ENGINEERING TOMORROW

Application of High Pressure Water Mist Fire Protection Systems in Data Centres, A Case Study

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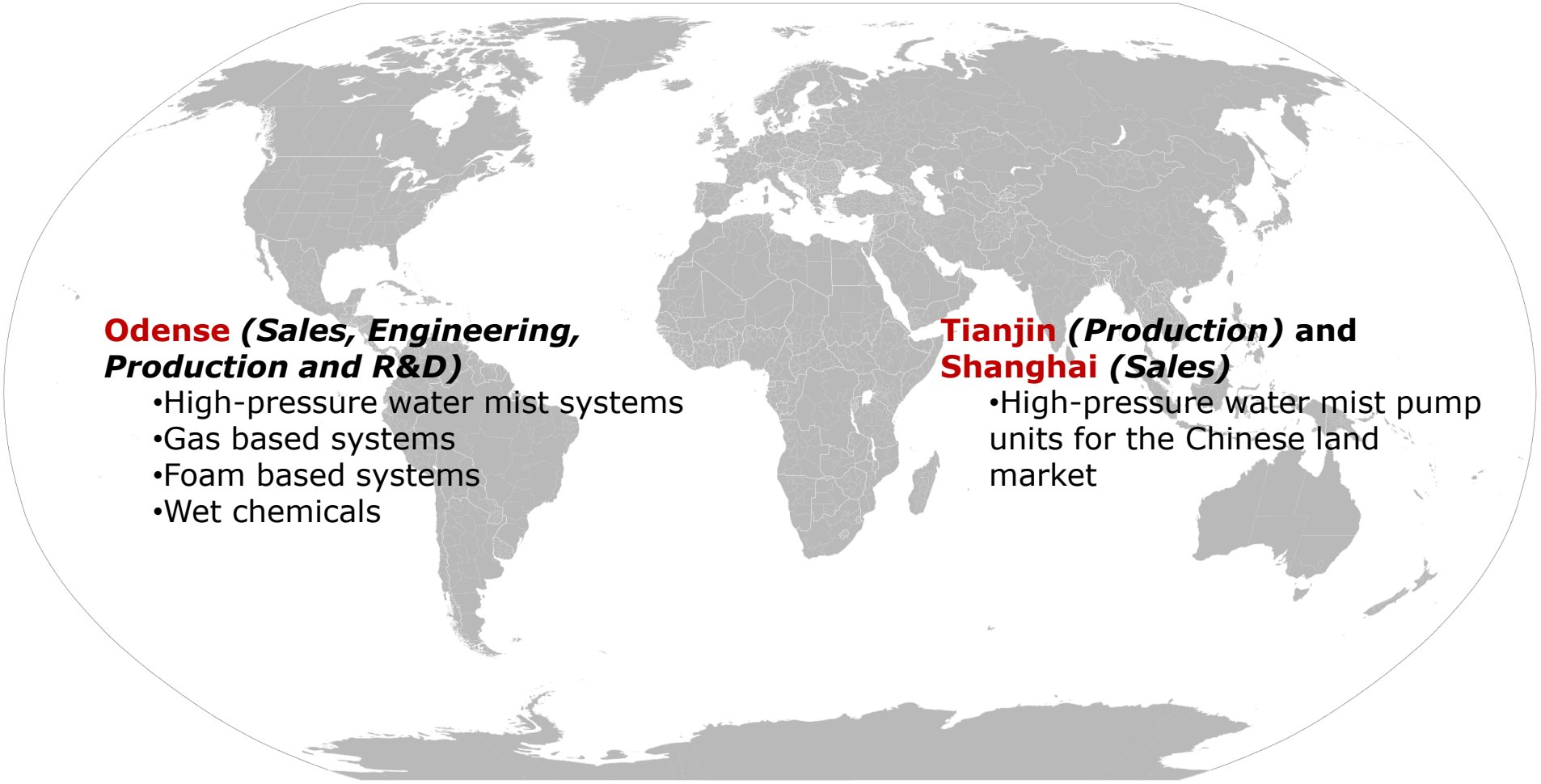
Introduction

- Danfoss Semco A/S is part of the Danfoss Group
- Formed from two **world leaders: Danfoss & Semco Maritime**
- Global leader in the sales, development, production and service/ commissioning of **certified fixed fire fighting systems**
- Supplier for both the marine and land segment

>50

Years expertise in fire fighting

Danfoss Semco A/S locations



Odense *(Sales, Engineering, Production and R&D)*

- High-pressure water mist systems
- Gas based systems
- Foam based systems
- Wet chemicals

