

**ENGINEERING SPECIFICATION**

***VESDA VLF***

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# Description

## General

The VESDA LaserFOCUS, very early warning aspirated smoke detector, shall be installed throughout the areas nominated on the drawings.

The system consists of highly sensitive laser based smoke detector using aspirated air sampling and is connected to sampling pipes. It shall be provided with a single sample inlet, internal flow monitoring, smoke detection and a facility for exhaust pipe connection. Reset, disable, test and fault determination functions will be available via the field service access door. System configuration will be provided through the AutoLearn functions, also available via the field service access door.

## Approvals

The Very Early Smoke Detection System must be of a type submitted to, tested, approved, and/or listed by:

UL (Underwriters Laboratories Inc), US

FM (Factory Mutual), US

ULC (Underwriters Laboratories Canada), Canada

LPCB (Loss Prevention Certification Board), UK

SSL (Scientific Services Laboratory), Australia

VdS (Verband der Sachversicherer e. V.), Germany

AFNOR – France

CCCF - China

## Codes, Standards or Regulations

The LaserFOCUS smoke detector shall be installed to comply with one or more of the following codes or standards:

* AS 1670, AS1603 NZ Part 2, 4, 8, ASNZS 3000
* NZ 4512 1994
* Local codes and standards

## System Description

### Design Requirements

* The detector shall consist of a highly sensitive laser based smoke detector, an aspirator, and a dual-stage filter cartridge.
* The detector shall have control switches for Reset, Disable, Test and restricted access switches for Alarm Setup and Flow Setup.
* The detector shall have individual illuminated ***indicators*** for:
* Four alarm levels (Alert, Action, Fire1 & Fire 2).
* Fault, Power & Disabled.
* Alarm Setup and Flow Setup.
* The detector shall have a front-panel, 10 segment, illuminated, yellow-colored smoke dial for the purpose of indicating current smoke level and detector status.
* The detector shall have individual relay outputs for Fault, Action and Fire 1
* The detector shall have an RS232-compatible serial control port for the purpose of configuration, control, status monitoring, event log extraction and upgrade.
* The detector shall provide for the addition of one interface card.
* The detector shall provide a general-purpose input to allow either; Reset, Disable, Standby, Alarm set 1, Alarm set 2 & External (external equipment trigger).
* The detector may also be configured by a PC and allow programming of four smoke threshold alarm levels, time delays, faults including airflow, detector, power and filter as well as an indication of the urgency of the fault and three relay outputs for remote indication of alarm and fault.
* The detector shall consist of an air sampling pipe network to transport air to the detection system and supports standard designs. Complex designs are supported by calculations from a computer-based design-modeling tool.

### Performance Requirements

* The VESDA LaserFOCUS (VLF-250) shall be tested and approved to cover up to 250 m2 in normal airflow.
* The detector shall be approved to provide very early smoke detection and provide up to four output levels corresponding to Alert, Action, Fire 1 and Fire 2. Alert and Action shall be programmable and able to be set at sensitivities ranging from 0.025 to 2.0% obs/m. Fire 1 and Fire 2 shall be programmable and able to be set at sensitivities ranging from 0.025 to 20% obs/m.
* The detector shall provide fault indication on the unit using the Instant Fault Finder function.
* The detector shall be self-monitoring for filter contamination.
* The detector shall incorporate an ultrasonic flow sensor in the pipe inlet port and provide staged airflow faults.

## Submittals

Product data and site drawings shall be submitted and shall include pipe layout, operational calculations (refer to the User Manual for simple pre-engineered designs, or use ASPIRE2) and performance criteria.

A copy of the manufacturer’s product manual shall be supplied to the user upon completion of the installation.

System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

## Quality Assurance

### Manufacturer Qualifications

The manufacturer shall have a minimum of 10 years production experience in the manufacturer and design of high sensitivity aspiration-type smoke detection systems.

The manufacturer shall be certified as meeting ISO 9001:2000 for manufacturing.

### Technology

Both light scattering and particle counting shall be utilized in this device as follows:

The laser detection chamber shall be of the mass light scattering type and capable of detecting a wide range of smoke particle types of varying size. A particle counting method shall be employed for the purposes of:

* Preventing large particles from affecting the true smoke reading.
* Monitoring contamination of the filter (dust & dirt etc.) to automatically notify when maintenance is required.

1. The particle counting mechanism shall not be used for the purpose of smoke density measurement.

The laser detection chamber shall incorporate a separate secondary clean air feed from the filter to provide clean air barriers across critical detector optics to eliminate internal detector contamination.

The detector shall not use adaptive algorithms to adjust the sensitivity from that set during commissioning. A learning tool shall be provided to ensure the best selection of appropriate alarm thresholds during the commissioning process.

