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Fire protection in plant rooms

Protection of people, business continuity and reputation

Plant rooms, in which power distribution equipment, control systems, security systems and IT infrastructure are accommodated, are risk areas that need to be especially protected. This applies particularly to fire safety in these areas.

Aspirating smoke detection systems (ASD) are able to detect even the smallest aerosol concentrations. For example, they can detect the minimal smoke concentrations which may be caused by the malfunction of an individual electrical device or electronic component. Fire can then be prevented by removing power from the unit concerned.

In the event of a fire, alerting and evacuating all parties at risk in good time has the highest priority. A fire protection system is needed that guarantees rapid, reliable fire detection and activates both the alarm devices and the relevant fire control installations. When necessary this also includes evacuating people from the danger area and activating the required extinguishing systems.

To protect people, business continuity and the reputation of a hotel, early hazard warning in combination with reliable extinguishing in case of fire is therefore indispensable. However, unnecessary evacuation due to false alarms must be avoided.

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Introduction

Every hotel has a number of plant rooms which contain technical installations required to keep the hotel functioning properly. This includes the following disciplines:

- Electrical engineering (power supply, control systems, security systems, communication technology, IT).
- Sanitary technology (water treatment, waste water disposal, gas facilities, sprinkler systems).
- Heating technology (heat generation, heat storage, heat distribution).
- Ventilation and air conditioning (ventilation systems, air conditioning, refrigerating plants).

The technical infrastructure is the heart of every hotel. This applies particularly to electrical engineering because most areas depend on electrical power, control systems, security technology, communication technology and a functioning IT system. Unrestricted availability of these systems is a basic requirement for the efficient operation of a hotel.

Plant rooms in which the electrical engineering and IT infrastructure of the hotel are housed, must comply with a higher security standard. They are designed in such a way that:

- Only authorized personnel can access the room, which prevents willful damage.
- The room is a separate fire zone and therefore there is no direct risk of fire from a neighboring area.
- The room is air-conditioned in accordance with system requirements.
- The central systems are connected to an emergency power supply.

Highlights*

- Plant rooms are considered the heart of every hotel because business continuity depends on them
- They have a high fire risk
- Hardware and cabling pose a continuous threat of potential ignition
- One out of every 12 hotels reports a structural fire per year

* NFPA, U.S. Hotel and Motels Structure Fires; U.S. Fire Administration's (USFA's), Hotel and Motel Fires

Basic conditions

Objective

- Detecting an unusual aerosol concentration and informing a technician so that the situation can be assessed and the appropriate measures taken (e.g. turning off the relevant device).
- In the event of a significant aerosol development indicating an incipient fire, damage must be minimized by shutting down the systems and extinguishing the fire with an automated extinguishing system.
- If there is a fire in the plant room, the spreading of the fire to other hotel areas must be prevented.
- Timely alarming and evacuating of all people at risk.

Typical fire hazards

- An overload or short circuit of an electrical component.
- Failure of the cooling system leading to excessive overheating of electronic components (e.g. microcontroller).

Typical development of a fire

In a plant room which exclusively contains electrical and electronic components and devices, there is a very typical development of a fire.

- If electrical or electronic components overheat, small aerosol quantities are generated. If the power supply is disconnected at this stage, no fire will develop and damage can be kept to a minimum.
- If the power supply is not disconnected, a smoldering fire will develop and progressively generate increasing quantities of visible smoke. If such a fire is detected at an early stage, it can be extinguished easily and damage can be restricted to one device or one area.
- If no appropriate measures are taken, the smoldering fire will develop into an open fire which may cause significant damage.

Critical points

- An increased aerosol concentration must be detected before a smoldering fire starts.
- During a smoldering fire, only a small amount of heat is generated, meaning the aerosols do not spread throughout the whole room.
- If the systems are cooled with forced ventilation, the aerosol concentration is diluted significantly by the high airflows.
- The extinguishing process must not cause additional damage (e.g. water damage, destruction of electronic equipment).
- The fire must be restricted to the plant room.

Solution

Such an area can be seen as the "heart of the hotel". It is therefore important that the functions fire detection, warning, alarming, control and extinguishing are co-ordinated. This is the only way in which damage to the "heart" can be kept to an absolute minimum.