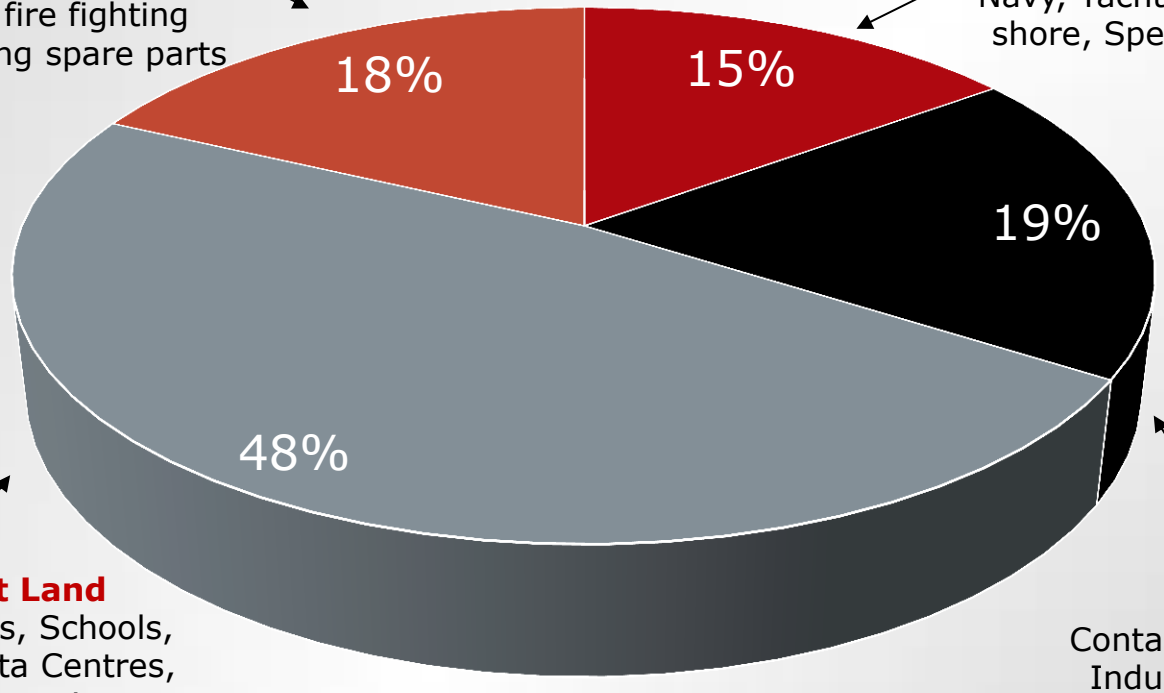
Tianjin *(Production)* and Shanghai *(Sales)*

- High-pressure water mist pump units for the Chinese land market

Business Areas

Service
Service and reparation of certified fixed fire fighting systems, inlcuding spare parts

Water Mist Marine
Navy, Yachts, Cruise, Off-shore, Specialised ships

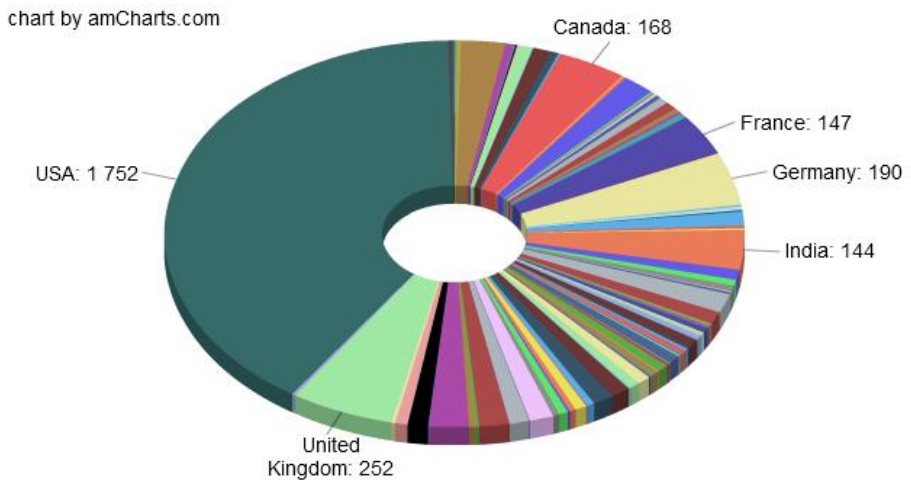


Water Mist Land
Hotels, Hospitals, Schools, Universities, Data Centres, Offices, Automotive

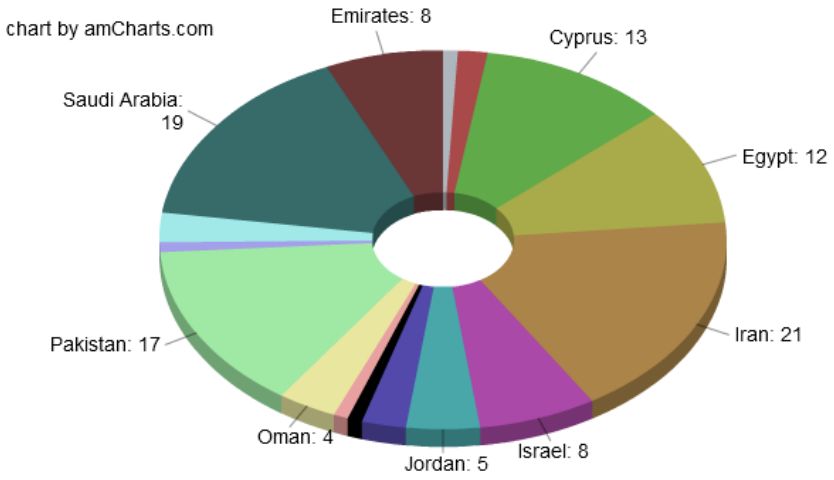
CO_2
Containers, Car carriers, Industrial applications

Currently there are **4359** colocation data Centres from **122** countries in the index.

