

ENGINEERING
TOMORROW

Danfoss

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

Shanghai Metro in China

The fastest-growing rapid transit system in the world

Danfoss Fire Safety A/S



Situated in China's largest city by population, Shanghai Metro was opened in 1955 and has since become one of the fastest-growing rapid transit systems in the world.

Biggest metro in China

The metro system includes 11 metro lines, 278 stations and more than 434 km of tracks. Shanghai Metro is the biggest metro in China and the third biggest in the world. With an annual passenger volume of 1,884 billion, the Shanghai Metro System is extremely busy during peak hours and remains busy during the rest of the day as it is located near important tourist destinations.

The system continues to grow, with new lines and extensions currently under construction. In such crowded places, ensuring people's safety was a challenge as evacuation of such a large number of passengers in case of a fire is very difficult. It was a prerequisite for the metro to be equipped with a reliable fire protection system that will make evacuation of the people possible and facilitate access to the fire fighting crew.



www.semsafe.danfoss.com

SEM-SAFE®

SEM-SAFE® high-pressure water mist system

In 2008, an agreement concerning the installation of SEM-SAFE® high-pressure water mist system from Danfoss was signed. The project covers metro lines, public space, electrical equipment rooms and technical rooms.

In 2009 all fire tests necessary were passed successfully, proving the reliability of the SEM-SAFE® system. The SEM-SAFE® high-pressure water mist acts efficiently in controlling the fire, with minimum water consumption and close to no water damage. In order to ensure the safe evacuation of the people from the train, in case of a fire, micro nozzles were installed at every door opening in the station.

Upon activation, dense water is rapidly discharged, forming a “water curtain”, which will keep the smoke inside the train. It offers control over the heat, smoke and toxic gas, thus ensuring safe evacuation of people and easy access for the fire fighting crew. The system will prevent fire from spreading from the train to the platform, while lowering the temperature and scrubbing the smoke.



SEM-SAFE® pump unit installed in the project site.



Access area to the metro protected with SEM-SAFE®.



Key operation equipment protected with SEM-SAFE®.

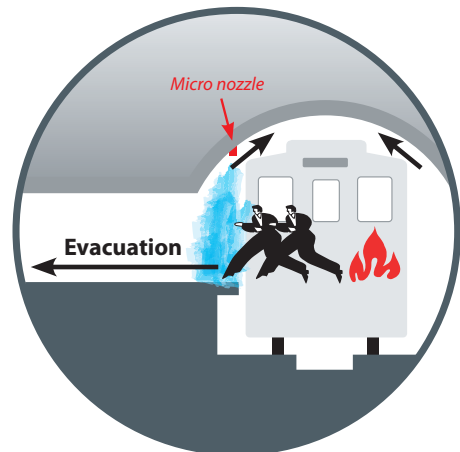
The benefits of SEM-SAFE®

The benefits of the SEM-SAFE® high-pressure water mist from Danfoss are immense:

- It was recorded to be harmless to electrical equipment, with excellent results during the tests
- It is totally safe for human beings
- Damage to surrounding equipment is minimal
- Release and disposal of water is a simple process
- The extinguishing time is reduced due to rapid and dense water discharge
- The cooling process is uniform and the smoke and toxic gas is kept under control

The benefits provided by the SEM-SAFE® system as well as the fact that it has been proven to be a money saving investment formed the reasons why SEM-SAFE® high-pressure water mist system was chosen as the best solution for fire protection of the Shanghai Metro.

Until the end of 2011, a total of approximately 6,000 nozzle heads and 40,000 micro nozzles had been installed in the metro stations in Shanghai in addition to more than 100 pump units. The protection of the metro line is an ongoing process because of the expansions of current line and construction of new ones.



The SEM-SAFE® micro nozzle creates a water curtain, which will keep the level of toxic gas under control, while simultaneous cooling.

SEM-SAFE®

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Danfoss Fire Safety A/S · Middelfartvej 9 · DK-5000 Odense · Denmark
Tel. +45 7488 7800 · E-mail firesafety@danfoss.com · www.semsafe.danfoss.com

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

Budapest Airport (ANS-III)

Fire protection of basement and underground car park
Danfoss Fire Safety A/S



ANS-III represents the newest addition to Budapest Air Traffic Control Centre. This provides the Hungarian Air Navigation Services with modern means of communication between air traffic controllers and the aircrew. It ensures international recognition for the Hungarian Air Traffic Control Navigation as well as laying the foundation for the development of a state of the art air navigation knowledge and training centre.

