

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

Equinix AM3 data centre in the Netherlands

“Digital Gateway to Europe” protected with SEM-SAFE®

Danfoss Fire Safety A/S



The Equinix AM3 Science Park Amsterdam is the third data centre built in Amsterdam by Equinix, the American provider of global carrier-neutral data centre services. The facility offers valuable data centre and service support to a worldwide business base. Construction of Equinix AM3 started in December 2011 and was completed in the third quarter of 2012.

A Danfoss SEM-SAFE® high-pressure water mist system has been chosen for the fire protection of the data centre. With no disruption to the building construction process, phase 1 of the installation of the system has been completed. As the data centre gradually expands, the system easily covers more sections.

Building description

The impressive Equinix AM3 measures 107 x 58 x 24 metres. All vital areas in the building are elevated 4.2 metres above ground level. The building has 250 interconnected networks and features a surface area for customers of 6,400 m² across 2 floors. In total the building has 4 floors, all protected with SEM-SAFE® high-pressure water mist.



SEM-SAFE® high-pressure water mist system

The excellent collaboration between Equinix, Danfoss, Unica (Danfoss Business Partner in the Netherlands) and the relevant authorities for the previous data centre, Equinix AM2, made Danfoss a trustworthy and reliable supplier of fire fighting system for the new Equinix AM3 data centre.

The protected areas comprise data halls, corridors, transformer rooms, mechanical plant rooms, switch gear rooms, generator spaces, battery rooms and UPS rooms.

The SEM-SAFE® high-pressure water mist system consists of a compact pump unit with 3 high-pressure pumps, 11 pre-action section valve systems (phase 1), and 6 pre-action section valve systems (phase 2). In the initial phase of the project, the Equinix AM3 has been fitted with a total of 826 nozzle heads, tested in accordance with the CEN/TS 14972 and VdS standard for office occupancies (OH1).

Some of the areas in Equinix AM3 are having a ceiling height of up to 8 metres. For protecting these areas, third generation drilled SEM-SAFE® high-pressure water mist nozzles have been installed. These innovative nozzles have been tested according to the VdS fire test protocol for OH1 areas with up to an 8-metre ceiling height.

The benefits of SEM-SAFE®

The SEM-SAFE® water mist system offers optimal fire protection of all areas in the data centre, simplifying operation and maintenance. The benefits of the SEM-SAFE® high-pressure water mist system are immense. The fire is put out rapidly, with minimal consumption of water and close to no water damage to the surrounding equipment and environment.

Being able to keep the data centre operating round the clock is critical. With SEM-SAFE®, the Equinix AM3 data centre can function even during a fire extinguishing process. Harmless to people, the facility does not need to be sealed off during the discharge of the water. By using a pre-action system, the reliable SEM-SAFE® water mist nozzles activate locally, only in the areas where a fire has been detected. Additionally, the design of the SEM-SAFE® system is modular, thus enabling easy system extension to cover more sections as the data centre gradually expands. The small footprint of the SEM-SAFE® pump unit also opens up more space in the Equinix AM3 centre for installation of computer equipment.

Approvals

The performance of the system has been approved by the recognized classification and inspection societies R2B Inspecties B.V. / NEN-EN 14972.

Project Manager at Equinix, Kevan Harrison, states:

"When looking for fire suppression for our new data centre in Amsterdam, following extensive market research, the SEM-SAFE® water mist system was chosen due to a mixture of good technical engineering systems, the quality of the installation, and cost. The system and engineers have matched our expectations."



Compact SEM-SAFE® pump unit installed at Equinix AM3.



SEM-SAFE® pre-action section valve placement in Equinix AM3.

