



VESDA LaserPLUS™

ENGINEERING SPECIFICATION



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General Engineering Specification

SCOPE

This document provides specification details of the VESDA LaserPLUS aspirating smoke detection products to assist in their installation and commissioning.

PART 1

1.01 General

A Very Early Smoke Detection System similar to the VESDA LaserPLUS System shall be installed throughout the areas nominated on the drawings.

The system shall consist of highly sensitive LASER-based Smoke Detectors with aspirators connected to networks of sampling pipes.

When required, an optional Display unit shall be provided to monitor each detector, and a Programmer shall be supplied to configure the system.

1.02 Approvals

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

UL (Underwriters Laboratories Inc)

ULC (Underwriters Laboratories Inc Canada)

FM (Factory Mutual)

Local codes and standards

Year 2000 Accreditation

1.03 Codes, Standards or Regulations

The entire installation shall be installed to comply with:

- NFPA Standards
- NEC Standards
- Year 2000 compliancy standards including, LPS2000, GTE PA96014T

1.04 System Description

1.04.1 Design Requirements

1. Shall consist of a highly sensitive LASER-based smoke detector, aspirator, and filter.
2. It shall be modular, with each detector optionally monitored by a Display featuring LEDs and a sounder. The system shall be configured by a Programmer that is either integral to the system, portable or PC based.

The system shall allow programming of:

- four smoke threshold alarm levels;
 - time delays;
 - faults including airflow, detector, power, filter and network as well as an indication of the urgency of the fault;
 - seven or more configurable relay outputs for remote indication of alarm and fault conditions.
3. It shall consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modelling tool.
 4. Optional equipment may include intelligent remote displays and/or a high level interface with the building fire alarm system, or a dedicated VESDA System Management (VSM) graphics package.
 5. Performance Requirements
 - Shall be tested and approved to cover up to 20,000 sq. ft
 - Shall be approved to provide very early smoke detection and provide four output levels corresponding to Alert, Action, Fire 1 and Fire 2. These levels shall be programmable and able to be set at sensitivities ranging from 0.005 – 0.0015–6% obsc/ft. For compliance to UL approval range is 0.0015-4% obsc/ft.
 - Shall report any fault on the unit by using configurable fault output relays or via VSM.
 - Shall be self monitoring for filter contamination.
 - Shall incorporate a flow sensor in each pipe and provide staged airflow faults.

1.05 Submittals

Product data and site drawings shall be submitted and shall include pipe layout, operational calculations (ASPIRE™) and performance criteria.

A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied 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.

1.06 Quality Assurance

1.06.1 Qualifications

1. Manufacturer

The manufacturer shall have a minimum of 15 years production experience in the manufacturer and design of high sensitivity aspiration-type smoke detection systems.

The manufacturer shall be certified as meeting ISO 9002 for manufacturing.

2. 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.

Note: The Particle counting circuitry 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; providing 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.

3. Equipment Supplier

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

PART 2 PRODUCTS

2.01 Manufacturer

Aspirating Smoke Detection System: Acceptable Manufacturer:

Vision Fire & Security
Private Bag 215
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Regional Offices:

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US

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EUROPE/MIDDLE EAST

Telephone: +44 1442 242330
Fax: +44 1442 249327

Website: www.vesda.com

2.02 Manufactured Units(s)

The VESDA LaserPLUS aspirating smoke detection system (Part Number VLP-XXX).

Many configurations are possible; typical configurations are:

Part Number	Description
VLP-000	Detector only
VLP-002	Detector with integral display
VLP-012	Detector with integral display and programmer
VLP-400	Detector only with Fault/OK lights

