What guarantees optimal business continuity for our clean room?

You can rely on our fire safety solutions to provide optimum security for your employees and to ensure maximum business continuity.

Answers for infrastructure.

SIEMENS

Complete solutions for a safe clean room – with a professional partner

No matter where clean rooms are being used – in healthcare, pharmaceutical industry, food & beverage or microelectronic industry – contamination by smoke and dust can interrupt production processes and thus cause excessive damage and unnecessary costs. That's why it's important to provide your clean room with a high level of safety. Siemens' fire safety solutions are tailored exactly to your clean room's requirements, offering maximum protection against all risks of fire. Based on the concept of a professional and innovative partner, they provide everything from consulting to commissioning and after-sales service for fire detection and extinguishing.

One-stop fire safety solutions

■ Protecting people, assets and processes – protecting your business

The clean room is the heart of a corporation's production and belongs to the group of mission-critical facilities (MCFs). MCFs comprise a collection of high-value assets, typically electronics and pharmaceuticals, which have significant monetary value. On the other hand, if the production process is disrupted, the company can suffer severely.

A fire in a clean room can cause much damage up to major losses. Typical causes of a fire include: short-circuit, spontaneous combustion of depositions in the air ducts or leakages of easily inflammable or self-combustible liquids and gases. Fire damages of equipment and assets can cause losses of several millions within minutes, but that's only the beginning. Because the high air flow (the air exchange rate can be up to 600 changes per hour) fans out the smoke, even far-off sensitive and expensive equipment can be contaminated. In a worst case scenario, assets will be so severely damaged that they have to be completely replaced. Even a small fire can cause a multi-million damage. Between 1996 and 2005, for example, major fires in the semiconductor industry worldwide caused losses ranging between 100 and 350 million dollars per incident – contingency losses not included (source: Munich Re Group).

The financial losses caused by business interruption can also quickly reach a similar magnitude. Until repairs, cleaning and recommissioning are completed, months may pass by. Given a fast technological development like in the semiconductor industry, such a down-time may even lead to the fact that recomissioning becomes uneconomical. This might even concern production units that were not directly affected by the disruption.

It is therefore recommended that a clean room has a high level of fire safety. Preventive and active fire safety is particularly important here.

Are you sure, the fire safety concept for your clean room is still up-to-date?

■ More safety and security through an integral concept

An adequate level of safety can only be reached with a comprehensive fire safety concept: For fire safety in clean rooms early and reliable detection is a central aspect. Smoke dilution caused by high speed of the air circulation and the high air exchange rate make fire detection difficult. The time elapsing between fire ignition and detection, however, is a fundamental factor for a reliable fire safety concept. After all, early detection ensures business continuity and avoids secondary damage.

As a next step, the initiation of appropriate measures is a critical factor in an effective protection concept. Fire detection, voice alarm and extinguishing systems must therefore be fully integrated. That's why we offer comprehensive, one-stop fire safety solutions that cover everything from fire detection and alarming to evacuation and extinguishing.

Plus, we take care of your system throughout its life cycle. From consulting and commissioning to choosing the best service concept – we offer you more than fire safety solutions: You can further enhance the security of your clean room with Siemens security systems such as video surveillance or access control. In addition, room comfort and energy consumption may be optimized with our building automation system. These three elements may be integrated into our management system for the users' convenience.