ENGINEERING
TOMORROW

Danfoss

Data Centres

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

Danfoss Fire Safety A/S

Reduced cost of ownership with **SEM-SAFE®** for fire fighting

www.semsafe.danfoss.com

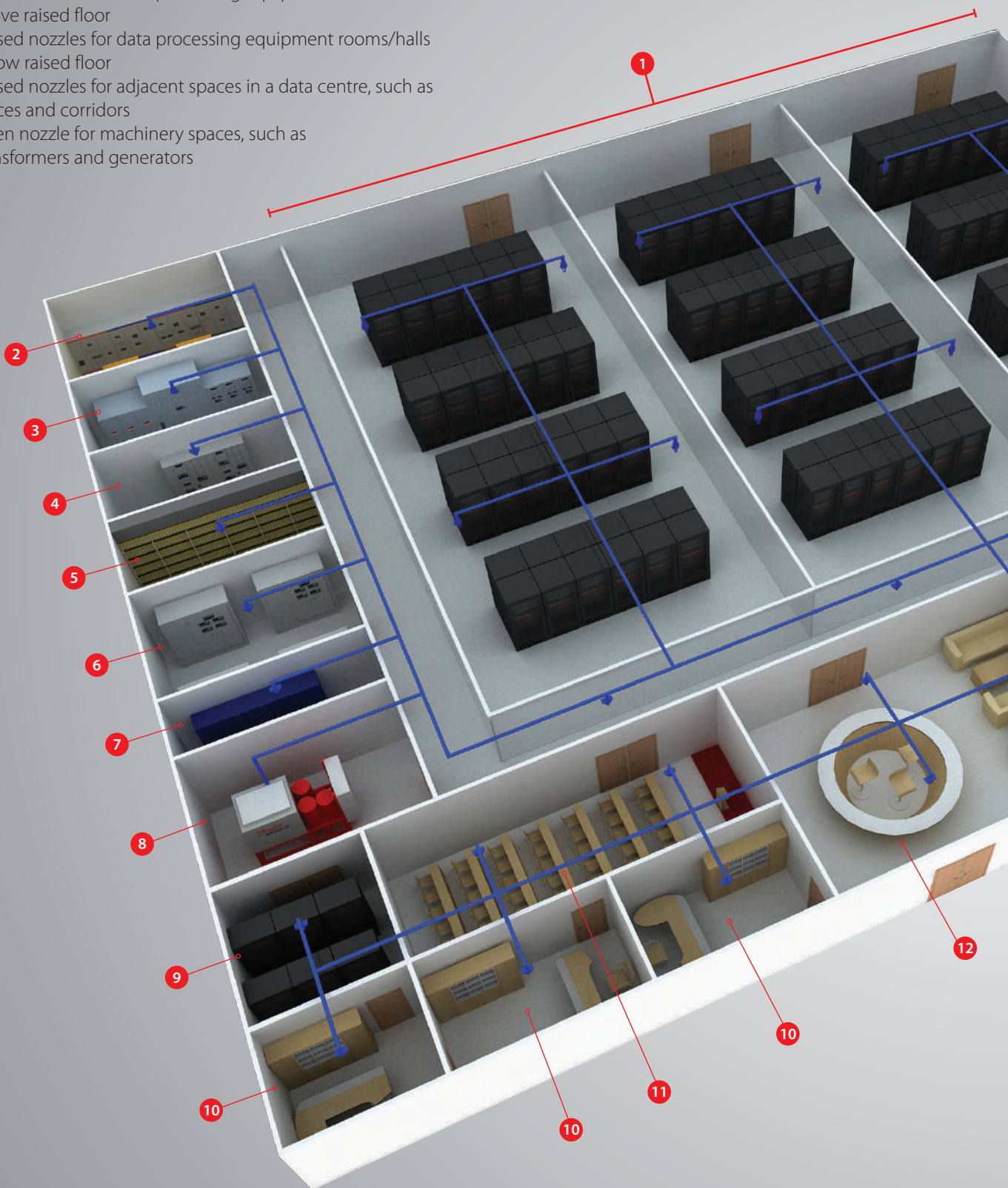
SEM-SAFE®