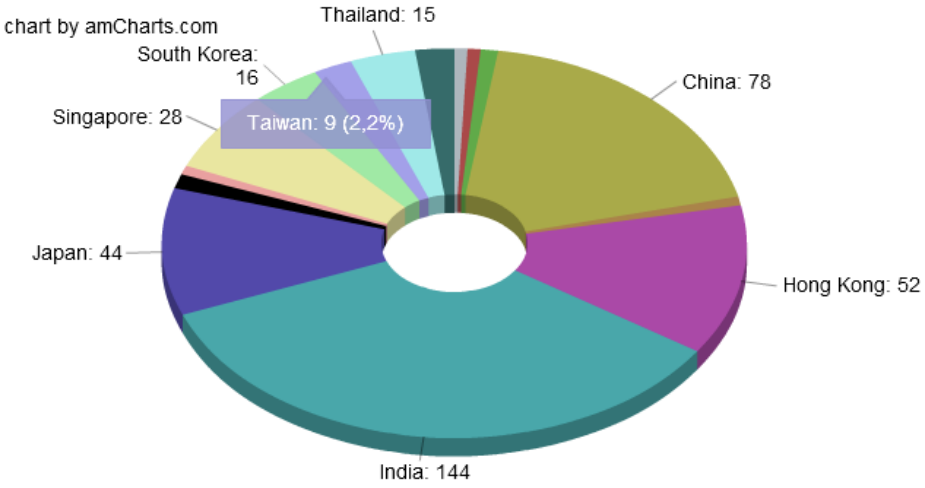
World



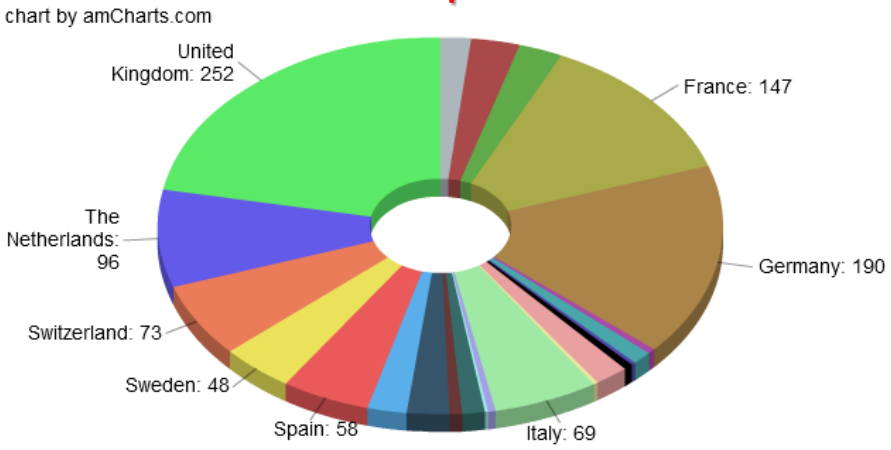
Middle East



Far East

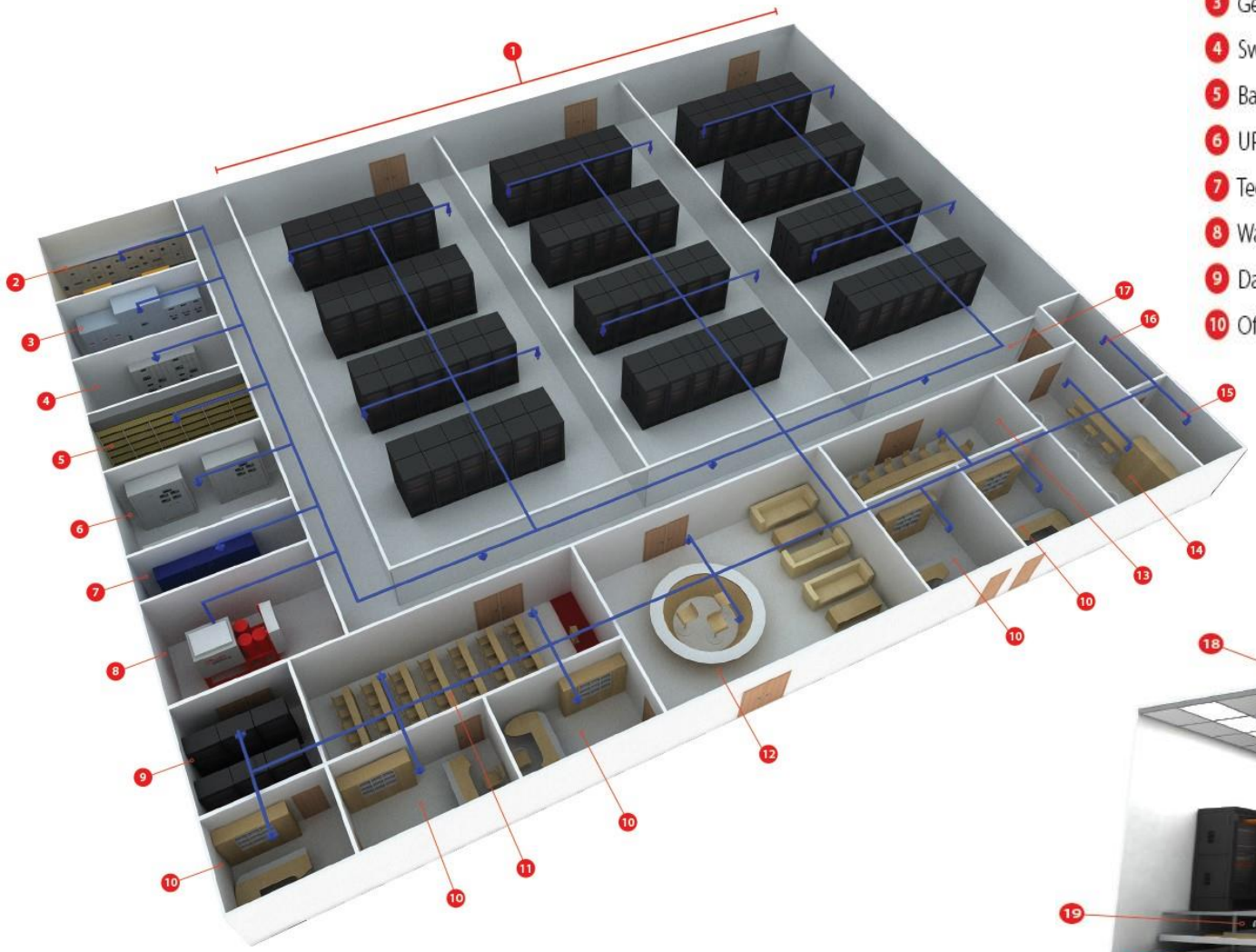


Europe



Why is SEM-SAFE® so **efficient** in data Centre?