■ Unique safety technology for your clean room

Our fire safety solutions offer you the benefits of unique technologies like state-of-the-art Sinteso™ fire detectors with a Genuine Alarm Guarantee and aspirating smoke detection that provides earliest possible warning. Highly reliable and effective Sinorix™ extinguishing is based on innovative technologies such as the constant discharge technology (CDT).
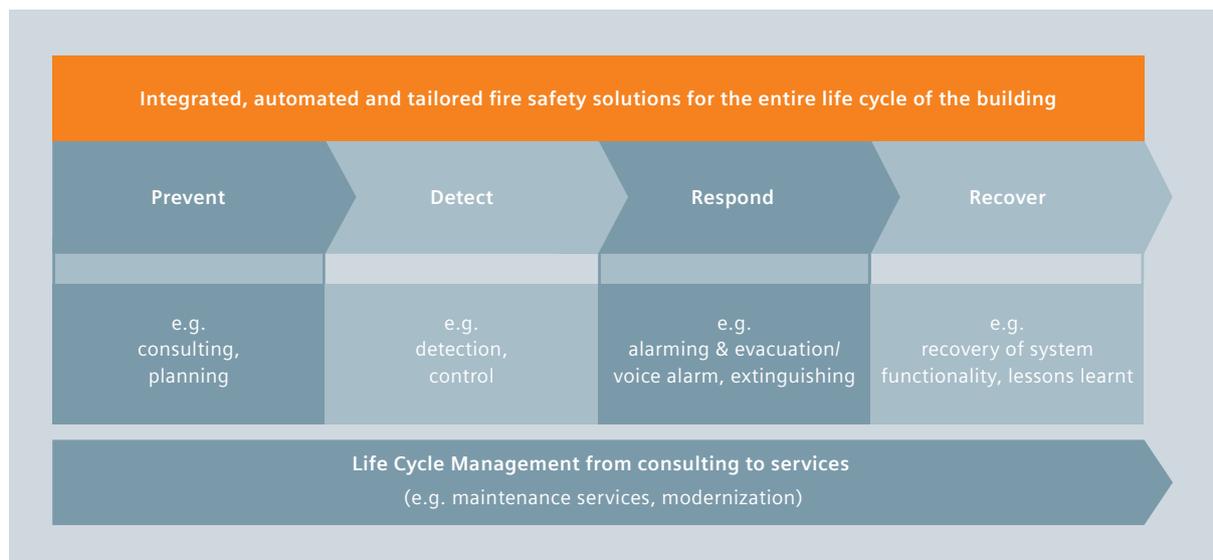
■ Providing highest standard of safety

With our fire safety solutions for clean rooms, you benefit from more than 150 years of experience in fire safety technology, comprehensive project and application know-how and more than 40 years of clean room experience. As a result, you receive best quality: Our solutions comply with the highest safety standards, incorporating only products that meet industry-specific standards and regulations certified by VdS, LPCB, FM or UL.

Highlights

- ■ Assured business continuity – due to industry- and application-specific know-how

- ■ One integrated solution from fire safety and security to building automation – thanks to fully integrated systems with certified interfaces

- ■ One project responsible – less coordination and interfaces

- ■ Highest possible system reliability and availability – thanks to an extensive global network of branches with highly trained service technicians

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Integrated, automated and tailored fire safety solutions for the entire life cycle of the building			
Prevent	**Detect**	**Respond**	**Recover**
e.g. consulting, planning	e.g. detection, control	e.g. alarming & evacuation/ voice alarm, extinguishing	e.g. recovery of system functionality, lessons learnt
Life Cycle Management from consulting to services (e.g. maintenance services, modernization)			

Fire safety process for integrated and tailored fire safety solutions

Fire safety solutions – very early and reliable fire detection for maximum safety

Siemens' competence is based on many years of application know-how, innovative systems and industry professionals.

■ **Prevent**
We offer technical solutions – and more. From the very beginning, we partner with architects, planners, contractors and building operators to provide comprehensive know-how and support during every phase of a project.

■ **Detect**
Typical causes of a fire include: electrical faults, short-circuits in cabling or other electronic equipment and ignition of solvents or flammable products, etc. To detect smoke particles caused by overheating and avoid the onset of flames, very early smoke detection is required. For this reason, our fire safety solutions are based on fast and reliable fire detection. Sinteso S-LINE detectors offer you unmatched detection accuracy and quick notification thanks to their **ASA***technology*™ with special detection parameters for clean rooms. **ASA***technology* stands for "Advanced Signal Analysis". Behind it stands a complex and unrivalled signal evaluation. Even under the most difficult conditions, Sinteso S-LINE detectors distinguish between genuine danger and deceptive phenomena. Signaling an alarm when threat is imminent. This works so well that Siemens offers a Genuine Alarm Guarantee for Sinteso S-LINE fire detectors.

Siemens provides for each fire risk a suitable detection solution: For slow starting fires with a long period of smoldering, we recommend the Sinteso optical smoke detector (FDO241). For the detection of erupting flames, Siemens recommends the Sinteso flame detector (FDF241-9) or the Sinteso neural fire detector (FDOOT241-9). In case of smoke dilution due to high air speed (for example ISO class 1 – 6 rooms), aspirating smoke detection (ASD) is recommended to ensure early detection which minimizes the risk of fire damage. Air samples are continuously taken at the danger spots and carried to the ASD device. As soon as smoke particles are detected in the air sampler, pre-alarm or alarm is triggered, depending on the smoke concentration. The response characteristic from normal to high sensitivity allows even a minimal smoke concentration to be identified unequivocally at an early stage of fire.

The Siemens detection concept integrates both technologies, smoke detection with Sinteso S-LINE and aspirating smoke detection, on one loop. This also prevents fire or smoke particles from spreading to adjacent clean rooms.