SEM-SAFE® high-pressure water mist system

One FM tested system to protect all areas in the data centre

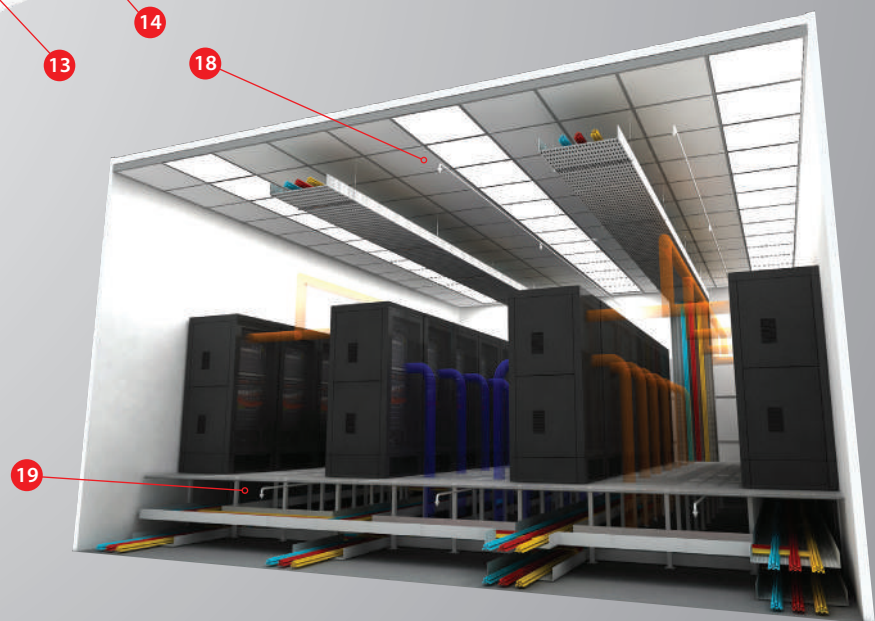
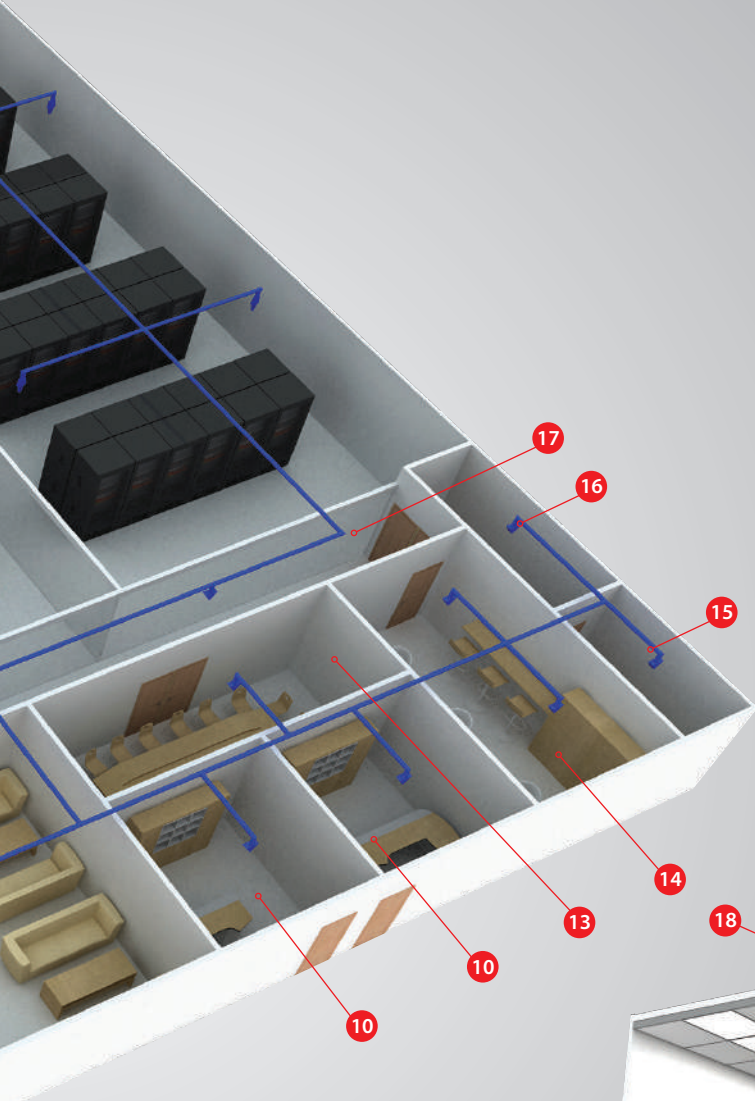
Danfoss has a complete portfolio of nozzles tested according to FM to protect any area in the data centre