As extremely low aerosol concentrations need to be detected in such an area, and as there are no deceptive phenomena, an ASD with very high sensitivity is used for detection. Modern ASDs are used which are able to generate different warnings and alarms. These are used for control functions, alarming and the activation of an extinguishing system.

If the local standard requires a two-detector dependency for the activation of the extinguishing system, in addition to the ASD, an alarm signal from at least one other sensitive smoke detector is required.

Dry extinguishing systems (i.e. systems with inert gases or chemical/clean agents) are ideal for the protection of delicate electrical and electronic equipment. However, it has been shown that under certain circumstances, the high noise levels that can occur when automated dry extinguishing systems are released may lead to malfunctions in hard disk drives (HDDs). Even though this is a very rare side-effect, Siemens recommends the use of a specially designed nozzle. The use of this nozzle ensures that the noise levels during a discharge remain well below the level that could pose a risk to HDDs.

In addition to the automatic fire detectors, a manual call point is installed so that a fire alarm can also be triggered manually.

An ASD can cover an area of several hundred square meters. In this way, large plant rooms can be monitored with a single system. If additional point type detectors are required, their number and position will depend on the size of the room and the ventilation conditions.

The system design of the automated extinguishing system depends strongly on the size of the room and the structural conditions. Smaller plant rooms are often equipped with a decentralized extinguishing system for one area.

The plant room in a hotel, in which electrical engineering and IT infrastructure are accommodated, is usually not very large. The following describes a solution which is suitable for the protection of small enclosures with a volume of up to 120 m³.

Details	Comments/Notes
Fire safety system: Sinorix Compact	<p>Pre-engineered fire protection system in one compact cabinet: an aspirating smoke detector, a Sinorix Silent Nozzle, an alarm device and a flashing signal lamp as well as a Novec 1230 extinguishing agent cylinder. All devices are prewired to an XC10 fire detection and extinguishing control panel. An additional nozzle can be easily connected to protect the false floor.</p> <ul style="list-style-type: none"> • Can be directly installed in the enclosure to be protected • Pre-wired cabinet – the cabinet only needs to be connected to an AC power supply • At least one manual release button needs to be installed • ASD suction pipe network to be calculated and installed • No hydraulic calculation required for the extinguishing pipe network
Manual call point:	<p>Manual call point</p> <ul style="list-style-type: none"> • Single or double action (depending on local regulations)
Manually activated (electrical) actuator:	To immediately trigger the gas extinguishing system
Overpressure flap:	In order to prevent structural damage to the room, all gaseous extinguishing systems need pressure relief openings. The size must be calculated using the appropriate tools.
Positioning: (see Figure. 1)	<p>Sinorix Compact</p> <ul style="list-style-type: none"> • Suitable in an area with no larger structures or installations, so that the extinguishing gas can be distributed unhindered. <p>ASD suction pipe</p> <ul style="list-style-type: none"> • In the airflow of the ventilation duct. <p>Manual call point</p> <ul style="list-style-type: none"> • In the plant room next to the door. • At a height of 1.4 m ± 0.2 m <p>Manually activated (electrical) actuator for extinguishing system</p> <ul style="list-style-type: none"> • In the plant room next to the door. • At a height of 1.4 m ± 0.2 m <p>Overpressure flap</p> <ul style="list-style-type: none"> • In the wall shared with a large room
Room without active ventilation	<ul style="list-style-type: none"> • If the plant room is not equipped with active ventilation, the ASD suction pipe should be installed beneath the ceiling. Very critical equipment, such as a large server, can be monitored more effectively with appropriate pipe routing (object monitoring).
Expansion	<ul style="list-style-type: none"> • If two-detector dependency is mandatory to activate the extinguishing system, an optical smoke detector is attached directly to the extinguishing control panel integrated into the system.

