MINIMAX

Experts in fire protection

Fire protection for **Data Centers & IT**

Custom fire protection solutions for every application.

INDUSTRIES | DATA CENTERS

Protection for systems

that have to stay online.

Data centers are the nerve centers of the digital economy. Every failure, every damaged component has direct consequences: for data availability, for operating continuity, for the reputation of the operator. At the same time, data centers concentrate more energy, more heat and more flammable materials in a small space than almost any other type of operation. Minimax develops integrated fire protection solutions that cover everything from server rooms to substations.

What is the most expensive fire that can impact a data center? It's not necessarily the biggest. It's the one that can break out in the wrong place at the wrong time.

Typical causes of fire

An overheated server in a cooling loop system that began to smolder unnoticed. A short-circuit in the UPS system at 3 a.m. that did not alert anyone. A leak in the cooling system that came into contact with hot surfaces.

Complex risks in confined areas

Data centers are highly complex systems in which energy, heat and sensitive electronics come together in a very confined area. The fire load is high: high-density wiring, synthetic materials in abundance, cooling systems that are under strain around the clock. Overheating creeps up gradually; short circuits in a flash. A fire protection system must be able to cover all possible risks - only then can it provide adequate protection.

The entire infrastructure must be covered: substations, UPS rooms, and emergency power systems all pose different fire risks. If a fire breaks out in any of these areas, the entire data center will go down, regardless of how well the server rooms themselves are protected.

Our solution: comprehensive fire protection

Minimax develops integrated protection schemes for data centers based on a detailed risk analysis of the entire infrastructure. HELIOS smoke aspiration systems identify smoldering fires before they are visible. Oxeo inert gas extinguishing systems fight fires without leaving a residue and without further damage to the hardware. Minifog water mist systems protect personal safety with minimum use of extinguishing water.

Fire alarm control panels coordinate all systems. Water or gas, early detection or fire prevention: Minimax manages all relevant technologies and selects the correct solution for each protection goal. Planning, installation, and service are all provided from a single source.

We accompany operators from A–Z:

