INSTALLATION, OPERATION, MAINTENANCE AND TROUBLE-SHOOTING MANUAL OF VESDA AUTOMATIC FIRE / SMOKE DETECTION WITH ALARM SYSTEM IN FULLY AIR CONDITIONED RAILWAY COACHES

INTRODUCTION

Xtralis VESDA system is a very early warning aspiration type smoke detection system.

VESDA system works on the principle of laser light scattering incorporating particle counting function with a fully integrated detection chamber. The particle counting mechanism is used to prevent false alarms due to large volumes of dust or fibers or large airborne particulates presented in the sampled air and not for the purpose of smoke density measurement and detection.

The Xtralis VESDA system installed is a proven and established technology system on International Railway systems for the protection of Rail coaches.

The Xtralis VESDA Aspiration Smoke Detection System installed consists of the following components.

- **Xtralis VESDA LASER FOCUS Detectors - Model No: VLF-500**
  Installed in the passage (attendant location) inside each coach

- **Xtralis VESDA System Manager Graphical Software – Model No: VSM- 4**
  Installed in the Pantry Car for control and monitoring of detectors installed in each coach

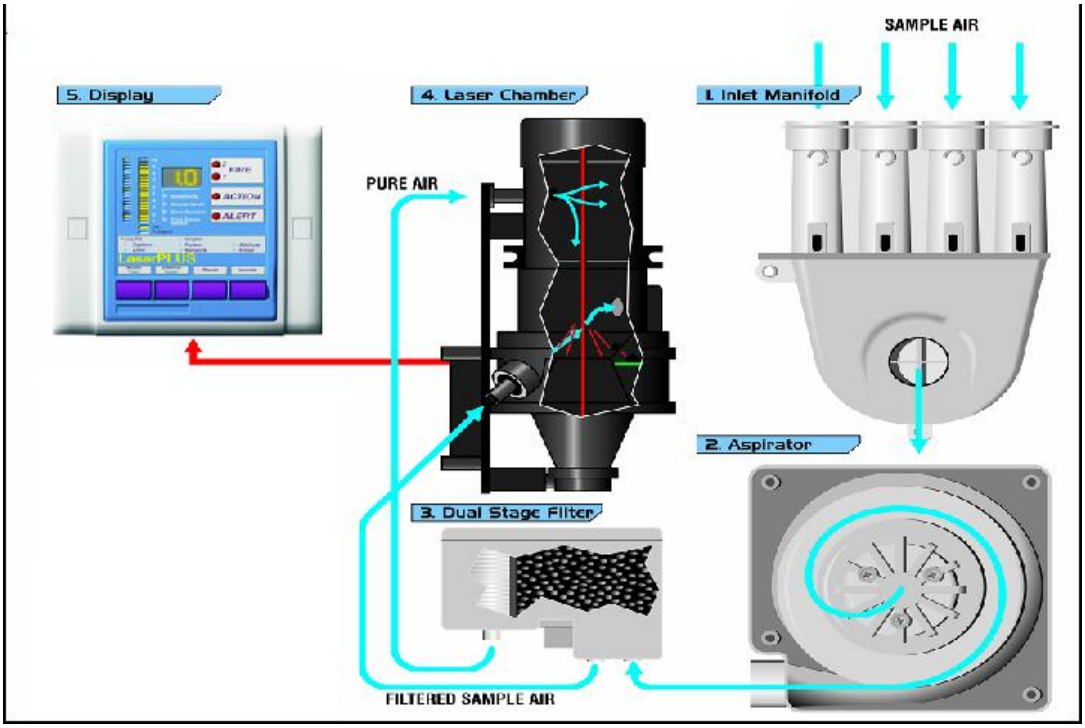
- **Air sampling pipe network with capillary sampling points and sampling holes to transport air to the detection system**
  Installed across the length of the coach covering passenger seating area, toilets, return air path, electrical cabinets and general area.

- **Sounder and Strobe light**
  Installed in the passage (attendant location) for audio visual annunciation of alarm condition

The detector installed is capable of indicating an alarm in four stages viz., Alert, Action, Fire1 and Fire2. The strobe light (visual indication) is triggered when the 'Action' Stage of Alarm is trigged and the sounder (audible indication) is triggered when the ' Fire1' Stage of Alarm is triggered.

1 XTRALIS VESDA DETECTOR OPERATION

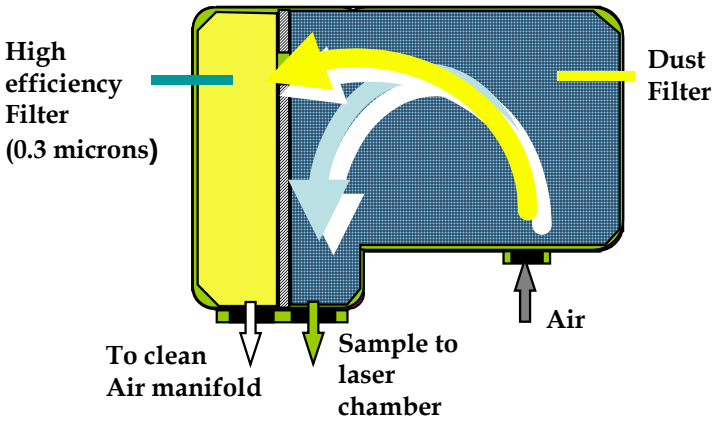
The diagram below illustrates the different parts of an Air Sampling Smoke Detection System



1. Air is sampled by the Xtralis VESDA detector through a pipe network specially designed to the requirements of the individual train coaches.

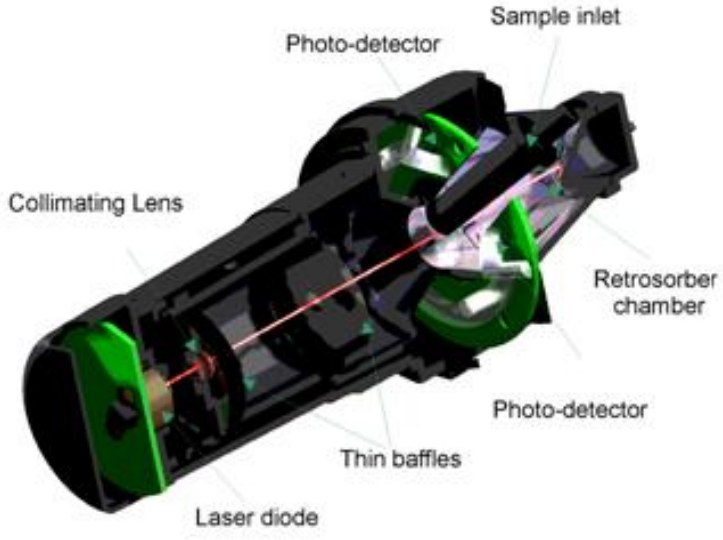
2. The air sample is filtered by the Xtralis VESDA detector to remove dust and dirt before it is passed through the laser detection chamber.

The filter used for filtering the air borne dust particles is indicated in the below diagram.



First stage of the filter removes dust and dirt from the air sample before the sample enters the laser detection chamber for smoke detection. The second (ultra fine) stage provides an additional clean air supply to keep the detector's optical surfaces free from contamination, ensuring stable calibration and longer detector life. The detector constantly monitors the filter efficiency and a fault is raised automatically on the detector when the filter needs to be replaced.