- Closed nozzles for data processing equipment rooms/halls above raised floor
- Closed nozzles for data processing equipment rooms/halls below raised floor
- Closed nozzles for adjacent spaces in a data centre, such as offices and corridors
- Open nozzle for machinery spaces, such as transformers and generators



Danfoss provides fire fighting solutions for areas such as

- 1 Data hall
- 2 Transformer room
- 3 Generator space
- 4 Switchgear room
- 5 Battery room
- 6 UPS room
- 7 Technical room
- 8 Water Mist pump room
- 9 Data centre room
- 10 Offices
- 11 Auditorium
- 12 Reception area
- 13 Conference room
- 14 Canteen
- 15 Kitchen
- 16 Storage room
- 17 Corridor
- 18 Above floor application
- 19 Below floor application



Cross section – a zoom on a part of the data hall

SEM-SAFE® for data centres

Need a fire fighting system that

- Allows you to keep your data centre running while suppressing a fire?
- Provides instant cooling in the fire zone?
- Allows you to keep ventilation running?
- Has no need for shutting fire dampers?
- Permits you to keep doors to protected space open?
- Doesn't harm people?

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

Date centres are the heart of the IT infrastructure and are essential for day-to-day business operations. It is crucial that data centres are fully and properly equipped to handle a fire situation.

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

Fire protection of data centres

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



Minimal downtime

Due to the minimal water damage to surrounding equipment and the environment, minimal downtime is achieved. Furthermore you can keep your data centre running while extinguishing the fire.

Safety

The system can be discharged immediately upon detection of a fire – without any threat to human safety.

Scalable

The modular design of the SEM-SAFE® system makes it easy to extend to cover more sections as your data centre gradually expands.

Simplicity

No need to shut off ventilation before releasing the water mist system.

Reliability

Danfoss continues to invest in new approvals as well as in R&D to ensure the most efficient and reliable system performance.

