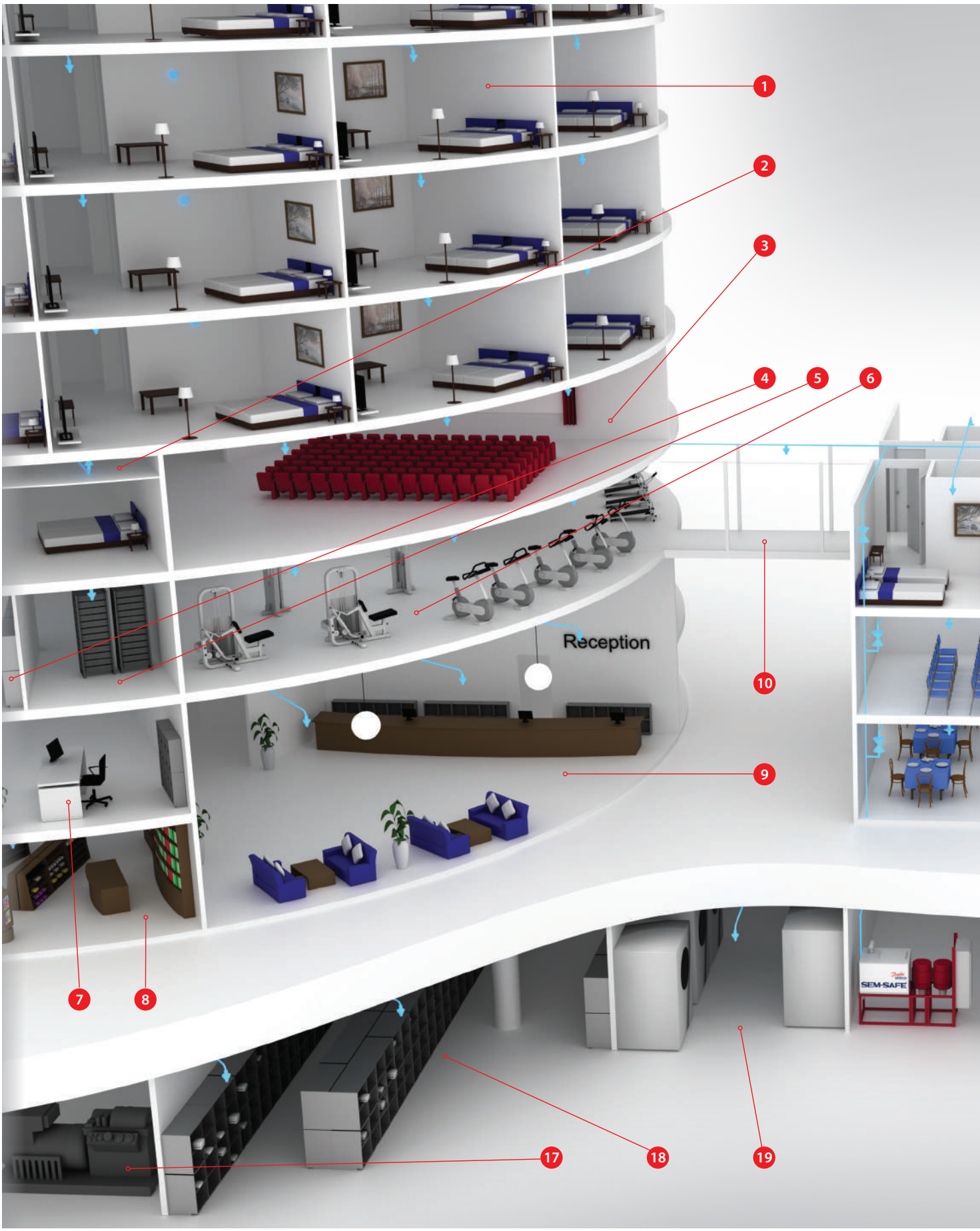
Optimum fire safety in hotels with **SEM-SAFE®** high-pressure water mist system

Danfoss Fire Safety A/S

www.semsafe.danfoss.com

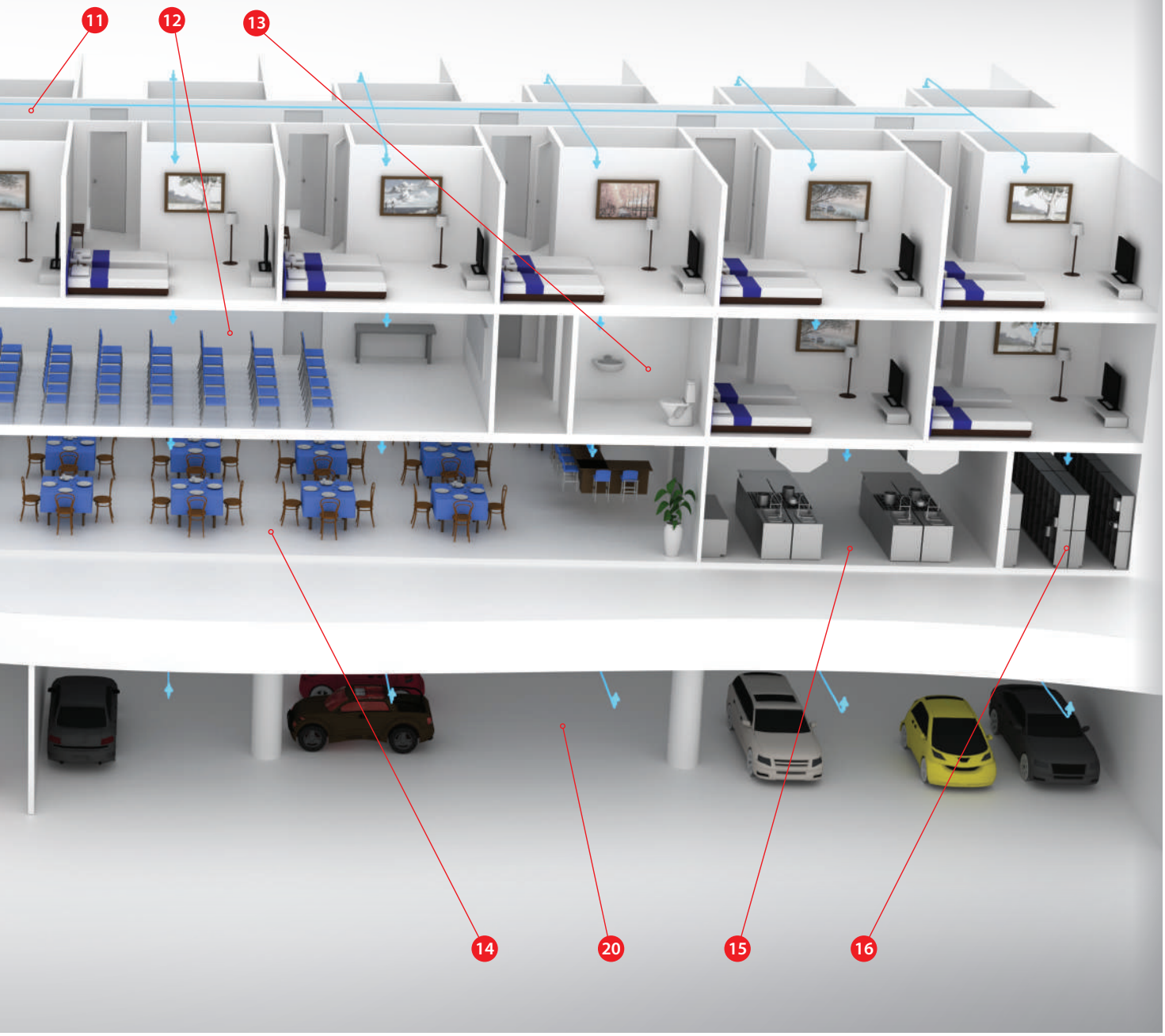
SEM-SAFE®

SEM-SAFE® high-pressure water mist system
One single system to protect all areas in the hotel



Danfoss provides fire fighting solutions for areas such as

1. Hotel rooms
2. Suspended ceilings
3. Theatres
4. Archives
5. Server rooms
6. Fitness rooms
7. Offices
8. Shops /boutiques
9. Reception
10. Glass corridors
11. Corridors
12. Conference rooms
13. Bathrooms
14. RESTAURANTS / BARS
15. Kitchens
16. Technical rooms
17. Generator rooms
18. Storage areas
19. Laundry rooms
20. Car parks



SEM-SAFE® for hotels

Need a fire fighting system that:

- Is harmless to people and environmentally friendly?
- Allows for safe evacuation of guests and staff?
- Reduces business interruption as water damage is minimised?
- Provides freedom in architectural design to match the surroundings?

Then SEM-SAFE® high-pressure water mist is your solution!

Hotels are usually associated with fun thoughts of vacation, family trip or attending a business meeting in a far away place. But hotels themselves are not safe from hazards and dangers of fire. A building owner has to take all measures possible to ensure fire protection for all guests and working personnel, but also measures that will keep to a minimum structural damage caused by a fire.

With SEM-SAFE® high-pressure water mist from Danfoss, the fight against fire is more efficient, with the ultimate goal of saving lives and limiting equipment damage.

Fire protection for hotels

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 hotels against fire, with reliability and cost-saving in mind. The system is safe, efficient and environmentally friendly.

Architectural design

The aesthetic design of our pipes and nozzles fits perfectly into a beautiful hotel environment. Due to the small and convenient pipe sizes, the system is easily installed, even retrofitted. The compact system also leaves more space for money generating activities.

Safe evacuation

- The priority in case of a fire is the safe evacuation of guests. The superior properties of water mist make this fire fighting technology the best choice for protecting a hotel
- The system is only activated in areas where fire is detected. Other areas in the hotel will not be affected

Minimised business interruptions

- Using high pressure water mist keeps secondary damage to a minimum due to the low water consumption
- Water coming from the pipes is clean water as SEM-SAFE® uses stainless steel pipes that are corrosion resistant. In case of system release, the clean-up is easier, faster and incurs lower costs

Fast installation

- Easy to install in modern hotels, where the SEM-SAFE® installation will not disrupt any of the desired architectural features
- Easy to retrofit in existing hotels where the system will blend in well with the surroundings. The small pipe sizes and large spacing make it simple and easy to install
- Perfect solution for old buildings, where valuable historical preservation is important

Benefits of SEM-SAFE® high-pressure water mist system

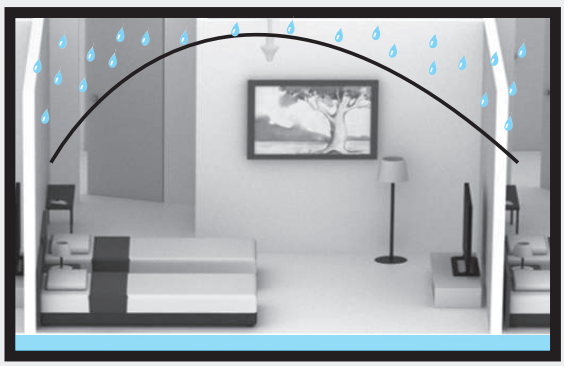
Tackles fire swiftly and efficiently

- Radial heat is blocked efficiently. This helps in protecting against any structural damage by not allowing the flames to expand
- Gentle to electrical equipment due to small water droplets. Therefore, the functionality of the electrical equipment in the hotel is not disrupted and data is saved

Cost saving solution

- The small water droplets evaporate immediately during discharge. The result is minimal water damage to surrounding equipment, reducing operational downtime to a minimum
- With fewer nozzles required thanks to optimized spacing and the need for only one pump unit for all applications, installation cost and time, as well as required service interventions, are considerably reduced
- Our high-pressure pumps are water-lubricated and hence virtually maintenance-free
- With 30% fewer components compared to other competing systems, the SEM-SAFE® system is lighter and more compact. This allows for easier installation, simplified maintenance and valuable space saving
- Cost of water supply is significantly reduced due to less piping, reduced water demand from the water supply, lower taxes and no or significantly smaller water reservoirs
- No need for other technologies. SEM-SAFE® is the perfect solution for fire protection of more sensitive areas such as server rooms and archives

SEM-SAFE®



Traditional sprinkler

SEM-SAFE® uses up to 50% less water when compared to low-pressure water mist systems and up to 80% less water when compared to traditional sprinklers.