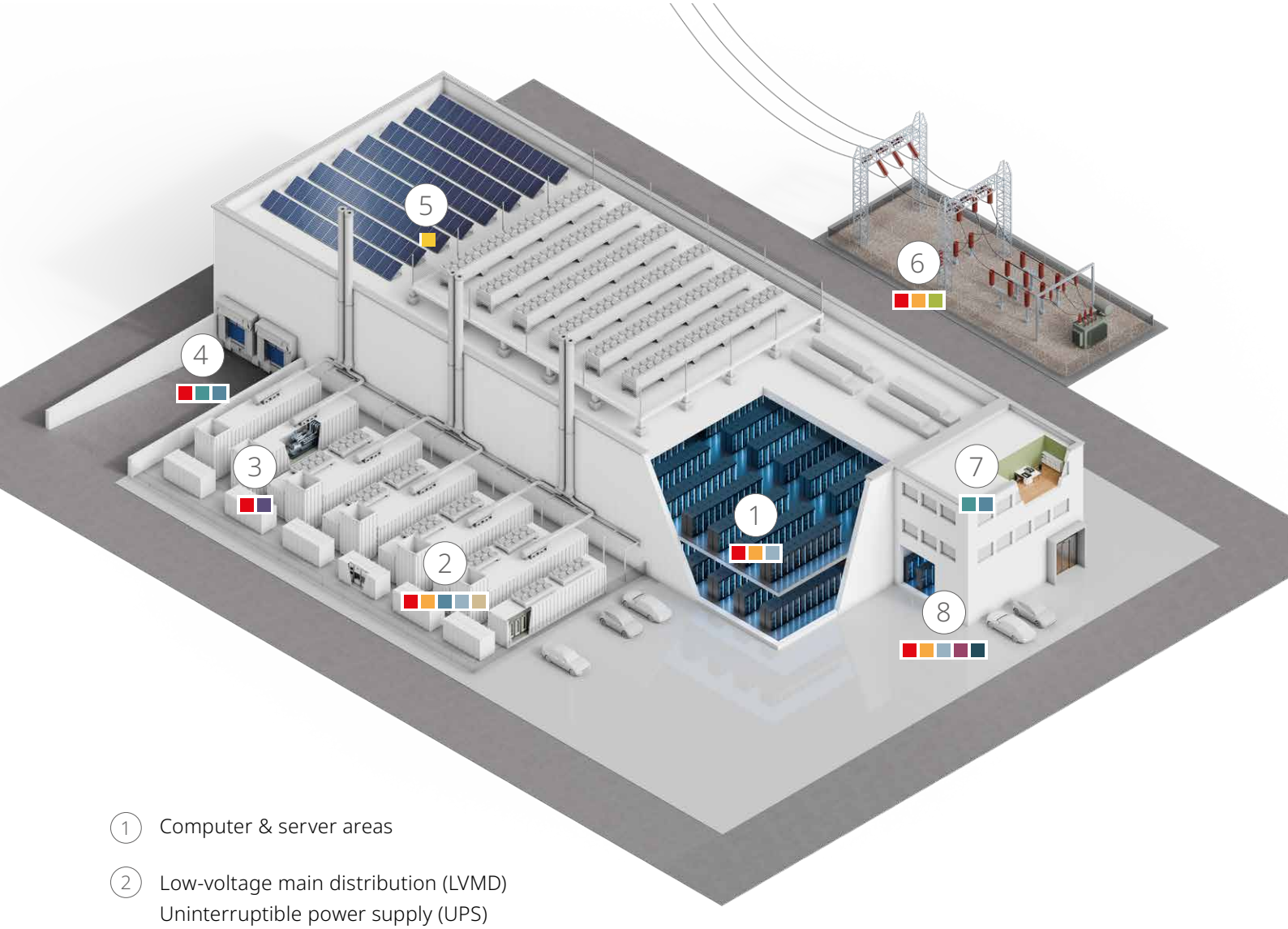
Risk analysis & engineering:
Systematically record all risk potentials