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

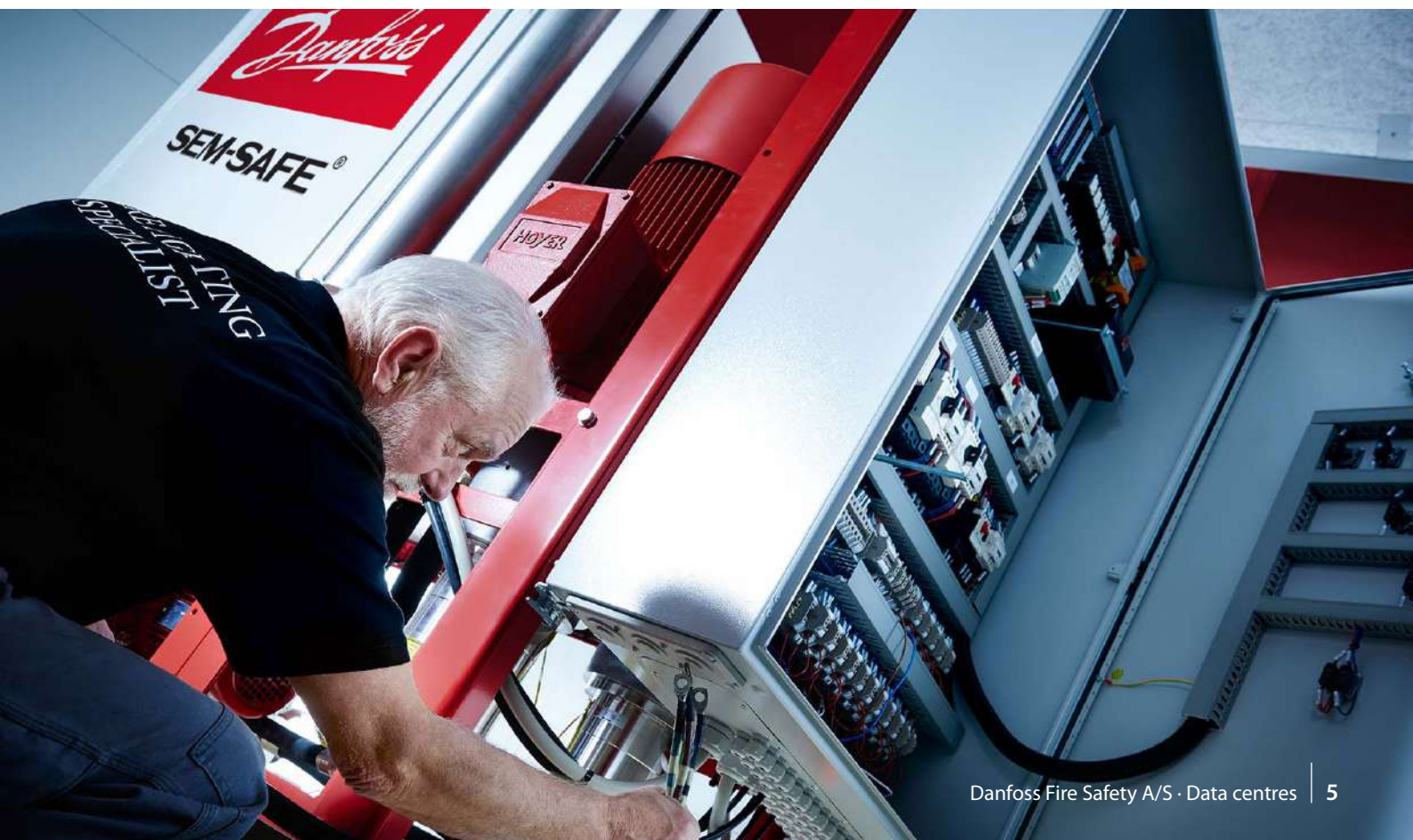
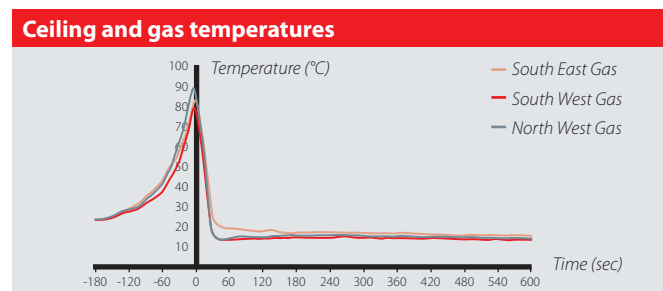
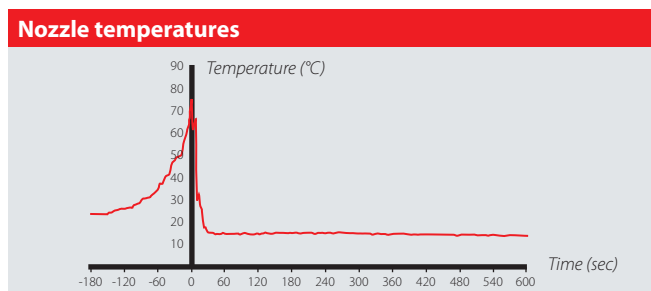
Tackles fire swiftly and efficiently