Proven experience across the world

For more than 15 years, Danfoss has been installing fire fighting systems in both new and retrofit hotels all over the world. The experience we build with each installation and project allows us to provide our customers with the best and most reliable fire fighting solution on the market.

The excellent fire suppression properties, and the system's advantages that allow for sustainability and reliable fire protection of buildings, people and the environment has made SEM-SAFE® the right choice for hotels, such as:

- CitizenM, Holland
- Hotel Gutshof Liepen, Germany
- CitizenM, England
- Scheelehof, Germany

In-house design
We have the necessary experience and technological know-how to provide you with the optimal fire fighting system based on fire risk analysis for your hotel.

Tested and approved
The design of the SEM-SAFE® high-pressure water mist system is based on full scale fire tests. For industrial and commercial applications, approvals are obtained through testing in accordance withspecifications from, for example, FM, UL and ISO, as well as from the European guideline CEN/TS 14972 and approvals from DBI and VdS.

VdS FM APPROVED

Internal HSE&Q system in accordance with:

- DS/EN ISO 9001:2015
- DS/EN ISO 14001:2015
- DS/OHSAS 18001:2008

DS/EN ISO 9001:2015

DS/EN ISO 14001:2015

DS/OHSAS 18001:2008

The intelligent use of water

How does it work

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

Decades of pioneering and engineering

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

Nozzle

Pump

Valve

Danfoss high-pressure water mist nozzles

- Highest market spacing (5.5m)
- 100% capacity and spray pattern tested
- Aesthetic nozzle design

Danfoss high-pressure pumps

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

Danfoss stainless steel valves

- Compact easy installation and operation
- Dirt resistant
- High-corrosion proof

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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_2.

Engineering a safer tomorrow

From a modern high-rise building to a state-of-the-art university, from a wood 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 sprinkler.

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. No matter 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 segment we offer two fire fighting technologies: SEM-SAFE® high-pressure water mist and SEM-SAFE® low-pressure CO_2.

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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ENGINEERING TOMORROW

Fallbeispiel | SEM-SAFE®-Hochdruck-Wassernebel-Löschanlage

Heinrich-Hertz-Institut in Deutschland

Mit Hochdruck-Wassernebel zur Brandbekämpfung geschütztes Hochhaus

Danfoss Fire Safety A/S

Das Heinrich-Hertz-Institut befindet sich in der Hauptstadt Deutschlands und genießt weltweit den Ruf, führend in der Forschung und Entwicklung von Informationstechnologien zu sein. Das Institut ist richtet sein Kompetenzfeld konsequent an der Entwicklung der Anforderungen des heutigen und zukünftigen Marktes aus und bietet Lösungen für Medizintechnik, Netzanbieter, Sicherheitssysteme, Bildung, Unterhaltungsindustrie, Automobilindustrie, virtuelle Welten und eGovernment.

Innovationszentrum

Die Gründung des Heinrich-Hertz-Instituts geht auf das Jahr 1928 zurück. Das Gebäude wurde 1968 an der gegenwärtigen Adresse Einsteinufer 37 fertiggestellt. In dem fast 100 Meter hohen Gebäude befinden sich Labore, Laserräume, ein spezielles 3D-Kino, Computerarbeitsplätze, Tagungs- und Konferenzeinrichtungen, Büros, eine große Eingangshalle mit Ausstellungen, Serverräume, Cafeterias, verschiedene Heizungsräume, Notstromdieselaggregate und Batterien, Werkstattbereiche usw.

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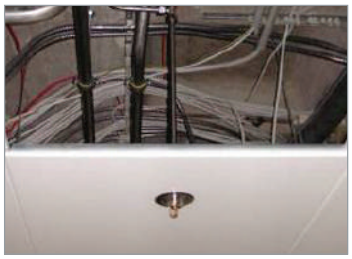
SEM-SAFE® Hochdruck-Wassernebel-Löschanlage

Bei der Sanierung des Gebäudes hat die Berliner Feuerwehr untersucht, ob der 50 Jahre alte Stahlbetonbau ordnungsgemäß gegen Brände geschützt war. Dabei ergab sich, dass zur Verbesserung der Feuerbeständigkeit von Wänden und Böden, wie z. B. Zwischendecken, Betonböden usw., eine Feuerlöschanlage installiert werden musste.

Vor allem angesichts des hohen Wertes der laufenden Forschungsprojekte in den Laboren hat der Eigentümer deutlich die Präferenz für eine Anlage zum Ausdruck gebracht, die Brandschäden auf ein absolutes Minimum beschränken und gleichzeitig Wasserschäden im Falle eines Brandes begrenzen würde. Deshalb hat man sich für den Brandschutz für SEM-SAFE®-Hochdruck-Wassernebel von Danfoss entschieden. Die Anlage wurde gemeinsam mit der Callies Brandbekämpfungssysteme GmbH, die ein Geschäftspartner von Danfoss ist, installiert und in Betrieb genommen.

Die SEM-SAFE®-Sprinkler fügen sich in den architektonischen Gestaltungsentwurf ein.

Im Gebäude wurden 600 Sprinkler für Zwischendecken und Unterböden sowie 650 Sprinkler für öffentliche Räume installiert.

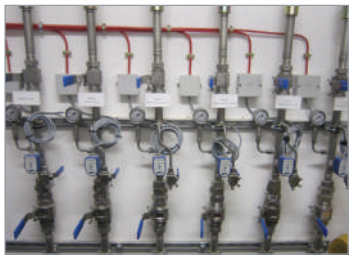


Die Vorteile von SEM-SAFE®-Hochdruck-Wassernebel

- Geringer Wasserverbrauch.
- Minimale Wasserschäden im Brandfall sowie geringe Brandschäden, was zu weniger Ausfallzeiten führt.
- Kleine Rohrabmessungen für ein sauberes architektonisches Design: einfachen Biegen, Handhaben, Verlegen und Installieren.
- Von der High-Tech-Anlage und den High-Tech-Komponenten gebotene Zuverlässigkeit: Sprinklereigenschaften und leistungsstarke Pumpenleistung, die auch in den obersten Stockwerken den erforderlichen Druck ohne Druckverluste oder andere Probleme bereitstellen kann.

Mit seinen beeindruckenden 17 Stockwerken und einer Bodenfläche von 10.000 m^2 ist das Gebäude in die Brandgefahrenklasse OH2 eingestuft (144 m^2). Es ist in 21 Abschnitte (17 Stockwerke und 4 Anlagenschächte) unterteilt. Bei der verwendeten Pumpe handelt es sich um ein 4 x PAH-80-System mit einer Kapazität von 448 Litern/Minute bei 120 bar. Der Tank des Pumpenaggregats fasst 1200 Liter und ist über zwei Förderpumpen an einen zweiten Wassertank in der untersten Gebäudeebene mit einer zusätzlichen Kapazität von 9500 Litern angeschlossen. Das System ist darüber hinaus an die öffentliche Wasserversorgung in Berlin und an eine zusätzliche Wasserentnahmestelle der Berliner Feuerwehr angeschlossen. Das Gebäude wurde mit 1250 Sprinklerköpfen und etwa 6000 Meter Rohrleitungen ausgestattet.

Die einzigartigen, kompakten Pumpen von Danfoss bieten eine Energieeffizienz von bis zu 95 % und eine sehr geringe Pulsation, was zu einer geringeren Geräuschbelastung führt.



Die VDHT-Hochdruckventile von Danfoss werden aus Edelstahl gefertigt und sind äußerst korrosionsbeständig und schmutzabweisend.

SEM-SAFE®

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ENGINEERING
TOMORROW

High-rise buildings

The intelligent solution to efficient fire fighting with **SEM-SAFE®** high-pressure water mist system

Danfoss Fire Safety A/S

Significant savings

in total building investment when using SEM-SAFE® high-pressure water mist for fire fighting

www.semsafe.danfoss.com | SEM-SAFE®

One SEM-SAFE® high-pressure water mist system to cover all fire fighting applications in a high-rise building

Up to
50%
faster
installation of SEM-SAFE® compared to traditional sprinkler

A safer tomorrow starts with SEM-SAFE®

It is crucial that high-rise buildings are fully and properly equipped to handle a fire situation. In high-rise buildings, the access for the fire fighting crew can be very difficult, especially on the last levels of the buildings. Also evacuating people presents challenges and limitations.

Having a fixed high-pressure water mist system installed in high-rise buildings can make the fight against fire more efficient, with the ultimate goal of saving lives and limiting property damage.

Imagine a fire fighting system that can put out the fire in seconds, with minimal consumption of water, giving the best possible protection.

With **SEM-SAFE®** – the unique high-pressure water mist system from Danfoss – that is what you get. By using pure water, the high-pressure water mist technology used by the **SEM-SAFE®** system is harmless to humans and environmentally friendly. Its reliability and efficiency has been successfully proven in rigorous fire tests.

Safe for people

The **SEM-SAFE®** high-pressure water mist system for fire fighting helps with controlling of heat, smoke and toxic gas. This can mean a great advantage when it comes to the safe evacuation of the occupants. Also, it can help facilitate access for the fire crew.
The system prevents fire from spreading, while lowering temperature.

Minimised down-time

Using high-pressure water mist keeps secondary damage to a minimum due to the low water consumption. Water coming from the pipes is clean water as **SEM-SAFE®** uses stainless steel pipes that are corrosion resistant. In case of system release, the clean-up is easier, faster and incurs lower costs. In addition, the system is only activated in areas where fire is detected. Other areas in the building will not be affected.

Aesthetic **design**

The Scandinavian design philosophy used for the **SEM-SAFE®** high-pressure water mist nozzle fits well with any interior environment. The nozzle has a beautiful and discrete shape, which will make it blend with the style of the room. In addition, the **SEM-SAFE®** high-pressure water mist nozzle can be manufactured in any color, contributing to a more aesthetically pleasing surrounding for the end user.

Fast installation

The **SEM-SAFE®** high-pressure water mist system is easy to install in modern buildings, but also easy to retrofit in existing buildings. The **SEM-SAFE®** high-pressure water mist pipes have a very small diameter, which makes them easy to bend. High-pressure resistant press fittings are used. This makes the installation of the **SEM-SAFE®** system faster than traditional sprinkler system, which requires time consuming pipe thread cutting.

Best choice for window cooling

The excellent cooling features of the **SEM-SAFE®** high-pressure water mist system make it the perfect choice for protecting glass facades. **SEM-SAFE®** has passed **EN-1364-1 fire resistance test for non-loadbearing elements.**
Instead of spraying water on the glass, the **SEM-SAFE®** system atomises the water in front of the glass. This three-dimensional cooling removes the risk of thermal stress cracks associated with traditional water-based sprinkler systems, and allows the use of a cheaper class of glass. This means significant savings for the building investors. In addition, the fire test has been passed by using a standard **CEN SEM-SAFE®** high-pressure water mist nozzle. Traditional sprinkler systems require a dedicated sprinkler for fire protection of glass facade, which can make the sprinkler solution for glass facade more expensive.

Tested and approved
The design of the **SEM-SAFE®** high-pressure water mist system is based on full scale fire tests. For industrial and commercial applications, approvals are obtained through testing in accordance with specifications from, for example, FM, UL, ISO and NFPA standards, as well as from the European guideline CEN/TS 14972 and approvals from DBI and VdS.

