Clean Rooms

Protecting high value
assets and production in:

Semiconductor/Wafer Fabs

Electronic Device
Manufacturing

Research and
Development Facilities

Process, Assembly and
Inspection Areas

VESDA®
by ◆ xtralis™

High risk and expensive consequences

There are many factors to consider when protecting a clean room from fire:

- They contain high value equipment
- Work in-process is very sensitive to damage and of high value
- Highly flammable liquids and gases are present
- The air exchange rate can be up to 600 changes per hour, causing smoke dilution and supplying oxygen to a fire
- There are many electronic components in a clean room. Electrical faults are a major cause of clean room fires
- Some processes require temperatures in excess of 800°C, posing a fire risk.

The high cost of contamination and lost production

The damage from a clean room fire can be thermal (from flame/heat) and non-thermal (smoke contamination and corrosion). Non-thermal damage can be far greater than the thermal damage as clean rooms are critical to the manufacturing process and often are not duplicated. Even a small fire with relatively low physical damage can result in significant loss of production while the room is being decontaminated.

Example

A fire that occurred in a 465 m² clean room was extinguished by a single sprinkler, but it took 74 days to clean up and resume operations.

In a typical wafer fab fire, losses due to business interruption are typically 30% of the total loss, which can run to millions of dollars[1].

1. From a 1995 study by Munich Reinsurance company of Canada of 21 semiconductor plants in Asia.

## Why spot-type smoke detectors don't work in clean rooms

Smoke doesn't reach the ceiling

Smoke in a clean room will be dragged along with the airflow and may never reach spot detectors on the ceiling. A fire has to be quite large for the smoke to have enough thermal energy to escape the airflow and travel upwards. By that time, considerable thermal and non-thermal damage has occurred.

High cost of ownership

Some fire codes (e.g. NFPA 75) require spot detectors in rooms with high air velocities to be installed at close spacing. This not only increases the installation costs, but demands high cost of ownership. Each spot detector has to be routinely tested and maintained—within the clean room, potentially halting production.

Clean room VESDA system installations

Design 1

Fresh Air

Sub-Fab Area

Cross Section of a Clean Room, illustrating 2 VESDA installation designs
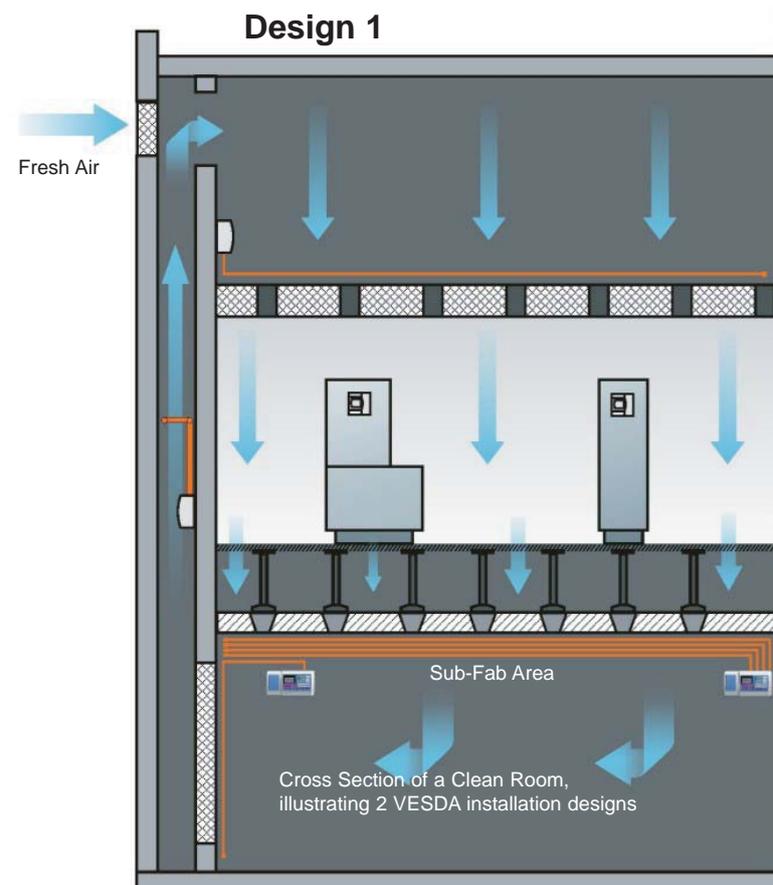
Reducing the risk by using very early warning smoke detection