2.03 Detector Assembly

1. The Detector, Filter, Aspirator and Relay Outputs shall be housed in a mounting box and shall be arranged in such a way that air is drawn from the fire risk and a sample passed through the Dual Stage Filter and Detector by the Aspirator.
2. The Detector shall be LASER-based type and shall have an obscuration sensitivity range of 0.005 – 0.0015%/ft – 6% obs/ft.
3. 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.
4. The Detector shall also incorporate facilities to transmit the following faults
 - Detector
 - Air flow
 - Filter
 - System
 - Zone
 - Network
 - Power
 - Urgent and Minor faults. Minor faults shall be considered as servicing or maintenance signals. Urgent faults indicate the unit may not be able to detect smoke.
5. The detector shall have four in-line sample pipe inlets and must contain a flow sensor for each pipe inlet. Both Minor and Urgent flow faults can be reported.
6. 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 0.3microns or larger, to provide a clean air barrier around the detector's optics to prevent contamination and increase service life.
7. The aspirator shall be a purpose-designed rotary vane air pump. It shall be capable of allowing for multiple sampling pipe runs up to 600 ft. in total, (4 pipe runs per detector) with a transport time of less than 120 seconds or as appropriate codes dictate.
8. The Assembly must contain relays for alarm and fault conditions. The relays shall be software programmable to the required functions. The relays must be rated at 2 AMP at 30 VDC. Remote relays shall be offered as an option and either configured to replicate those on the detector or programmed differently.
9. The Assembly shall be able to be surface mounted to a wall or recessed in the wall cavity (the unit may be inverted in either option).
10. The assembly shall have built-in event and smoke logging. It shall store 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 and does not require the presence of a display in order to do so.

2.04 Displays

1. When required, a detector Display module may be located within the detector, a remote mounting box or a 19 inch remote rack.
2. Each Display shall provide the following features at a minimum:
 - A 20 segment bargraph display.
 - Four independent high intensity alarm indicators, Alert, Action, Fire 1 and Fire2, corresponding to the four alarm thresholds of the detector.
 - Alarm threshold indicators for Alert, Action and Fire 1.
 - Detector fault and airflow fault indicators.
 - Faults originating in the particular VLP zone (Zone Fault) shall be distinguished from those produced by the overall smoke detection system and from those resulting from network wiring errors (Network Fault). LED indicators shall be provided for each fault category.
 - Minor and urgent fault LED indicators.
 - A remotely mounted Display may be optionally equipped with 7 or 12 configurable relays for signalling alarm and fault conditions.
 - Four buttons supporting the following features:
 - a) Mode/Test - Scrolls through the information on the Display's digital display: Sensitivity (Fire 1 Threshold setting), current smoke level and VLP Zone number. When pressed and held initiates a lamp test on the individual display module.
 - b) Silence - Silences all devices on the system
 - c) Reset - Unlatches all latched alarm conditions on the assigned VLP zone.
 - d) Isolate - Isolates the individual VLP zone (inhibits Alarm and Fault relays and initiates Isolate relay).

2.05 Programmers

1. When required, a Programmer module may be located within the detector, a remote mounting box, a 19 inch remote rack, or in a portable hand-held unit. Alternatively, programming may be performed using a Windows® application running on a PC connected through a High Level Interfacing unit (PC-Link HLI).
 2. Each Programmer shall support the following features at a minimum:
 - Programming of any device on the VESDAnet system.
 - Viewing of the status of any device in the system.
 - Adjustment of the alarm thresholds of a nominated detector.
 - Setting of Day/night, weekend and holiday sensitivity threshold settings.
 - Initiation of AutoLearn™, to automatically configure the detector's alarm threshold settings to suit the current environment.
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- Multi-level password control.
- Programmable latching or non-latching relay operation.
- Programmable energised or de-energised relays.
- Programmable high and low flow settings for airflow supervision.
- Programmable aspirator speed control.
- Programmable maintenance intervals.
- Facilities for referencing with time dilution compensation.
- Testing of relays assigned to a specific zone to aid commissioning.

2.06 Device Networking Requirements

1. The devices in the smoke detection system shall be capable of communicating with each other via twisted pair RS485 cable. The network shall be able to support up to 250 devices (detectors, displays and programmers), of which at least 100 detectors can be supported.
2. The network shall be capable of being configured in a fault tolerant loop for both short circuit and open circuit. Any communication faults shall be reported unambiguously and shall be clearly attributable to an individual device or wire link in the fault messages.
3. PC based configuration tools shall be available to configure and manage the network of detectors.

2.07 Digital Communication Port

Shall comply with EIA RS485 Protocol.