### Equipment Supplier

The equipment supplier shall be authorized and trained by the manufacturer to calculate, design, install, test and maintain the aspirating system and shall be able to produce a certificate stating such on request.

# Products

## Manufacturer

Aspirating Smoke Detection System: Acceptable Manufacturer:

|  |  |
| --- | --- |
| **Vision Fire & Security**  Private Bag 215 495 Blackburn Road Mount Waverley VIC 3149 Australia Telephone: +61 3 9211 7200 Fax: +61 3 9211 7201 | **Regional Office:**  ASIA PACIFIC/AFRICA Telephone: +61 3 9211 7200 Fax: +61 3 9211 7202 Free Call (in Australia) 1800 700 203 |

## Manufactured Units

The VESDA LaserFOCUS aspirating smoke detection system is available in the following configurations:

|  |  |
| --- | --- |
| **Part Number** | **Description** |
| VLF-250 | LaserFOCUS Detector |

## Detector Assembly

* The detector, filter, aspirator and relay outputs shall be housed in an enclosure and shall be arranged in such a way that air is drawn from the fire risk area and a sample of air is passed through the dual stage filter and detector by the aspirator.
* The detector shall be laser based type and shall have an obscuration sensitivity range of 0.025 – 20% obs/m.
* The detector shall have four independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0 - 60 seconds.
* The detector shall also incorporate the facility to transmit a fault either via a relay or via a VESDAnet card as an option.
* The detector shall have a single pipe inlet that must contain an ultrasonic flow sensor. High flow fault (urgent and non-urgent) and low flow fault (urgent and non-urgent) can be reported.
* The filter must be a two-stage disposable filter cartridge. The first stage shall be capable of filtering particles in excess of 20 microns from the air sample. The second stage shall be ultra- fine, removing more than 99% of contaminant particles of 0.3 microns or larger, to provide a clean air barrier around the detector’s optics to prevent contamination and increase service life.
* The aspirator shall be a purpose-designed aspirator assembly.
* VESDA LaserFOCUS (VLF-250) shall be capable of supporting a single pipe run of 25 m, or two pipe runs of 15 m, with a transport time of less than 60 seconds or as appropriate codes dictate.
* The assembly must contain relays for basic alarm and fault conditions. The relays shall be software programmable (latching or non-latching). The relays must be rated at 2 A at 30 VDC. Remote relays shall be offered as an option with a VESDAnet Interface card and either configured to replicate those on the detector or programmed differently.
* The assembly shall have built-in event and smoke logging. It shall have separate event log storage for smoke levels, alarm conditions, operator actions and faults. The date and time of each even shall be recorded. Each detector (zone) shall be capable of storing up to 18,000 events.

## Displays

* The detector will be provided with LED indicators.
* Each Detector shall provide the following features at a minimum:
* Alert, Alarm, Fire 1 and Fire 2 corresponding to the alarm thresholds of the detector
* Smoke Dial display represents the level of smoke present
* Fault indicator
* Power indicator
* Disabled indicator
* Buttons supporting the following features shall be accessible to authorized personnel:
* Reset – Unlatches all latched alarm and faults.
* Disable – Disables the fire relay outputs from actuating and indicates a fault.
* Test – (press and release) Simulates a Fire 1 condition.

## Device Networking Requirements (VESDAnet card required)

* The devices in the smoke detection system shall be capable of communicating with each other via twisted pair RS485 cable with the addition of a VESDAnet Interface card. The network shall be able to support up to 250 devices (detectors, displays and programmers), of which at least 100 detectors can be supported.
* Backward compatibility with VESDA Laser Product via VESDAnet card
* The unit shall be capable of being configured in a fault tolerant loop for both short circuit and open circuit.
* PC based configuration tools shall be available to configure and manage the network of detectors.

### Digital Communication Port

An RS 232 compatible serial port will be provided on the detector for configuration, status monitoring, command input, event log extraction and software upgrades. It shall comply with EIA RS232 Protocol.

## Application

### Detection Alarm Levels

The standard laser based aspirating detection system is supplied with ***two alarm outputs*** (Alert and Fire 1). For four relay alarm levels use the optional Relay Interface card***.(to be released)***

The standard alarm outputs may be used as follows:

* **Alert** (Alarm Level 1) - activate a visual and audible alarm in the fire risk area.
* **Fire 1** (Alarm Level 3) - activate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

The additional alarm outputs, ***.(to be released)*** with the optional Relay Interface card may be used as follows:

* **Action** (Alarm Level 2) - activates the electrical/electronic equipment shutdown relay and activates visual and audible alarms in the Security Office or other appropriate location.
* **Fire 2** (Alarm Level 4) - activate a suppression system and/or other suitable countermeasures (e.g. evacuation action or shutdown of systems).

Note: The alarm level functions as listed are possible scenarios. Consideration should be given to the best utilization of these facilities for each application and the requirements of local authorities.