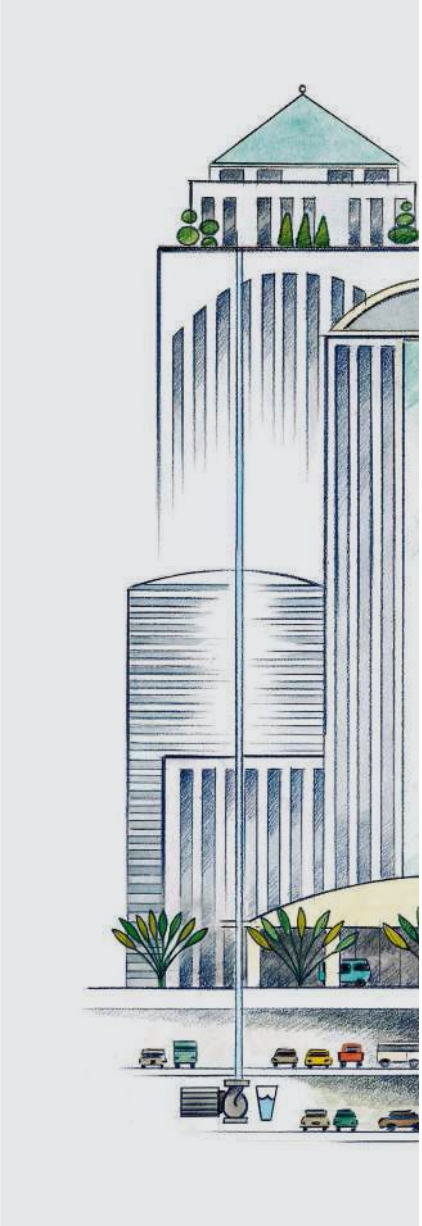
VdS

FM APPROVED

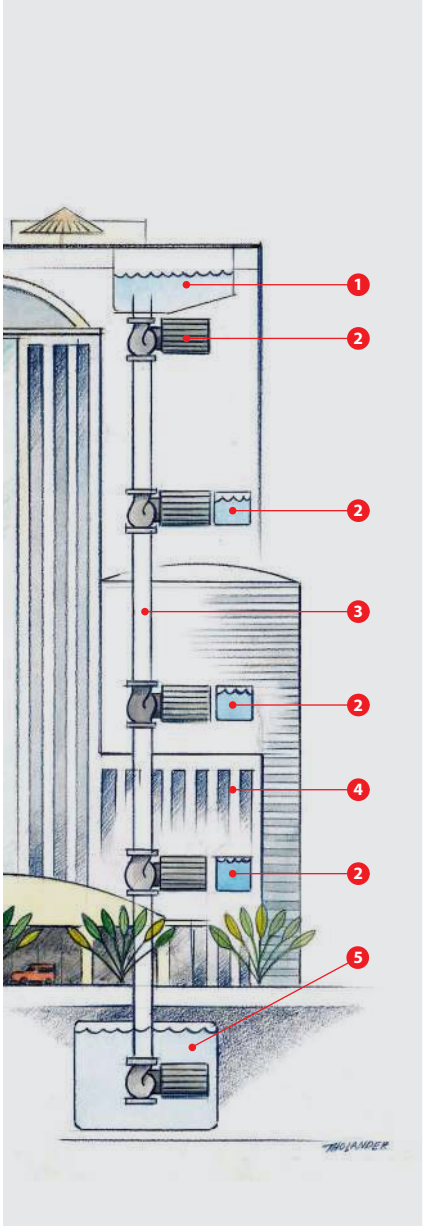
Internal HSE&Q system in accordance with:

- DS/EN ISO 9001:2015
- DS/EN ISO 14001:2015
- DS/OHSAS 18001:2008

Money saving solution for high-rise buildings



High-pressure water mist



Traditional sprinkler

1. No need to place a large reservoir on top of the building; you can instead use the top floor for penthouse flats.

2. No need for sprinkler units on more floors of the building to prevent pressure loss; the space saved can be used for other money generating purposes.

3. No need for large diameter pipes; sprinkler systems requires 3 times larger diameter riser pipes than high-pressure water mist systems; money and time in installation is saved with SEM-SAFE®.

4. No need for expensive fire resistant glass and expensive dedicated sprinkler for fire protection of glass facade; money can be used for interior decoration, for example.

5. No need for large water supply reservoir; the space saved can be used for an integral garage, for example.

OH1 areas: Suspended ceilings and sub floors

	SEM-SAFE® high-pressure water mist	Traditional sprinkler
Coverage area in m^2	25.00	12.00
Flux density (l/min/m^2)	0.50	5.00

OH1 areas: Offices

	SEM-SAFE® high-pressure water mist	Traditional sprinkler
Coverage area in m^2	30.25	12.00
Flux density (l/min/m^2)	0.90	5.00

OH2 areas: Parking garages

	SEM-SAFE® high-pressure water mist	Traditional sprinkler
Coverage area in m^2	18.06	12.00
Flux density (l/min/m^2)	2.69	5.00

The intelligent use of water

How does it work

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

Decades of pioneering and engineering
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 us in a unique position to maintain our technological leadership in the future. All our products are made of first-class materials and in a comprehensively tested design.

Nozzle

Danfoss high-presssure water mist nozzles

- Highest market spacing (5.5m)
- 100% capacity and spray pattern tested
- Aesthetic nozzle design

Pump

Danfoss high-pressure pumps

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

Valve

Danfoss stainless steel valves

- Compact easy installation and operation
- Dirt resistant
- High-corrosion proof

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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_2.

Engineering a safer tomorrow

From a modern high-rise building to a state-of-the-art university, from a wood 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 sprinkler.

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. No matter 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 segment we offer two fire fighting technologies: SEM-SAFE® high-pressure water mist and SEM-SAFE® low-pressure CO_2.

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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Case story | SEM-SAFE® high-pressure water mist system

Lund University Library
in Sweden

Digitalising the medieval time and modernising fire safety

Danfoss Fire Safety A/S

Lund University is one of northern Europe's oldest and most prestigious universities, consistently ranking among the world's top 100 universities. The current university, located in the city of Lund in the province of Scania, Sweden, was founded in 1666. The library in Lund University is one of the largest and oldest research libraries. It holds large historical collections that cover over 2000 years in basically all subjects and languages.

Building description

In 2013, the collections in this library took up approximately 107 kilometres of shelving; and around 650 metres of shelving are required every year to accommodate additional volumes.

The University library is currently implementing a number of major digitalisation project. For instance, all medieval manuscripts will be digitalised and made available to researchers. The building's fire safety has been modernised in connection with this.

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SEM-SAFE® high-pressure water mist system
For the Lund University Library project, Danfoss and Dafo fire and rescue systems (the Danfoss business partner in Sweden) have cooperated to find the optimal fire fighting solution for the OH1 hazards to comply with CEN/TS 14972 and the VdS standard. The building is equipped with a SEM-SAFE® high-pressure water mist pump unit with pilot pump.

A total of 780 CEN nozzles are installed in the entire old building. The type of nozzles used is the CEN nozzle type with a 5.5 metres spacing at a height of 3 metres and a nominal release temperature of 57°C.

The library, which was completed in 1907, was constructed using steel girders. There is always a risk of girders melting in the event of fire, and this is why a decision has been made to protect the building using the high-tech, low impact SEM-SAFE® water mist system from Danfoss. Installation of the system began in the first quarter of 2014 and was completed in the first quarter of 2015.

The benefits of SEM-SAFE®
The system's low water consumption limits water damage, keeping people, valuable books, and other effects unharmed. The small pipe sizes also make the system easy to retrofit, without damaging the environment.

The compact SEM-SAFE® high-pressure water mist unit installed at Lund University.

The library at Lund University which is fully covered with SEM-SAFE® high-pressure water mist system for fire fighting from Danfoss.

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Case story | SEM-SAFE® high-pressure water mist system

Philipps University in Germany

High-pressure water mist fire protection system for the BSL 4 Laboratory

Danfoss Fire Safety A/S

The BSL 4 (biological safety level 4, the highest safety level for laboratories) laboratory at the Philipps University in Marburg, Germany, researches in viruses and bacteria from ebola, sars and bird flu. A total of 32 different companies have been involved in the development of the new laboratory, and a variety of new technologies, including the SEM-SAFE® high-pressure water mist fire fighting system, have been used in the construction of the building.

In October 2005, the German fire protection company HOENIG Wandhydranten GmbH contacted Danfoss regarding a high-pressure water mist installation for the new laboratory.

The laboratory has a surface of 285 m^2 inside the building and it is hermetically sealed from the outside world. In December 2007, the laboratory was ready for operation.

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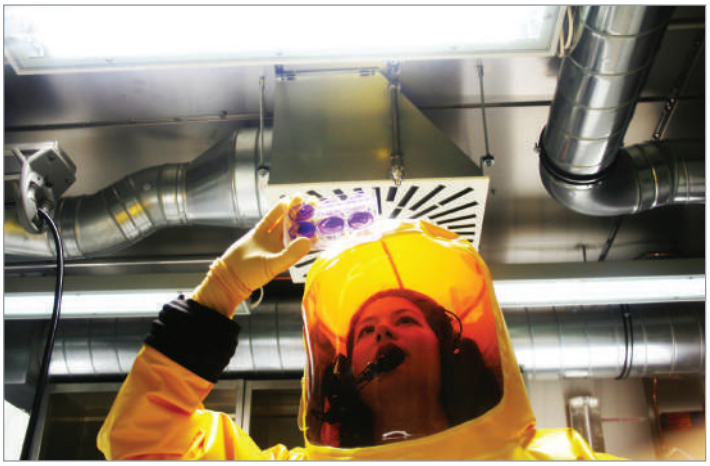
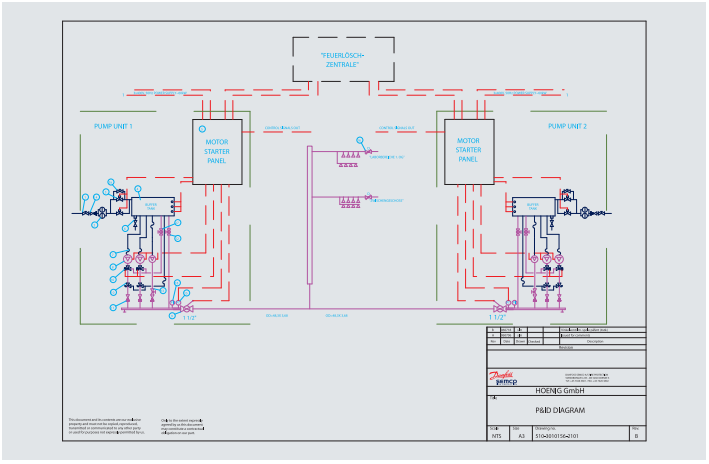
SEM-SAFE® high-pressure water mist system
The SEM-SAFE® system for the building was designed from our full-scale fire tests for public space areas in accordance with the fire suppression tests described in IMO Res. A800 (19). Hence, our type approved water mist nozzle heads were used for this application.

A total of 86 public space SEM-SAFE® high-pressure water mist closed nozzle heads with glass bulbs were supplied and installed at two storeys in the laboratories and surrounding areas.

It was requested that the water mist system should be designed to cover an area of maximum 150 m^2. Thus, our pump unit should have the capacity to serve a total of 13 SEM-SAFE® nozzle heads released simultaneously. Furthermore, the SEM-SAFE® pump unit should be 100% redundant. Two identical pump units were therefore supplied and installed.

Our corporation with HOENIG Wandhydranten GmbH was a success. In October 2007, the water mist system was approved by the government approval authority Ingenieur- und Sachverständigenbüro für Brandschutz.





P & I Diagram for the system.

SEM-SAFE® pump units, 100% redundancy.

SEM-SAFE®

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Case story | SEM-SAFE® high-pressure water mist system

AB6 - Office block in Denmark

A unique buidling in the middle of Copenhagen, protected with SEM-SAFE® high-pressure water mist

Danfoss Fire Safety A/S

Building description
Situated in the heart of Copenhagen, Denmark, the building consists of six levels with offices of different sizes, two atrium areas, an underground car park and a service area, and covers a total area of approx. 30,000 m^2. The building came into service in October 2008 and was finalised February 2009.

The office block is fully protected with a SEM-SAFE® high-pressure water mist system from Danfoss, developed for office buildings.

The turn-key contractor, KPC byg, states:
"KPC entered the water mist sprinkling project with concerns about economy and compliance. These worries soon turned out to be groundless, and water mist sprinkling turned out to be more advantageous than standard sprinkling with regards to implementation. Comparatively small pipe dimensions, connection flexibility and less area required for sprinkler rooms have contributed to an extremely positive experience. The only minor disadvantage over traditional systems is the need for a redundant electrical connection, but that is insignificant compared to the many advantages offered by the water mist system".

