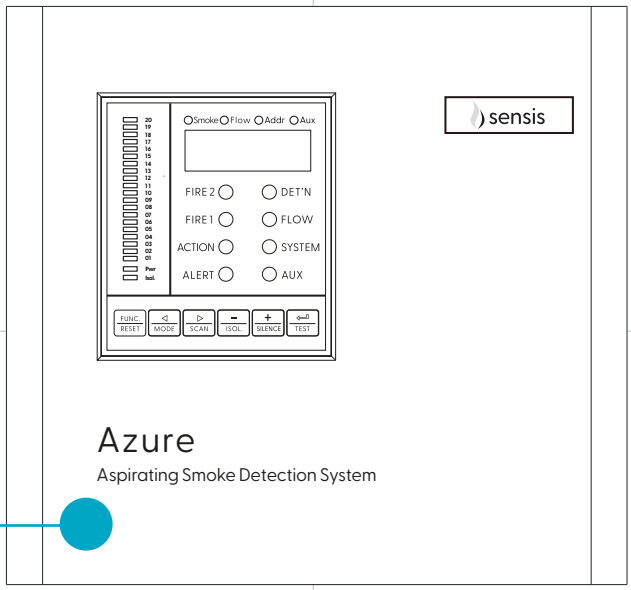
sensis®



Sensis Azure 500s Aspirating Smoke Detector User guide

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Contents

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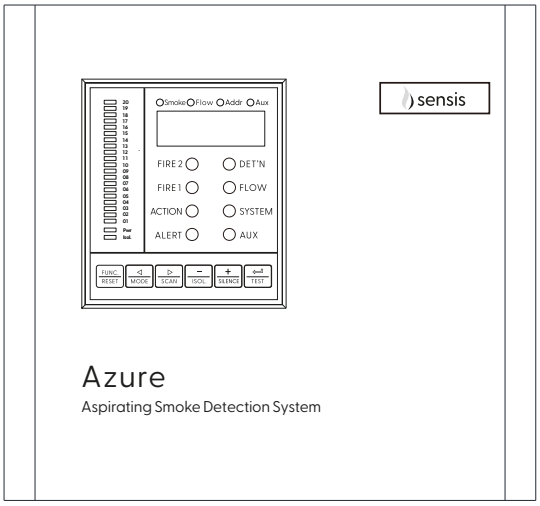
1. General

Sensis Azure 500s is an Aspirating Smoke Detector especially developed for small area very early warning fire detection.

Most early warning fire detection systems which employ very high sensitivity smoke detection are designed to protect large areas. The Sensis Azure 500 series offers industry-leading aspirating smoke detection technology engineered specifically for compact environments, by combining exceptional performance with cost-efficient design.

Sensis utilises a high-power Blue LED as its detection light source, ensuring exceptional sensitivity to small smoke particles during the incipient stage of a fire. The short wavelength of 470 nm blue light is highly responsive to smaller particles, making the Blue LED an optimal choice for detecting particles across a wide range of sizes, from the smallest to the largest.



2. Features

Sensis Azure uses high-power, short-wavelength blue LED technology as the detection light source. It is very sensitive to small smoke particles generated during the incipient stage of a fire, at which time the smoke is invisible to the human eye. The highest alarm sensitivity of Sensis Azure is 0.005%/m, which is 1000 times more sensitive than conventional point type smoke detectors.

- Alarm sensitivity range: 0.005~20%/m
- Four alarm levels
- Up to 60 x Class C sampling holes, 60 x Class B sampling holes, or 18 x Class A sampling holes
- Maximum pipe length: 100 m (328 ft) single pipe or 240 m (787½ ft) branched
- 7 relay outputs
- 3-in-1 Control/Display/Programmer Front Panel
- RS485 network
- Support Modbus RTU Open Protocol

NOTE: Maximum pipe length and maximum number of sampling holes cannot be achieved at the same time. When maximum pipe length is the major design consideration, the number of sampling holes must be reduced. Alternatively, when the maximum number of sampling holes is the major design consideration, the pipe length must be reduced.

3. Specification

SMOKE DETECTION PRINCIPLE	
Forward light scattering mass detection	
Smoke sensitivity	
Smoke detection range	0.001~25%/m
Alarm sensitivity range	0.005~20%/m
NOTE: Operation of the Detector beyond 12%/m obscuration is not allowed per NFPA 72 guidelines.	
Sampling pipe	
Material	ABS/UPVC
Metal fabrication	25 mm (1")
NOTE: Per EN54-20, the sampling pipes and fittings shall have adequate mechanical strength and temperature resistance in accordance with EN61386-1 to at least Class 1131. The requirements of EN54-20 sub-clause 5.7 should be met.	