2.08 Application

1. Detection Alarm Levels

The laser based aspirating detection system shall have four (4) independently programmable alarm thresholds. The four alarm levels may be used as follows:

- Alarm Level 1 (Alert)
Activate a visual and audible alarm in the fire risk area.
- Alarm Level 2 (Action)
Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.
- Alarm Level 3 (Fire 1) initiates an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.
- Alarm Level 4 (Fire 2)
Activate a suppression system and/or other suitable countermeasures.

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 (e.g. Authorities Having Jurisdiction in the US).

2. Initial Detection Alarm Settings

Initial settings for the alarm levels shall be determined by the requirements of the fire zone. However, the setting for Fire 1 (Alarm Level 3) shall always appear as 100% on the bargraph scale. Default settings of the unit shall be:

- Alarm Level 1 (Alert) 0.025% Obs/ft
- Alarm Level 2 (Action) 0.044% Obs/ft
- Alarm Level 3 (Fire 1) 0.062% Obs/ft
- Alarm Level 4 (Fire 2) 0.61% Obs/ft

3. Initial (factory default) Alarm Delay Thresholds

Initial (factory default) settings for the alarm delay threshold shall be:

- Alarm Level 1 (Alert) 10 seconds
- Alarm Level 2 (Action) 10 seconds
- Alarm Level 3 (Fire 1) 10 seconds
- Alarm Level 4 (Fire 2) 10 seconds
- Fault Alarm 5 seconds

4. 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 Minor Fault and Isolate relays 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).

5. 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, Standards or Regulations. Typically 24 hours standby battery back up is required followed by 30 minutes in an alarm condition.

Local Power Supply Standards that may apply:

UL 1481 Listed (provided the power supply and standby batteries have been appropriately sized/rated to accommodate the system's power requirements).

US Telecommunication Central Office Power Supply: The system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted to 24VDC.

2.09 Sampling Pipe Design

2.09.1 Sampling Pipe

1. The sampling pipe shall be smooth bore with an internal diameter between _ to 1 inch. Normally, pipe with an outside diameter of 1 inch and internal diameter of _" should be used.
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2. The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body.
3. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
4. The pipe shall be identified as Aspirating Smoke Detector Pipe (or similar wording) along its entire length at regular intervals not exceeding the manufacturers recommendation or that of local codes and standards.
5. All pipes should be supported at not less than 5ft centres, or that of the local codes or standards.
6. The far end of each trunk or branch pipe shall be fitted with an end cap and drilled with a hole appropriately sized to achieve the performance as specified and as calculated by the system design.

2.09.2 Sampling Holes

1. Sampling holes of 5/64", or otherwise appropriately sized holes (see Section 3.05), shall not be separated by more than the maximum distance allowable for conventional point detectors as specified in the local code or standard. Intervals may vary according to calculations.

N.F.P.A. 72 (1996 Edition) the maximum allowable distance between sample points is 30 feet.

2. Each sampling point shall be identified in accordance with Codes or Standards.
3. Consideration shall be given to the manufacturers recommendations and standards in relation to the number of Sampling Points and the distance of the Sampling Points from the ceiling or roof structure and forced ventilation systems.

3.04 Commissioning Tests

1. 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.
2. All necessary instrumentation, equipment, materials and labour shall be provided by the Contractor.
3. 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.

3.05 System Checks

1. Visually check all pipes to ensure that all joints, fittings, bends, sampling points, 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 (for both day and night settings),
 - Pipes in use,
 - Detector address,
 - Display address,
 - Clock and date,
 - Time delays,
 - Air flow fault thresholds,
 - Display buttons operable (Mode, Silence, Reset, Isolate),
 - Referencing
 - Units set to U.S./S.I.,
3. Check to ensure that all ancillary warning devices operate as specified.
4. Check interconnection with Fire Alarm Control Panel to ensure correct operation.

3.06 Tests

1. Introduce Smoke into the Detector Assembly to provide a basic functional test.
2. Introduce smoke to the least favourable Sampling Point in each Sampling Pipe. Transport time is not to exceed the local codes (see 3.03).
3. If more than two bargraph divisions illuminate under normal conditions (no smoke test), review event log for two (2) weeks from date of commissioning and make appropriate adjustments to the alarm and delay thresholds.
4. 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.

END OF SPECIFICATION



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