Building description

The new blocks cover nearly 10,000 m² and consist of 3 floors and a basement area. The Air Traffic Control Centre has one floor basement, with a surface of approximately 3,000 m², which includes mechanical rooms, storage areas, locker rooms, corridors and underground parking area. The entire basement is completely protected with the SEM-SAFE® high-pressure water mist system from Danfoss.



SEM-SAFE® high-pressure water mist system

The customer was interested in a water mist system that could provide optimal fire fighting, as well as compensate for the lack of a smoke extraction system that should have been installed according to local regulations. By using a water mist system, there was no need to have a smoke extraction system. In the beginning of 2012, the customer contracted TÚZÓR Ltd, Danfoss distributor in Hungary for the installation of the SEM-SAFE® high-pressure water mist system. The scope of work was to replace a water based fire fighting system already approved.

Classification of protected areas:

- Corridors, hallways, lobby, mechanical rooms: OH1 up to 6 m ceiling height
- Garage: OH2 up to 3 m ceiling height
- Warehouse, storage areas: OH3 up to 6 m ceiling height

For the protection of the entire basement area, a unit with 6 pumps and 305 nozzles were installed. In addition, 29 section valves, which are operated by the fire alarm system, were installed in the water mist pump room.

The benefits of SEM-SAFE®

SEM-SAFE® high-pressure water mist system provides multiple advantages and benefits. With only one system the entire basement area is protected. It provides rapid fire fighting and keeps deep seated fire under control, while efficiently suppressing fuel spills.



Minimal water consumption.

A convincing argument for the customer was the unique upright design of the SEM-SAFE® garage nozzle, which avoids the risk of accidental hit by cars as well as eliminates frost clogging in drop pipes and nozzles.

Having a cost efficient fire-fighting solution was important for the customer. The high spacing means fewer nozzles to be installed, therefore reducing installation costs. The unique multi-axial piston pumps are lubricated by water, therefore they require almost no maintenance. The pump unit is compact and its footprint occupies less than half the parking space needed for one car.

The compact section valves were easily integrated into the water mist pump room and are easily accessible. This provides a huge advantage, as the previous system installed had large section valves placed in the suspended ceiling area of changing rooms and storage room.

Approvals

The SEM-SAFE® high-pressure water mist nozzles are tested and accepted by VdS, an internationally recognized approval authority. Also, SEM-SAFE® successfully passed the fire criteria set by the local BM OKF (National Directorate General for Disaster Management-Fire Protection). During the public certification, a full scale test of the SEM-SAFE® high-pressure water mist system took place in the car park. All technical requirements were passed successfully.



High quality stainless steel pipe offers long life span, while the small pipe dimension ensures easy installation and integration as well as an aesthetic design.

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Danfoss

Underground Car Parks

Optimum fire safety in underground car parks with **SEM-SAFE**[®] high-pressure water mist system

Danfoss Fire Safety A/S

High cooling effect with **SEM-SAFE**[®] for fire fighting

www.semsafe.danfoss.com

SEM-SAFE[®]

SEM-SAFE® high-pressure water mist system

Only 1 system to cover your entire building!

With SEM-SAFE® high-pressure water mist you can:

Protects an entire building

- Only one pump needed

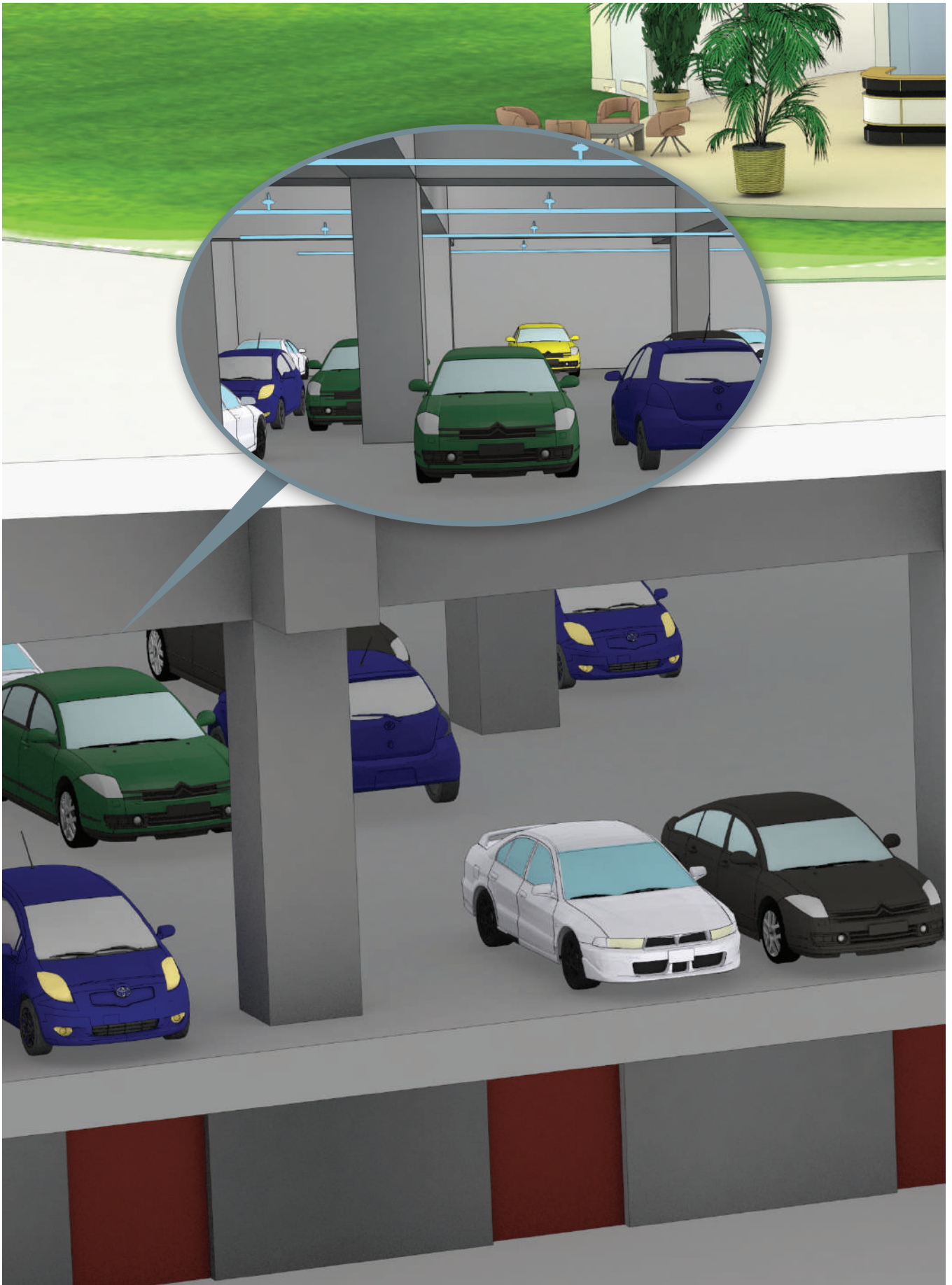
Design the building just the way you want

- Small stainless steel pipes
- Aesthetic nozzle design

Save space for money generating activities

- Modular, compact system





SEM-SAFE® for car parks

Need a fire fighting system that:

- Provides efficient fire protection?
- Can be easily integrated in the architecture of the car park area?
- Is durable in the relatively aggressive environment of a car park?
- Occupies very little space?
- Is easy to install and maintain, due to fewer components needed?

Then SEM-SAFE® is your solution!

Budapest Air Traffic Control Centre - picture from test in underground car park, fully protected with SEM-SAFE® high-pressure water mist system



Underground car parks present a number of fire risks, mainly due to combustible fuels, materials of the vehicles, building structure and area access. A fire in such a place can turn into a disastrous scenario. Thus, it is important for an underground car park to be installed with a reliable fixed fire fighting system. Danfoss has developed a fire fighting solution based on high-pressure water mist dedicated to underground car park areas.

Fire protection of car parks

With small pipe dimensions, large coverage, minimal water consumption, a compact skit unit and simple design, SEM-SAFE® high-pressure water mist is the perfect choice to protect underground car parks, with reliability and safety in mind. The system is safe, efficient and environmentally friendly.



Effective fire fighting with SEM-SAFE®

- Suppresses fire in fuel spills.
- Higher cooling capacity of the small water droplets.
- Fast nozzle activation.
- Good control of the thermal environment.

Unique patent nozzle design

- The only upright garage nozzle in the market.
- Tested and accepted by a highly recognized authority, VdS.
- No risk of accidental hit by a car.
- No need to remove the nozzles in order to drain the water, when pressure testing.
- Tested below ceiling 50-100 mm. The nozzles do not need to be flush with the ceiling, therefore the installation is fast and with less costs.
- Up to 50% higher coverage area in comparison with sprinklers. This means fewer nozzles to be installed.

Flexibility in installation

- Flexibility of pipes positioning under the concrete ceiling.
- Easy to integrate with other services required in the cars par (signs, vents, security systems, etc.).