Planning & system design:
Tailored concepts according to international standards

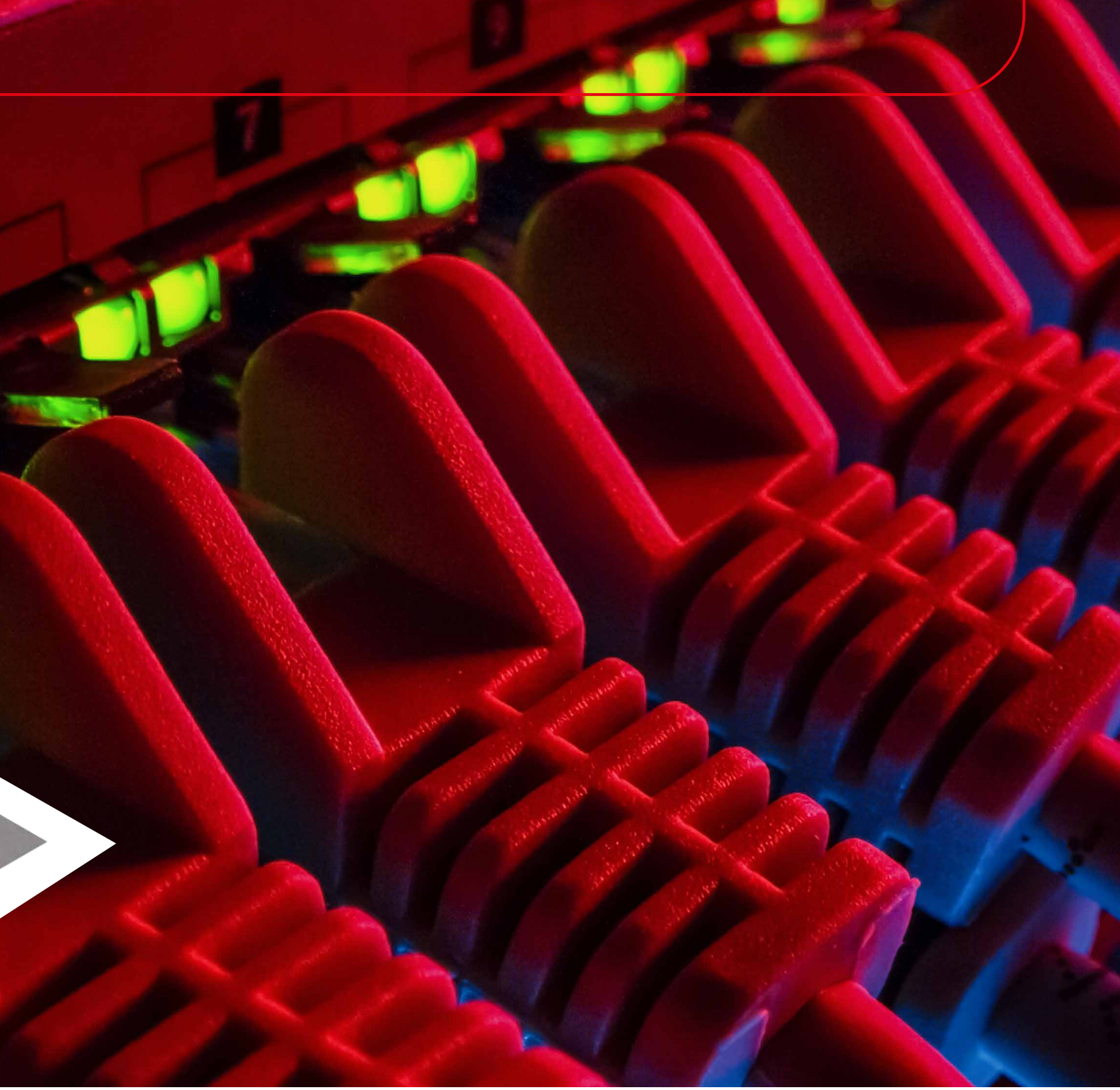
Installation & commissioning:
Professional implementation from a single source

Maintenance & upgrades:
Comprehensive service for permanently high operational security

A data center consists of many protection zones, not just one. Each part of the infrastructure has its own risk profile, its own fire loads, its own requirements for detection and extinguishing. What is good for the server facility is less helpful in the substation. Minimax understands these differences and develops the right solution for each area: certified, proven, and from a single source.



1. Computer & server areas
2. Low-voltage main distribution (LVMD)
   Uninterruptible power supply (UPS)
3. Emergency power systems (EPS)
4. Delivery & storage areas
5. Photovoltaic system
6. Substation
7. Office & recreation rooms
8. Building systems & server rooms



- Fire detection and suppression control systems
- Oxeo inert gas suppression systems (Ar/N_2)
- PVProtect
- Deluge systems
- Hydrant systems
- Sprinkler systems
- Minifog ProCon low-pressure water mist extinguishing systems
- Minifog ProCon XP high-pressure water mist extinguishing systems
- MX 1230 extinguishing systems
- CPS 1230 cabinet protection system OneU fire protection system
- Inveron hazard management

Computer/server areas & cooling loop systems

1

Server rooms are the core of the data center, and the goal is to protect them at any cost. High energy density, intensive heat build-up and high-density wiring create fire loads that can only be managed with suitable fire protection technologies. Even small faults have immediate impacts on availability, and this is precisely why fire protection cannot be compromised.

Risks

- Heat nests due to overloaded or insufficiently cooled components
- Short circuits, technical defects, thermal overload of active electronic components
- Concealed fire growth in false floors and cable ducts

Fire protection

Those who rely on maximum uptime choose Oxeo inert gas fire suppression systems: they leave no residue, cause no damage to hardware, and are back up and running quickly after suppression. Minifog water mist fire suppression systems are safe for people, provide excellent cooling, and do not require the structural modifications needed for a gas system. HELIOS smoke detection systems detect fires even before they become visible.