3. The air sample after filtration enters the laser detection chamber. The laser detection chamber used for smoke measurement and detection is indicated in the below diagram

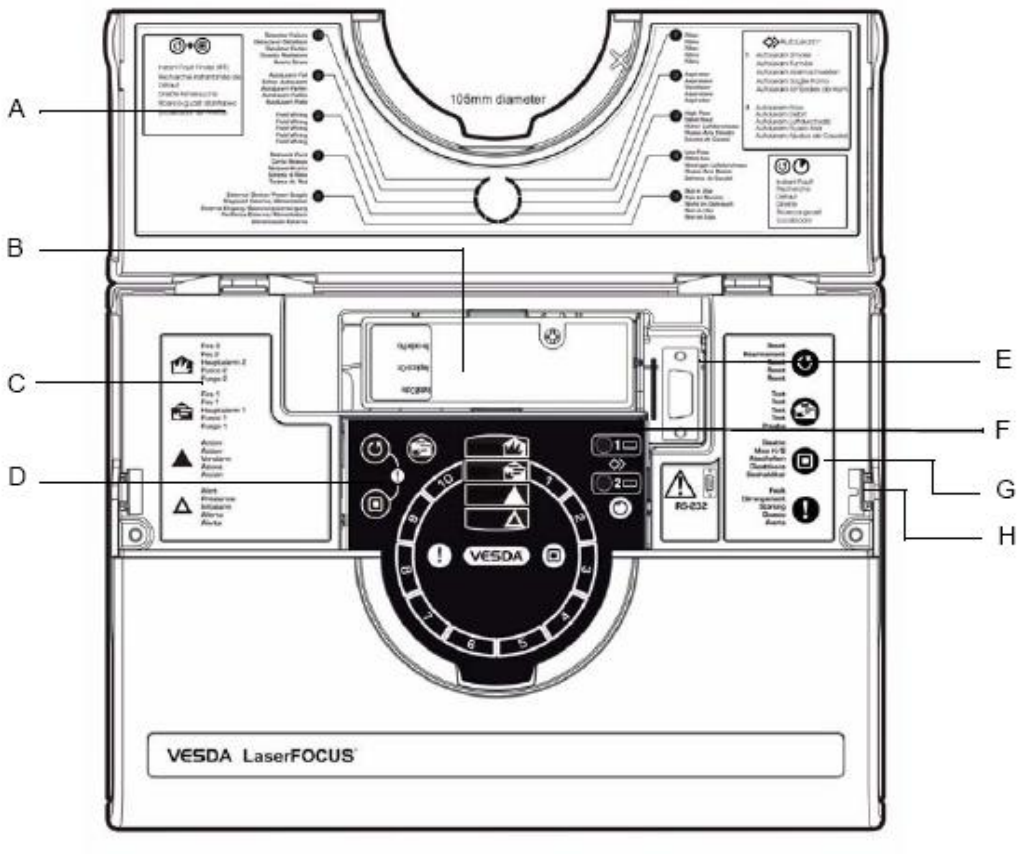


When smoke is present, the laser light gets scattered within the detection chamber that is detected by a very sensitive receiver system using sophisticated electronics. This signal is processed to represent the absolute level of smoke present. When the smoke density reaches the set threshold an alarm is raised.

4. The sampled air is expelled via an exhaust port at the top of the detector.

The Xtralis VESDA detector components are housed inside a polycarbonate enclosure positioned on a standard mounting bracket supplied with the detector. The detector receives power and communicates with the host equipment via screw terminal connections within the unit. Alarms and troubles are communicated to the host equipment via programmable relays and via an RS232 asynchronous communications port. The front of the detector includes a sophisticated user interface to display the operating state, alarm and fault status of the detector.

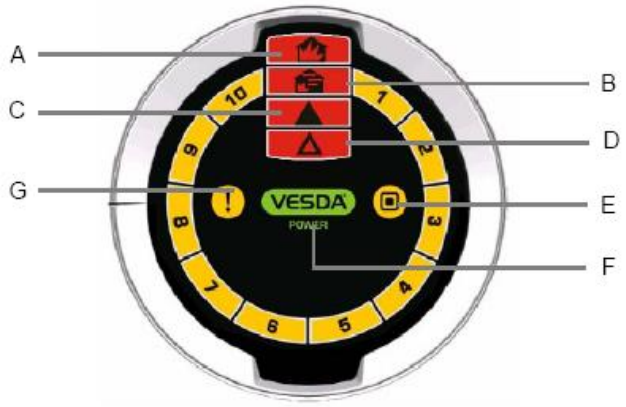
2 XTRALIS VESDA LASERFOCUS (VLF) DETECTOR



Legend	
A	Instant Fault Finder fault descriptions.
B	Dual stage air filter cartridge.
C	Alarm level definitions.
D	Control buttons - Reset, Disable, (Instant Fault Finder) & Test.
E	RS232 DB9F serial port.
F	Control buttons - AutoLearn Smoke, AutoLearn Flow.
G	Control button definitions.
H	Security tab.

Each detector covers an area of up to 500 m² for open space protection and maximum pipe length of 50 meters.

- Instant Recognition display and Instant Fault Finder™ on detector – allows easy determination of detector status and alarm and fault detail

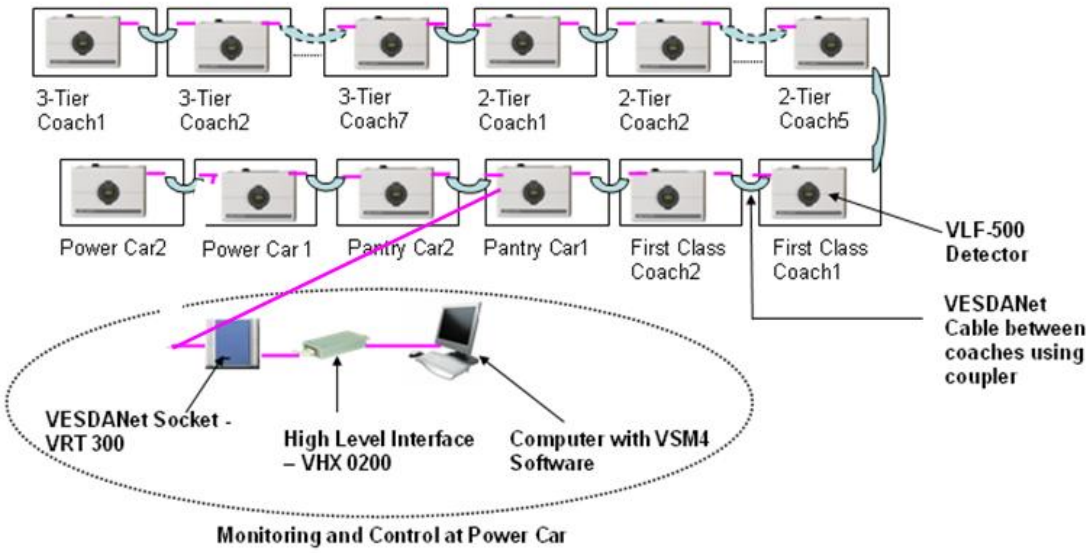


Legend			
	Option	Definition	LED Color
A	FIRE 2	Indicates the Fire 2 threshold has been reached.	Red
B	FIRE 1	Indicates the Fire 1 threshold has been reached.	Red
C	ACTION	Indicates the Action condition has been reached.	Red
D	ALERT	Indicates the Alert condition has been reached.	Red
E	DISABLED	Indicates the unit has been disabled (solid) or is in standby mode (flashing).	Yellow
F	POWER	Illuminates when the detector is powered.	Green
G	FAULT	Fault light continuously on indicates a Major Fault . When flashing indicates a Minor fault.	Yellow

3 MONITORING AND CONTROL SYSTEM

To set up a centralised monitoring system, a VESDAnet loop (RS485) is created by networking all the Xtralis VESDA Detectors installed in each coach in peer to peer/daisy chain.

The following block diagram indicates the system setup.



This VESDAnet loop is used for PC based monitoring and control using VSM-4 software.

VESDA System Manager-4 Graphic Software Based Central Monitoring

The VESDAnet loop is interfaced using High Level Interface (HLI) with a PC installed at the monitoring location. VESDA System Manager-4 (VSM-4) software is installed on the PC for complete monitoring and control of all the VESDA detectors installed.