### Initial Detection Alarm Settings

Initial settings for the alarm levels shall be determined by the requirements of the fire zone.

Default settings of the unit shall be:

* Alarm Level 1 (Alert) 0.08% obs/m Delay 10 seconds
* Alarm Level 2 (Action) 0.14% obs/m Delay 10 seconds
* Alarm Level 3 (Fire 1) 0.20% obs/m Delay 10 seconds
* Alarm Level 4 (Fire 2) 2.00% obs/m Delay 10 seconds
* Fault Alarm Delay 5 seconds

### Fault Alarms

The detector fault relay shall be connected to the appropriate alarm zone on the Fire Alarm Control Panel in such a way that a detector fault would register a fault condition on the FACP. The fault relay shall also be connected to the appropriate control system.

Check local Codes, Standards or Regulations to determine whether compliance with this set‑up is required.

### Power Supply and Batteries

The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes and Standards.

Local Power Supply Standards that may apply include:

ASNZ 1603 Part 4 –1987

## Sampling Pipe Design

### Sampling Pipe

* The sampling pipe shall be smooth bore with an internal diameter between 19 - 21 mm. Normally, pipe with an outside diameter of OD 25 mm and internal diameter of ID 21mm should be used.
* The pipe material should be suitable for the environment in which it is installed, or of material as required by the Specifying Body.
* All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
* The pipe shall be identified as Air Sampling Pipe or Aspirating Smoke Detector Pipe or similar warning along its entire length, for every branch and every change in direction at regular intervals not exceeding the manufacturers recommendation or that of local codes and standards.
* To minimize flexing, all pipes should be supported every 1.5 m or less, or at a distance described in local codes and standards.
* The far end of each trunk or branch pipe shall be fitted with an end cap and made air tight by using solvent cement. Use of an end vent will be dependent on pre-engineered pipe design or ASPIRE2 calculations.

### Sampling Holes

* Sampling holes of 3 mm, or otherwise appropriately sized holes (see Section Air Sampling Pipe Network Calculations), shall not be separated by more than the maximum distance allowable for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations. For AS1670 the maximum allowable distance is 10.2 m.
* Each sampling hole shall be identified in accordance with Codes or Standards.
* Consideration shall be given to the manufacturers recommendations and standards in relation to the number of sampling holes and the distance of the sampling holes from the ceiling or roof structure and forced ventilation systems.

# Installation

## The Detection system

The contractor shall install the system in accordance with the manufacturer's System Design Manual.

## The Capillary Sampling Network

* Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and capillary-sampling points shall be installed on the ceiling and connected by means of a capillary tube.
* The minimum internal diameter of the capillary tube shall be 5 mm, the maximum length of the capillary tube shall be 1.8 m unless the manufacturer in consultation with the engineer have specified otherwise.
* The capillary tube shall terminate at a ceiling sampling hole specifically designed and approved by the manufacturer. The performance characteristics of the sampling holes shall be taken into account during the system design.

## Air Sampling Pipe Network Calculations

Pre-engineered pipework setups are provided in the VESDA LaserFOCUS Product Manual. For specific performance requirements that fall outside the pre-engineered designs, a sampling pipe aspiration-modeling program such as ASPIRE2 shall provide air sampling pipe network calculations. Pipe calculations shall be supplied with the proposed pipe layout design to indicate the following performance criteria.

### Transport Time

The manufacturer’s recommended transport time (i.e. the time taken by smoke sampled to reach the detector) for the least favorable sampling hole is less than 60 seconds for open hole sampling and less than 90 seconds for capillary tubes.

Local codes and standards may also apply. For example:

AS1670, Part 1 Australia 90 Seconds

The maximum transport time must never exceed the local codes.

## Commissioning Tests

* The contractor shall allow for the manufacturer’s representative to attend commissioning of the entire installation in the presence of the owner and/or its representative.
* The Contractor shall provide all necessary instrumentation, equipment, materials and labor.
* The Contractor shall record all tests and system calibrations and a copy of these results shall be retained on site in the System Log Book.

## System Checks

1. Visually check all pipes to ensure that all joints, fittings, bends, sampling holes, etc., comply with the Specification.
2. Check the system to ensure the following features are operational and programmed in accordance with the specification.

* Alarm threshold levels,
* Detector address,
* Time and date,
* Time delays,
* Air flow fault thresholds,
* External button operable (Reset / Disable),
* Referencing
* Units set to U.S./S.I.,

1. Check to ensure that all ancillary warning devices operate as specified.
2. Check interconnection with Fire Alarm Control Panel to ensure correct operation.

## Tests

* Introduce smoke into the detector assembly to provide a basic functional test.
* Introduce smoke to farthest sampling holes in each sampling pipe. To verify transport time does not to exceed the local codes.
* Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the log book and commissioning report accordingly.