Electrical infrastructure (LVMD, UPS)

2

The data center is more than just a server room. UPS rooms with lithium-ion batteries ensure an interruption-free power supply. LV main distribution containers distribute the energy. Cooling systems stabilize the temperatures in the server rooms. If one of these areas fails, the entire data center comes to a standstill, regardless of how well the server rooms themselves are protected.

Risks

- Overheating of technical equipment and electronics
- Short circuits in switch and distribution systems
- Lithium-ion batteries in UPS rooms: thermal runaway as uncontrolled fire risk
- Significant operating failures even with small fires in these zones

Fire protection

Oxeo inert gas extinguishing systems protect LV main distribution zones and cooling plants without leaving any residue – even in compact container solutions. Halocarbon type MX 1230 extinguishing systems are suitable for confined installation conditions. For rooms with lithium-ion batteries, Minimax develops specific protection concepts designed for the particular fire reaction of these energy sources. Fire alarm control panels ensure early alerting and coordinate all fire extinguishing systems.

Emergency power systems (EPS)

3

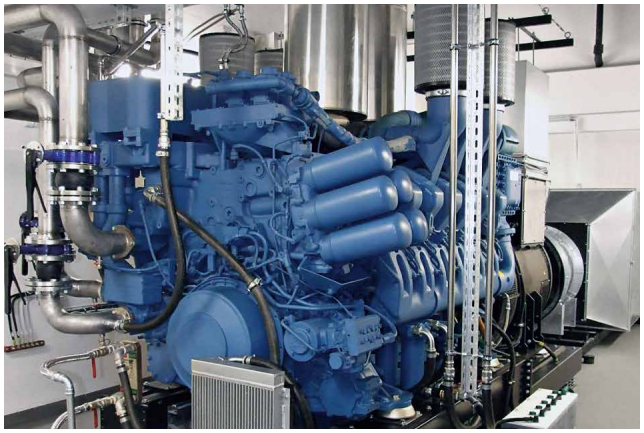
An emergency power system secures the power supply, maintains operations and prevents the economic damage of an unplanned standstill. Emergency power systems are usually housed in separate rooms or, increasingly, held as complete mobile units in containers directly on the site. Container EPSs have a key advantage: no separate building is required; they are also scalable and quickly replaced if damaged.

Risks

- Diesel fuel that ignites on hot surfaces
- Leaking lubricating oil

Fire protection

Minifog ProCon XP high-pressure water mist systems use 95 percent less extinguishing water than traditional deluge systems - and they cool hot machine parts so quickly that thermal damage does not occur.
The compact water supply unit needs little space and thus retrofitting is also easier - even in container EPSs. And because they suppress fire with water instead of gas: no evacuation, no risk of personal injury, no pressure relief flaps necessary.



Delivery & storage areas

4

In warehouse and delivery areas, cardboard boxes, cleaning supplies, IT equipment, and packaging materials are all stored in a confined space. While this may sound unremarkable, it creates a significant fire hazard: full shelves, flammable materials, and ignition sources like distribution cabinet – fires can spread quickly here. And if a fire breaks out in the warehouse, operations everywhere come to a standstill.

Risks

- Short circuits in distribution panels or cable trays
- High fire load due to the concentration of stored goods in a confined space
- Cigarette butts discarded carelessly

Fire protection

Sprinkler systems are the top choice for logistics areas – installed either on the ceiling or directly on the shelves, depending on the type of warehouse. The Minimax fire hydrant cabinet saves space and enables employees to respond quickly in an emergency. Fire alarm systems detect fires early and sound the alarm before the fire spreads.

Photovoltaic systems

5

More and more data centers are installing rooftop solar panels. Here's the problem: high-voltage DC power cannot be easily shut off in the event of a fire, the rooftops are difficult to access, and flammable insulation materials accelerate the spread of the fire. If the roof goes up in flames, everything underneath is also at risk.