- Can be instantly activated without the need to seal off and/or evacuate the area
- Immediately cools the fire, preventing fire growth
- Water mist is documented to be harmless to electrical installations (IP23), which enables you to keep your data centre running even while fighting a fire
- With 30% fewer components compared to most competing systems, the SEM-SAFE® system is lighter and more compact. This allows for easier installation, simplified maintenance and valuable space saving
- No over-pressurisation of the fire-affected area when the SEM-SAFE® system is activated
- Only one SEM-SAFE® water mist unit needed to cover all areas of your entire data centre

Cost effective solution

- 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
- The SEM-SAFE® system is ideal for both new building projects and for installation in existing facilities
- Our high-pressure pumps are water-lubricated and hence virtually maintenance-free
- The small water droplets evaporate immediately during discharge. The result is minimal water damage to surrounding equipment and the environment, reducing operational downtime to a minimum

Superior cooling properties of the SEM-SAFE® high-pressure water mist system



Proven **experience**

Extensive reference list

For decades, Danfoss has worked successfully with high-pressure water mist for commercial and industrial applications. Mission-critical fire protection for data centres has been implemented for numerous companies all over the world.

Selected references

- Equinix, Netherlands
- Equinix (former Digital Realty Trust), France
- Digital Realty Trust, UK
- Equinix (former Telecty) Condorcet, France
- Equinix (former Telecty), Germany
- Yandex, Finland

For more references, please contact Marketing via semsafe@danfoss.com.

In-house design

We have the experience and technological knowledge to provide you with the optimal fire fighting solution based on a fire risk analysis made for your data centre.

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 by testing according to specifications from, for example, the European guideline CEN/TS 14972 and approvals from VdS, FM and DIFT.

For data centers in particular, Danfoss have received the FM Approvals Class 5560, Approval Identification Number: 3058726. Additionally, FM HC-1 approval can be used in corridors and offices approved for 5 meters ceiling height for temperature of 57°C and 68°C. The SEM-SAFE® high-pressure water mist system from Danfoss has successfully passed FM fire test for machinery spaces.

Results from test demonstrate the excellent performance of the SEM-SAFE® high-pressure water mist system in comparison with competitors:

- up to 20% less water per nozzle
- significantly less water demand in design area
- only 2 nozzles activated during tests for above floor application

Internal HSEQ system in accordance with

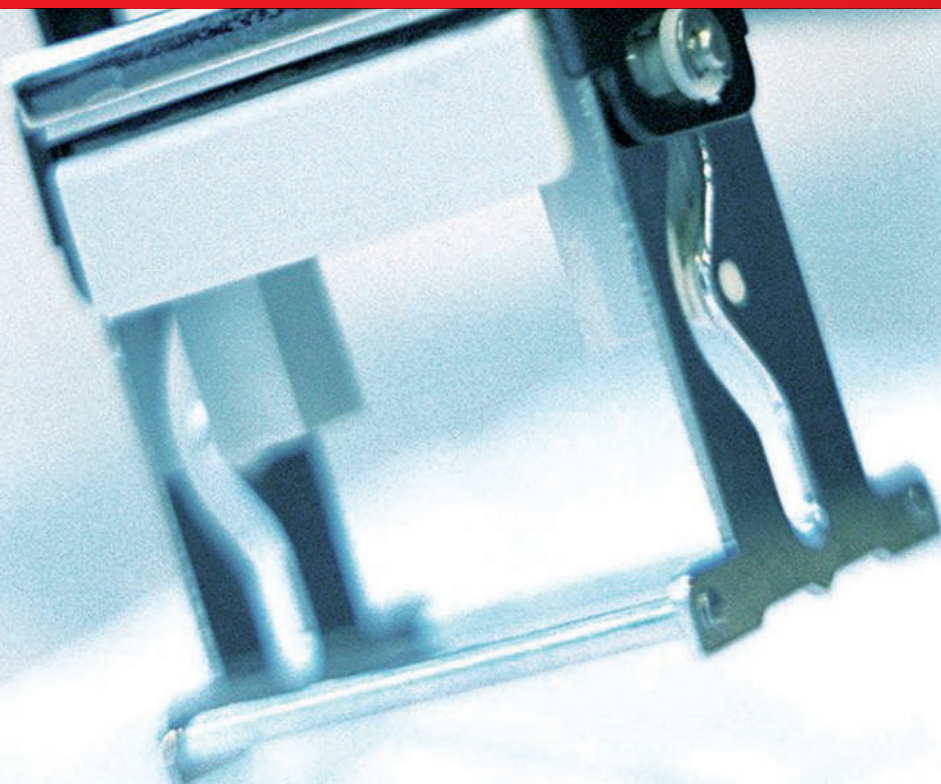
- DS/EN ISO 9001:2015
- DS/EN ISO 14001:2015
- DS/OHSAS 18001:2008



