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Fire detection in kitchens

Protection of people, business continuity and reputation

Large cooking vessels, frying pans, and deep frying vats present a very serious fire hazard in commercial kitchens. This is mainly because of the distinct possibility of fire due to overheating and the local high fire load.

ASA neural fire detectors with the combination of smoke/heat detection and sophisticated signal processing are recommended for monitoring these areas. Avoiding unwanted alarms due to the inevitable presence of deceptive phenomena, such as fumes or steam, requires in-depth knowledge and experience in positioning the detectors in such applications.

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.

Early warning of a fire is essential; not only for protecting people, but also for ensuring business continuity and the reputation of the hotel. However, unnecessary evacuation activities due to false alarms must be avoided.

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Introduction

Based on the number of possible fire sources, there is a high risk of fire in kitchens. That is why kitchens are one of the most dangerous areas in a hotel. Although not all fire risks can be eliminated in a kitchen, they can be significantly reduced by simple measures. These include:

- Limiting to a minimum those materials which are easily flammable such as paper or cardboard packaging.
- Being careful when lighting the gas stove.
- Not leaving oven mitts and tea towels in the area of the stove.
- Turning off electrical appliances as soon as they are no longer being used.
- Turning off the gas supply if the gas stove will not be used for a longer period.
- Regularly cleaning, checking and maintaining appliances.

Highlights*

- Cooking is the leading cause of hotel fires (46%)
- The kitchen is the number one origin of confined fires in a hotel
- Almost all cooking fires are confined fires
- 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

- Alerting people in the kitchen before a dangerous situation can develop.
- Preventing the fire from spreading to other hotel areas.
- Timely alerting and evacuating all people at risk.
- Preventing unnecessary alerting of guests and the fire brigade.

Typical fire hazards

- An overload or short circuit of an electrical appliance such as a stove, oven, fridge, dish washer or other kitchen equipment.
- Careless handling of the gas stove.
- Flammable materials such as oven mitts or packaging material on a hot plate.
- Loose clothing and hair which can catch fire when cooking with an exposed flame.
- Insufficiently maintained grease traps which ignite when hot fat is added.

Typical development of a fire

In a commercial kitchen, there is no typical development of a fire – a fire can start with a smoldering phase or directly with an open flame.

An overload or short circuit of an electrical appliance can lead to a fire which starts with a smoldering phase and progressively generates increasing quantities of visible smoke. If such an incipient fire is detected at an early stage, it can be dealt with easily (e.g. by disconnecting the power supply).

If easily flammable material comes in contact with a powerful heat source or even an exposed flame, this can suddenly lead to an open fire. If such a fire is detected in time, it can often be extinguished with water, a fire blanket or with a suitable fire extinguisher.

Critical points

- Preventing false alarms due to deceptive phenomena. For example:
 - Steam from boiling water.
 - Rapid increase in local temperatures caused by opening an oven.
- Preventing delayed fire detection:
 - E.g. by the fire aerosols being diluted by the airflow from the HVAC system.
- Restricting the fire to the kitchen area.

Solution

When planning and implementing the fire detection system, the increased fire risk and the deceptive phenomena which occur during normal operation must be borne in mind. The system must not only guarantee early and reliable detection of a fire, it must also respond robustly to deceptive phenomena.

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

The number and position of the automatic fire detectors are chosen based on the size of the kitchen, the areas in which deceptive phenomena occur and the fixtures which prevent even distribution of smoke and heat.

Details	Comments/Notes
Automatic fire detectors: ASA neural fire detectors	Early detection of all types of fires and a robust response to deceptive phenomena (steam, heat): operation in a harsh environment with high humidity <ul style="list-style-type: none"> • Parameter set with robust behavior to deceptive phenomena • IP protection at least IP43
Manual call point:	Manual call point <ul style="list-style-type: none"> • Single or double action (depending on local regulations) • IP protection of at least IP43 (for operation in a humid environment)
Positioning of the detectors: (see Figure. 1)	Automatic fire detectors <ul style="list-style-type: none"> • On the ceiling • At least 0.5 m from the wall • As far as possible from the cooking area and the oven • Away from the airflow of the HVAC system Manual fire detector <ul style="list-style-type: none"> • In the kitchen next to the fire exit • At a height of 1.4 m ± 0.2 m
Related measures	
<ul style="list-style-type: none"> • Fire blanket and fire extinguisher for Fire Category F (vegetable or animal oils and fats) • Automatic detection and extinguishing system in the cooking area – in the extraction hoods • Sounder beacon to warn people in the kitchen • Trash can with a tight lid made of non-flammable material 	