■ **Respond: alarming and evacuation**
In order to centrally control and monitor the fire safety system, Siemens recommends to integrate the clean room's fire detection system and other systems into a management station. This allows the control room to monitor fire alarms and system faults. It also permits uniform operation of all integrated systems.

In case of fire, standard alarm sounders and sounder beacons are used to alert people. To ensure more precise information and instructions for action, the voice alarm system E100 is automatically activated by the fire safety system. This guarantees that the clean room and its neighboring areas are evacuated in a safe and orderly manner. In addition, safety messages and clear instructions can be transmitted to avoid contamination by intervention forces.

■ **Respond: extinguishing**
Clean rooms present several fire risks that require an extinguishing solution. However, in the majority of cases, the extinguishing solutions for clean rooms are **object protection** (such as in handling and packaging, solvent and acid bays, chemical distribution cabinets, etc).

4

Object protection is in most cases the preferred solution due to the complexity of planning an extinguishing system in combination with the sophisticated air circulation concepts typical in clean rooms, often with a certain low- or overpressure that cannot be altered. Additionally, the concentration of high fire risk and the value of a specific machine makes it logical to decide for an object protection extinguishing solution.

In clean rooms, the preferred extinguishing agents are generally inert gases. Our Siemens Sinorix extinguishing portfolio provides solutions based on Carbon Dioxide (CO_2), Argon (Ar) and Nitrogen (N_2). They offer fast and reliable extinguishing for all three essential fire classes: Class A (solids), Class B (flammable liquids) and Class C (combustible gases).

All Sinorix inert gases are chemically neutral, a great advantage when protecting all types of clean rooms. It means that machines or the goods under production will neither be damaged nor contaminated. Additionally, N_2 and Ar are non-toxic, colorless, odorless and tasteless (important advantages in pharma and food industries).

For certain clean rooms, the criticality of the process demands a **room protection** extinguishing solution. That is the case in certain biochemistry and microelectronic clean rooms.

In clean rooms with continuous overpressure, the use of Sinorix N_2 is recommended. Based on 200 or 300 bar technology, it offers flexibility in engineering and reliable extinguishing. The innovative Sinorix CDT N_2 (Constant Discharge Technology) provides additional advantages with a considerable reduction in overpressure and turbulences.
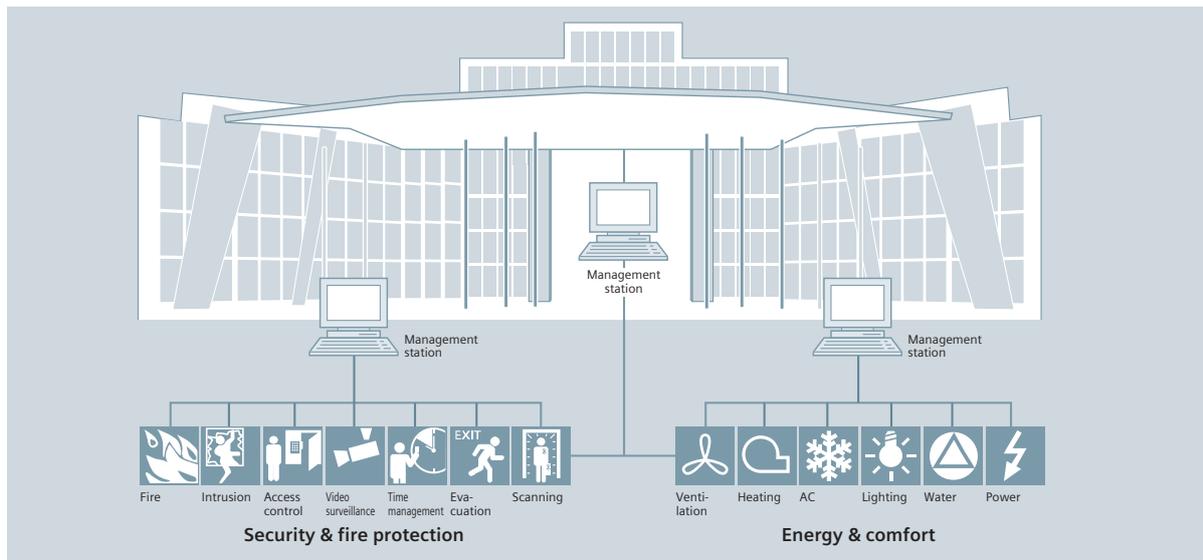
When the clean room is in constant low-pressure, Sinorix 1230 is recommended. Based on the efficient and environmentally friendly 3M™ Novec™ 1230 Fire Protection Fluid, it assures flooding of the room within 10 seconds and fast extinguishing, before any equipment can be severely damaged.