Risks

- Short circuits and arcing at electrical connections
- Potential ignition sources are constantly exposed to the elements
- Flammable insulation materials in the roof accelerate the spread of fire

Fire protection

PVProtect detects fires on PV roofs early and automatically extinguishes them using specially designed PV nozzles – even when no one is on site. At the same time, the system sounds an alarm and notifies emergency responders. Flammable insulation materials in the roof pose one of the greatest risks of fire spread: PVProtect stops exactly that before the fire can work its way through the roof.

Transformer rooms & substations

6

No power, no data center. Transformers convert high voltage into operational power supply voltage and are the link between the public network and the complete infrastructure. Large data centers often operate their own substations with enclosed transformers on site to maximize power supply security and independence.

Risks

- Faults such within the transformers
- Overheating and ignition of the transformer oil
- Leakages in oil-carrying lines: coolers, oil expansion tanks, oil-filled isolators

Fire protection

TraFoProtect is a deluge system developed especially for transformers: customized nozzles are perfectly aligned with the geometry of the transformer – reducing the quantity of extinguishing water used and making the system less vulnerable to wind. Escaping oil or extinguishing water is safely retained by the collection system. Oxeo inert gas extinguishing systems use argon or nitrogen for residue-free extinguishing of enclosed transformers in substations - no additional damage to the system, quickly operational again.

Office & recreation rooms

7

Offices and recreation rooms seem harmless compared to server rooms. But fires can also develop here: from defective devices, overheated lighting, short circuits. And at night, when no-one is there, there is also no-one to see what is looming.

Risks

- Defective electrical devices such as computers or projectors
- Overheating of illumination
- Short circuits in machines or chargers

Fire protection

Sprinkler systems provide basic protection for offices and recreation areas: they are triggered independently in the heat of a fire - with no fire detector. To act earlier, more sensitive fire detectors can be used in combination with a water mist suppression system which reacts at an early stage. The fire detection and fire alarm system detects identifies the fire and takes over coordination: It alerts the fire department and automatically activates the fire extinguishing system in the affected area. Fire hoses and fire extinguishers enable employees to intervene in an emergency.

Building systems & server rooms

8

Server racks and control cabinets concentrate enormous computing power into a very small space. That is their strength—and their risk profile: the more densely packed they are, the greater the heat generation, and the higher the fire load. Complex cabling in confined spaces can cause short circuits, and systems operating at capacity overheat. Building infrastructure runs in the background—but for anyone who needs to be online at all times, a failure is not an option.

Risks

- High fire load due to compact component assembly in a very small space
- Thermal overload due to permanent high-load operation
- Short circuits in the high-density wiring

Fire protection

Fire suppression systems must also function in very confined spaces. The OneU fire protection system protects enclosed 19-inch IT racks while occupying only a single height unit (44 mm)—leaving the rest of the space free for IT components. Control cabinets are protected by CPS 1230, which was developed specifically for these environments. Both systems detect fires early and extinguish them without leaving any residue using FK 5-1-12.

Everything for the **moment** when it matters.

Whether water-based suppression systems, gas-based extinguishing systems, fire prevention systems, or fire detection systems: Minimax can draw on a unique range of tested and certified components and systems from its own development and production facilities.


FIRE
1 detector group in alarm

Gas-based extinguishing system or water mist? For data center operators this is not just a theoretical question, it is a decision with direct consequences for data availability, personal safety and investment costs. Both technologies are used successfully in this sector. However, choosing the right one depends on the protection goal: a system in which maximum data availability without interruption is essential would need a different solution from one which can prevent operational interruptions through redundancies. Minimax can do both.

Gas-based extinguishing system: maximum protection for IT

Oxeo inert gas extinguishing systems use argon or nitrogen. MX 1230 halocarbon extinguishing systems use the chemical extinguishing agent FK 5-1-12. They flood the protection zone in seconds without water, they leave no residue, no consequential damage to hardware. Following extinguishing, servers can usually return to operations immediately, no expensive drying, no cleaning, no waiting for restart.
This makes gas-based extinguishing systems the first choice if high availability is non-negotiable. They also work well with concealed fires in cable ducts or high-density racks because of the three-dimensional gas distribution. Non-conductive, residue-free, effective immediately: there is hardly a better solution for server rooms with maximum availability requirements. However, gas-based extinguishing systems have more planning and building requirements.
The protection room must be virtually gas tight. Oxygen displacement using inert gas means: people in the room must be evacuated promptly, acoustic and visual warning signals and a delay time are mandatory. Investment costs are frequently higher than for water-based solutions. Pressure relief flaps must also be installed.