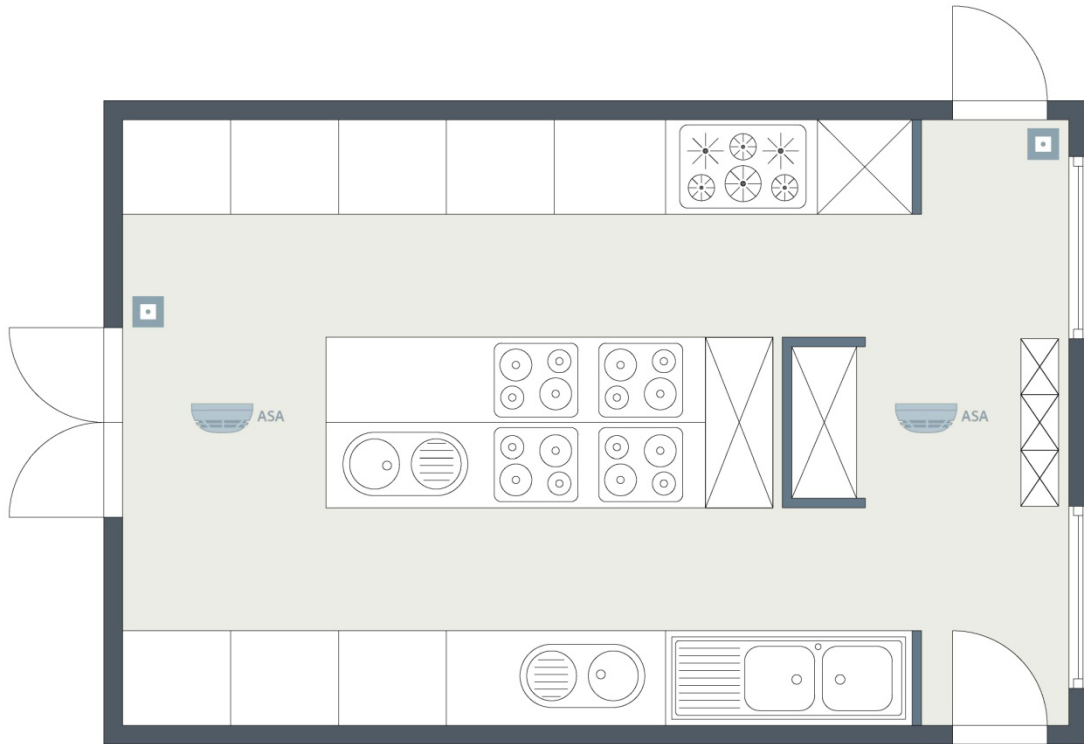




Figure 1 Positioning of the fire detectors

- 
ASA neural fire detector

- 
Manual call point

Practical experience

Fire detection

In the past, smoke detectors were not used in commercial kitchens because the steam caused too many false alarms. If fire detectors were used in kitchens, then they would have been heat detectors which triggered an alarm at a maximum temperature (typically 80 °C). Often, just manual call points were installed so that an alarm could be triggered manually in the event of a fire.

Modern fire detectors are able to perform an intelligent signal analysis and the detection behavior can be adapted to the environmental conditions. They can be set to respond robustly to steam and if they are not positioned directly in the cooking area, they can be used without problems in large kitchens. This provides significantly improved fire monitoring because, in addition to an open fire, a smoldering fire can also be detected automatically.

Steam as a deceptive phenomenon

Aerosols and increased temperature are the fire characteristics which are detected by a multi-sensor fire detector (optical and thermal). Boiling water, cooking meat or opening an oven door creates steam, aerosols and leads to an increase in temperature. Practical experience has shown that the ASA neural fire detectors can differentiate very well between real fire characteristics and aerosols caused by cooking, thanks to its signal processing with **ASAtechnology** (ASA = Advanced Signal Analysis). If such detectors are not installed directly above the cooking area and they are operated with the relevant detector setting, the risk of false alarms can be practically excluded.

Temperature as a deceptive phenomenon

Cooking, frying, opening an oven and other typical activities in the kitchen may lead to rapid temperature increases of several tens of degrees Celsius in that area. Two to three meters away, however, the temperature increase will be considerably less.

If the ASA neural fire detectors are not installed directly above this area and they are operated with the relevant detector setting, the risk of false alarm due to a significant temperature increase can be practically excluded.

Interference from the HVAC system

To guarantee reliable fire detection, the fire detectors must be mounted away from the airflow of the HVAC system so that, in the event of a fire, the smoke is not diluted in the vicinity of the detectors.

ASATEchnology – for intelligent, reliable fire detection with genuine alarm guarantee

ASATEchnology is a unique technology from Siemens that converts signals into mathematical data which is compared with programmed values in real time using intelligent algorithms. The special signal analysis process is very reliable in preventing false alarms caused by on-site deceptive phenomena, such as steam, tobacco smoke or exhaust emissions. Find out more about [Sinteso](#) or [Cerberus PRO](#) fire detectors with ASATEchnology.

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 detection solutions, offering an unrivalled financially backed "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 alerting 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](#).

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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.

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