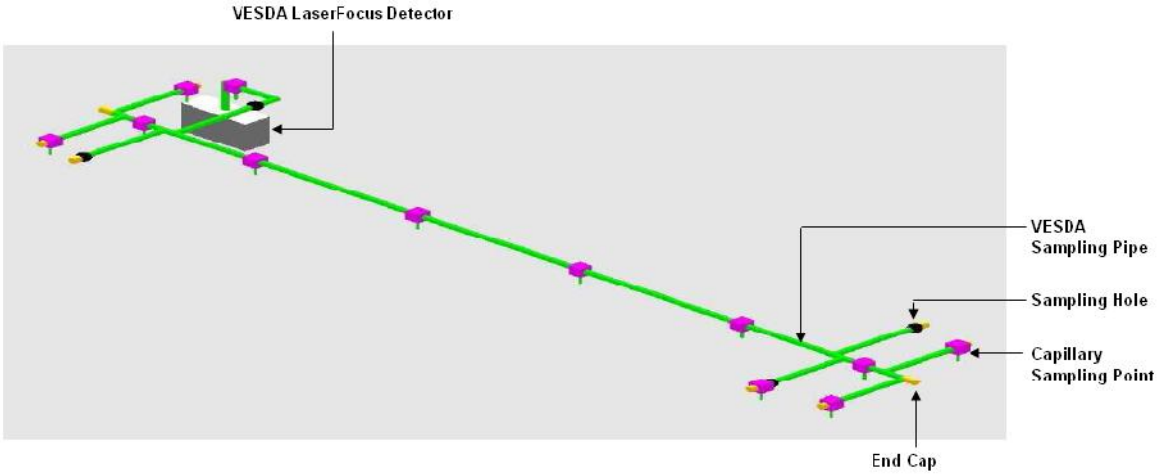
Key features of VSM-4 software are as follows:

- **3-D Floor Plan**: showing the entire area and the location of each detector within the area
- **Real-time Smoke Trending**: Click on a detector and see the real time smoke level in the area. You could also see alarm settings, filter status, event log etc.
- **Group Trend Graphs**: The Operator could compare the smoke level in multiple areas on real time basis in a single graph. This feature is particularly useful, when the operators monitoring finds all of a sudden smoke level rising in a particular coach, then they could compare the smoke level of this coach with the adjacent coach or farthest coach. The supervisor could also review history of the event across multiple detectors on the same graph to ascertain extent and trends of smoke movement.
- **Text2Speech Option**: provides an audible warning to operators.
- **Status Bar**: highlights the latest and most important event (prioritised and colour coded)

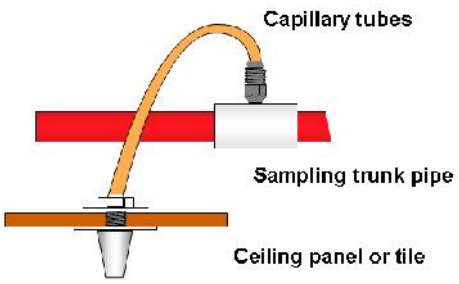
- **Graphical Location information**: exact event location is pinpointed on the floor plan.
- **Remote Event Log Retrieval, Viewing and Sorting**
- **Multiple Event Log Database Management**
- **Auto-discovery of detector network**: wiring order and device configurations.
- **Full Remote Programming of all the detectors**: change any function or parameter through multiple editing views.
- **Event Response notification** by Email and SMS to defined users on defined events using SMS module

4 PIPE NETWORK LAYOUT AND SAMPLING METHODS

The following diagram indicates the typical pipe layout in each coach.



The typical arrangement of a concealed sampling point is shown in the diagram below.



These sampling points are installed at locations with public (passengers) access – passage and seating area. Inside equipment cabinet, normal sampling holes are considered.

In certain locations of the train, Heat Activated Sampling Point (HASP) is used. These areas include engine room of the Power Car, Kitchen Area of Pantry Car and in all Lavotories of all the coaches. The picture below is a sample of HASP sampling head.

The HASP head operates on thermal detectors principle in its normal operating mode. As fire starts and develops, heat (ambient temperature) increases to such point that the sampling hole is opened and it becomes a normal air sampling hole, hence the detection of the fire and alarm from Xtralis VESDA detectors. As per the Certificate of Appraisal, issued by National Building Technology Centre of Australian Government, the heat activation temperature is 68 °C.

DETECTOR INSTALLATION & OPERATION

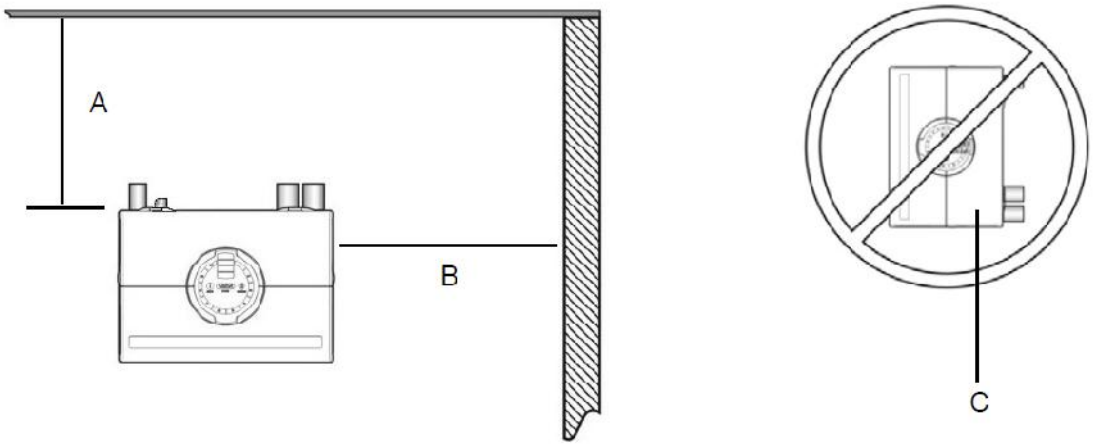
DETECTOR MOUNTING

The VESDA Laser FOCUS can be installed upright, inverted or horizontally.

Note: Ensure the smoke detector is mounted away from obstructions and below ceiling Level
Caution: An exhaust deflector must be fitted for upright mounting, unless the exhaust port is connected to a return air pipe.
Caution: Do not install this unit on its side. There is a risk of particulate and condensation collecting on critical elements of the detector chamber reducing the detectors performance.

Ensure that there is sufficient clearance to mount the detector, noting the location of air sampling pipes and cable entry points. Owing to the rigid nature of the plastic pipe, installation must provide for sufficient movement in all pipework (air inlet, air exhaust and cable pipes) to allow pipe ends to be easily fitted and removed.

Mounting location



Legend	
A	Min. 200 mm (8 in.) below ceiling level
B	Min. 500 mm (20 in.) from a wall or obstruction to allow access to the security tab
C	Do not install the detector on its side

Installing the smoke detector

In all installation cases the mounting bracket must be fitted (upright) as shown in figure.

Note: Ensure the mounting surface is flat. This will permit an air tight seal to be achieved between the sampling pipe and the tapered air ports on the detector.
Warning: Prior to drilling the attachment holes for the mounting bracket, ensure that all mounting surfaces (i.e. walls, cabinet sides, etc.). are clear of electrical wiring and plumbing.

When the pipe network and cabling are already fitted, the bracket can be used to aid alignment of the detector with the pipes. The Installation procedure below explains this process.

Installation procedure

Cut the air inlet pipe and exhaust pipe (if used) at 90 deg., and to the same length (for normal and inverted mounting). Remove all rough edges. This is critical to obtain an air tight seal with the smoke detector.

1. Position the air inlet centerline mark (A), see Figure, of the mounting bracket against the end of the air inlet pipe.