A key component in an effective fire protection system for a clean room is very early warning smoke detection. Detecting smoke as early as possible minimizes contamination of the clean room and allows the most time to respond to a threat.

VESDA aspirating smoke detectors provide the very early warning that is critical in a clean room. They continuously draw air through a network of pipes back to the detector, instead of waiting for the smoke to arrive at the detector. This makes them extremely sensitive.
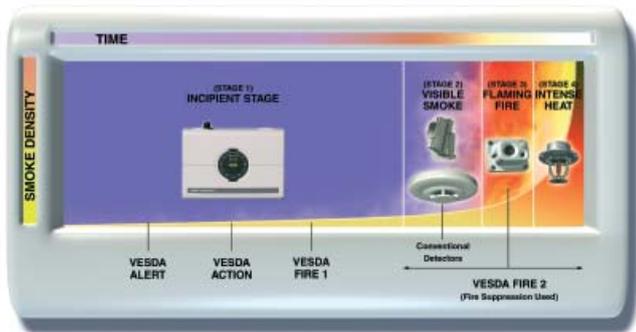
Fire Growth Curve
The progression of fire growth over time. A VESDA system detects a fire at the incipient stage, avoiding damage and lost production.
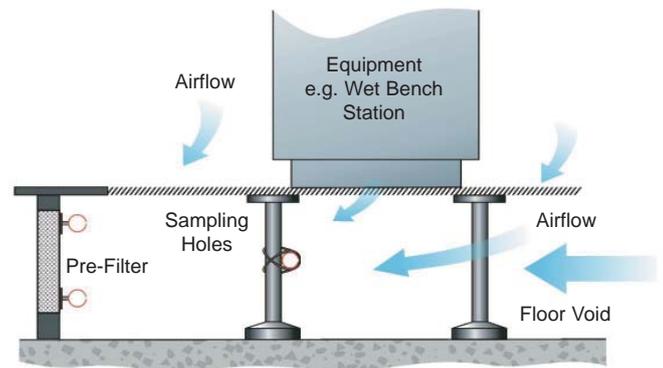
Design 2

Sample pipe in the floor void beneath a raised access floor will capture smoke as it is carried by the airflow.
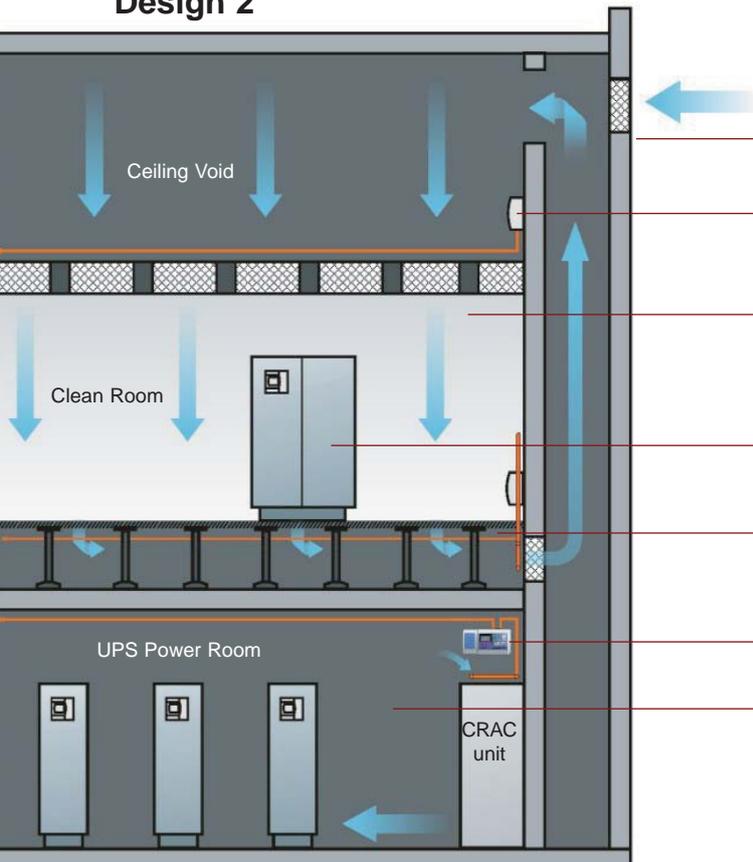
A reference detector can detect external pollution entering the airflow via the fresh air make-up supply

