Aspirating Smoke Detection (ASD) Systems

Fire Detection

A complete guide for the fire system specifier, designer and installer
Aspirating Smoke Detection

WAGNER UK Limited

Better Solutions in Fire Protection

This guide has been produced by WAGNER UK.

WAGNER has developed a number of innovative fire protection solutions to meet the demands of today’s complex buildings and business operations. These include the TITANUS® family of air sampling smoke detection systems and OxyReduct® - a fire prevention system that stops fires from starting in the first place.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to ASD</td>
<td>1</td>
</tr>
<tr>
<td>Standards</td>
<td>3</td>
</tr>
<tr>
<td>ASD System Design</td>
<td>5</td>
</tr>
<tr>
<td>Applications</td>
<td>7</td>
</tr>
<tr>
<td>WAGNER Product Range</td>
<td>11</td>
</tr>
<tr>
<td>The WAGNER Advantage</td>
<td>13</td>
</tr>
<tr>
<td>OxyReduct®</td>
<td>15</td>
</tr>
<tr>
<td>Support Services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Back cover</td>
</tr>
</tbody>
</table>
ASD systems can detect fires at a very early stage, often before visible smouldering takes place, before an open fire occurs and before intense smoke develops. This early detection is vital to mission critical and high-risk applications. The earliest possible fire detection brings significant time benefits, enabling a fast response to the first signs of smoke. ASD can detect fires with a thousand times more sensitivity than point smoke detectors.
Operation

ASD systems draw air samples continuously from the monitored area through a pipe system fitted with sampling holes at regular intervals. The airflow is then analysed for smoke particles and an alarm is raised if smoke is present. The system is active, continually pulling air samples from the risk.

Monitored area

The sampling holes in the monitored area are arranged so that the same amount of air is drawn through each hole. Each sampling hole is therefore allocated the same monitored coverage as a point-type smoke detector.

Cumulative effect

A cumulative effect is achieved by having multiple sampling holes in a room extract any smoke that arises simultaneously. In these conditions the sensitivity of an ASD system offers a huge advantage. In spaces with high ceilings, the cumulative effect can often contribute up to 50%, an amount that can increase still further depending on the space and height of the room.

High false alarm immunity

The physical separation of the detection unit from the monitoring area reduces the risk of transient faults such as those caused by condensation and electromagnetic radiation. The use of filters and the appropriate signal processing also guarantee reliable detection in dusty conditions.

Simple accessibility – minimal disruption

Maintenance and service tasks are carried out in central, easily accessible places. This means that the monitored area does not have to be accessed. There is no longer any need to inspect individual detection points under the ceiling, as is the case with conventional fire detectors.

Aesthetically pleasing

The smoke sampling holes in the ceiling can be installed so inconspicuously that they do not interfere with the aesthetics of the building interior. This reduces the limitations on architects and planners and gives them greater freedom of design.

Deterrent against vandalism

The virtually invisible integration of the smoke sampling holes in the ceiling offers almost no target for vandals.

Simplified operating principle
Standards

The new EN54-20 European Standard

EN54 Part 20 is the new European product standard for Aspirating Smoke Detectors (ASD). From July 2009 the vast majority of ASD systems installed in Europe will have to fully comply with this standard. The standard encompasses both the project design and the ASD systems installed. Since ASD systems, like other detectors for fire detection systems, fall under the Construction Products Directive, compliance with EN 54 Part 20 is a prerequisite for CE marking.
Sensitivity Classes

EN54-20 introduces three classes for detector sensitivity:

Class A - Very High Sensitivity – Used where very early warning fire detection is required. Designed primarily for high-risk areas and where high levels of air conditioning and air dilution exist.

Class B - Enhanced Sensitivity - Very early fire detection for most areas in which valuable goods and/or processes need to be protected.

Class C - Normal Sensitivity – For general fire protection applications. This sensitivity is equivalent to standard point detection.

It is vitally important that sensitivity thresholds do not change due to long-term drift and changing environmental conditions, as installations could become non-compliant over time.

These Classes now define a transparency for designers allowing system performance to be properly compared.

ASD Accessories

The standard also dictates that all accessories such as blow back equipment for maintenance, external filters and water traps have to be tested and approved with the system. It is no longer acceptable to design ASD systems with non-approved components.

British Standards

In addition to EN54-20, ASD systems should be designed and installed in accordance with the FIA Code of Practice, BS5839 and BS6266 where relevant.

BS5839 - Used when the design mimics that of standard detection. ASD systems are used to directly replace point or other conventional detection methods for practical and/or financial reasons.

BS6266 - Used when installing ASD systems with Electrical Equipment such as IT/Communication suites. Again design mimics that of conventional detection, however the use of High Sensitivity Smoke Detection (HSSD) systems are encouraged and in some cases demanded.