2. In the cut out section of the mounting bracket mark a line across the top of the cut out if metric size pipe is used or mark a line across the bottom of the cut out if Imperial size pipe is used.

3. Slide the mounting bracket down (up for inverted mounting) until the top of the bracket aligns with the marked line.

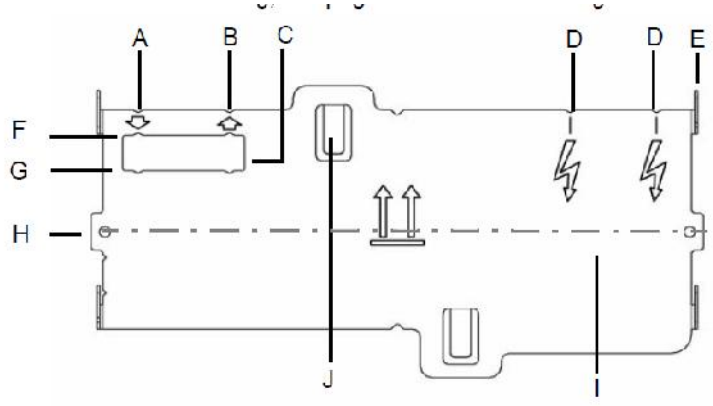
4. Mark off and drill the 2 bracket mounting holes (H).

5. Screw the bracket to the mounting surface.

6. Hook the smoke detector onto the mounting bracket tabs and pull it down into place.

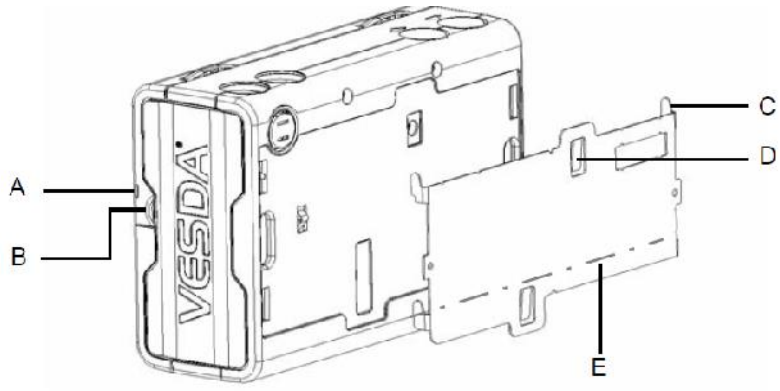
7. Use the two M4 x 20 mm locking screws provided and screw them into the screw holes on the left and right side of the detector. See the items marked (F) in the Figure Detector removal.

8. The air sampling pipe can now be attached and power connected.
(See section wiring connections for connection information).



Legend	
A	Air inlet port centerline
B	Exhaust air port centerline
C	Cutout
D	Cable entry centerlines
E	Mounting tab
F	Metric OD 25 mm pipe mark
G	Imperial IPS ¾ in. pipe mark
H	Bracket mounting holes
I	Centerline of detector
J	Anti-tamper clip

Mounting bracket orientation for upright mounting



Legend	
A	Security tab
B	Finger clip
C	Mounting tab
D	Anti-tamper clip
E	Centerline of detector

Mounting Bracket Rear View

Air inlet pipe connections

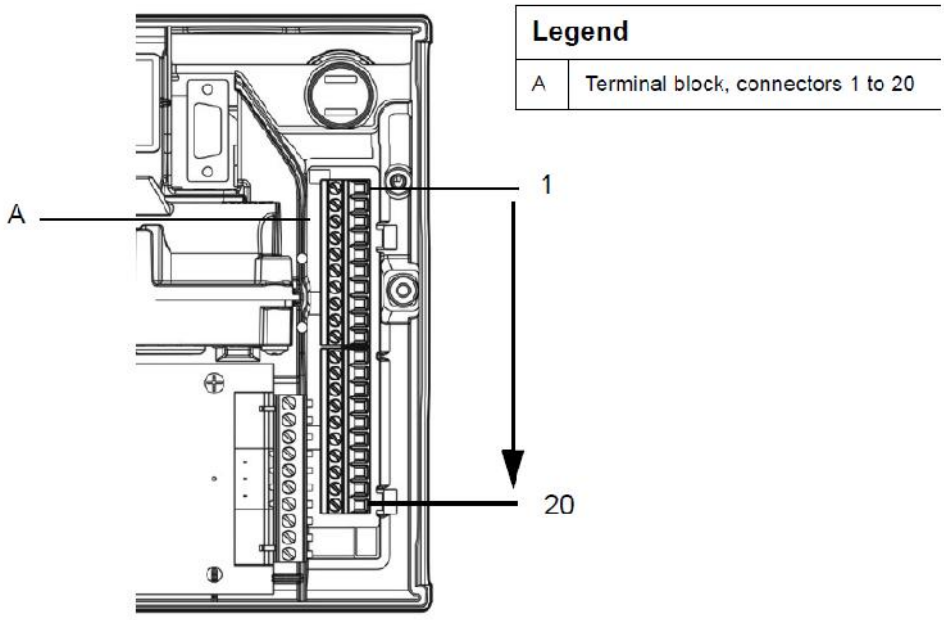
The tapered shape of the air inlet port is designed to accept standard pipes of OD 25 mm (ID 21 mm) or IPS ¾ in (OD 1.05 in) and provide an air tight seal.

Note: Do not glue the air inlet pipe to the detector. This will void your warranty.

Detector cabling requirements

The screw type terminals located on the termination card within the VESDA Laser FOCUS will accept wire sizes from 0.2 sq. mm to 2.5 sq. mm (30 – 12 AWG).

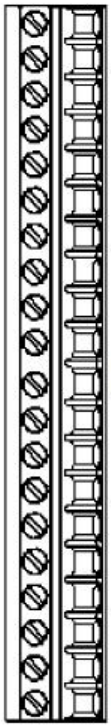
To reach the terminal block, open the field service access door, (see Controls and indicators section), and then unscrew the front cover retaining screws. Lift off and swing down the front cover. The terminal block is located on the right hand side of the detector.



Legend	
A	Terminal block, connectors 1 to 20

Terminal block

Terminal Block Connections:



1	GPI	
2	GPI	
3	Display TX	
4	Display RX	
5	Display Common Ground	
6	Display Power -	
7	Display Power +	
8	Power Return 0 VDC	From power supply unit
9	Power In 24 VDC	
10	Power Return 0 VDC	To next detector (if more than 1 detector per Power Supply Unit)
11	Power Out 24 VDC	
12	NC	
13	Common	Fault relay
14	NO	
15	NC	
16	Common	Action relay
17	NO	
18	NC	
19	Common	Fire 1 relay
20	NO	

GPI – General Purpose Input (Terminals 1 & 2)

The General Purpose Input (GPI) is a programmable input. When the GPI function parameter is set to external, the detector shall indicate an external equipment fault condition by monitoring the line impedance. An End of Line (EOL) resistor is supplied with the product and must be assembled in parallel with the device to be monitored.
The EOL resistor provides a known termination to the external equipment, this allows the VLF to detect open or short circuits. The detector monitors the EOL resistor, see Figure , and reports any faults when the GPI function is set to any value, except None.

Caution: These terminal blocks come assembled and should NOT be disassembled.

If GPI will not be used we recommend that you leave the EOL resistor assembled.

Power supply (Terminals 8, 9, 10 & 11)
It is recommended that the power supply be compliant with local codes and standards required by the regional authority.

Caution: Check the product termination wiring label during installation and subsequent Maintenance visits.

Operating voltage: 24 VDC nominal (18 - 30 VDC)
Power consumption: 5.2 W nominal, 7.0 W in alarm
Current consumption: 220 mA nominal, 295 mA in alarm

Relays (Terminals 12 - 20)
The relays allow alarm and fault signals to be hard wired to external devices, such as fire alarm control panels and loop interface modules away from the detector (example, sounding a siren at Action threshold).