S412003
S414003



3058726



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 nozzle

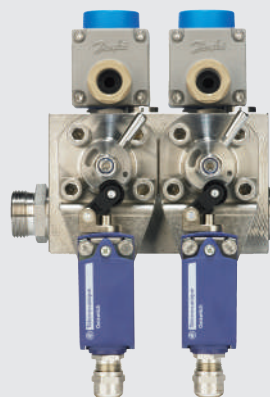
- Highest market spacing (5.5m)
- 100% capacity and spray pattern tested
- Aesthetic nozzle design



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

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
Tel. +45 7488 7800 · E-mail firesafety@danfoss.com · www.semsafe.danfoss.com

Danfoss Fire Safety A/S can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss Fire Safety A/S reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specification already agreed. All trademarks in this material are property of the respective companies. SEM-SAFE® logotype is trademark of Danfoss Fire Safety A/S. Danfoss logotype is trademark of Danfoss A/S. All rights reserved.

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

Danfoss Silicon Power in Germany

Fire safety in one of Europe's largest clean rooms

Danfoss Fire Safety A/S



Danfoss Silicon Power is an innovative designer and manufacturer of power modules for solar and wind power plants, electric cars, medical equipment, industrial and automotive controls as well as many other appliances.

Needing to keep up with the growing demand for power modules, Danfoss Silicon Power moved to a larger facility in Flensburg, Northern Germany in 2012.

Building description

The Danfoss Silicon Power building covers a total of 34,000 m². Within the building complex an area of approx. 3,900 m² was constructed and turned into one of Europe's largest single contiguous clean rooms. The clean room has been equipped with specialized production machinery, which is vital for manufacturing sensitive components.

In line with this cutting edge technology, SEM-SAFE® high-pressure water mist system from Danfoss Fire Safety was chosen for fire protection in the clean room at Danfoss Silicon Power.

The project has been a successful collaboration between Danfoss and Callies Brandbekämpfungssysteme GmbH, a Danfoss business partners for high-pressure water mist systems in Germany.



SEM-SAFE® high-pressure water mist system

For ensuring fire protection of the new clean rooms, the initial recommendation was to extend the already installed sprinkler system, which was covering the office and former production area. However, analysis indicated that a traditional sprinkler system was not a favourable solution.

The water usage was problematic, due to the fact that a traditional sprinkler system has large water consumption. Using 8 litres of water per m² per minute, a traditional sprinkler system would cause extensive water damage to the very expensive equipment installed in the clean rooms. Replacing the expensive and sensitive equipment was evaluated to take between 8 and 12 months. This would cause significant business interruption.

Our SEM-SAFE® high-pressure water mist system was evaluated to be the perfect solution for fire protection of the clean room at Danfoss Silicon Power. With approx. 2 litres per m² per minute, the SEM-SAFE® system will cause no water damage if activated. In addition, high-pressure water mist is documented to be harmless to electrical equipment, which is imperative for the high-tech clean rooms in Danfoss Silicon Power.

The SEM-SAFE® high-pressure water mist system uses very small pipes in comparison with traditional sprinkler systems. This allows for flexibility in design, faster installation and easy integration of the system with the other installations present in the clean rooms.