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

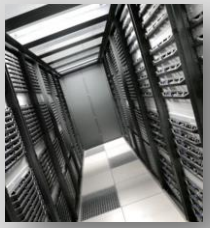


Cross section – a zoom on a part of the data hall

DATA Centre FIRE RISKS

- Fire protection for modern data centres is complex, the protection concept needs to be based on the level of acceptable risk for the data centre user.

- Expected Fire Risks





  - Digital Equipment
  - Wire and Cable Containment
  - HVAC Equipment
  - Raised Floors or Suspended Ceilings
  - Other Combustibles (Packaging)
- A comprehensive protection concept should be developed to address expected fire risks, rather than simply meeting local codes and regulations, provides a robust approach to meet these goals.

CHOOSING THE CORRECT SOLUTION

- There are major conditions to be taken into account in terms of designing a fire protection solution for a Data Centre:
  - a) identify/localise the presence of a fire
  - b) communicate the existence of a fire to the occupants and authorities
  - c) control and finally extinguish the fire
- Prior to selection, the design engineer needs to clarify following hazard influencing aspects…

a) Will the data centre have false floors / false Ceilings?

b) Will it have high ceilings?

c) Will that area be manned or unmanned?

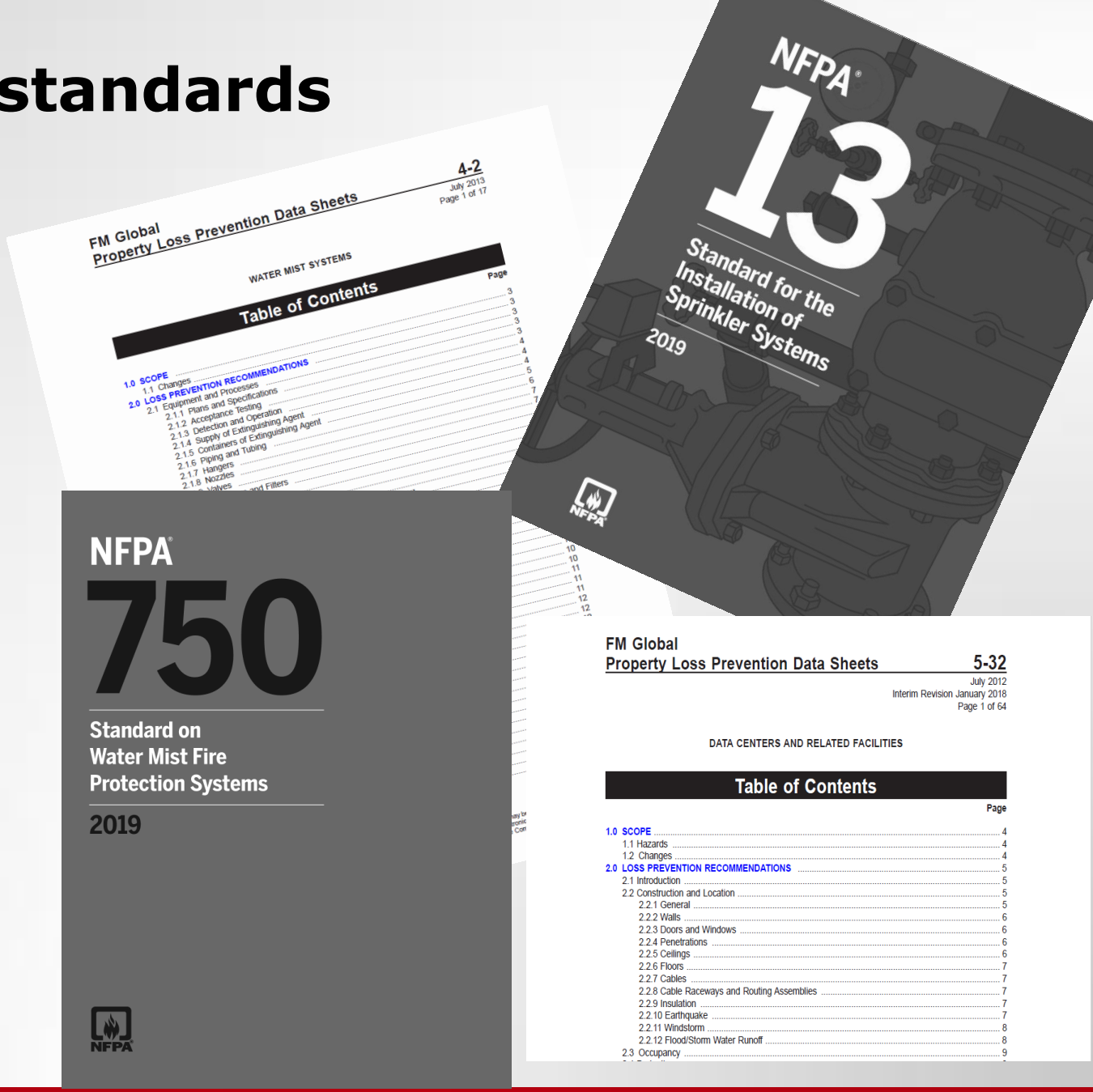
d) Will the detection of fire be obstructed in any way?

e) Will the water spray be obstructed in any way?

f) How to integrate the extinguishing system in the entire fire protection concept (cause & effect integrity…) ?