Maximum coverage

The maximum coverage of an ASD system is determined by the number of point-type detectors than can be replaced by an ASD device. This is a crucial factor in determining what savings can be made by installing an air sampling system. The coverage can be worked out simply by calculating how many sampling holes can be installed at a reasonable distance from each other (usually about 8 m).
If an ASD device has been correctly classified as Class A or B, this does not necessarily mean that it will satisfy the class specified in the project design. Labelling a device with a detection class simply indicates that a minimum project design with a single sampling hole corresponding to the specified class can be implemented. It is therefore important to check that the entire project design satisfies the desired detection class.
Fast, reliable project design

The various manufacturers of air sampling smoke detectors have found different ways of ensuring that their systems conform to the detection classes specified in EN 54-20. The majority of the project design software available needs to produce detailed system plans to be able to make a reliable statement about the conformity. It is often the case, however, that not all project design parameters are known in advance. Particularly in the case of future extension of a feed pipe or an increase in the distance between two openings can lead to loss of conformity.

WAGNER’s TITANUS® project design software, on the other hand, is designed to ensure that a reliable project design can be achieved in minutes - including the use of accessories.

The software is based on worst-case project design and takes into account the configuration options within the scope of the defined project design limits. The intuitive software does not require any specialist training and quickly gives exact, easy to follow results. The software produces a conformity declaration for the detection categories specified by the selected project design in accordance with EN 54-20.

Specialist accessories

There are a number of important EN54-20 approved accessories that can be incorporated into the final project design to aid operation and maintenance.

Blow through valves: A blow through system is used to clean the pipe system and/or the air sampling points in restricted areas. The deposits which form in the pipe system in very dusty applications are blown through by means of overpressure applied via check valves installed at the ends of sampling branches. Either a manual or automatic system can be deployed, depending how often the pipe system has to be blown through.

Filters: These can be installed in the pipework to remove dust particles from the aspirated air in order to extend inspection time and reduce blow through intervals.

Flame arresters: These in-line devices can be used to create an explosion-proof ASD system for use in hazardous areas.

Steam traps: These can be installed for the draining of condensate from the pipe system. They contain a sintered metal filter.
Applications

High Rack Storage Areas

- Pipe system can be easily integrated into the high rack storage construction
- Better detection due to active air sampling throughout the entire height
- No interruption of operation for service and maintenance required
- Easy access, therefore reduced costs for maintenance and service

Industrial Production

- Easy layout of the pipe system within the supporting structure of the production area
- Suitable for extreme applications with high dust and dirt contamination
- Installation of the detection unit at eye level
- Maintenance and service can be carried out without any problems even in high halls with multiple ceiling conveyors
Clean Rooms

- Safe smoke detection, even with forced air flow and high air speeds
- No air contamination within the production area due to active air sampling of the ambient air
- Maintenance and service personnel do not need to enter the clean room

Deep Freeze Storage

- Better detection of slow smoke at low temperatures due to active air sampling
- Possible icing of air sampling points is detected safely
- Iced sampling points can be blown free
- No heating elements required

Electrical Cabinets

- Optimum detection even with heat cushion due to active air sampling out of the cabinet
- Possible monitoring of several cabinets with one air sampling smoke detection system
- No switch-off for servicing required, since the detection unit is located outside the monitored area

Lift Shafts

- Installation of the detection unit outside of the danger area
- No interruption during maintenance required
- Easy access for services and maintenance
Historic Architecture

- no damage of elaborate ceilings
- hidden installation of the pipe system
- control unit hidden at accessible location
- individually adjustable sensitivity for each room

Libraries & Archives

- highly sensitive fire detection technology for very early smoke detection
- graded safety concept for protecting unique valuables
- almost invisible technology of the ASD systems as the air sampling is installed at the book shelves

EDP Facilities

- ideal solution for air-conditioned EDP devices
- reliable detection by air sampling conduction to the detection unit
- adaptable to every cabinet and computer room design

Saunas

- detection possible even up to temperatures up to 110°C
- reliable detection even with heat cushion under the ceiling
- no false alarms caused by condensate of water or ethereal oils
- almost invisible fire detection system
Conveyor Belts

- layout of the pipe system at the frame construction of the conveying belt
- safe detection due to active air sampling throughout the entire length
- reliable detection even with changing ambient conditions
- insensitive against dust, dirt and humidity

Floor Voids

- no risk of detector damage during cable distribution in the floor void
- applicable even for small heights of the floor void
- easy access for service and maintenance

Paper Mills & Recycling

- no false alarms caused by dust or condensate
- no soiling of the detection unit
- no operation interruption during maintenance

Steel/Glass Architecture

- almost invisible pipes installed within the frame elements of the ceiling construction
- reliable detection even with heat cushion under the glass dome
- wide planning freedom for architects
WAGNER Product Range

TITANUS® - Smoke detection for any situation

The performance, flexibility and functionality of the TITANUS® product range mean they are used in a wide range of applications, from areas where traditional point detection is considered through to specialist installations where only air sampling solves the fire detection requirement.
**TITANUS PRO-SENS®**

Cost effective, universal air sampling solution for a broad range of applications. The modular device has 3 alarm levels, double knock detection and a range of accessories.

**TITANUS TOP-SENS®**

High specification, fully featured air sampling system for a broad range of applications. The unit has graded alarms and a smoke level bar graph display.