The ceiling-space can be monitored by installing VESDA sample pipe above the ceiling

Include the air volume exchange rate when calculating the area coverage of a smoke detector

Install sampling points in close proximity to identified risks (i.e. equipment)

Use shorter sampling pipe networks to reduce the time taken for the smoke to reach the detector & place sampling points in the direct path of the airflow

Install the detector units outside the clean room, so they can be maintained without disrupting production

Consider protecting other areas in the fab such as service corridors and ducted air plenums below a raised access floor

Adding VESDA System Management (VSM4) software allows monitoring and control of smoke detectors from a Central Monitoring Station or Emergency Control Room

Xtralis's global network of offices
and representatives means that
help is soon at hand

Why use a VESDA system?

When selecting an aspirating smoke detection system for a clean room, consider:

Look for	Why?	What VESDA offers
The best sensitivity	To achieve the earliest possible warning of a fire	VESDA can detect smoke at 0.005% obscuration per meter
A wide sensitivity range	So that detection levels can be set to suit the environment, avoiding false alarms	VESDA detectors have a sensitivity range of 0.005%–20% obscuration/m
A redundant peer-to-peer communications network	To give you flexibility in positioning and programming detectors and display modules	The VESDAnet communication network allows you complete installation flexibility
Multiple programmable alarm thresholds	So that the response can be appropriate for the stage of the fire, from 'Investigate' at the first alarm through to 'Activate de-smoke system' or 'Release suppression' at the fourth alarm level	VESDA has 4 programmable alarm levels
Event log and reporting	A forensic tool for investigating faults, alarms, user actions and smoke trends.	Each VESDA detector has an event log that stores the last 18000 events
A wide product range	So that there's a product to suit any size area that you want to protect… from a large open manufacturing floor to within the confines of production equipment	VESDA has the widest product range on the market
Absolute calibration	Ensures repeatable and reliable detection of very slow growth incipient fires	VESDA is the only aspirating smoke detector with Absolute calibration
Monitoring of particles less than 10 microns diameter	Ensures that smouldering fires in a clean room are detected early	VESDA detectors can detect particles smaller than 0.1 microns
Monitoring and control of smoke detectors from a Central Monitoring Station or Emergency Control Room	Allows response to be controlled and monitored from a central point by trained operators	Using VESDA System Management (VSM4) software, every VESDA detector can be controlled and monitored remotely.
An accredited global distribution and support network	So you get the right technical advice when you need it	All distributors of VESDA products are factory-accredited

Some of the Clean Rooms that are protected by VESDA

IBM	Texas Instruments	Samsung Semiconductors	Applied Materials Inc.
Intel	Seagate	Honeywell Microswitch	Fujitsu
Motorola	Peregrine Semiconductors	AT&T Microelectronics	Hyundai Semiconductors
Komatsu	Phillips	Sony	TSMC
AU Optronics	LG Electronics	China Picture Tube (CPT)	Chi Mei Operations (CMO)

Approvals

UL   FM APPROVED   VdS   LPCB   ACTIVFIRE SSL LISTED   CCCF

Need more information?

Call the Xtralis office closest to you, as listed below. Visit www.xtralis.com to access information about the VESDA smoke detector product range and our Clean Room Design Guide.

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