Minimal water consumption

- Up to 50% less water used in comparison with sprinkler.
- By using SEM-SAFE®, the cost of water supply is significantly reduced.

Space saving

- The compact and modular SEM-SAFE® pump unit has a small footprint, occupying less than half the space needed for the parking area for one car.

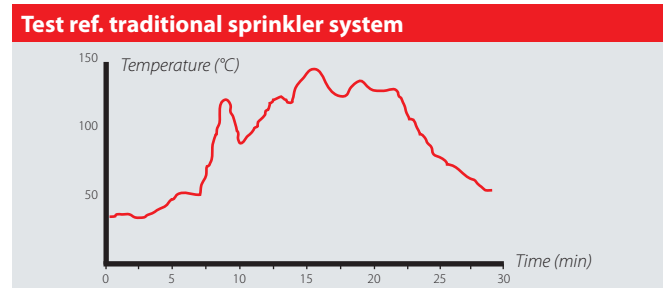
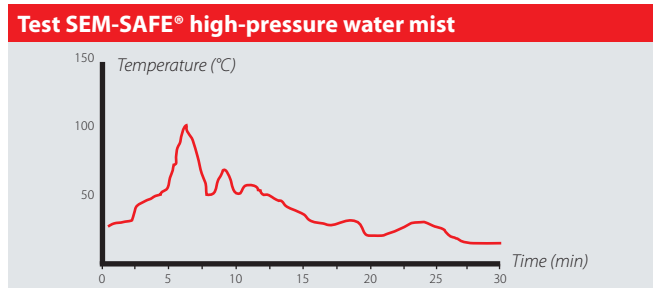
Benefits of SEM-SAFE® high-pressure water mist system

Tackles fires swiftly and efficiently

- Immediately cooling of smoke gasses, preventing flashover
- Reduced extinguishing time due to rapid and water discharge
- Minimal consumption of water
- Immediately cools the fire, preventing fire growth
- With up to 30% fewer components compared to most competing systems, the SEM-SAFE® system is lighter and more compact. This allows for easier installation, simplified maintenance and valuable space saving

Cost saving solution

- With fewer nozzles required thanks to optimized spacing and the need for only one pump unit for all protected applications, installation cost and time as well as required service interventions are considerably reduced
- The SEM-SAFE® system is ideal for both new building projects and for installation in existing facilities
- Our stainless steel pipes are extremely corrosion-proof and dirt resistant to prevent malfunctions, e.g. clogging that usually affects other types of pipes
- The high-pressure pumps are water-lubricated and hence virtually maintenance-free



Average ceiling gas temperature



Safe & reliable solution

Proven experience

The SEM-SAFE® high-pressure water mist system has proven to be the optimal fire protection solution for protecting the entire basement and car park of ANS-III, which is an addition to the Budapest Air Traffic Control Centre. One SEM-SAFE® system protects the basement, including OH2 area, such as garage, as well as OH1 and OH3 areas.

In-house design

We have the experience and technological knowledge to provide you with the optimal fire fighting solution based on fire risk analysis made for your car park. Danfoss can help with design of the right fire fighting system for the car park as well as show the performance of our SEM-SAFE® high-pressure water mist system via our live fire tests.