**TITANUS MICRO-SENS®**

Compact and cost effective ASD for monitoring small to medium-sized spaces and equipment. With optional ROOM•IDENT, the unit can monitor up to 5 rooms and identify the source of the alarm.

**TITANUS SUPER-SENS®**

High-end ASD for the most demanding smoke detection applications. The unit is highly-sensitive and provides very early smoke detection for areas with high levels of air dilution.

**TITANUS RACK-SENS®**

ASD system for server racks and control cabinets with automatic shutdown and extinguishing options.

**VisuLAN®**

Central control and display for all TITANUS® ASD systems.
Thanks to their outstanding reliability, sensitivity and false alarm immunity, TITANUS® air sampling smoke detection systems have been tried and tested in a wide variety of applications and are the first choice for many fire system designers and consultants. Advanced and unique features across the family ensure a TITANUS® ASD solution is available for every smoke detection requirement.
Innovative detection technology

Traditional ASD systems use an expensive laser light source to detect smoke in the detection chamber. When smoke particles are present the laser light scatters and is detected by light receivers in the chamber. TITANUS® ASD products use a similar concept except that the expensive laser is replaced by a lower cost High-Power LED Light Source (HPLS). This approach is equally as sensitive and provides high quality detection to EN 54-20. However, the cost benefits mean that ASD can be used in a much wider range of applications.

False alarm immunity

LOGIC•SENS is an advanced signal processing technology that analyses the smoke sample and provides the earliest possible smoke detection whilst safely eliminating false alarms such as theatrical special effects smoke and diesel fumes.

Reliable operation

PIPE•GUARD is a unique monitoring system that detects if a sampling hole is blocked, a pipe is ruptured or if the air sampling unit has failed. This feature is vital in inaccessible areas where access is restricted and identification of individually blocked sampling points is essential.

Wide operating temperature

TITANUS® air sampling smoke detection systems are approved for use in cold storage units at temperatures as low as -40 °C. The upper temperature limit for site installations can be as high as +60 °C.

Silent running

TITANUS® Silent can be fitted to TOP•SENS® and PRO•SENS® products to produce a totally silent running system for applications such as domestic premises and offices where ambient background noise is low.

Addressable smoke detection

The TITANUS MICRO•SENS® can be fitted with ROOM•IDENT to provide individual detection of up to 5 rooms or areas. The source of the fire can be identified providing a cost effective replacement for addressable point detection for demanding environments and smoke detection applications.

Discrete air sampling

WAGNER’s capillary sampling hole can be mounted in a false ceiling, remotely from the sampling pipe. This ensures that smoke detection is discrete and does not distract from the décor. Areas such as detection cells also benefit from this discrete approach where conventional detection equipment has to be additionally protected against vandalism.
All traditional forms of fire protection and extinguishing systems rely on a fire starting for them to work, so some damage is inevitable. In applications where any business disruption is unacceptable or archive/stock is invaluable a different approach is required.

OxyReduct® is the ultimate form of fire protection as it stops a fire from occurring in the first place.
How it works

In order for a fire to occur there are essentially three fundamental elements that are required - fuel, heat and oxygen. Decreasing the concentration of oxygen in the air reduces the combustibility of all substances. An open fire cannot occur nor can it sustain itself if there is a lack of oxygen. Inert gas extinguishing systems have used this principle successfully for many years, but crucially there must have already been a fire for the extinguishant to be released.

The ultimate form of fire protection is to prevent fires from happening in the first place. This is how OxyReduct® differs from all other traditional fire detection and extinguishing systems.

OxyReduct® employs innovative technology that continuously reduces the oxygen level in a room by adding nitrogen to the air. The oxygen is reduced to a level in which most combustibles do not inflame and an open fire is impossible.

Safe access

OxyReduct® does not prevent the area being used by people. The effects of lowered oxygen levels on the human body are well known and safety guidelines have been established that allow staff to enter or work in the protected area.

Atmospheric environment

Nitrogen is used to inert the area as it is completely non-toxic in any quantity and is easily produced on site. Other benefits of Nitrogen are that it is electrically non-conductive and will not harm any product stored in the area. The Nitrogen being fed into the risk area is in fact fresh air with a 95% Nitrogen content. This prevents the air within the risk area from becoming stale and also prevents a build-up of carbon dioxide. The Nitrogen is not stored in pressurised bottles, but produced as required by the OxyReduct® system to replace natural leakage in the risk area. This allows accurate control of the atmosphere within the risk and saves space.

Applications

OxyReduct® is used where reliable fire protection is essential for the organisation’s success. The application spectrum stretches from small IT rooms to warehouses of 100,000m³ and more.

OxyReduct® installations have a critical advantage in areas with both a high concentration of goods and value. In high-rack storage, deep freeze, paper or hazardous goods areas any fire would have catastrophic effects on the ability to deliver.

OxyReduct® is now a mature technology that has been adopted by over 200 organisations throughout Europe. When business continuity is of prime importance, OxyReduct® can provide the ideal solution for fire protection.
Support Services

Complete Design Service
Installation
Commissioning
Service & Maintenance
Training
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