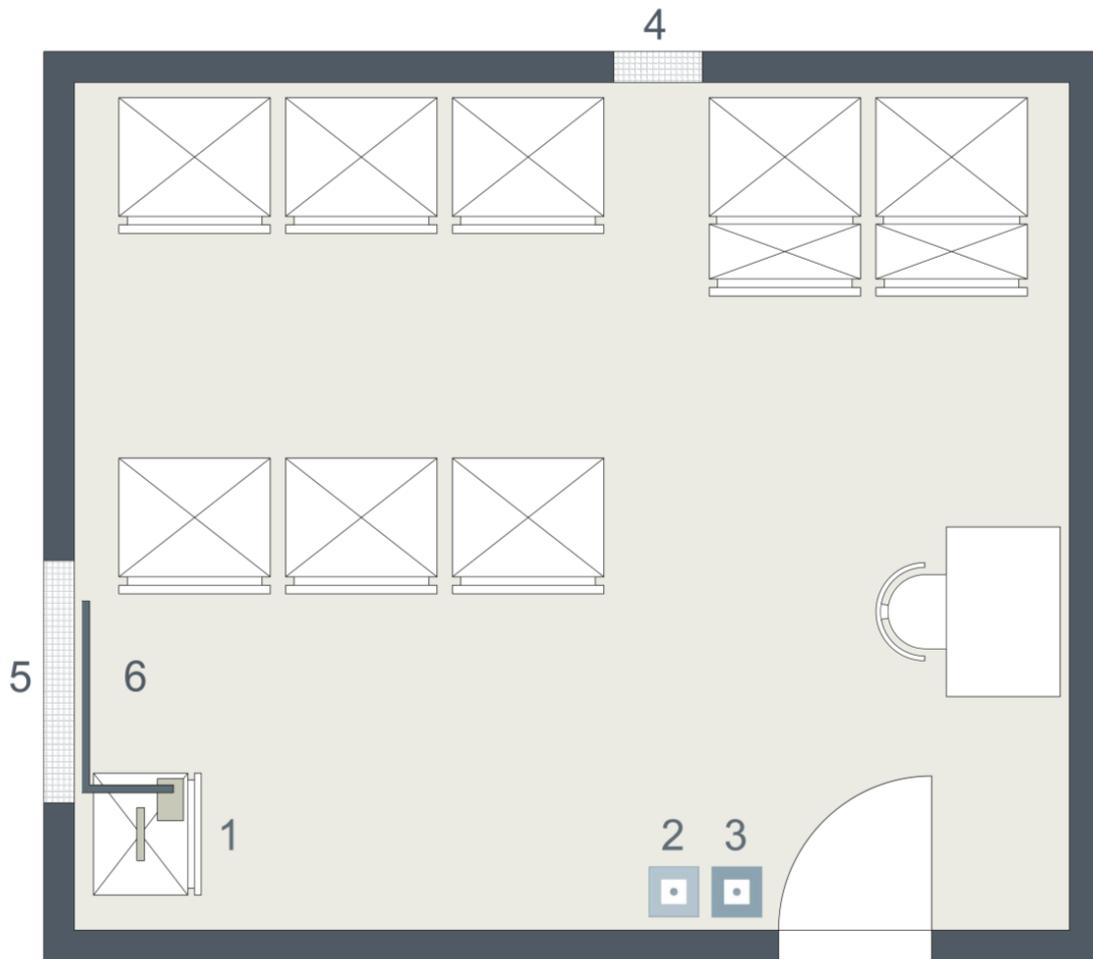


Figure 1 Positioning

- 1 Sinorix Compact
- 2 Electrical manual actuator for extinguishing system (yellow)
- 3 Manual call point (red)
- 4 Overpressure flap
- 5 Ventilation duct
- 6 ASD suction pipe

Practical experience

Fire safety system

For hotels, a reliable fire protection system is essential, especially in such plant rooms. In the past, fire protection systems (fire detection, alarming, control and extinguishing) were made up from different components. These components had to be connected and coordinated in an elaborate and costly manner. This was the only way in which the entire system could be guaranteed to function correctly. Sinorix Compact now combines extremely early and reliable detection and alarming with quiet and safe extinguishing of electrical fires.

The solution described here is limited to the protection of plant rooms with a volume of up to 120 m³. Systems in larger rooms must still be assembled from individual components of fire detection, alarming and extinguishing.

Extinguishing system

It has been shown that malfunctions can occur in hard disk drives when automated dry extinguishing systems are released. These malfunctions range from automatic shutdowns to more severe effects, resulting in a loss of data. Studies by Siemens and independent organizations concluded that it was primarily the high noise level generated by conventional extinguishing systems during the discharge process that created the hard disk drive malfunctions. Various factors can help reduce the noise level during a discharge, such as improving the room acoustics or extending the discharge time. Research conducted by Siemens identified the nozzle design as one of the main contributing factors in reducing the noise.