Codes and standards

- US Standards :
  - NFPA750
  - NFPA13
  - FM DS 4-2
  - FM DS 5-32
  - FM 5560
  - UL

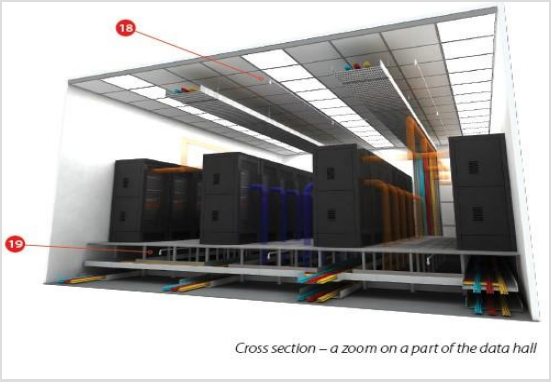


Codes and standards

- EU Standards :
  - CEN TS14972 (EU)
  - EN12845 (EU)
  - CEA4001 (Ins)
  - BSI (UK)
  - VDS (Germany)
  - D2 APASAD (FR)

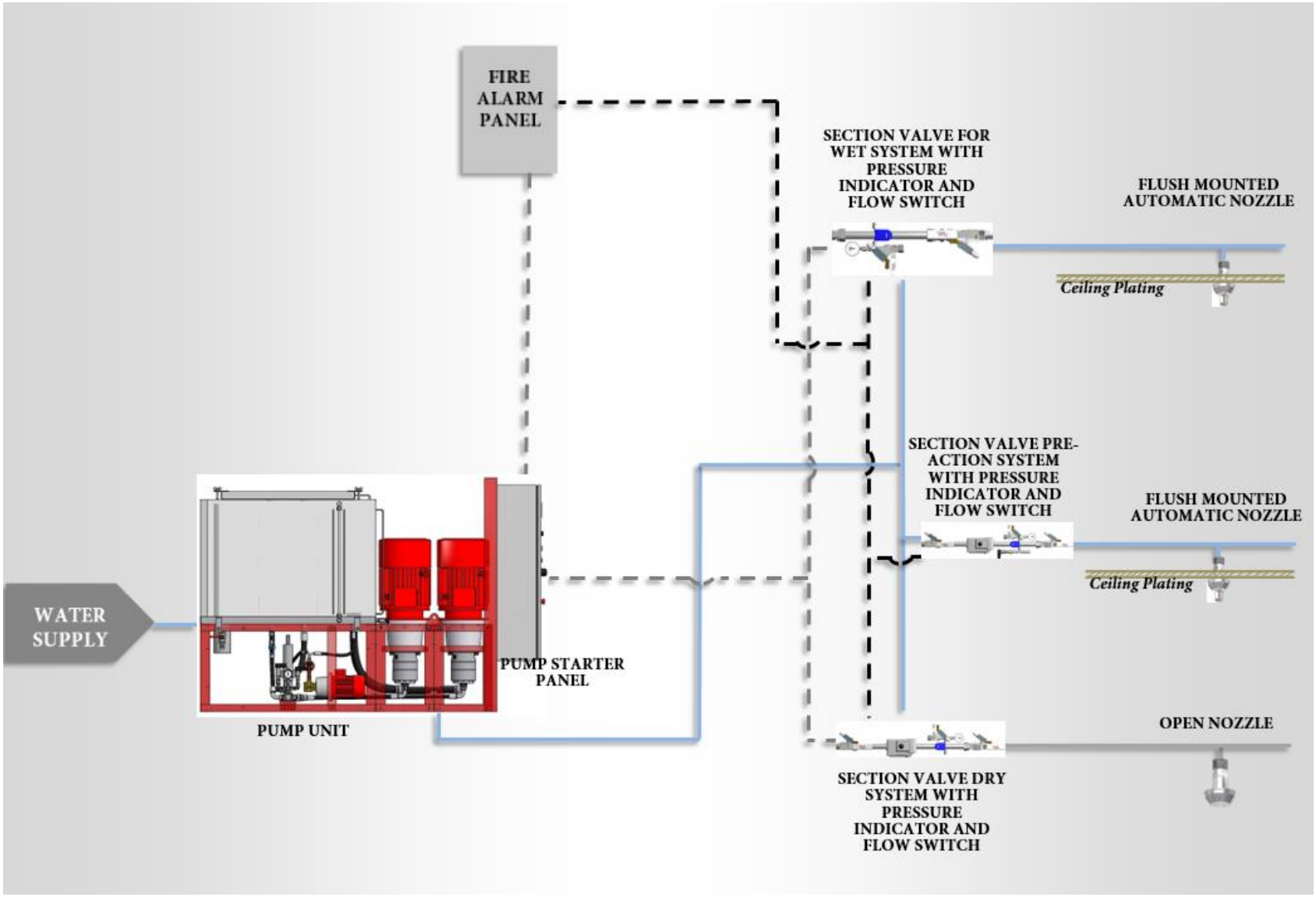
Data Centre fire protection

Specific for data Centres	Objective HPWM	Principle of protection
• **One could consider three major areas of protection of the Data Room:** ❑ Floor void ❑ Ceiling void ❑ Data Hall	• **Data Rooms :** ❑ Extinguishing fire ❑ Minimum duration of the system 60 minutes • **Machinery spaces :** ❑ Extinguishing fire ❑ Minimum duration of the system 30 minutes	• **Public Spaces :** ❑ Offices WET system ❑ Corridors WET system • **Data Rooms :** ❑ Pre-action system with single or double interlock detection system. • **Machinery spaces :** ❑ Total flooding or local application system with a detection system