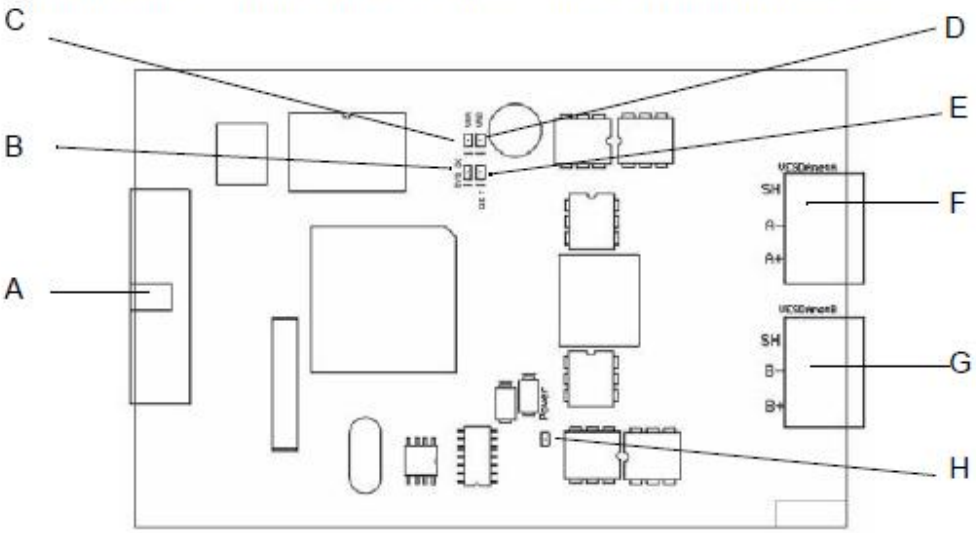
Note: By default, the Fault relay is normally energized when no fault is present. For example when there is no fault present, terminal 12 is held open and terminal 14 is held closed. When there is a fault present, terminal 12 is held closed and terminal 14 is held open.

Interface card

The VESDA LaserFOCUS allows for the installation of network interface card used for networking multiple detectors to form a VESDAnet.

Network Card

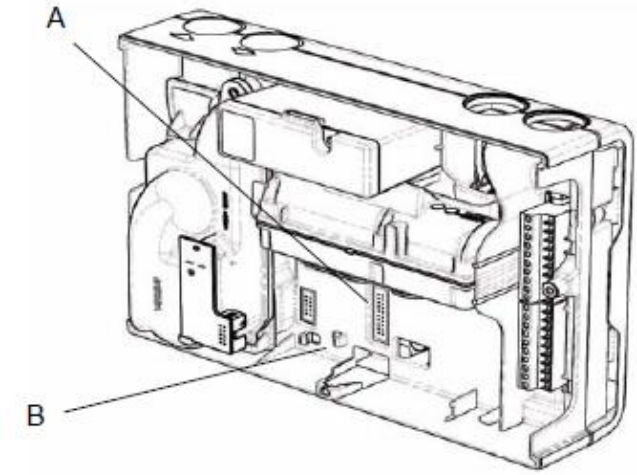
The VN Card is a printed circuit board with connectors on either end. It is designed to be installed inside a smoke detector such as the VLF.



Legend		Label on PCB
A	Detector Interface Cable socket	-
B	System OK LED	SYS OK
C	VESDAnet Port A LED	VN A
D	VESDAnet Port B LED	VN B
E	Detector (Comms) LED	DET
F	VESDAnet Port A Socket	VESDAnet A
G	VESDAnet Port B Socket	VESDAnet B
H	Power Indicator LED	Power

Installing the VESDAnet Card into VLF

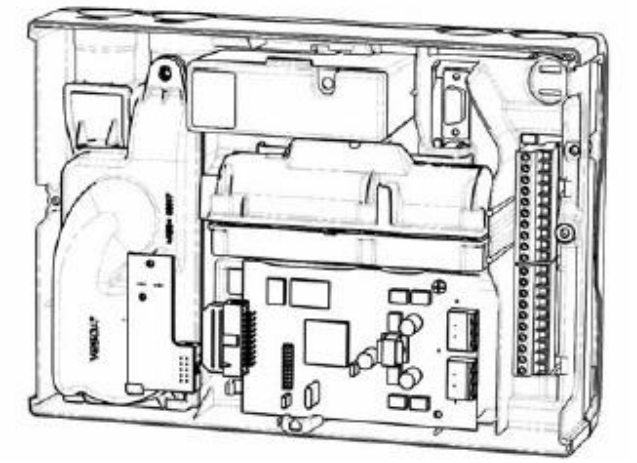
Caution: The detector must be powered down before installing or swapping an interface card otherwise damage may occur.



Legend	
A	VLF Interface Cable socket
B	Mounting space for VESDAnet Interface Card

Detector with front cover open showing the space for interface card inside the detector

1. Ensure the detector is powered off.
2. Open the VLF. See the VLF product guide for details.
3. Plug the interface cable from the VESDAnet Interface Card into the socket marked (A).
4. Place the card in the space provided, ensuring that the mount for the screw matches up with the hole on the card. The interface cable should fold under the card.
5. Once the card is seated firmly, use the screw provided to secure the card. The mounting screw must be installed as it also grounds the card.
6. Power up the detector



Detector with front cover open with interface card installed inside the detector

Testing the Installed VESDAnet Interface Card

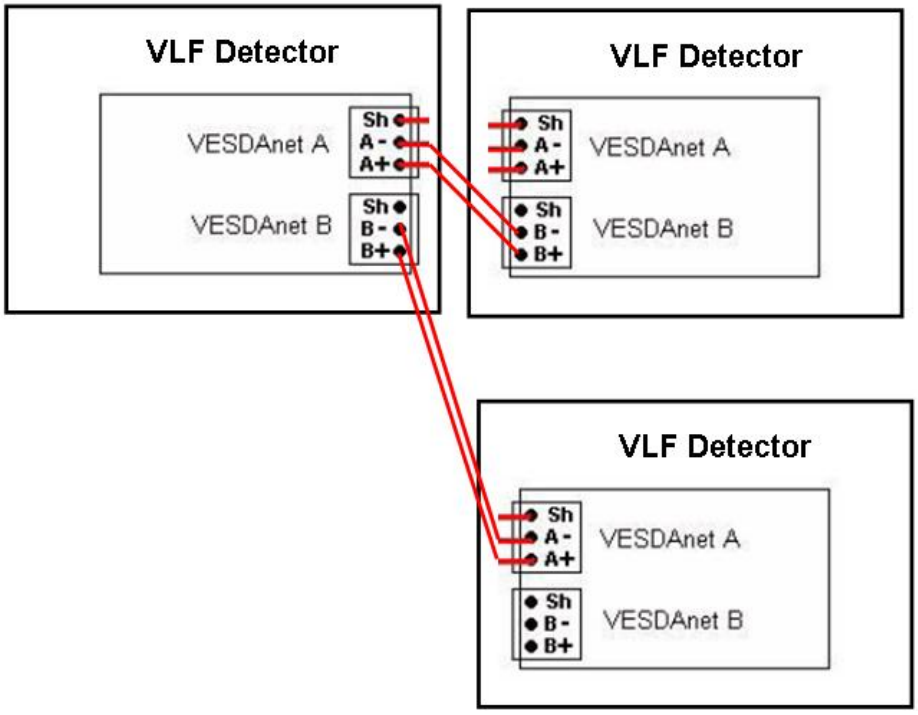
The VESDAnet Interface Card uses LEDs to signify certain conditions

LED	Color	Status
Power	Green	Is lit when power is supplied to the card
SYS OK	Amber	Is flashing when the card's processor is running
VN A	Amber	Is lit when the card is communicating on VESDAnet Port A
VN B	Amber	Is lit when the card is communicating on VESDAnet Port B
DET	Amber	Is lit when the card is communicating with the detector.