Water mist: safe for people, flexible, cost-efficient

Minifog water mist suppression systems tackle fires using extremely fine water droplets. The mist cools, displaces local oxygen and suppresses the fire without needing the quantities of extinguishing water used in conventional sprinkler systems. This greatly reduces the risk of water damage to hardware and makes water mist a serious alternative for IT areas. Compared to gas-based extinguishing systems, there are also fewer construction requirements: the room does not need to be gas tight. Suppression can also take place if people are present without causing a life-threatening reduction in oxygen. System costs are lower and the supply of extinguishing water is usually easier to secure. When international operators or insurers prefer water-based solutions, Minifog is the answer.

The compromise: after activation, the affected IT components must be inspected. Restart times may be longer than after suppression with a gas-based system. For operators with a redundancy concept, the restart protocol can be easily integrated into operating processes.

Minimax can do both.

The decision of whether to use gas or water mist is not a question of which is the best system, but which is the correct protection goal. Minimax develops the right concept for every data center: based on a detailed risk analysis and in close cooperation with operators, insurers and authorities. Both technologies are developed and manufactured in-house, are VdS-approved and FM-certified, and are planned, installed and supported in full by a single provider. Whichever protection goal is followed, no compromises are made with the fire protection solutions from Minimax.

Sprinkler systems are among the most common water suppression systems and provide reliable fire protection for buildings and IT areas. The principle of selective suppression makes them particularly effective: if a fire breaks out, only the sprinklers in the immediate vicinity of the fire are opened. The fire is tackled immediately; the remaining sprinklers remain closed in order to minimize secondary damage from extinguishing water. At the same time, the fire alarm control panel activates an alarm and notifies emergency personnel.

Applications: Offices and common areas, delivery and storage areas

Deluge systems evenly flood the entire protection zone with extinguishing water. They immediately respond to fires that are spreading rapidly. They can also be used in a targeted manner so only a particular area is cooled or protected with a water spray curtain. Where necessary, a foam concentrate can be added to the water to increase the extinguishing effect.

Applications: Transformer rooms and substations

Minifog EconAqua water mist sprinkler systems protect buildings using low-pressure water mist: they are efficient, space-saving, and use up to 85% less water than traditional sprinkler systems. Water damage is kept to a minimum. The compact control unit can be connected directly to an existing sprinkler system. This makes EconAqua the ideal solution for retro-fitting existing buildings.