Raymond Frauenfelder
KPC-BYG A/S

KPC BYG
www.kpc-byg.dk

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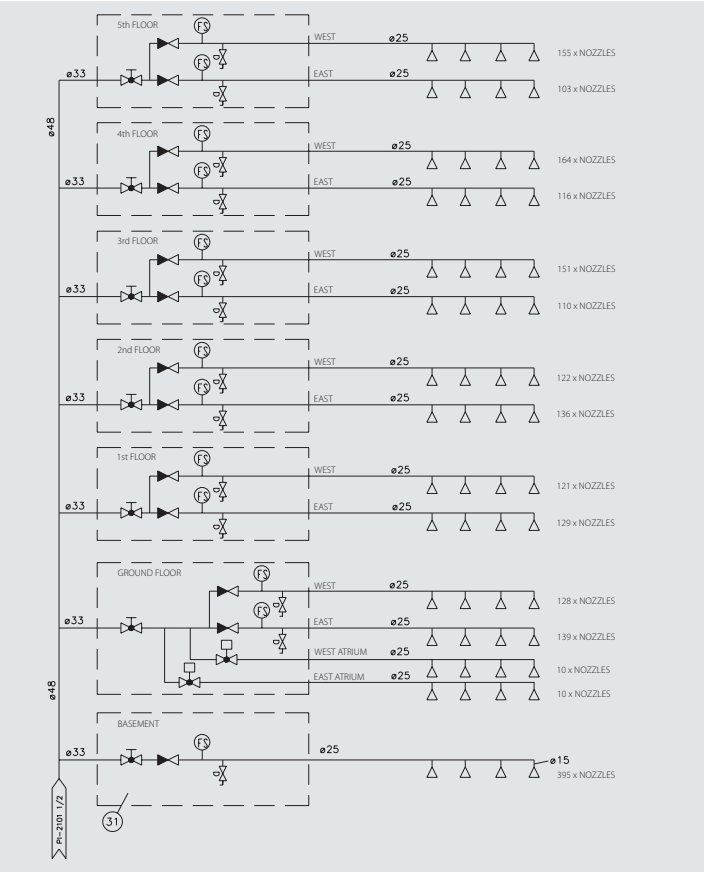
SEM-SAFE® high-pressure water mist system
The high-pressure water mist system installed in the new building covers all 30,000 m^2; including the offices, the atrium and service areas, as well as providing water mist protection for the glazed sections of the emergency escape routes.

The benefits of SEM-SAFE®
The properties of high-pressure water mist technology for fire fighting presents several advantages, which made SEM-SAFE® the perfect choice for this unique office block:

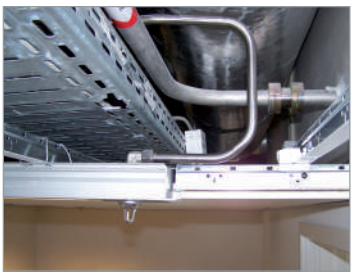
- Easy and flexible installation with narrow-bore tubes.
- Blends sensitively with the architectural design scheme.
- High-tech, efficient fire fighting capabilities with very low water consumption.
- Flexible pipe routing and planning.
- With high-pressure water mist it is possible to cover multiple applications with the same system, i.e. server rooms, emergency generators, glazing etc.



Seven section valves, with flow indicators.

The water mist system consists of approx. 1,900 nozzles with different surface finishes – including satin, white and chrome – to help them blend into the architectural design scheme.

The system runs off one high-pressure pump unit with controls and a pilot pump to maintain a pilot pressure of approx. 12 bar. The minimum pressure when nozzles are activated is 100 bar.



All water-side pipes, valves and fittings are stainless steel.

Advisor for SEM-SAFE®

DBI

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Case story | SEM-SAFE® high-pressure water mist system

Alsion in Denmark

Large-scale project in Denmark using high-pressure water mist

Danfoss Fire Safety A/S

The Alsion building was finished on 30 October 2007 and was opened by Her Majesty Queen Margrethe II of Denmark. Alsion was build to create a unique environment in a unique building at a unique location to stimulate local & regional growth. Therefore, a unique fire protection system was chosen: the innovative SEM-SAFE® high-pressure mist system from Danfoss.

Building description

The building covers a gross area of 28,400 m^2 and a total of 10 blocks. Each block consists of four levels and one basement.

The building has three different applications:
University/education of 15,400 m^2, concert hall of 1,795 m^2 and research park of 5,900 m^2.

Fire test criteria

The system chosen for the Alsion project had to comply with the European standard draft prEN 14972, prepared by the Technical Committee CEN/TC919 "Fixed fire fighting systems", the secretariat of which is held by BSI.

The SEM-SAFE® high-pressure water mist system was thus tested according to the fire test procedures described in this standard. The tests were carried out to prove that an automatic high-pressure water mist system achieved better results than comparable tests carried out with a sprinkler system.

After successful testing, the SEM-SAFE® high-pressure water mist system was approved by DIFT (Danish Institute of Fire and Security Technology) to comply with the European standard for water mist system prEN 14972 for Ordinary Hazard Group 1.

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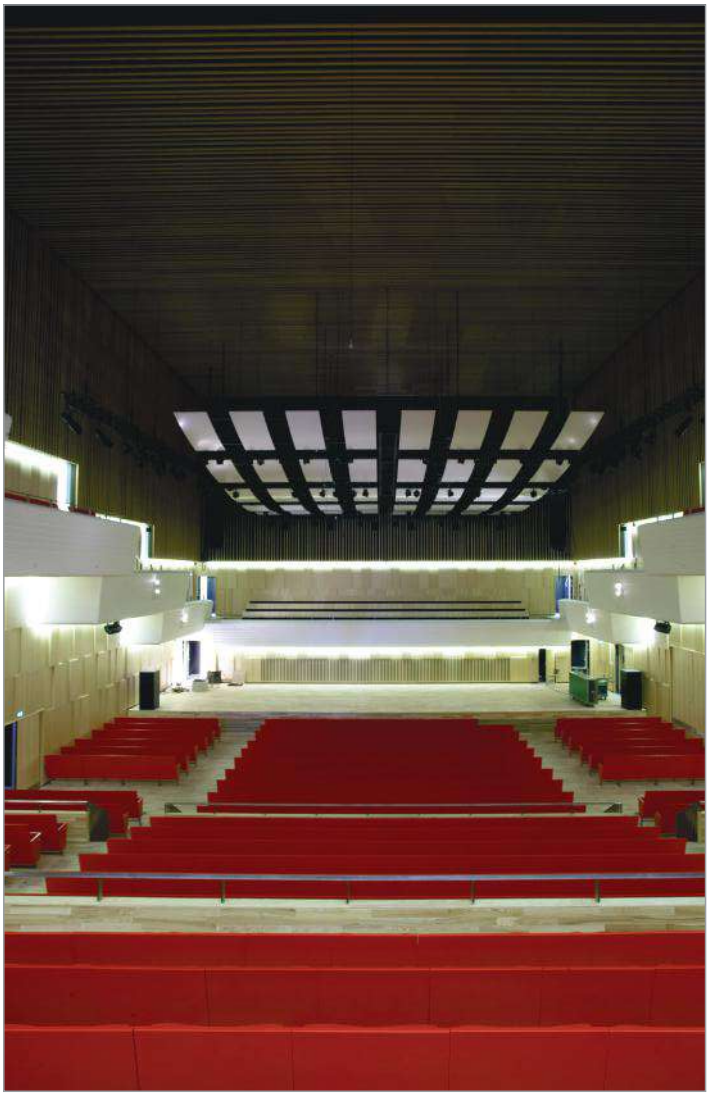
SEM-SAFE® high-pressure water mist system
To protect the Alsion building, a SEM-SAFE® high-pressure pump unit was used. The type of nozzle used is our CEN nozzle with a 5.5 metres spacing at a height of 3 metres and a nominal release temperature of 57°C.

A total of 2,200 nozzles were installed:
- 2,000 closed nozzles (wet system) – offices, corridors, restaurants, classrooms, etc.
- 200 open nozzles (dry system) – atrium, concert hall, etc.



Alsion Concert Hall, famous for its exceptionally good acoustics, is fully protected with SEM-SAFE®.

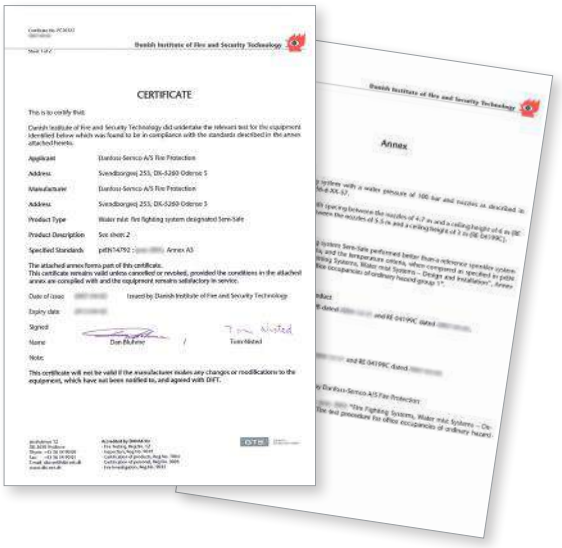
Torben Sten Hansen from the Danish consulting engineering firm Sloth Møller states:
"The water mist system fits well with the innovative "spirit" characterising the project. There are many reasons as to why water mist was chosen over a traditional sprinkler system.

First of all, the system is much more flexible to incorporate than the sprinkler system. It requires less space as the pipes are smaller. This makes it easier to incorporate the pipes in a way that makes them less conspicuous. The actual nozzle is also smaller than the traditional sprinkler nozzle and is therefore less conspicuous when mounted in the ceiling. In other words, a water mist fire protection system is more aesthetic and thus preferred by most architects.

Another strong argument is that the solution is very economical. The water volume used in a fire situation is less than ten per cent of the volume used when a sprinkler system is activated. This means that a lot of water is saved. But what is more important is to limit the damage caused by the fire, which is the whole concept behind water mist.

The water mist is good for cooling down glass. It acts as a sort of "water film" which quickly spreads over even large glass surfaces, cooling them down."

The vision is to make a close connection between Research Park, university and culture by creating innovative and unique solutions. High-pressure water mist is the direct result is a direct result of this vision. It is an innovative and effective method for fire fighting in buildings.


CERTIFICATE

Annex

SEM-SAFE®

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Fire fighting technology

The intelligent use of water

SEM-SAFE® high-pressure water mist system for fire fighting in buildings

Danfoss Fire Safety A/S

www.semsafe.danfoss.com | SEM-SAFE®

Engineering a safer tomorrow in fire fighting

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

For centuries, water has been used to fight fires. Research and development efforts resulted in the use of water as a fire fighting medium for cooling the fire. As the fire increases the temperature of the water, energy is absorbed from the fire, resulting in a cooling effect. 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.

Danfoss Fire Safety A/S, an integral member of the Danfoss Group, is one of the pioneers in the high-pressure water mist fire fighting market. For decades, Danfoss has been developing, manufacturing, selling, installing and servicing high-pressure water mist systems under the brand name **SEM-SAFE®**.

In the **SEM-SAFE®** high-pressure water mist system, clean water is forced by Danfoss high-pressure water mist pumps through a tested stainless steel piping network and specially engineered **SEM-SAFE®** nozzles from 60 to 100 bar working pressure.

The very fine water droplets discharged by the **SEM-SAFE®** high-pressure water mist system have an average size ranging from 50 to 100 µm. When the mist comes into contact with flames, the small droplets quickly evaporate, while expanding a minimum of 1,700 times, cooling the fire like a traditional sprinkler and simultaneously displacing the oxygen at the fire like a fire extinguishing gas system.

Combined cooling and oxygen displacement effects provide higher cooling capability (up to 7 times better than traditional sprinkler) and reduce water consumption by up to 80% compared to traditional sprinklers.