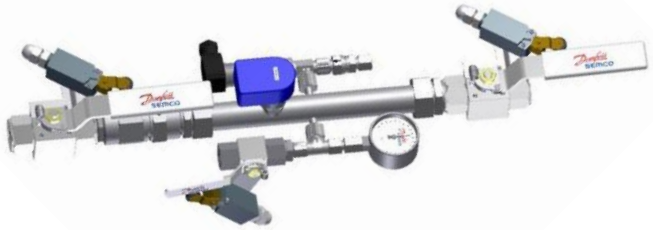


Cross section – a zoom on a part of the data hall

Principle diagram

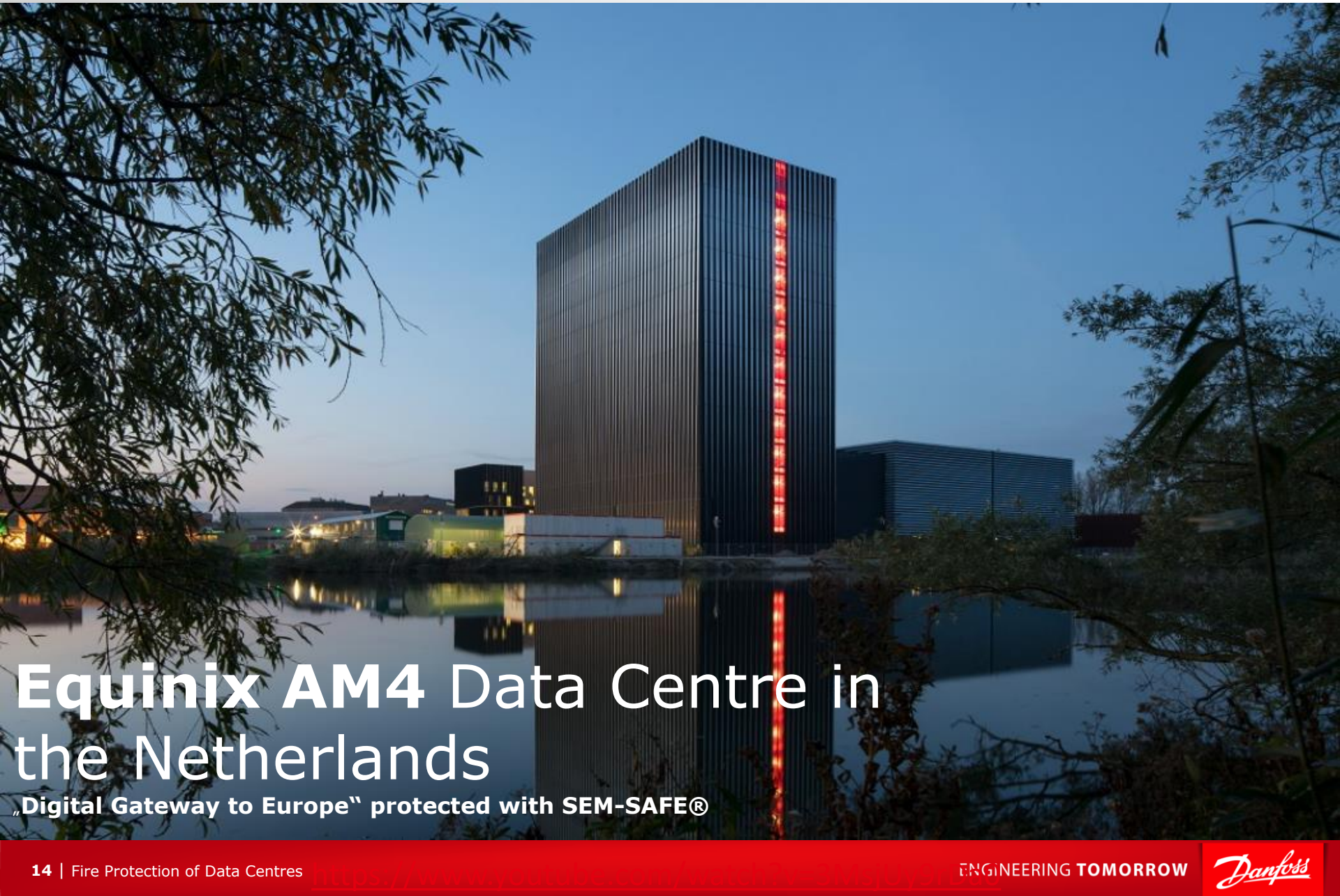


SEM-SAFE® key components



- Compact pump unit
- Highly-corrosion proof valves
- Unique nozzle design

How does it look like in real…?