That is why the Sinorix Silent Nozzle was introduced – which is also part of Sinorix Compact. Its unique, linear design ensures that the noise level during a discharge remains below the level that poses a risk to HDDs. Additionally, by directing the gas discharge, and hence the sound, in a predefined direction, the Sinorix Silent Nozzle effectively prevents sound-generated HDD malfunctions during extinguishing. Of course, the nozzle also allows smooth and efficient distribution of the extinguishing agent.

Installing Sinorix Compact is straightforward because all components are pre-engineered. In addition, no hydraulic calculation is required. This saves valuable time and ensures a high-quality solution. Nevertheless, the system is intended for use by installers authorized by Siemens, who have experience in the design, installation and maintenance of automated extinguishing systems. They must ensure that this product is correctly used according to the specified conditions, that there is no danger for themselves or others, and that the Siemens instructions are followed (assembly instructions, technical instructions, commissioning instructions and installation manuals). Checks shall also be made to ensure that the product is installed in accordance with the accident prevention regulations and national regulations in force. The installers shall also ensure that users have read and understood the information relating to this product.

Sinorix Compact – easy, unique, all-in-one fire protection with genuine alarm guarantee

The unique Sinorix Compact combines fast and reliable detection with quiet and safe extinguishing as well as easy and efficient control in one compact package. It is the perfect choice for protecting small enclosures that contain electronic and electrical equipment. The unique and optimized design of this all-in-one fire protection solution makes it fast and easy to install, commission and maintain. Furthermore, the clean chemical extinguishing agent that it uses, is ideal for the protection of delicate electronics because it is non-corrosive and non-conductive and is safe for both people and the environment.

And because all the devices come from a single source – Siemens – you get 160 years of experience and expertise in fire protection in one compact cabinet.

Find out more about Sinorix Compact [here](#).

Everything you need for comprehensive fire protection

Incorporated in a concept tailored to your customers' requirements, Siemens and its Solution Partner network provide:

- Early and reliable fire protection solutions, offering a Genuine Alarm Guarantee
- Fully forwards and backwards compatible systems, to ensure any system provided is equipped to integrate the latest technology Siemens has to offer
- Clear and fast alarming and evacuation processes

All these aspects are at the core of comprehensive fire protection. Only when these are fulfilled can you be assured that people in your buildings are safe and assets and business operations are protected.

In order to offer your customers peace of mind, Siemens and its Solution Partner network have a variety of service and solution offerings that can be tailored to an individual client's needs. To find out more about this, please visit our Web site at www.siemens.com/firesafety-markets or contact your local Siemens organization through [the online contact form](#).

Advantage Engineering – share the experience

With our dedicated program for consulting engineers, you can benefit from our extensive application know-how and complete portfolio.

With Siemens, you can offer your customers comprehensive fire safety for any application and environmental condition. Your customers will appreciate this as it enables them to reliably protect people, assets and business processes from fire.

Backed by more than 160 years of experience in the field, our offerings for early detection, reliable alarming, orderly evacuation and safe extinguishing are based on innovative and unique technologies. They provide you with convincing arguments like maximized life safety or environmental friendliness, and open the door to strong, long-term customer relationships. And with Siemens, you gain a reliable partner at your side and benefit from our smart tools, in-depth trainings and personal support – wherever you are, wherever you go. For more information please visit www.siemens.com/advantage-engineering.

Siemens Switzerland Ltd
Infrastructure & Cities Sector
Building Technologies Division
International Headquarters
Gubelstrasse 22
6301 Zug
Switzerland
Tel +41 41 724 24 24

The information in this document contains general descriptions of technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract. The document contains a general product overview. Availability can vary by country. For detailed product information, please contact the company office or authorized partners.

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Answers for infrastructure and cities.

Our world is undergoing changes that force us to think in new ways: demographic change, urbanization, global warming and resource shortages. Maximum efficiency has top priority – and not only where energy is concerned. In addition, we need to increase comfort for the well-being of users. Also, our need for safety and security is constantly growing. For our customers, success is defined by how well they manage these challenges. Siemens has the answers.

“We are the trusted technology partner for energy-efficient, safe and secure buildings and infrastructure.”