High-pressure water mist technology is now one of the most progressive fire fighting technologies and is commonly used:

- to protect buildings and other objects from heat exposure from fire
- for fire extinguishment in enclosures, controlling smoke and chemical clouds
- as self-protection by fire fighters

Up to 7 times better cooling

The ideal fire fighting system for any building type

Danfoss has proven expertise with high-pressure water mist installations worldwide.
Danfoss has built a successful track record for more than two decades, which stands as proof of our reliability, expertise and professionalism in engineering, manufacturing and servicing high-pressure water mist systems for museums and heritage buildings, data centres, hotels, high-rise office buildings, hospitals, care homes and a large variety of industrial applications.

Tested and approved

The design of the **SEM-SAFE®** high-pressure water mist system is based on full scale fire tests.
For industrial and commercial applications, approvals are obtained through testing in accordance with specifications from, for example, FM, VdS, UL, ISO and NFPA standards.
SEM-SAFE® has been tested in accordance with CEN/TS 14972.

VdS

FM APPROVED

EHS&Q system in accordance with:

- DS/EN ISO 9001:2015
- DS/EN ISO 14001:2015
- DS/OHSAS 18001:2008

BIM models from MagiCloud

Access Danfoss **SEM-SAFE®** high-pressure water mist fire fighting **BIM models** from **MagiCloud** and benefit from:

- High-quality 3D models with accurate dimensions and comprehensive technical data
- BIM library for MEP designers
- Lean building construction
- Powerful modelling and engineering calculations
- Plug & play **SEM-SAFE®** fire fighting technologies supported by BIM

danfoss.magicloud.com
Magic words
Danfoss & sprinkler | Danfoss & pump

MagiCloud

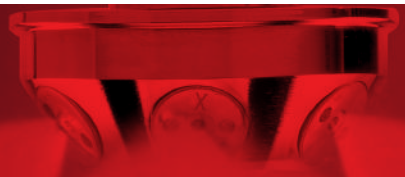
Largest **B**uilding **I**nformation **M**odelling
Helping MEP designers make everyday living easy

Benefits of SEM-SAFE® high-pressure water mist fire fighting system

The **SEM-SAFE®** high-pressure water mist system is increasingly being considered as a suitable and competitive option for the protection of public and commercial buildings.

After conducting a comparative analysis with a conventional sprinkler system on each specific project, key benefits of effective fire protection with high-pressure water mist system can be appreciated by end users as well as the opportunity to identify and quantify important savings.

In many circumstances, the high-pressure water mist "solution" is proving to be a cost-effective solution, leaving more space for other money generating activities and providing a lower total cost of ownership.



Less water consumption, water damages & **minimum downtime**

Small droplet size and fast evaporation of water, yet sufficient droplet speed to penetrate the fire means less water. There is reduced water consumption and no need for a large water supply reservoir.
The size of the water supply reservoir is up to 66% smaller than with a conventional sprinkler system.

In case of a fire, there is little water damage to furniture and equipment. The clean-up is easier with no business interruption and, consequently, lower risk of losing market shares and lower insurance costs.

Simplicity & flexibility in installation

High-pressure water mist is a minimally invasive technology, with a piping network that is easier to integrate into both retrofit installations and modern buildings. The stainless steel pipes are easy to handle due to low weight and they can be bend on site, due to the very small diameter.

The weight of the installed water mist pipes, including water, is typically 85% less than a traditional sprinkler system. The installation of the **SEM-SAFE®** high-pressure water mist system is up to 70% faster.

The **SEM-SAFE®** high-pressure water mist system will not compromise the architectural design, increasing architectural freedom. The modular design of the system provides flexibility for future extensions to cover more protected areas.

Lower costs for maintenance

All key components of the **SEM-SAFE®** high-pressure water mist system are high-quality components that are manufactured in-house.

Danfoss high-pressure pumps are multi-axial piston pumps made from corrosion-resistant stainless steel. Water is used as a lubricant, making the pumps virtually maintenance free.

The piping network, nozzles and section valves are also made from corrosion-resistant stainless steel. This ensures a long service life for the system installed.

CFD simulations: the future in fire fighting solutions

Water mist standards are focused on controlling, suppressing or extinguishing a fire, like traditional sprinkler systems.

The base function of the water mist system can be documented through the fire test reports issued by an internationally recognized third-party laboratory and/or through the approval certificates issued by an international notified body.
Very often only the equivalencies with sprinkler systems are documented.
The important cooling effect and absorption of radiation are only indirectly included in the fire test protocols. The capability to control smoke & gas from the fire is not included at all.

High-pressure water mist system is not only a modern fire suppression system, but a new technology with a better performance than more traditional active systems such as sprinkler systems.

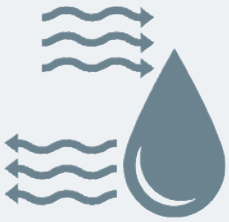
Besides the traditional benefits of the **SEM-SAFE®** high-pressure water mist system, Danfoss has been looking at how to further prove very important indirect benefits of the **SEM-SAFE®** system.

CFD (computational fluid dynamics) simulations have been introduced to reproduce the results of **SEM-SAFE®** high-pressure water mist system fire testing for use in extended fields of application based on results from large scale fire tests.

Rigorous CFD calculations show:

Superior cooling effect for reliable fire fighting

High-pressure water mist has superior capabilities to absorb heat from the fire and is characterized by effective cooling of combustion gases in enclosure and steel structures.



Absorption of heat radiation for fire control

High-pressure water mist is characterized by effective absorption of heat radiation (the transfer of heat from a fire caused by electromagnetic waves). The droplets absorption of heat from the gas layer and/or the plume can be calculated and verified.

Smoke & gas control for safer evacuation

High-pressure water mist helps with controlling smoke and reduction of soot & particles from a fire. The droplets' capability to control smoke and gasses can be estimated.

CFD
calculations for SEM-SAFE® testing

Innovation in designing safer buildings

Throughout 100 years of fire safety design, a predominant principle has been to mitigate the risk of fire spread by using passive fire separation. Separation units have been used in order to mitigate the risk of a fire spreading inside a building or between several buildings.

As modern architecture has developed extensively over the same period to include more and larger areas of open space within public and commercial buildings, such as atriums, the opportunities for traditional passive fire separations design have been greatly challenged.

In addition, there is a growing demand for fire safety initiatives supporting instead of restricting processes & flows within public and commercial buildings. The starting point of the overall fire safety strategy is expected to consider not only the total cost for a new building, but also the running costs of ineffective working processes counted over a long period, since they could exceed the total building cost of the fire safety initiatives.

Performance-based design

Performance-based design is increasingly used in Europe to define prevention and protection measures that must be taken in applications of public and commercial building types that present fire hazards.

The methods of **fire safety engineering (FSE)** are used in the pre-flashover phase to verify / dimension the escape route systems according to the propagation of fires and the development of the products of combustion, while in the post-flashover phase fire engineering methods are used to calculate the fire resistance of structures and the intervening of the fire brigade.

High-pressure water mist technology provides an opportunity to rethink traditional ways of designing fire safe buildings.

Due to the characteristics of water mist technology, it is natural to base the fire safety strategy on water mist applications to match the overall environment requirements for a project.

High-pressure water mist technology can attenuate temperatures and radiation. This **performance** is evaluated by determining the level of critical temperatures and radiation according to acceptance criteria for human safety and fire safety in relation to fire and smoke spread.

A **fire performance safety analysis** can be conducted on typical fire safety focus areas like evacuation & rescue measures, fire brigade's intervention, fire safety installations, fire and smoke spread and structures.

By combining additional advantages of high-pressure water mist's superior characteristics with the performance based fire safety strategy, a safer building design and very important indirect savings can be ensured.

Successful fire fighting solution

Among the available special solutions studied by Danfoss to enhance safety within public and commercial buildings, the following were successfully provided:

Glass facades protection
The excellent cooling features of the **SEM-SAFE®** high-pressure water mist system make it the perfect choice for protecting glass facades.
SEM-SAFE® has passed the EN-1364-1 fire resistance test for non-loadbearing elements. Instead of spraying water on the glass, the **SEM-SAFE®** system atomises the water in front of the glass.

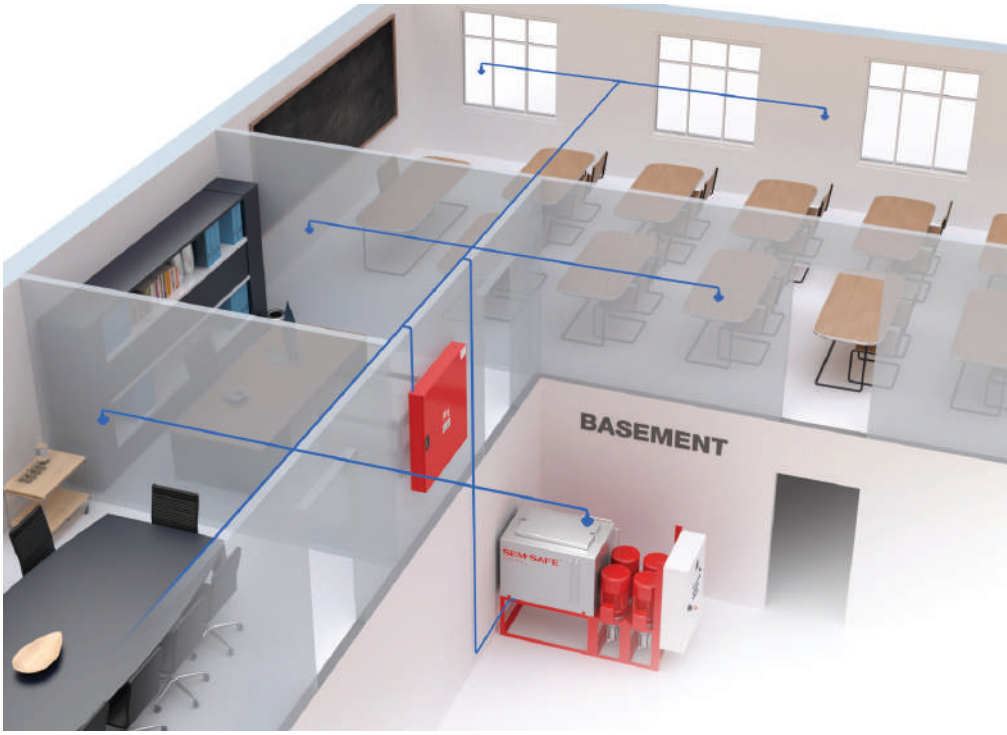
The cooling removes the risk of thermal stress cracks associated with traditional water-based sprinkler systems and allows the use of a thinner class of glass. This means significant savings for the building owner.

Section valves with automatic test
The possibility to test all the flow switches from a flow switch panel at the supervision central room of the building reduces time and personnel required for the test and maintenance of the **SEM-SAFE®** high-pressure water mist system.

High-pressure water mist fire hose reel cabinet
The possibility to directly connect a fire hose reel cabinet to the **SEM-SAFE®** high-pressure water mist system by sharing the same pump unit and pipes means significant savings for the building owner.

Ventilation system
Numbers of fire and smoke dampers in the ventilation system can be reduced and it is possible to keep the ventilation system for smoke extraction running during a fire.

Water spray curtains
Absorption of radiation for fire control can be implemented by using the ability of a high-pressure water mist curtain to serve as an active fire barrier for the protection of building and people.



ENGINEERING
TOMORROW

Danish super hospital saves 11 million euros with SEM-SAFE® high-pressure water mist fire fighting system

Very large Danfoss SEM-SAFE® high-pressure water mist system for fire fighting has been installed in Aarhus University Hospital in Denmark.
More than 30,000 **SEM-SAFE®** high-pressure water mist nozzles have been delivered and installed in Aarhus University Hospital, which is Denmark's first super hospital. The hospital complex is 400,000 m^2 with buildings between four and eighteen storeys.

The benefits of the **SEM-SAFE®** high-pressure water mist system are many in comparison with traditional sprinklers. The most important is the economic advantage, as **SEM-SAFE®** is a money saving solution.
For Aarhus University Hospital, more than 11 million euros were saved with **SEM-SAFE®** high-pressure water mist system.