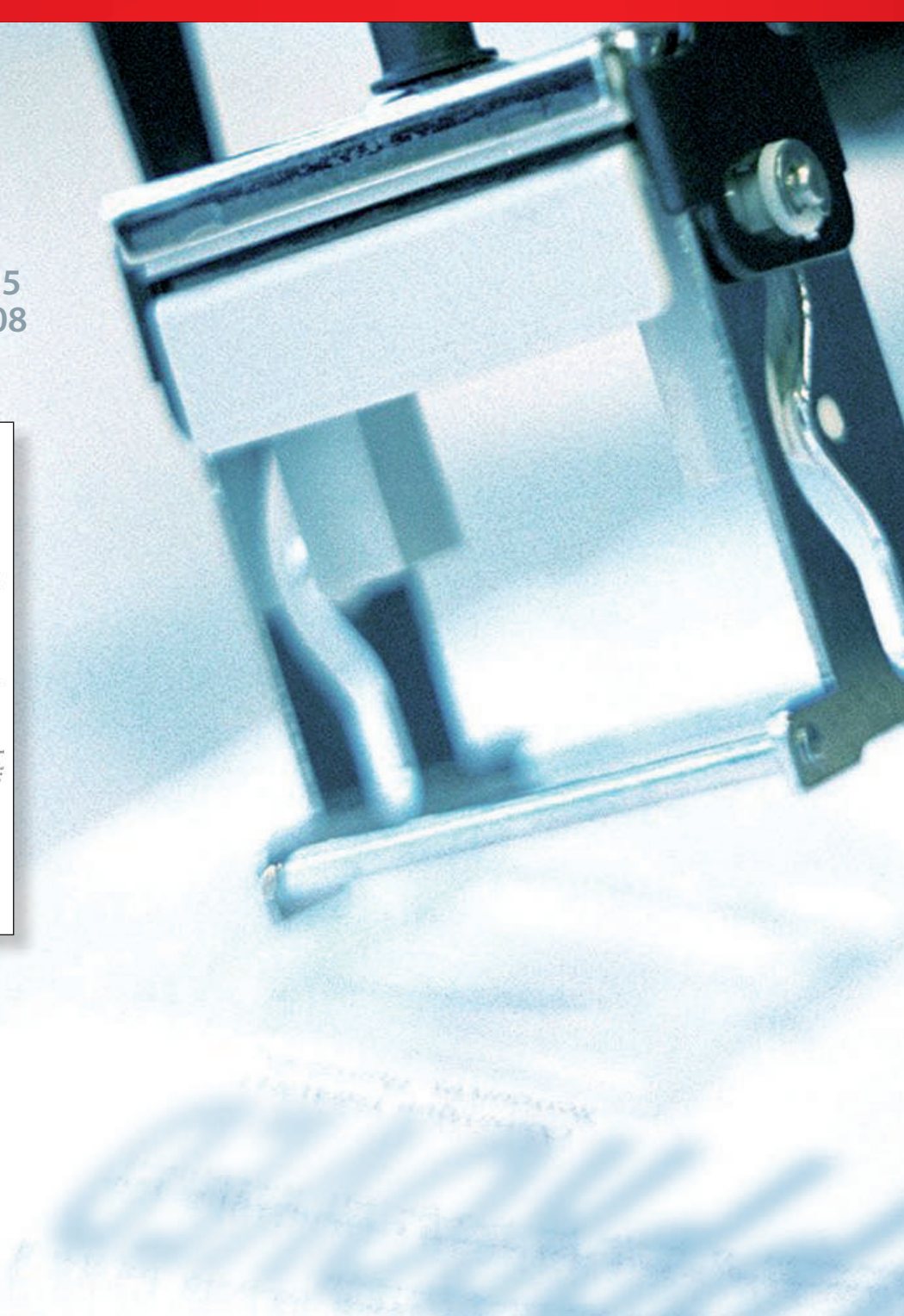
Tested and approved

We provide a unique and complete fire protection system for car parks and basement garages (OH2), fully approved by VdS, an internationally recognized authority. As a high quality and reliable system, SEM-SAFE® has successfully passed difficult fire and component test criteria.



Internal HSEQ system in accordance with

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



Zertifikat Certificate

Anerkennung von Bauteilen und Systemen

Approval of Components and Systems

Hersteller des Bauteils / Systemes:
Danfoss Service A/S
Fire Protection
Middelaldervej 9
DK-5000 Odense C

Bauteilnummer / Part number	Anzahl der Bauteile / No. of parts	gültig von / Valid from	gültig bis / Valid until	gültig für / Valid for
S 41 2004	7	01.01.2015	31.12.2015	S 41 2004

Bestimmung des Bauteils / Systemes:
Hochdruck-Feinsprüh-Feuerlöschsystem /
High-pressure fine water spray fire extinguishing
system
"SEM-SAFE"

Bestimmung:
zum Schutz von OH2-Risiken gemäß Anlage 3
for the protection of OH2-risks according to enclosure 3

Bestimmungsnummer:
VdS 2344-2005-12
VdS 2562-1997-06 Entwurf / erfüllt

Köln, den 08.08.2015

Rütermann
Geschäftsführer
Managing Director

Wilke-Valentini
Leiter der Zertifizierung
Head of Certification Office

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 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-pressure water mist nozzles

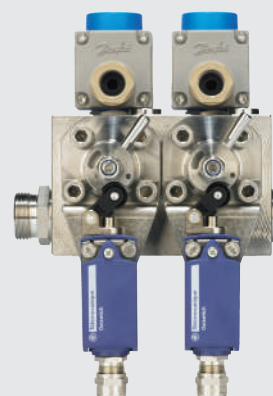
- High spacing
- 100% capacity and spray pattern tested
- Aesthetic nozzle design



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

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 CO₂.

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 CO₂.

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®

Danfoss Fire Safety A/S · Middelfartvej 9 · DK-5000 Odense · Denmark
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