To test the card:

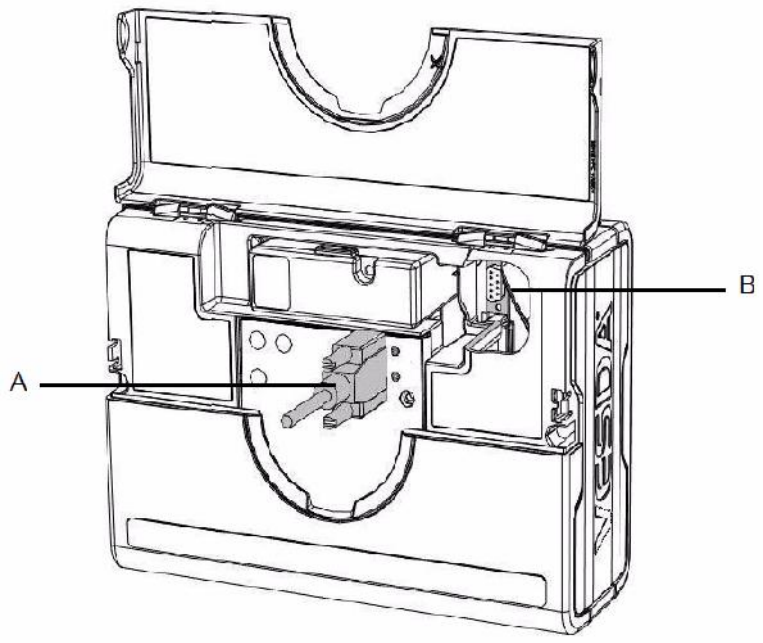
1. Apply power to the VLF.
2. View green Power LED and flashing SYS OK LED on the card.
3. View amber DET LED lit.
4. View amber LEDs lit corresponding to correct Port A and B connections to the next device.

Typical Wiring to VESDAnet – Network of detectors installed in different coaches



RS232 Compatible serial port

The RS232 serial port requires a standard 9-pin DB9 PC COM serial extension cable (male to female) for configuring the detector using a PC with VESDA System Configurator (VSC) installed, for status monitoring and command input, and for event log extraction and software upgrades.



Legend	
A	9 Pin DB9 PC COM Serial extension cable (male)
B	Cutaway, exposing the RS232 Serial Port (female)

9 Pin connector and RS232 serial port

Installation Checklist

Perform the following checks listed below to ensure that all the necessary items are completed

Site Name	
Address	
Detector Serial Number(s) and Date of Manufacture	
Interface Card Serial Number & Date of Manufacture	
Name of Installer	
Signature	
Date	

Perform the following checks listed below to ensure that all the necessary items are completed before handing over to a commissioning engineer.

INSTALLATION CHECKS	**Yes**	**No**
1. Were the detector and the mounting bracket intact in the box?		
2. Is the detector securely locked onto its mounting bracket? Note that the two mounting bracket securing-screws are provided in a separate bag with the detector.		
3. Is the sampling air pipe firmly connected to the air inlet port? Ensure the pipe is NOT glued.		
4. Have the power wires been connected to the correct terminals on the detector?		
5. If required, has the end of line resistor been connected?		
6. Have the alarm signalling wires been terminated to the correct terminals of the detector?		
7. Has the Interface card been correctly installed according to the instructions provided (if applicable)?		
8. Has the plug at the exhaust port been removed and the exhaust pipe (if fitted) not glued?		
9. Has the front cover been replaced correctly?		
10.Has AutoLearn Flow and AutoLearn Smoke been performed? Please state the AutoLearn Smoke period_____		
11.Is the air sampling pipework installed and checked as per the site plans?		

Installation Checklist

COMMISSIONING SMOKE TEST

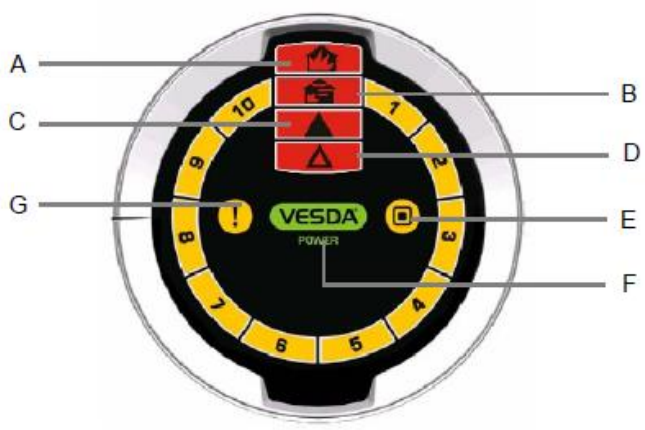
It is recommended that a smoke test be carried out to prove the integrity of the pipe network, to demonstrate that the system is working and to measure the transport time to the detector.

This test involves introducing a smoke sample at the furthest sampling hole and then measuring the time taken for the smoke to travel to the detector. Results are logged and compared to subsequent tests to note variations of the system.

PRODUCT INTERFACE

The VESDA LaserFOCUS provides the following information and control options without the need for additional configuration tools.

- Detector status: Normal, Alarm, Disabled and Fault.
- Alarm levels: Alert, Action, Fire 1 and Fire 2.
- Smoke levels relative to Fire 1.
- Detector fault types (Instant Fault Finder).
- Test, Reset and Disable.
- AutoLearn Smoke (setting alarm thresholds).
- AutoLearn Flow (setting baseline for normalizing air flow and flow thresholds).



Legend			
	Option	Definition	LED Color
A	FIRE 2	Indicates the Fire 2 threshold has been reached.	Red
B	FIRE 1	Indicates the Fire 1 threshold has been reached.	Red
C	ACTION	Indicates the Action condition has been reached.	Red
D	ALERT	Indicates the Alert condition has been reached.	Red
E	DISABLED	Indicates the unit has been disabled (solid) or is in standby mode (flashing).	Yellow
F	POWER	Illuminates when the detector is powered.	Green
G	FAULT	Fault light continuously on indicates a Major Fault . When flashing indicates a Minor fault.	Yellow

Instant Recognition Display

The Instant Recognition display provides you with an immediate understanding of smoke levels relative to Fire 1 alarm threshold.

Icon	Button	Use	Description
	Reset	Resets the system and resumes normal operation.	Press and hold down this button to test the function of LEDs on the unit. To enable or lockout this button VESDA System Configurator (VSC) software is required. Release this button to clear latched faults and alarms. Alarm and fault lights will switch off, and if the system is still in alarm or fault mode, the lights will reappear after the appropriate delay.
	Disable	Disables the fire relay outputs from actuating and reports a fault. Pressing Disable for 6 seconds will put the detector into Stand-by mode.	This button allows the operator to toggle between disable and normal modes. When disabled smoke and air flow are not reported to the system (e.g. FACP). To enable or lockout this button VESDA System Configurator (VSC) software is required. The fan continues to run when VLF is disabled but stops when it is in stand-by mode.
	Instant Fault Finder	Indicates current active faults on the detector.	Pressing and holding in the Reset button and the Disable button together will show the fault type, by number, on the Smoke Dial.
	Fire 1 Test	Simulates a Fire 1 condition and the alarm relay is activated after the appropriate delay **Note:** This will initiate a Fire 1 Alarm.	By default this button is locked out. To activate this button VESDA System Configurator (VSC) software is required. **Note:** Notify the monitoring authority before testing commences. To activate, press and release the Fire 1 Test button. All the segments of the Smoke Dial, and alarm conditions up to Fire 1 are activated (after the configured delay period). Press the Reset button to stop the test and clear any latched alarms. **Note:** Remember to return the system to normal mode after the test is complete.