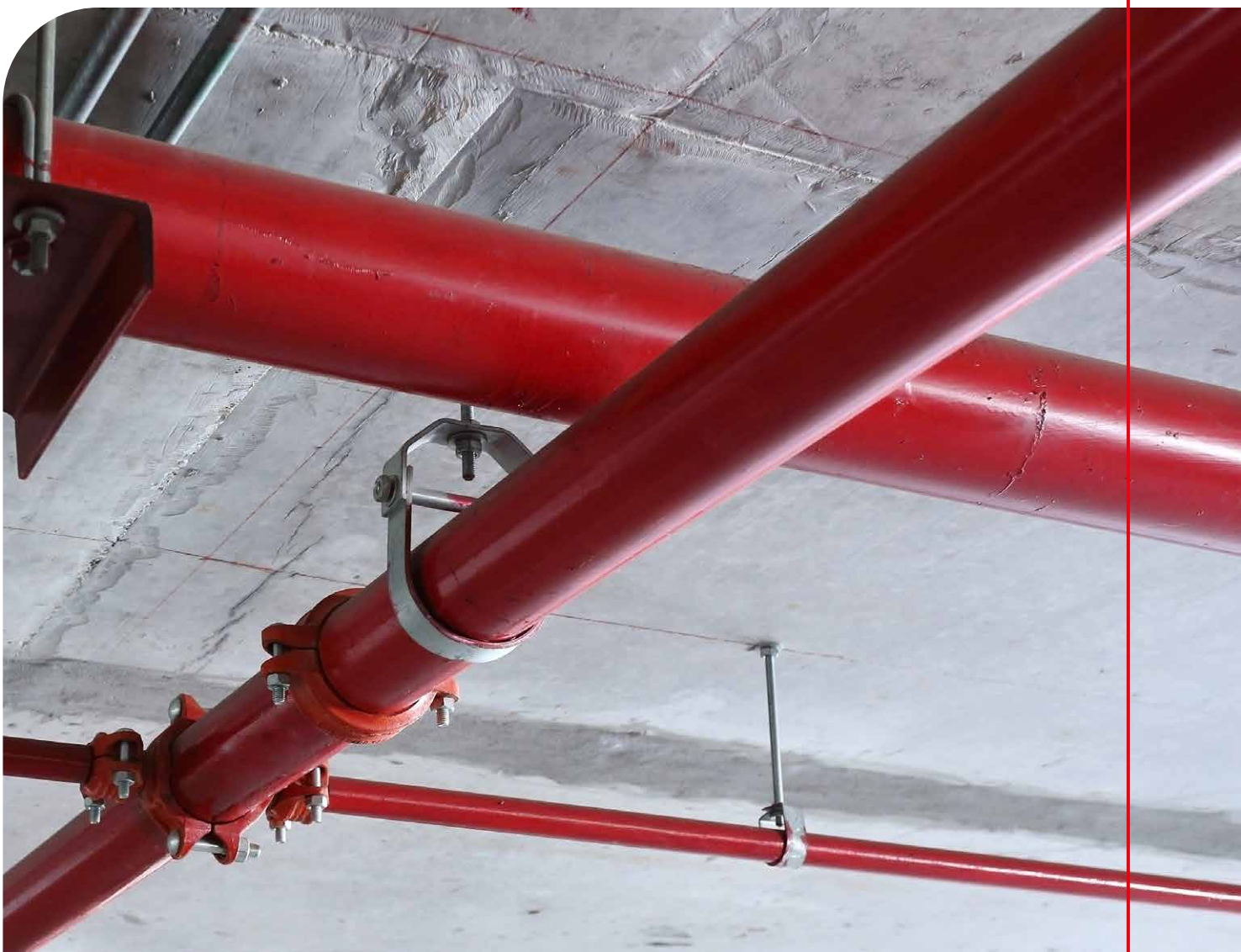
Applications: Offices and common areas

Minifog ProCon water mist suppression systems use higher operating pressures to atomize water so finely that it evaporates within seconds. This combined cooling and oxygen-displacement effect extinguishes fires effectively using significantly less water than conventional deluge systems. Less water means less collateral damage. Depending on the application, various system configurations are available for server rooms, emergency power systems, and building services.

Applications: Computer/server rooms, emergency power systems, building systems

Hydrant systems: Wall hydrants and outdoor hydrants are the fastest way for the fire department and personnel to access extinguishing water in an emergency. There is more to this than meets the eye: pump systems and underground pipework, which are tailored to local conditions, maintain the pressure and permanently guarantee the supply. The system simply has to work when it matters.

Applications: Delivery and storage areas



Oxeo inert gas extinguishing systems use argon or nitrogen: the gases reduce the oxygen content in the air so that the fire is extinguished. Both gases are natural components of the air that are non-toxic, non-conductive, and residue-free. Servers, switchgear and sensitive electronics remain undamaged. In a standard-compliant design, inert gas extinguishing systems are also suitable for areas where people are present.

Applications: Computer/server rooms, technical and other IT areas, transformer rooms

Oxeo EcoPrevent oxygen reduction systems prevent fires before they start. The oxygen reduction systems permanently lower the oxygen content in the air by means of a controlled nitrogen supply, thus creating a fire-safe atmosphere. It is impossible for an open fire to develop. This is active fire protection – because where there is no fire, there can be no damage.