■ Recover
There are multiple causes for a fire. After a fire occurred, one must identify the reason for it. Depending on the development of the fire, conclusions regarding prevention, detection and response to the event must be drawn. This helps to recognize specific kinds of hazards, general principles of fire propagation and reduce or mitigate damage in the future.

Highlights

- Fast and reliable Sinteso S-LINE detectors with special clean room parameter set

- Very early fire detection, minimizing damage in all building areas

- Genuine Alarm Guarantee

- Safe evacuation – thanks to safety messages and clear instructions for taking action

- Fast and reliable extinguishing – Sinorix ensures business continuity and protects people, using environmentally friendly extinguishing agents

- Integrated and scalable fire safety solutions

Security & fire protection	Energy & comfort
Fire · Intrusion · Access control · Video surveillance · Time management · Eva-cuation · Scanning	Venti-lation · Heating · AC · Lighting · Water · Power

One management station to simplify the control of the complete system

Siemens gives you a solution at hand that ensures complete monitoring of all events associated with fire safety, security and building automation systems. We are also your partner who is there for you throughout the entire life cycle.

■ Overall monitoring

Siemens MM8000 Danger Management Station allows the integration of multiple disciplines, such as fire safety, security and automation control systems. This provides centralized supervision and alarm handling, and allows interactions between the different systems in the clean room. Integrated access control allows only authorized people to enter the clean room area. Our building automation and control systems provide means of controlling heating, ventilation and air-conditioning and in addition monitoring and optimizing energy consumption.

■ Feel safe with our innovative service solutions for particular high risks

Our service portfolio covers the entire spectrum throughout the life cycle – from alarm management, system maintenance and extensions to modernization, allowing you to focus on your core business activities. As the availability of clean rooms is so critical, we recommend "Advantage Plus" with dedicated service options for clean rooms. It is a fully comprehensive service concept that ensures that your systems will perform with the greatest possible reliability and availability. The concept includes a wide range of proactive and reactive components, designed to keep your system stable and secure.

For example with SafeGuard, our proactive remote service, Siemens will identify critical system deviations before they become problems and support the analysis of fault messages. Additionally, Siemens offers a "Guaranteed repair time" to assure high availability of the fire safety system, enabling people protection and process continuity. Also, the use of an efficient and ecological detector testing device without gas avoids clean room contamination.

Highlights

- Centralized supervision and event handling for the user – due to integration of multiple disciplines

- Highest system availability and reliability – thanks to SafeGuard, our proactive remote service solution, and "Guaranteed repair time"

- Avoidance of clean room contamination during inspections – thanks to gas-free detector testing

Fire control panels

The Sinteso FC20 fire control panel is the heart of every fire safety solution. It converts a fire alarm into actions for alarm notification, evacuation and extinguishing. The extremely simple user interface with prompting texts lets users quickly check the system status, either locally or by remote access.

Extinguishing control unit

1

XC10 is a control unit for one zone. It can be used as a stand-alone or fully integrated unit. All relevant incidents are forwarded to connected fire control panels. It also interfaces with ventilation systems.

Voice alarm system

2

IIn case of fire, the voice alarm system E100 is automatically activated by the fire detection system. It ensures that the clean room and neighboring areas are evacuated in a safe and orderly manner. In addition, safety messages and clear instructions can be transmitted to ensure the cleanness class.

Aspirating smoke detection

3

Is a highly sensitive system for the earliest possible fire detection in highly ventilated clean rooms, minimizing the risk of fire damage. In a clean room, it is typically applied in false floors and ceilings or air ducts.

Point type fire detectors

4

Sinteso S-LINE detectors FDO241 or FDOOT241-9 are used in the clean room area. The ASA parameter sets provide unsurpassed detection security to ensure early recognition in clean rooms and service areas. This works so well that Siemens offers a Genuine Alarm Guarantee for Sinteso S-LINE fire detectors.

Flat detector base

Our flat detector bases are recommended in clean rooms to avoid any gap between detector and ceiling. In addition, the use of the seal element FDBZ295 is suggested.

Flame detectors

In clean rooms where an open flame is expected, such as pills production or in microelectronics factories, the flame detector FDF241-9 ensures fastest fire detection.

Ex devices

In Ex-classified clean rooms, such as pills production or in microelectronics factories with highly flammable and explosive solvents and flammable gases, Ex devices have to be used.