Key savings:

- Structural design, insulation of steel, insulation of breach through fire sections, piping etc. **Actual savings 3.45 million euros** plus added value as lower temperature secure options for reduced dimension of the steel structure.

- Standard glass instead of expensive fire glass. **Total savings 2.8 million euros.**

- Isolation & insulation of **ventilation system**, numbers of fire & smoke dampers in ventilation system. **Actual savings 4.15 million euros** plus added value by keeping the ventilation system for smoke extraction running, during a fire.

- Vertical fire spread. **Actual savings 0.16 million euros** plus added value as smoke in general is reduced.

- **Water curtains** instead of automatic fire doors. **Actual savings 0.14 million euros** plus reduced service cost at water curtain compared to higher service cost of alternative solution with automatic fire doors.

Aarhus University Hospital in Denmark,
*fully protected with **SEM-SAFE®** high-pressure water mist system for fire fighting*

SEM-SAFE®

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Danfoss

Product brochure
SEM-SAFE® fire hose reel cabinet with spray gun product version 2.0.

SEM-SAFE® fire hose reel cabinet improves safety in any building

Immediate & efficient fire fighting tool for fire brigades & non-professionals

Danfoss Fire Safety A/S

Easy installation by one person

www.semsafe.danfoss.com | SEM-SAFE®

Improved fire safety in any building

With more than half a century of experience in engineering fire fighting systems based on high-pressure water mist technology and a deep understanding of customer needs, we have developed a state-of-the-art fire hose reel cabinet with spray gun, suitable for any building type.

High-pressure water mist technology is increasingly preferred when it comes to fire safety in buildings, because it provides efficient protection of people and assets in case of a fire.

At Danfoss Fire Safety A/S, we took high-pressure water mist technology one step further by integrating it into our **SEM-SAFE® fire hose reel cabinet with spray gun.** Through extensive engineering and development, we created a fire fighting product that is an immediate tool for fire brigades and non-professionals to use in the fight against fire. It is efficient and very easy to use in a fire situation, as well as offering great flexibility in installation.

Tested and approved

The SEM-SAFE® fire hose reel cabinet with spray gun has successfully passed fire test criteria

The **SEM-SAFE®** fire hose reel cabinet with spray gun is a CE marked product. It has been tested in accordance with standard EN 3-7-2004+A1:2007[1]. The fire hose complies with ISO-11237.

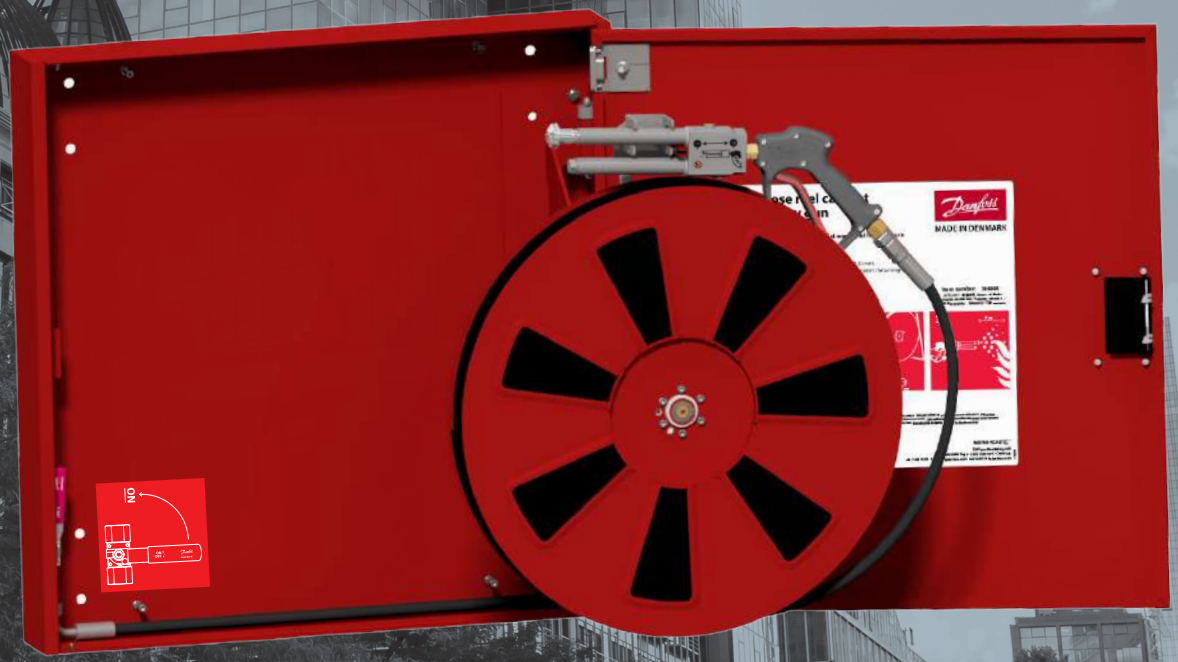
The **SEM-SAFE®** fire hose reel cabinet with spray gun is fire tested against Class A fires (solid fuels) and Class B fires (flammable liquids).

The SEM-SAFE® fire hose reel cabinet with spray gun is suitable for installation in any building type, modern or historic, and of any size and height.

It is an immediate fire safety solution for commercial applications such as hotels, stores, warehouses, underground car parks, health care facilities, educational facilities, museums, offices and high-rise buildings. Also for combating potential fire risk, the SEM-SAFE® fire hose reel cabinet with spray gun is ideal for a wide variety of industrial applications, for example: factories, manufacturing facilities and automotive.

The Danfoss **SEM-SAFE®** fire hose reel cabinet with spray gun is suitable for fire fuelled by wood, furniture, plastics, but also flammable liquids and combustible liquids.

Simplicity in operation has been a top priority when designing the product.
Using the **SEM-SAFE®** fire hose reel cabinet with spray gun does not require extensive fire fighting training.



Benefits when choosing Danfoss SEM-SAFE® fire hose reel cabinet with spray gun

Efficient **fire fighting**

Added safety
The spray gun of the SEM-SAFE® fire hose reel cabinet is equipped with a SEM-SAFE® high-pressure water mist nozzle. When activated, the nozzle forms a "water mist umbrella" effect. This "water mist umbrella" effect has cooling properties, offering significant protection to the person operating the spray gun from the heat wave generated by the fire. In addition, the high-pressure water mist will capture smoke particles and sink the smoke layer.

Extinguishes several classes of fire
The SEM-SAFE® fire hose reel cabinet with spray gun has been thoroughly fire tested against solid fires (class A fires) and flammable liquid fires (class B fires).

Perfect integration with the SEM-SAFE® high-pressure water mist system
The SEM-SAFE® fire hose reel cabinet with spray gun can easily be connected to the SEM-SAFE® high-pressure water mist system. The fire hose reel cabinet works with a 60 bar system and a 100 bar system.

Cost effective

Reduced initial investment cost
The SEM-SAFE® high-pressure water mist system uses pipes with small dimensions, and the fire cabinet flexible hose has a very small diameter. Thus it is possible for the fire hose to be 50 metres long, which results in a large coverage area.

Avoid additional pipework and structural damage
As the SEM-SAFE® fire hose reel cabinet with spray gun is an integrated part of the SEM-SAFE® high-pressure water mist system, there is no need for a separate water supply piping system, unlike traditional designs with separate sprinkler system and hose reel system.
This means less time and cost is spent on piping work and wall/ceiling drilling.

Time-saving installation
The large coverage area allows for fewer cabinets in an installation. Due to low weight and low installation complexity, the SEM-SAFE® fire hose reel cabinet with spray gun can be installed by a single technician.

A **trusted fire safety tool** for the fire brigade

Professionals from the fire brigade will use the SEM-SAFE® fire hose reel cabinet with spray gun as the first instrument to fight an emerging fire immediately, hence saving valuable time until fire trucks are in place.
Whether the person is a fire fighter or not, the SEM-SAFE® fire hose reel cabinet with spray gun is always ready to be used in case of a fire.

User **friendly**

Easy to operate
Due to its very light and compact design, the SEM-SAFE® fire hose reel cabinet with spray gun is easy to handle. The hose reel can be swung out from the cabinet with little effort. The hose is thin and extra flexible for added ease of handling. All these features enable operation of the SEM-SAFE® fire hose reel cabinet with great precision. Tests indicate there is very light "kickback" effect while operating the lightweight spray gun, thus contributing to smooth operation.

Straightforward design
Training staff on how to use the SEM-SAFE® fire hose reel cabinet with spray gun is done in a few simple steps and with no complex procedures and methods. If a non-trained person needs to use the SEM-SAFE® fire hose reel cabinet with spray gun, it would not be a problem. The design of the product is intuitive. This makes the product simple to use. In addition, there are clear signs on the product showing how to use it.

Precision and simplicity
Placed within reach, one simply opens the inlet valve, pulls out the fire hose reel in the direction of the fire and presses the trigger to start the water flow to the spray gun. It is as simple as that: no heavy equipment, no specific set-ups and wait time. Important moments are saved in the fight against fire, which can mean saving a person's life and protecting valuable assets.

Fast & **easy installation**

One-person installation
Everything is optimised on the SEM-SAFE® fire hose reel cabinet with spray gun for quick and easy installation by just one person.
Pre-cuts for pipework and adjustment screws make fast and adjustable set-up possible.

Full flexibility in installation
By turning the cabinet around and by reassembling the internal main components, the fire cabinet door can be changed to left or right hinged.

Environmentally **friendly**

100% harmless to people and environment
The SEM-SAFE® fire hose reel cabinet with spray gun uses clean water as the extinguishing agent, a sustainable fire safety technology.
Thus, we actively contribute to better and more eco-friendlier solutions for the buildings and cities of tomorrow and towards protecting our planet against polluting technologies.

State-of-the-art product

Added durability due to high quality
The SEM-SAFE® fire hose reel cabinet with spray gun is very resistant due to high-quality materials and manufacturing. Attention to detail and quality has been given while developing the product to ensure a sturdy and long-lasting solution.

Simplicity & applicability

The SEM-SAFE® fire hose reel cabinet with spray gun is designed for direct connection to a high-pressure water mist system for fire fighting.

To meet customers' needs, the SEM-SAFE® fire hose reel cabinet is equipped with a spray gun that has both a SEM-SAFE® high-pressure water mist nozzle and a high-pressure water jet nozzle.

The water flow between the **SEM-SAFE®** high-pressure water mist nozzle and the high-pressure water jet nozzle can be changed easily by pushing the two tubes forward.
It is recommended that the spray gun be secured with a locking clip. The locking clip must be removed in order to activate the water jet function. Thus, the user makes an active decision in switching from water mist to water jet, for added safety.