Applications: Computer/server rooms

MX 1230 halocarbon extinguishing systems use the chemical extinguishing agent FK 5-1-12: non-corrosive, non-conductive, and ideal for rooms with electronic and electrical equipment. The system extinguishes without leaving a residue and does not cause secondary damage to sensitive equipment. Particularly suitable for small and medium-sized rooms. The extinguishing agent can be stored in a space-saving manner directly in the room or in an adjacent area.

Applications: Server rooms, electrical rooms, and switch rooms

OneU fire protection system: In a rack, every millimeter counts. The OneU fire protection system only takes up a single rack unit (44 mm) – the rest remains completely free for IT components. In the event of fire, it uses FK 5-1-12 to extinguish the fire without leaving any residue which could damage hardware. Its own emergency power supply and redundant assemblies ensure that it functions when it is most necessary.

Applications: Server racks

CPS 1230 cabinet protection system: Electrical and control cabinets contain sensitive electronics packed into a very small space – and thus pose a fire risk due to short circuits, overloads, overheating, or component failures, a risk that is often underestimated. CPS 1230 detects such internal fires early and extinguishes them with FK 5-1-12: electrically non-conductive, residue-free, and without damaging the electronics. Compact, standardized, and easy to install – for new installations as well as retrofits.

Applications: Switch and control cabinets

Fire alarm control panels are at the heart of the fire protection system. They receive signals from detectors, alert authorities and the fire department, and automatically activate fire extinguishing systems in the case of fire. Communication with hazard management systems and building management systems is also possible. The Clunid FMZ6000 is available in four different sizes and can be modified to a wide range of requirements.

Applications: Entire facility

HELIOS AMX5000 smoke aspiration systems detect even the smallest smoldering fires before they become visible. The system actively takes air samples from the protection zone and analyses them in a measuring chamber for various signs of fire. In this way, the detectors reliably identify fires at an early stage before they pose a real danger. Their sensitivity can be individually adjusted according to the environment.

Applications: Computer/server rooms, air conditioning units, technical and other IT areas

UniVario industrial fire detectors identify flames, smoke, fire gases, and heat – indoors and outdoors, at close range and from a distance, in clean environments as well as under the harshest conditions. For data centers, they are particularly valuable in areas where traditional detectors reach their limits: emergency power systems, UPS containers, and outdoor technical areas. Modular design: always the right detector, always in the right place.

Applications: Emergency power systems, technical and other IT areas

Learn more about our technologies at
www.minimax.com/technologies

PVProtect: Solar modules on the roof of a data center increase energy efficiency – but also pose new fire risks. DC high voltage cannot be easily disconnected, the areas are difficult to access, and a fire on the roof threatens the entire infrastructure below. PVProtect reliably restricts fire propagation below the system and protects the roof of the building as well as everything below it.

Applications: Roofs with photovoltaic systems

Smoke and heat extraction systems: In the case of fire, smoke and heat are more deadly than the flames themselves. Smoke and heat extraction systems therefore keep escape and emergency routes clear and make firefighting operations much easier. Pneumatic or electrical drives automatically open skylights and windows or activate extraction systems. Smoke, heat, and explosive flashovers are diverted before they can spread. Activation is carried out manually or automatically.

Applications: Entire facility

Fire extinguishers: Minimax portable fire extinguishers use water, foam, powder, or even carbon dioxide as the extinguishing agent and cover fire classes A, B, C, D, and F. In the case of fire, people can intervene immediately and prevent a fire from spreading before it develops. The entire range is developed and produced in-house and is available for systems of all sizes. Anyone who carries out regular maintenance will not be caught off guard in an emergency.

Applications: Entire facility

Structural fire protection takes effect before the first spark flies: through construction, materials, and room partitioning. Fire and smoke protection doors, fire-resistant glazing, fire protection gates, and protective coatings for steel structures limit how far and how quickly a fire can spread. Minimax solutions for ventilation systems additionally prevent smoke and fire gases from spreading via ducts and shafts in the building.

Applications: Entire facility

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