	AutoLearn Smoke	Automatically sets alarm threshold values based on the normal operating environment.	Pressing the recessed AutoLearn Smoke button initiates the automatic smoke alarm set-up mode. The LED, beside the button, will remain on for the duration of the AutoLearn process (up to 14 days which is also the default period). During this period the unit is online, alarms are communicated and default thresholds are active. To deactivate this function, press the AutoLearn Smoke button again.
	AutoLearn Flow	The detector automatically measures air flow to the pipes and sets the air flow threshold values.	Pressing the recessed AutoLearn Flow button sets the airflow fault thresholds as well as normalizing the detector's airflow. The LED, beside the button, will remain on for the duration of the AutoLearn process (up to 14 days which is also the default period). To deactivate this function, press the AutoLearn Flow button again.

Detector control buttons

Smoke level display

The smoke level is displayed on the Smoke Dial and provides incident information essential for effective response in very early warning situations. This display provides you with an instant understanding of the smoke event relative to the Fire 1 Alarm Threshold. Between 1 and 10 segments may illuminate. Each segment is equivalent to 1/10 of a Fire 1 warning.

Legend			
A	Smoke Dial and Fault Type indicator.	C	Disable button.
B	Reset button.	D	Fault light.

Smoke level and fault condition display

DETECTOR SPECIFICATION

Power Supply -	Supply Voltage 24 VDC nominal (18 - 30 VDC)
Power Consumption @ 24 VDC -	5.2 W nominal, 7.0 W in alarm
Current Consumption @ 24 VDC -	220 mA nominal, 295 mA in alarm
Case Dimensions (WHD) -	245 mm x 175 mm x 90 mm (9 5/8 in. x 6 7/8 in. x 3 1/2 in.)
Weight -	2 kg (approx. 4.4 lbs)
IP Rating -	IP30
Mounting-	Upright, inverted or horizontal with appropriate mounting bracket
Operating Conditions	
Detector Ambient	0°C to 40°C (32 °F to 104 °F)
Sampled Air	0°C to 40°C (32 °F to 104°F)
Humidity (non-condensing)	5% to 95%
Sampling Network	
Air inlet pipe (PVC pipe)	OD 25 mm (ID 21 mm) / IPS ¾ in. (OD 1.05 in.)
Single pipe length	50 m max.
Branch pipe length	30 m (50 ft.) max. per branch
Area Covered -	Upto 500 m2
Field Wiring	
Access	3 x 25 mm (1 in.) Cable entries (1 rear entry)
Terminals	0.2 mm2 - 2.5 mm2 (30 - 12 AWG) Interfaces
Power In/Out.	
Fire 1 Relay	(changeover, 2A @ 30 VDC).
Action Relay	(changeover, 2A @ 30 VDC).
Fault Relay	(changeover, 2A @ 30 VDC).
General Purpose Input	(clean contact).
External display port	(with power limited output).
RS232 programming port.	
Alarm Ranges	
Alert, Action	0.025 – 2.0% obs/m (0.008 – 0.625% obs/ft.)*
Fire 1, Fire 2	0.025 – 20% obs/m (0.008 – 6.25% obs/ft.)*
Individual Delays	0 - 60 seconds
2 Threshold sets (1 & 2)	Day and night
Display	
4 Alarm State Indicators	(Alert, Action, Fire 1 and Fire 2). Fault and Disabled Indicators. 10-sector Smoke Level Indicators.

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10-sector Instant Fault Finder.
Reset, Disable and Test Controls.
Smoke and Flow AutoLearn Controls and Indicators.
Event Log
Up to 18 000 events stored.
Smoke trend, flow trend, faults events, configuration events and operational events.

Date and time stamp.
AutoLearn Smoke & Flow
Minimum 15 minutes, maximum 15 days (default 14 days).
During AutoLearn, thresholds are NOT changed from pre-set values.

TROUBLESHOOTING

Instant Fault Finder

When a fault is registered on the detector, the fault light remains ON for Major Fault situations and flashes for Minor Fault. The Instant Fault Finder function is operated by pressing the Reset and Disable buttons together.

Instant Fault Finder provides rapid fault diagnosis and is an additional function of the Smoke Dial display. One or more segments of the Smoke Dial will illuminate, indicating the fault by number.

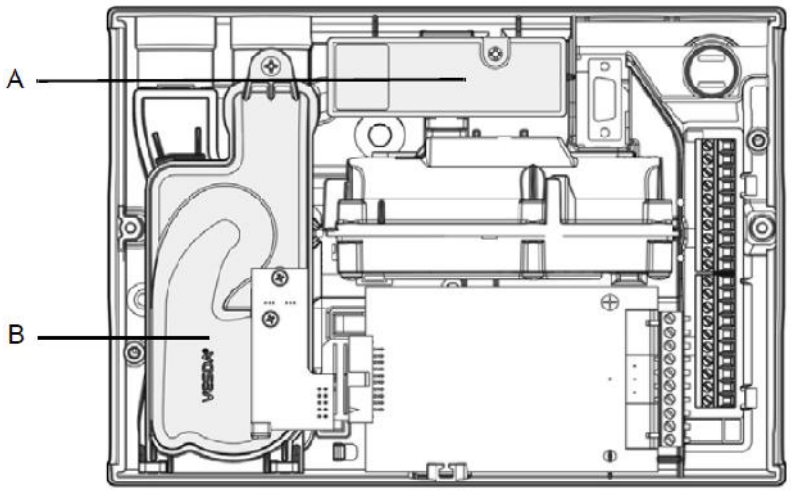
The Instant Fault Finder function aids rapid diagnosis of faults.

Fault	Type	Explanation	Action
1	Filter	Air filter needs replacement due to dust or smoke contamination or has reached the end of its life.	Replace the air filter with a new unit remembering to reset the filter fault.
2	Aspirator	Aspirator fault has occurred.	Initially replace the aspirator. If the fault remains replace the VESDA unit.
3	High flow	High flow fault present (urgent or non-urgent). Flow readings are above user set flow limits or the detector maximum flow	Check the pipe network for breakages. Also check the suitability of the pipe network in ASPIRE2.
4	Low flow	Low flow fault present (urgent or non-urgent). Flow readings are below user set flow limits or the detector maximum flow	Check the pipe network for blockages. Also check the suitability of the pipe network in ASPIRE2.
5	Not in use		
6	External Device/Power Supply Unit	External equipment signaling a fault via the General Purpose Input.	Inspect the external device and also check that the GPI is set to the correct mode. Also check that the EOL resistor is correctly connected.
7	Interface card	Interface Card needs replacement.	Replace the Interface Card.
8	Field wiring	General Purpose Input or Interface Card wiring.	If no interface card is installed check the GPI wiring for an open circuit. If an interface card is installed refer to the card manual. Refer to *GPI* section of the *LaserFOCUS Manual*
9	AutoLearn fail	AutoLearn Smoke or Flow failed.	Repeat AutoLearn Smoke or Flow process. Inspect logs if repeated failures occur. AutoLearn Flow will fail if there is an airflow fault on the detector. Fix airflow fault and re-start AutoLearn
10	Detector failure	A fault has occurred that cannot be fixed.	Contact the supplier and replace the detector.

Instant fault finder diagnosis

MAINTENANCE

The VESDA LaserFOCUS smoke detector continuously monitors its own operation and conducts frequent health checks. There are two serviceable items, the air filter cartridge and the aspirator.
Caution: Electrostatic discharge precautions need to be taken prior to removing the front cover from the detector otherwise damage may occur to the detector.



Legend	
A	Dual stage air filter cartridge
B	Aspirator

Maintenance - replaceable items

Prior to any work or maintenance being carried out on the VESDA LaserFOCUS take the necessary steps to advise the monitoring authority that power may be removed and the system disabled.

Maintenance schedule

Maintenance should be conducted by a qualified service contractor.