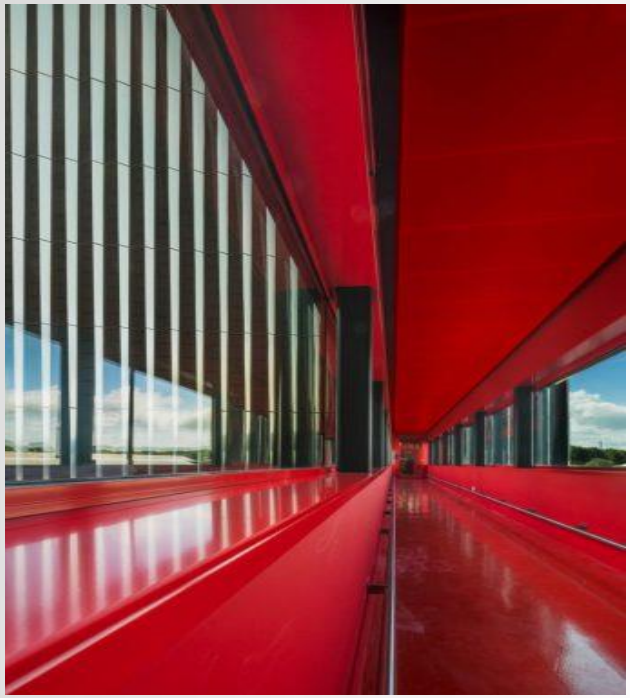


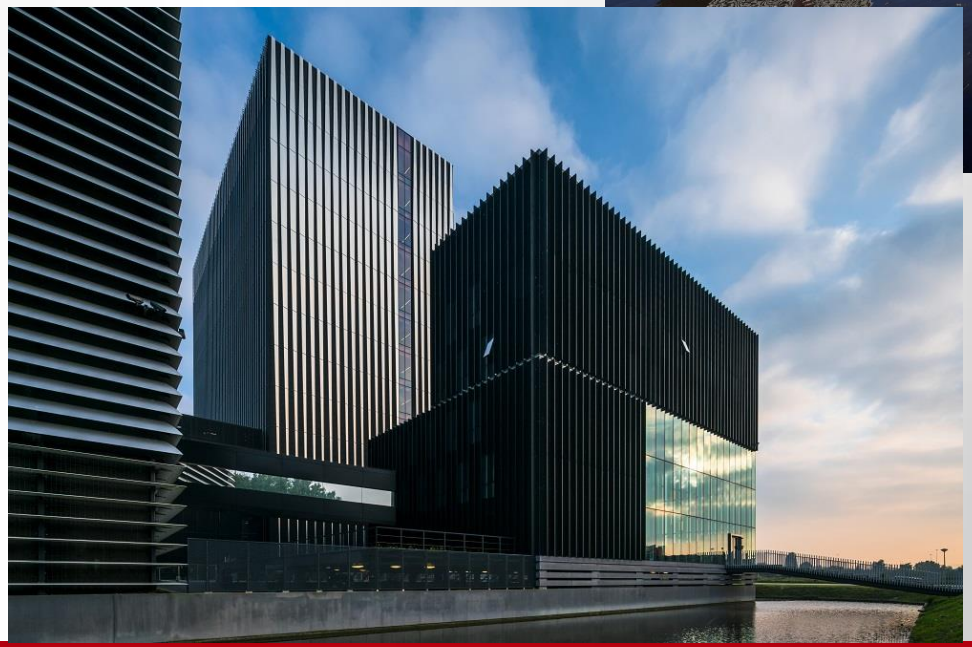
Equinix AM4 Data Centre in the Netherlands

„Digital Gateway to Europe" protected with SEM-SAFE®

- AM4, the new and 4th data centre built in Amsterdam by Equinix, makes the invisible visible.

- The tower with a height of 72 meters has been opened in summer 2018 on the Science Park, an academic campus in Amsterdam.



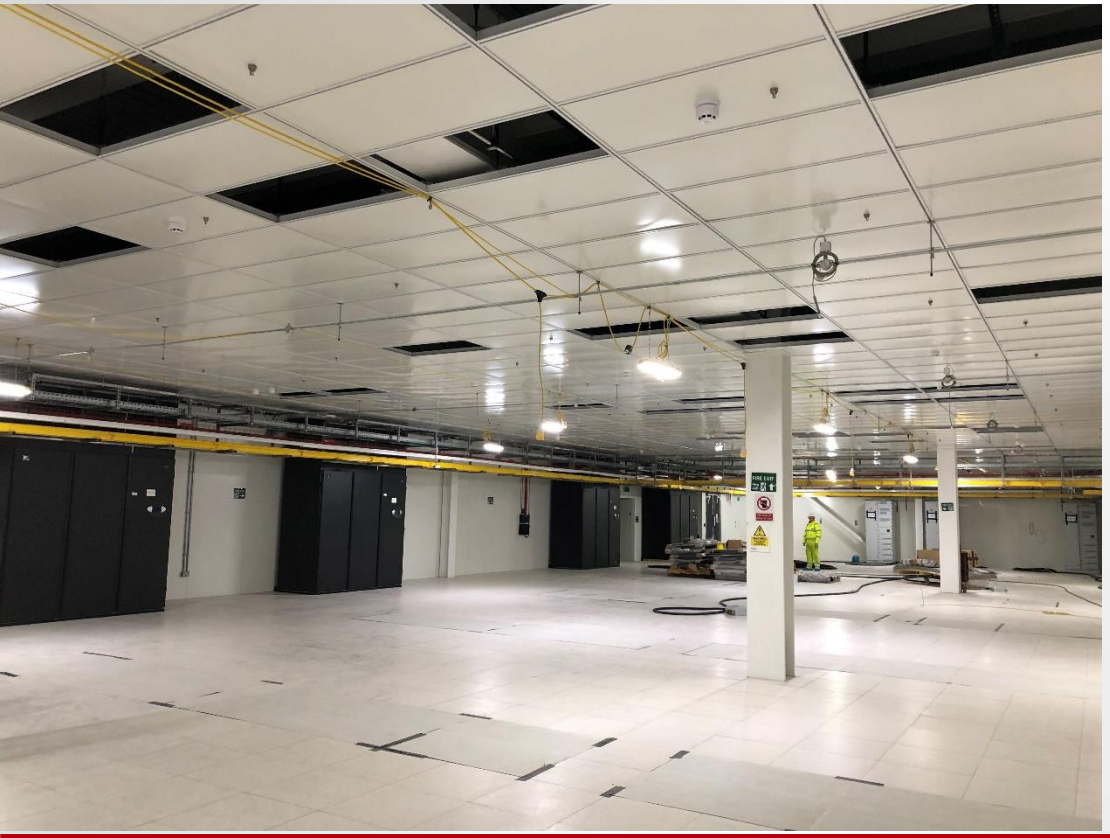


- The new building is Equinix's second data center on the Amsterdam Science Park. The campus processes about 38 percent of all Dutch data traffic.
- In 2012, the first data center (AM3) was opened, with horizontal lamellae which is also protected by SEM-SAFE® High Pressure Water Mist System, and now the tower - AM4 with 24.000m² of server space - has been added.
- The buildings are linked by bridges.