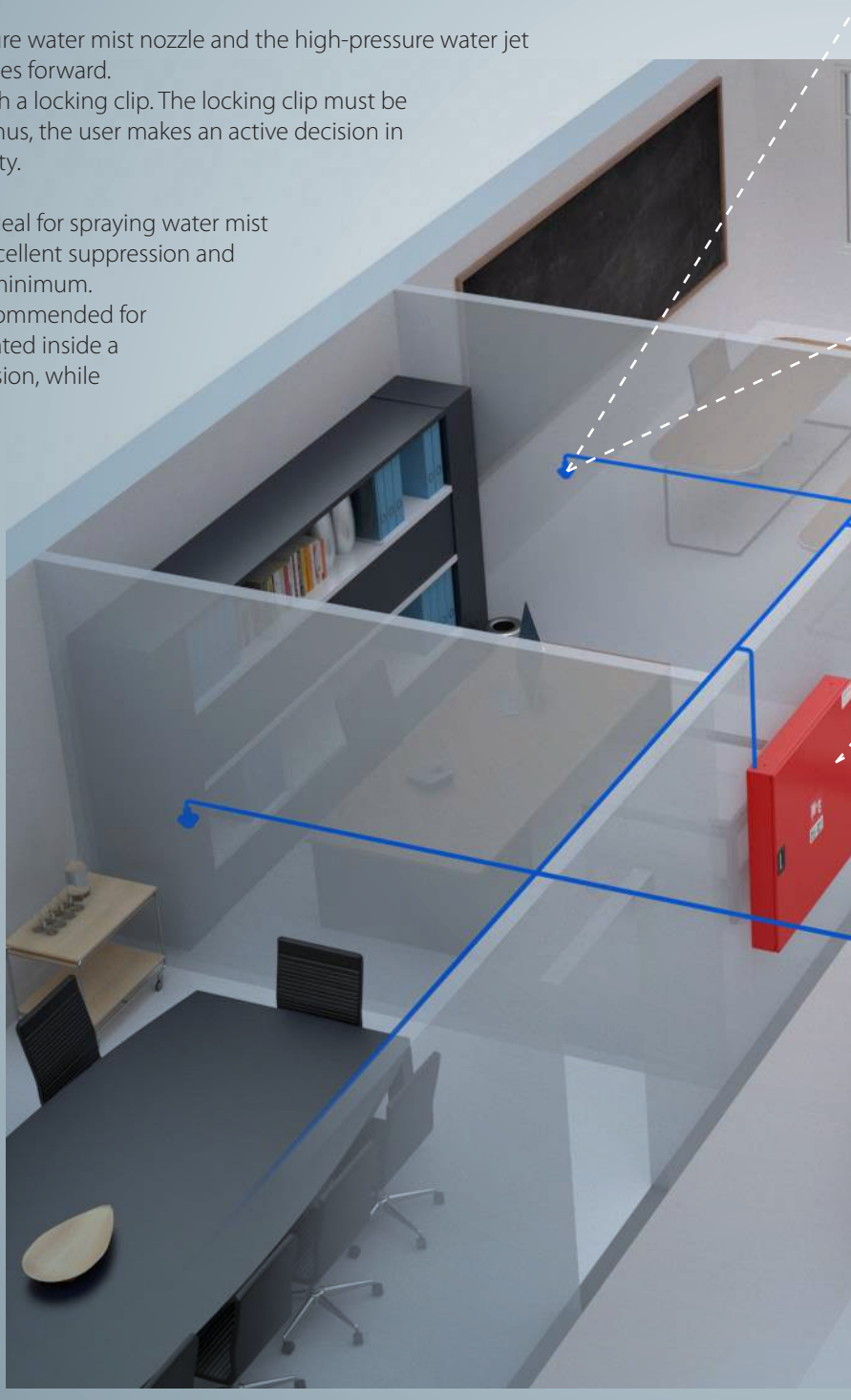
The **SEM-SAFE®** high-pressure water mist nozzle is ideal for spraying water mist over a large surface. High-pressure water mist has excellent suppression and cooling properties and will keep water damage to a minimum.
Using the high-pressure water jet nozzle is highly recommended for deep fires that are hard to reach, for example fire situated inside a mattress. This will help in attacking the fire with precision, while keeping a safe distance.

The fire hose reel and the spray gun are placed inside a compact, steel cabinet.

The 50-metre-long high-pressure hose is very thin and flexible. With such a long fire hose, a larger surface can be covered, which means fewer fire hose reel cabinets with spray gun need to be installed.

A reel keeps the fire hose neat and accessible at all times. The hose reel has swinging brackets which allow the hose to be pulled in any direction.

For activation and easy maintenance, the design includes an inlet valve, which must be opened to enable water flow.



One SEM-SAFE® high-pressure water mist fire safety system to cover all areas in a building

SEM-SAFE®
high-pressure
water mist nozzle

SEM-SAFE®
fire hose reel
cabinet with spray gun

SEM-SAFE®
high-pressure
water mist section valve

SEM-SAFE®
high-pressure
water mist pump unit

General specification

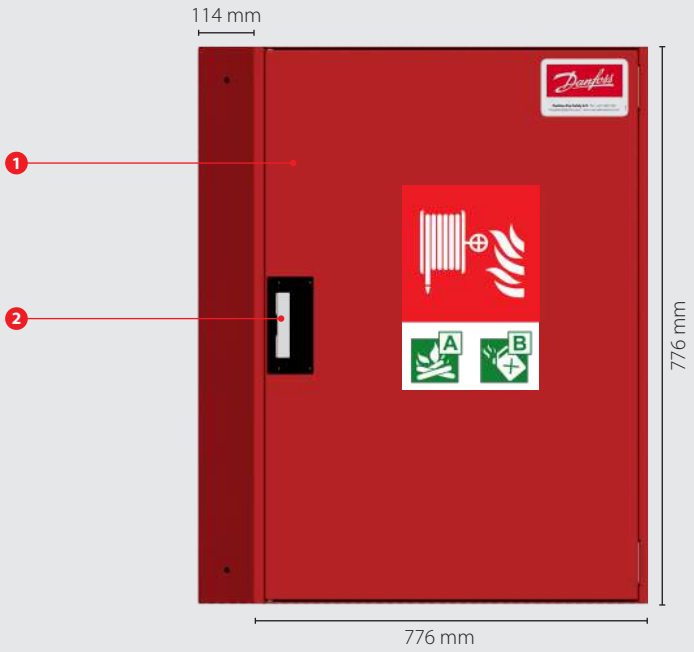
Product number (for right hinged door)[1)]	700095
Installation	Flush mount
	Surface mount
Fire test	EN 3-7-2004+A1:2007[1] Portable fire extinguishers
Application	Class A Fire and Class B Fire
CE marking standard	DS/EN 671-1:2012 and EN ISO 12100:2011
Total dry weight of complete fire hose reel cabinet	53 kg (including hose and spray gun)
Total wet weight of complete fire hose reel cabinet	58 kg (including hose and spray gun)
Water consumption	30 L/min
Min. inlet pressure on hose reel	82 bar
Max. inlet pressure	160 bar
Inlet connection type	3/8" BSPP (DN10)

1) Fire hose reel cabinet with left hinged door can be ordered on request.

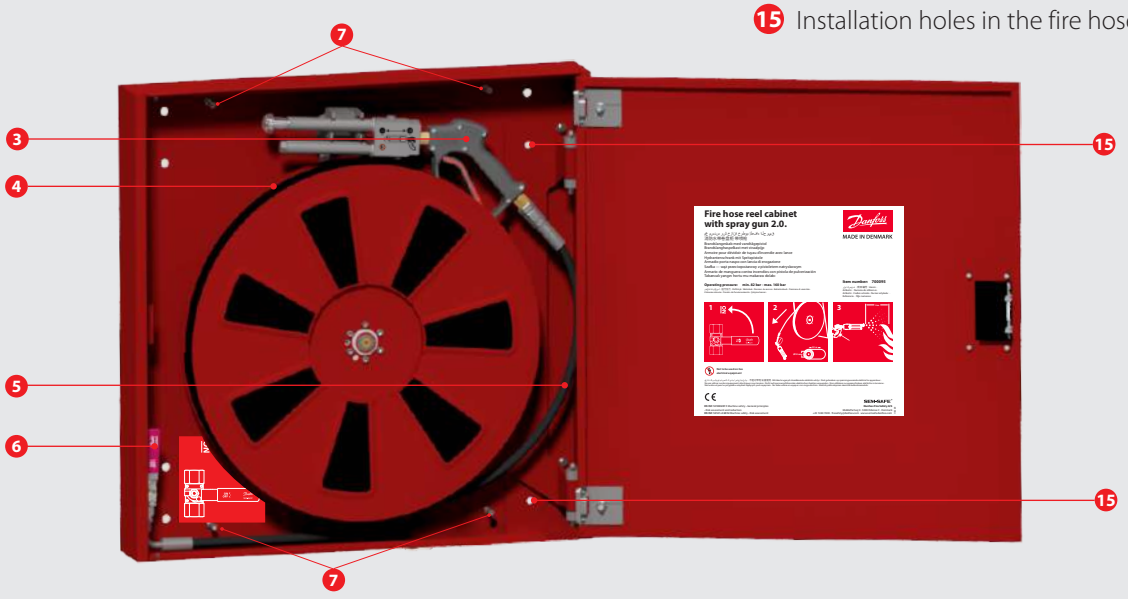
Key components specification

Fire hose reel cabinet	**Outside dimensions**	776 x 776 x 114 mm
	Colour	RAL3000
	Material	S235JR
High-pressure hose	**Type**	AT3K - Minetuff
	Inside diameter	3/8" (10 mm)
	Max. working pressure	210 bar
	Length	50 m
	Temperature range	+4°C to +70°C operation
	Material	Flexible rubber hose reinforced by one high tensile steel wire braid
High-pressure water mist spray gun	**Water mist nozzle type**	SEM-SAFE® Nozzle type HNDP-0-12-3.87-00 (CG) AISI316L Conical spray pattern Throw length: 5 m
	Water jet nozzle	Concentrated sheet spray pattern Throw length: 10 m

Key components of the
SEM-SAFE® fire hose reel cabinet with spray gun



1. Fire cabinet door
2. Fire cabinet door handle
3. Spray gun
4. Fire hose reel
5. Fire hose
6. Inlet valve
7. Adjustment screws
8. Locking clip (to prevent from using the water jet function by accident)
9. SEM-SAFE® high-pressure water mist nozzle
10. High-pressure water jet nozzle
11. Spray gun trigger
12. Fire hose reel arm
13. Steel rod
14. Security pin
15. Installation holes in the fire hose reel arm



Spray gun with SEM-SAFE® high-pressure water mist nozzle and high-pressure water jet nozzle

Installation

The SEM-SAFE® fire hose reel cabinet with spray gun has a design that allows for easy and fast installation

Modular & compact
The fire cabinet used for the SEM-SAFE® fire hose reel cabinet with spray gun is one of the thinnest cabinets on the market, with a depth of just 114 mm. It has a small footprint and it is very compact.

Types of installation

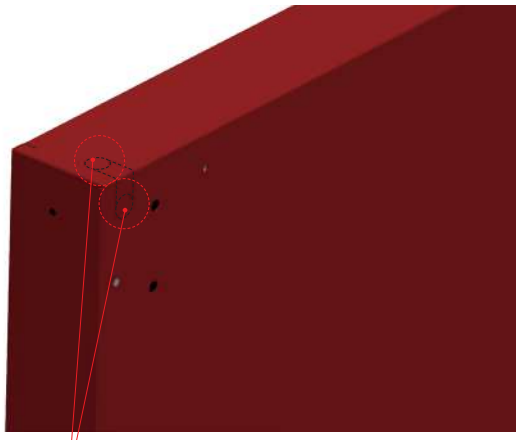
Mounted outside the wall (surface wall mount)
The cabinet is simply installed outside the wall.

Mounted inside the wall (flush mount)
The flush mount installation means the cabinet is completely placed in the wall.

Moving the fire cabinet on the construction site is done easily. Components can be installed by one person.

Plug & play

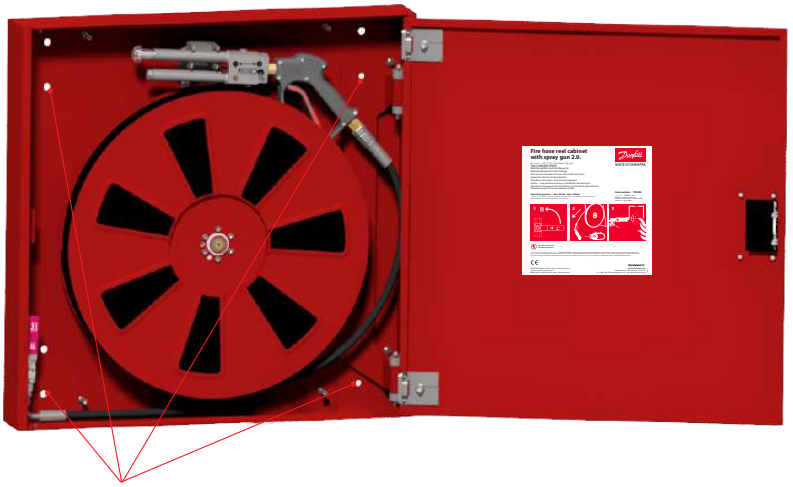
The **SEM-SAFE®** fire hose reel cabinet with spray gun has been manufactured with pre-cut holes for piping. This gives the installer all the flexibility needed when it comes to installing the product and connecting it to the pipe of the high-pressure water mist system.