ACTION	FREQUENCY	DETAILS
Check Pipe Network	Once in 3 Months or when flow faults occur	Check pipe connections to ensure all pipe runs are intact and that pipe supports and joints are firm
Airflow	Check after every trip	Check air flow via VSM4 or VSC software. Compare the current reading with previous reading to determine if the flow rate has reduced
Smoke test	Monthly	Conduct smoke test and verify detector performance. Compare response times with those previously recorded and investigate any discrepancies
Check power supplies	Check after every trip	Check the voltages and investigate for any drop in voltages
Filter replacement	6 Monthly	Recommended change out period. The filter status can be checked via VSM4 or VSC software. If the filter usage 80% replace the filter
Clean sampling pipe and sampling holes	As necessary	If frequent low faults occur clean the sampling pipe network by back flushing

Maintenance schedule

Replace the Filter Cartridge (VLF)

The VESDA Laser FOCUS smoke detector uses a disposable dual stage air filter cartridge. This filter removes dust contamination from sampled air and provides a clean air bleed to preserve the detector chamber optics. The detector constantly monitors filter efficiency. To maintain the operational integrity of the smoke detector, it is recommended that the filter be replaced every 2 years, or when a filter fault occurs or more often for environments that experience high levels of contamination.

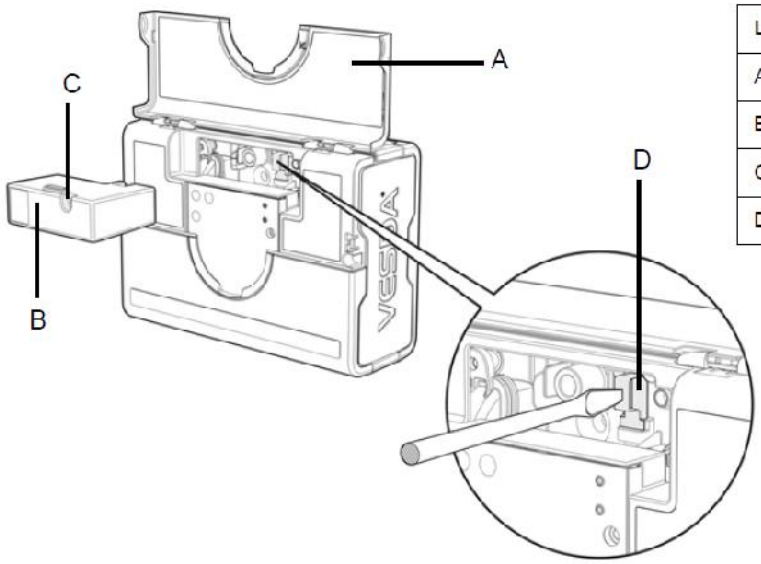
A fault is raised on the detector, when the filter needs to be replaced. During the replacement process the detector needs to be informed that a new filter has been installed.

Note: Ensure the area surrounding the filter is clear of dirt and debris prior to replacement.
Note: The filter is for single use only, it cannot be cleaned and re-used.

Filter replacement steps

Ensure the detector remains powered up during filter replacement and a new filter cartridge is available:
1. Push in the security tab and lift up the field service access door (A).
2. Set the detector to 'Standby' mode by pressing the Disable button for 6 seconds. The Disabled LED begins to flash. After releasing the Disable button the disabled LED will slowly flash.
3. Undo the recessed retaining screw (C) and pull out the old filter (B).
4. Using your finger, firmly press the filter switch (D) (in the filter recess of the detector) 5 times within 5 seconds to confirm to the detector that a new filter is about to be

installed (see inset). A LED next to the serial interface will flash each time you push the filter switch, and will continue flashing once you have successfully pressed the switch 5 times in 5 seconds.
5. Insert the new filter (VSP-005) and tighten the retaining screw.
6. Press the Disable button for 6 seconds to return the detector to normal operation.
7. Record the filter replacement date on the filter.
8. Close the field service access door.



Legend	
A	Field service access door
B	Dual stage air filter cartridge
C	Retaining screw
D	Filter switch

Filter replacement

Aspirator replacement

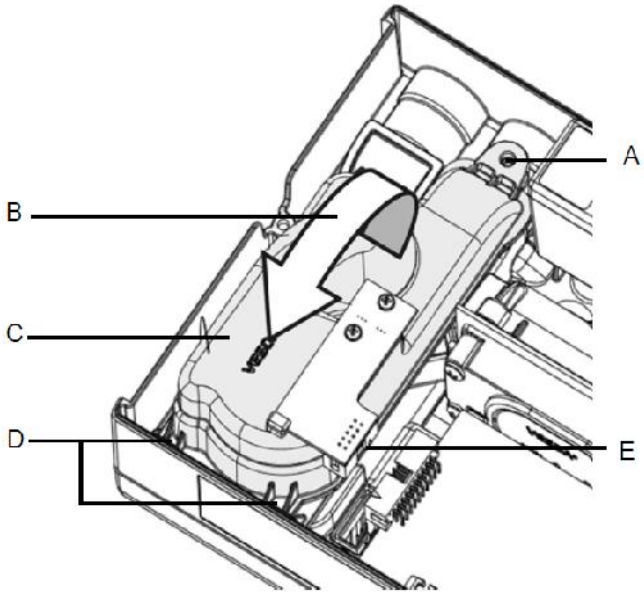
Caution: Electrostatic discharge precautions need to be taken prior to removing the front cover from the detector otherwise damage may occur to the unit.

Aspirator removal (assumes normal mounting, see Figure):
1. Disconnect power to the detector.
2. Push in the security tab and lift up the field service access door.
3. Unscrew the two front cover retaining screws, lift and swing down the front cover.
4. Only disconnect the fan wiring loom from the connection point (E) at the aspirator.
5. Undo the retaining screw on the aspirator (A).
6. Swing out the aspirator, then lift and remove it from the detector.
Legend
Note: Any time the aspirator is removed ensure the area surrounding the aspirator is clear of dirt and debris prior to replacement.
Note: Care must be taken during aspirator replacement. The aspirator must be correctly

seated; this is essential so that gaskets are not damaged or dislodged from the underside of the aspirator.

Aspirator replacement steps

1. Clip the aspirator (VSP-715) into the retaining clip (D) and swing it back into the detector.
2. Tighten the retaining screw (A) (do not over tighten).
3. Reconnect the fan loom to the aspirator (E).
4. Replace the front cover and screw it into place.
5. Close the field service access door.
6. Reconnect power to the detector.



Legend	
A	Aspirator securing screw
B	Swing aspirator out to remove
C	Aspirator
D	Retaining clip points
E	Fan loom connector must be disconnected here

Aspirator replacement

Cleaning Sampling Pipes

Follow the instructions below to clean the sample pipe network.

1. Ensure that detectors are isolated from the monitoring panel and fire suppression systems.

2. Notify the relevant authorities that the work is being performed.

3. Check and record the current airflow for before and after comparison.

4. Disconnect the detector power supply.

5. Remove all pipes from the detector inlet(s) and exhausts then cover them to ensure that no further dust can enter the detector.

6. Ensure that end caps are set firmly in place.

7. Connect a vacuum cleaner to the detector end of each pipe in turn. When turned on, it will extract dust and contaminants that have built up inside the pipes.
8. Alternatively, introduce compressed air (400 KPa for 2 minutes) at the detector end of each pipe in turn to blow dust and contaminants out through the sample holes.

9. Take precautions to ensure that dust is not blown into undesired areas. Ensure that end caps are still set firmly in place.

10. Compare the before and after flow rates. Ideally, the flow should be close to 100% for each used pipe. If this is not the case, the capillaries and detector may need closer inspection. If the sample pipe network appears to be OK, continue with the remainder of this section to determine the cause of the reduced airflow.

11. Once the system has been serviced, cleaned, tested and is operating fault-free, return it to its normal operating mode.