The attic above the clean rooms is also protected with SEM-SAFE® high-pressure water mist. Installing a traditional sprinkler for fire protection in the attic area was not possible. This is due to the fact that the water usage required by a traditional sprinkler system would make the system very heavy when activated.

The area was classified as OH2. A total of 230 SEM-SAFE® nozzles have been used.

Approvals

Design of the high-pressure water mist system was agreed and approved by a fire-consultant. The basics for the design followed the VdS standards.

As a reliable and high-quality manufacturer, Danfoss has passed successfully difficult test criteria and holds CEN, VdS and FM certificates. The Danfoss approval portfolio and the numerous references were extremely important in the process of choosing the SEM-SAFE® high-pressure water mist system.

Willibald Gabler, Director Operations from Danfoss Silicon Power states:

As a supplier to the global automotive industry, we deliver products for up to 10 million cars per year. Highly complex, singular existing production facilities would be destroyed when fighting a fire with conventional sprinkler systems due to the resulting water damage. The replacement of these systems is time consuming and costly. Triggering by false alarms must be excluded at all times. In close cooperation with Danfoss and its partner Callies Brandbekämpfungssysteme GmbH, we have thoroughly analysed the special clean room requirements and could certify the SEM-SAFE® high-pressure water mist system for our needs.



SEM-SAFE® nozzle installed in the clean room at Danfoss Silicon Power.

ENGINEERING
TOMORROW

Danfoss

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

Sachtleben Chemie GmbH in Germany

Fire protection of electronic rooms and steam turbines

Danfoss Fire Safety A/S



Sachtleben is a leading manufacturer of top-quality chemical products with a unique range of white pigments and extenders. Fire protection systems installed at Sachtleben Chemie GmbH are local application systems for protection of electronic rooms and steam turbines.

The local application system is a SEM-SAFE® fire extinguishing system. It is a fixed high-pressure water mist system approved to protect high fire risk objects or areas.



The system in the turbine house located at Sachtleben's production facility protects four steam turbines that generate electricity produced from excess heat from the production. The system was installed and commissioned in April 2008 in corporation with our business partner in Germany: Callies Brandbekämpfungssysteme GmbH.

During normal operation, the system is powered by two PAH 50 high-pressure pumps mounted on the SEM-SAFE® high-pressure pump unit. To fulfil Sachtleben Chemie's specifications, the system has been customized with the possibility to feed the pipe and nozzle system from a fire truck equipped with a super power pack from Callies Brandbekämpfungssysteme GmbH. This ensures full system redundancy.

SEM-SAFE® high-pressure water mist system

The pipe and nozzle system for each turbine consists of four local application nozzles placed above and four nozzles placed below the turbine plus two additional nozzles for protection of the turbine oil lubrication systems. The system is operated manually from either locally placed alarm push buttons or an operation panel in one of Sachtleben's operation centres.

Several electronic rooms, production lines and service areas are also protected by local application systems, powered by only two fire trucks equipped with "Super Power Packs" from Callies Brandbekämpfungssysteme GmbH. They ensure water supply on more than 180 nozzles all over the facility since 2003.

High-pressure couplings in wall cabinets ensure safe connections from the Callies fire truck to the SEM-SAFE® fixed installations with dry piping.

The Callies fire trucks are equipped with special high-pressure water mist jet nozzles on 100 m hoses which have a very low water consumption achieving a maximum effectiveness on almost all kinds of fires. The jet nozzles from Callies are part of the built in wall cabinets with a length of 40 m hoses.

The customer is very pleased with the combination of the Callies and SEM-SAFE® high-pressure water mist system for fire fighting from Danfoss.



SEM-SAFE®

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

Danfoss Fire Safety A/S can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss Fire Safety A/S reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specification already agreed. All trademarks in this material are property of the respective companies. SEM-SAFE® logotype is trademark of Danfoss Fire Safety A/S. Danfoss logotype is trademark of Danfoss A/S. All rights reserved.