Building description

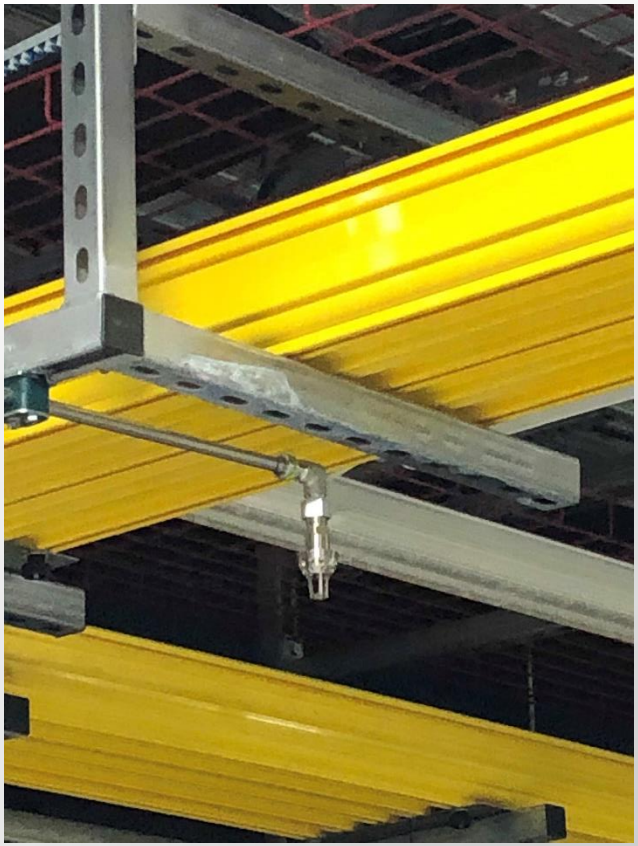
- The abstract data cloud is wrapped in an impressive tower where 12-storeys of servers facilitate internet traffic and data storage 24 hours a day.

- The data halls are all protected by a pre-action system.



Building description

- The halls, divided in 12 floors, will have space for 1,550 cabinets in its first phase and 4,200 when fully built out, with a usable floor space of 24,000m².



SEM-SAFE® high-pressure water mist system

- The remaining protected areas comprise, 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 5 high-pressure pumps
  - 35 pre-action/wet/deluge section valve systems
  - a total amount of 906 nozzle heads (closed/open)

Benefits of SEM-SAFE®

- With SEM-SAFE®, the Equinix AM4 data centre can function even during a fire extinguishing process. Ventilation can run all the time
- No need to seal off and/or evacuate the area. No need for being gas-tight
- Immediately cools the fire
- Harmless to electrical equipment and to human beings
- No over-pressurization of the fire-affected area when the SEM-SAFE® system is activated. No need for fire dampers
- 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 AM4 data centre for other commodities.

Approvals

- Meanwhile For data Centres in particular, we have recently received the FM Approvals Class 5560, App. ID 3058726
- Additionally, FM HC-1 approval, can be used in corridors and offices approved for 5 m ceiling height for 57°C and 68°C
- Successfully passed FM fire test for machinery spaces.

FM APPROVED

Certificate of Compliance

This certificate is issued for the following:

Water Mist System

System Designation:	SEM-SAFE® Water Mist Systems for the Protection of Data Processing Equipment Rooms/Halls
Design, Installation, Operation and Maintenance Manual:	SEM-SAFE® Water Mist Fire Fighting Systems for Protection of Data Processing Equipment Rooms/Halls Design, Installation, Operation, and Maintenance Manual, Document ID: 46-0001-511-04, Revision: 4, Date of Issue: June 2018

Prepared for:

DANFOSS SEMCO A/S
MIDDELFARTVEJ 9
ODENSE C
DK-5000 DENMARK

Manufactured at:

DANFOSS SEMCO A/S
MIDDELFARTVEJ 9
ODENSE C
DK-5000 DENMARK

FM Approvals Class: 5560

Approval Identification: 3058726 Approval Granted: July 11, 2018

To verify the availability of the Approved product, please refer to www.approvalguide.com

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

David B. Fuller
VP, Manager – Fire Protection Group
FM Approvals
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FM Approvals
Member of the FM Global Group

Equinix AM3 Data Centre, The Netherlands

Iliad/Free France

Saint Dennis Data Centre, France

PROJECT NAME	PARTNER	COUNTRY	YEAR (Delivery)
Airbus Sera	Atlantique Automatismes Incendie	France	2018
Data Centre Bruxelles	Sonatech	Belgium	2018
AIRBUS DATA Centre	Sonatech	France	2018

Our promise

Earn customer loyalty

Our vision

Be a front runner in fire fighting

Our position

We engineer a wide range of fire fighting systems across gas and high-pressure water mist applications under the brand name SEM-SAFE®.
The SEM-SAFE® fire fighting systems are the optimal solution for any vessels and building type.

SEM-SAFE® by Danfoss

Engineering a safer tomorrow in fire fighting

THANK YOU

ENGINEERING
TOMORROW

Danfoss Semco A/S, Member of the Danfoss Group

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www.semsafe.Danfoss.com