Pre-cut holes for piping

Installation guidelines

It is highly recommended to install the **SEM-SAFE®** fire hose reel cabinet with spray gun in places that are easily accessible and near entrances, corridors and escape routes. The optimal installation height is 1200-1500 mm from the floor.



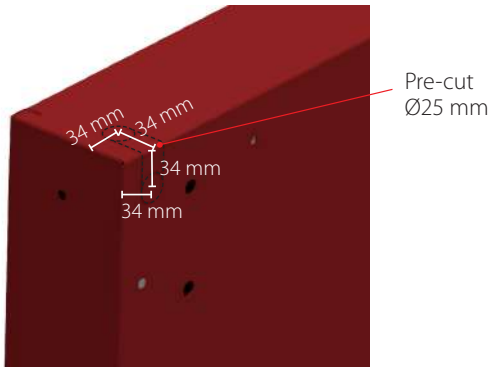
Mounting holes

Installation guide

See below the steps in installing the SEM-SAFE® fire hose reel cabinet with spray gun:

1. Piping preparation

- Punch out only the necessary pre-cut hole.
- Use the included grommet for protective seal.

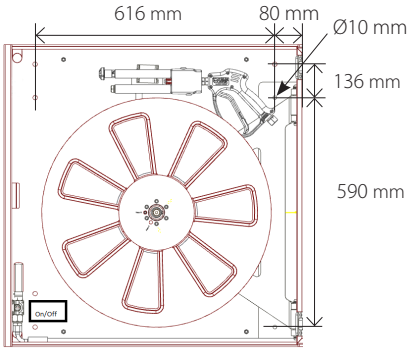


2. Cabinet installation

Note: *For easier lifting of cabinet, take the door and the hose reel off by pulling the security pin (14) and the steel rod (13) situated behind the reel. The hoses shall not be disconnected from the inlet valve. Dismount inlet valve from bracket.*

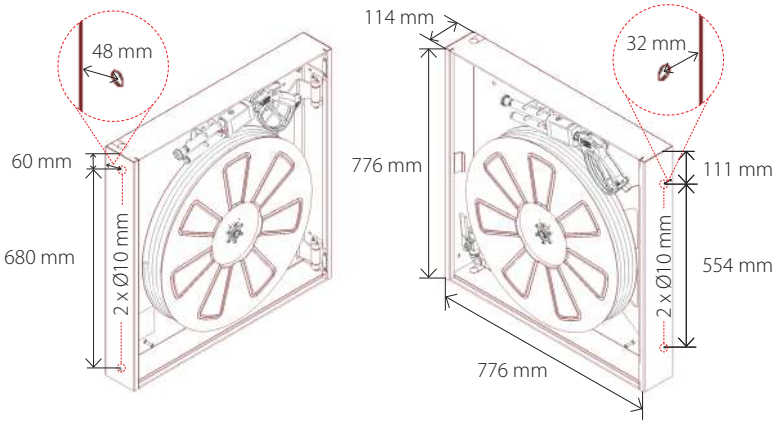
a. Surface wall mount (outside the wall installation)

- Put cabinet on the wall.
- Secure the cabinet in the wall with bolts in the 4 holes of the cabinet backplate.
  The two holes in the fire hose reel arm must always be used. M10 8.8 bolts are recommended + washers.



b. Flush mount (inside the wall mount)

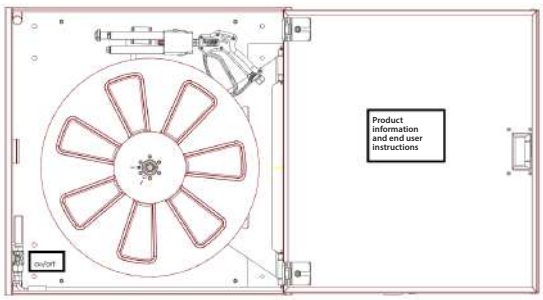
- Put the cabinet into the hole in the wall (800x800mm).
- Level up cabinet basis in wall cut-out using wedges or similar.
- Adjust distance to backwall by using the 4 adjustment screws.
- Secure the cabinet with 4 bolts, 2 on each side of the cabinet. M10 8.8 bolts are recommended + washers.
- Care must be taken to avoid twist of cabinet.
  Place shims between side of cabinet and wall structure where bolts are fitted.



3. Final installation

Note: *If installation of cabinet was performed by removing the door and hose reel, then install hose reel back on the fire hose reel arm.*
Mount the inlet valve on the bracket. Place the door back on the cabinet.

- The fire cabinet shall be secured to a supporting steel structure, which shall be made to withstand reaction forces at each of the four bolts of no less than 950N in a horizontal direction and 620N in a vertical direction.
- For flush mount, apply 12 mm fire resistant sealing against wall and cabinet.



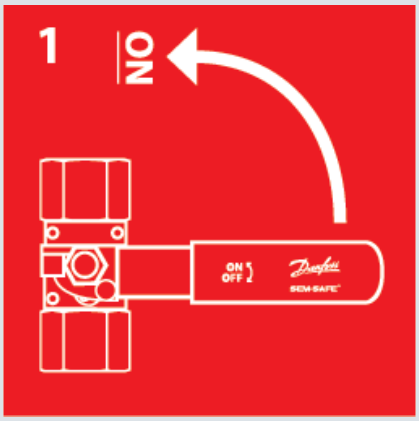
SEM-SAFE® fire hose reel cabinet with spray gun is an essential modern-day fire fighting tool

The **SEM-SAFE®** fire hose reel cabinet with spray gun is easy to locate.
All the **SEM-SAFE®** fire hose reel cabinets with spray gun are labelled with a visible fire hose reel pictogram.

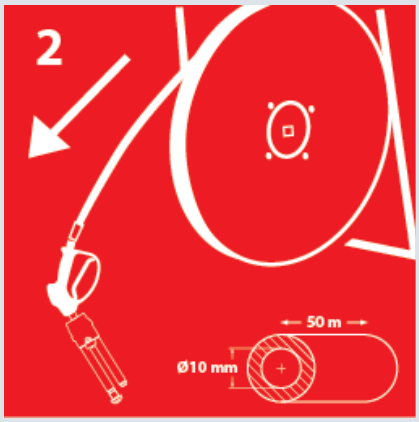
The spray gun has a 5-metre shooting range when using the SEM-SAFE® high-pressure water mist nozzle and a 10-metre shooting range when using the high-pressure water jet nozzle.

To efficiently use the **SEM-SAFE®** fire hose reel cabinet with spray gun in case of a fire situation, open the fire cabinet door and follow the following steps:

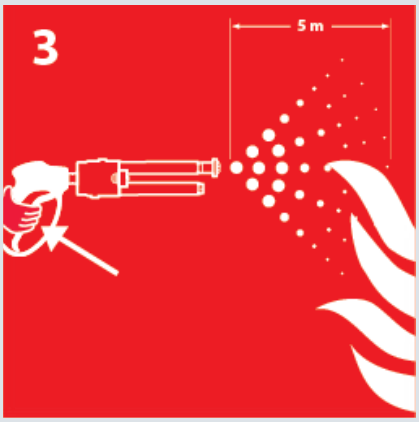
Fire hose reel pictogram label



Turn valve anti-clockwise to open fully.



Pull hose out in direction of fire.



For water mist release

Hold and squeeze spray gun trigger to release water mist.

Not to be used on live electrical equipment

It is recommended that the water ject function of the gun be used in specific situations, for example deep fires that are harder to reach, and by fire fighting professionals.

To use the water jet function, the following simple steps must be followed:

A. Remove locking clip.

B. Push tubes forward and squeeze spray gun trigger to release water jet.

To release water mist again, pull tubes back and squeeze spray gun trigger.

Avoide releasing jet discharge on humans

Clear labelling and instructions on the spray gun

Servicing & maintenance

The SEM-SAFE® fire hose reel cabinet with spray gun requires no special maintenance. A standard inspection is sufficient.

The periodical service should be scheduled and should cover the following:

- check if the cabinet door can open easily
- ensure that the inlet valve can open and that it can be moved into the 2 positions "ON" and "OFF"
- check the fire hose and the pipe for any signs of damage
- check that all connections are tight
- check for frost damage
- check for leakage
- check that the fire hose is in its place on the wheel and that it can be pulled easily
- check that the spray gun is in place

Danfoss Fire Safety recommends following EN671-3, Annual Inspection.
It is the duty of the supervision body performing the inspection to report any damages.

The inspection should include a functional test, where the water flow through the spray gun is tested.

The following need to be observed:

- water discharge length (5 metres for the SEM-SAFE® high-pressure water mist; 10 metres for the high-pressure water jet nozzle)
- water flow is satisfactory
- water is clean

All inspections need to be marked on an inspection label provided by the authorised supervision body.

The intelligent use of water

We took our knowledge about the excellent properties of high-pressure water mist technology and incorporated it into the SEM-SAFE® fire hose reel with spray gun.

By pointing the spray gun directly in the direction of the fire, the cooling effect is greater. It allows for better control of the fire.

Also, it uses little water, which means low water damage.

How does high-pressure water mist work
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 technology for fire fighting 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 system, it simultaneously cools the fire like a traditional sprinkler. The cooling effect additionally lowers the risk of reignition.

When high-pressure water mist comes into contact with flames, it evaporates and expands a minimum of 1700 times. The dense vapour created displaces the flames and quickly extinguishes the fire.

SEM-SAFE® system in short

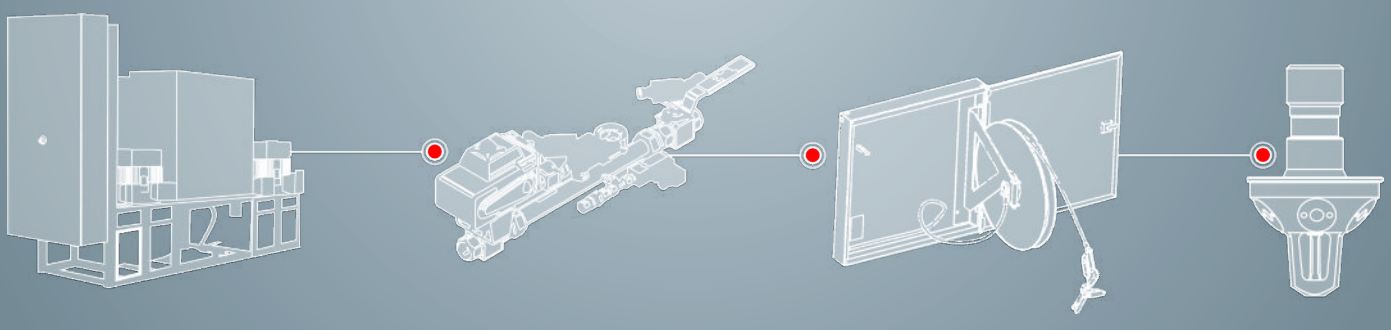
SEM-SAFE® is a high-pressure water mist fire fighting system that uses micro-droplets released through nozzles into protected areas. Water is discharged in a form that ensures fire suppression, control or extinguishment.

A **SEM-SAFE®** high-pressure water mist system is comprised of several **SEM-SAFE® high-pressure water mist nozzles** connected by stainless steel piping to a modular **SEM-SAFE®** high-pressure pump unit.

The **SEM-SAFE® high-pressure water mist pump unit** can feed either automatic glass bulb nozzles or open nozzles in "wet", "pre-action" or "deluge/dry" applications. Stainless steel **SEM-SAFE® high-pressure water mist section valves** are supplied with the **SEM-SAFE®** system in order to separate the individual fire sections.

The **SEM-SAFE® fire hose reel cabinet with spray gun** is an integrated part of the SEM-SAFE® high-pressure water mist system.

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



ENGINEERING
TOMORROW

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_2.

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 with 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 onboard ships is critical, and this places great demands on fire fighting systems. Regardless of 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 demanding marine segment we offer two fire fighting technologies:
SEM-SAFE® high-pressure water mist and SEM-SAFE® low-pressure CO_2.

Reaching even higher

Simplicity in design, achieved 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

SEM-SAFE®

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