Manual call points

5

For immediate manual actuation of an alarm, manual call points are placed along the exit routes.

3

9

Sounder and sounder beacon [6]

In the clean room area, the sounder beacon FDS229 is highly recommended to alert the clean room staff in noisy environment.

Access control [8]

The access control system provides safe and flexible access authorization to the clean room – sluice and surrounding area. In highly classified areas, pin code or a finger print reader are recommended to avoid contamination due to the batch.

Alarm indicators [7]

If a fire detector that is not easily visible triggers an alarm, the alarm indicator will quickly identify the area in danger, for example false ceiling or objects.

Automated extinguishing [9]

Sinorix provides the ideal fire extinguishing solution for risks in clean rooms. For object protection, Sinorix CO_2, Ar and N_2 offer reliable extinguishing for a wide range of fire types. In room protection applications, Sinorix 1230 and Sinorix CDT N_2 convince with outstanding extinguishing performance.

References and experience

■ Song-do RFID Research Center, Incheon, Korea

The Radio Frequency Identification/Ubiquitous Sensor Network center in Song-do, Incheon, is a research institute under the Ministry of Economy and Knowledge, dedicated to Micro-Electromechanical Systems (MEMS) and sensors, the fabrication of MEMS and ubiquitous IT clusters. The center has various clean rooms classified ISO 3. In case of fire, dangerous products and chemicals could massively damage the infrastructure. There's also a potential risk of cross-contamination of remote sensitive, expensive equipment due to a high air flow rate. Smoke dilution caused by high air speed makes fire detection even more difficult.

Siemens implemented an ASD fire detection solution for earliest possible warning. It is based on four levels of event messages: alert, action/control, pre-alarm

and fire alarm. 13 ASD systems are within the clean rooms. Thereof, ten systems monitor the false ceiling area and the plenum area. The remaining three monitor the chip bonding clean room and are in charge of alarming and controlling. They also trigger the extinguishing system, which is based on HFC227ea, using 14 cylinders of 68 l. In addition, the fire control panel is integrated into a danger management system.

■ Roche, Switzerland

Headquartered in Basel, Switzerland, Roche is a leader in research-focused healthcare with combined strengths in pharmaceuticals and diagnostics. Roche is the world's largest biotech company with truly differentiated medicines in oncology, virology, inflammation, metabolism and CNS. It is also the world leader in in-vitro diagnostics, tissue-based cancer diagnostics and a pioneer in diabetes management.

Roche's personalized healthcare strategy aims at providing medicines and diagnostic tools that enable tangible improvements in the health, quality of life and survival of patients.

In the new laboratory building erected in Basel, Siemens was given the task to engineer and supply a fast and reliable fire detection system. As usual in many clean rooms, many areas were equipped with air circulation concepts using laminar flow, with high air speed (up to 9m/s in the air duct). This type of high flow rates poses a particular challenge for the fire detection systems, and requires a special detection concept combining different types of detection technologies.

Siemens proposed a solution based on neural smoke detectors with special detection algorithms for the lower classified zones and aspirating smoke detection (ASD) for the highly ventilated rooms. A total of 11 ASD detectors guarantee an early smoke detection under high air flow conditions and strong smoke dilution. The rooms classified EX (Explosion) were equipped Siemens' specific detectors for this use, based on optical and thermal fire detection.

A dedicated fire alarming and control panel together with an indication panel directly control all devices monitoring the fire events and interface to the existing Alarm Management System. Roche laboratory is now equipped with a state-of-the-art fire safety solution.

Song-do RFID Research Center,
Incheon, Korea

Roche, Basel, Switzerland

Answers for infrastructure.

■ Megatrends driving the future

The megatrends – demographic change, urbanization, climate change and globalization – are shaping the world today. These have an unprecedented impact on our lives and on vital sectors of our economy.

■ Innovative technologies to answer the associated toughest questions

Throughout a 160-year history of proven research and engineering talent, with more than 50,000 active patents, Siemens has continuously provided its customers with innovations in the areas of healthcare, energy, industry and infrastructure – globally and locally.

■ Increase productivity and efficiency through complete building life cycle management

Building Technologies offers intelligent integrated solutions for industry, commercial and residential buildings and public infrastructure. Over the entire facility's life cycle, our comprehensive and environmentally conscious portfolio of products, systems, solutions and services in the fields of electrical installation technology, building automation, fire safety and electronic security, ensures the:
– optimum comfort and highest energy efficiency in buildings,
– safety and security for people, processes and assets,
– increased business productivity.

www.siemens.com/firesafety