MAXIMUM PIPE LENGTH	
EN54-20 Class A: Maximum 30 holes in total	
Single pipe	60 m (196¾ ft) (30 holes)
Two branch pipes	2 x 40 m (131¼ ft) (2 x 15 holes)
Four branch pipes	4 x 30 m (98½ ft) (4 x 7 holes)
EN54-20 Class B & C: Maximum 60 holes in total	
Two branch pipes	2 x 60 m (196¾ ft) (2 x 25 holes)
Four branch pipes	4 x 60 m (196¾ ft) (4 x 15 holes)
NOTE: Please refer to the Sensis Design manual for the relationship between pipe length and the number of sampling holes. The SensisFlow air-sampling pipe network design tool can be used to calculate the maximum transport time and sampling hole sensitivity.	

ALARM LEVELS AND TIME DELAY	
Alert	(0~60 seconds)
Action	(0~60 seconds)
Fire-1	(0~60 seconds)
Fire-2	(0~60 seconds)

ENVIRONMENT SMOKE LEARNING
24 hrs, 365 days non-stop smoke background level learning

FLOW DETECTION
Heat mass detection principle
Pipe flow normalised to 100%
Flow high and flow low faults
Adjustable flow detection sensitivity
Adjustable flow fault threshold

RELAY OUTPUT	
7 relays on termination board (configurable)	
Rating	2 A @ 30 Vdc

GENERAL PURPOSE INPUTS (GPI)
4 x GPIs (configurable)
GPI functions RESET/ISOLATE/SILENCE/TEST/MAINS FAULT/BATT. FAULT/POWER FAULT/SENSITIVITY MODE 1/ SENSITIVITY MODE 2/SCAN/UDI-1/UDI-2/UDI-4/UDI-5
NOTE: UDI = user-defined input

COMMUNICATION
RS485 network
Max. number of devices on network: 250
Built-in repeater
Max. cable length between two adjacent devices: 1.2 km (3,937 ft)
Supports modbus RTU open protocol

CONTROL
Buttons <Reset>, <Isolate>, <Silence> & <Test>

DISPLAY	
20-segment smoke level bar graph	
6-digits numerical LEDs display	Real time smoke level Real time airflow level Device address Active event & codes
4 fire alarm indicators	Alert, Action, Fire 1, Fire 2
4 fault indicators	Detector, Airflow, System, Auxiliary
Isolated indicator and beeper	

PROGRAMMER
Access controlled by password
Bar graph and 6-digits LED display
<Func.> < ◁ > < ▷ > <+> <-> <↵> buttons to change settings

EVENT LOGS	
Number of events	13,000 event log 170,000 data points
Event type	Alarm/Fault/Operation/Smoke Flow/Auxiliary Gas Sensors

OPERATING CONDITIONS	
Ambient temperature	0° ~ 40°C (32° ~ 104°F)
Pipe flow normalized to 100%	-20° ~ 60°C (-4° ~ 140°F)
Humidity	10~95% RH non-condensing

POWER
24 ±4.8 Vdc
175~320 mA (Aspirators setting from 1 to 10)

DIMENSIONS & WEIGHT
92(h) x 201(w) x 216(l) mm (3½" x 8" x 8½")
Net weight: 2.5 kg (5.5 lb)

4. Sampling pipework design

Aspirating system design is inherently simple. It is often possible to achieve good system performance with very simple installations. There are, however, a few rules which must be adhered to and these rules are equally applicable to all aspirating systems. The information contained in this manual is intended as an overview only. For further information please see the complete Sensis Design Manual.

CONSIDERATIONS

Primary detection sampling systems

These systems are usually arranged to monitor the flow of air movement by the use of pipework and air-sampling points mounted directly in the airflow. This type of system is usually regarded as supplementary to other forms of detection due to its limited response capability once the air movement ceases.

In such a system when monitoring a single point of supply or extract, its system sensitivity may be directly related as equal to the sensitivity of the central Detector due to the cumulative effect. In the case of a system monitoring more than one point of supply/extract then the system sensitivity will only be determined in discussions with the manufacturer or his representative.

Always locate the sampling points in a position to which smoke may reasonably be expected to travel. This may sound obvious, but, for example, do not expect ceiling-mounted sampling points to operate satisfactorily if air flow prevents the cool smoke from an incipient fire from reaching ceiling level. In this instance it is usually better to locate the sampling pipes directly in the airflow (for example, in an air-conditioning unit air intake). There is no substitute for carrying out smoke tests prior to installation of pipes to indicate suitable sampling point location.

Figure 1. Single-branch system

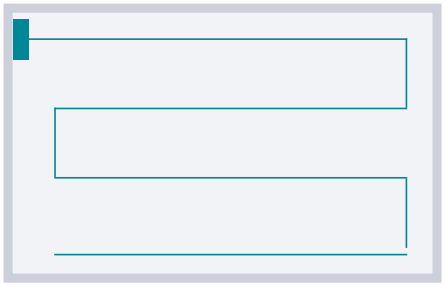


Figure 2. Two-branch system

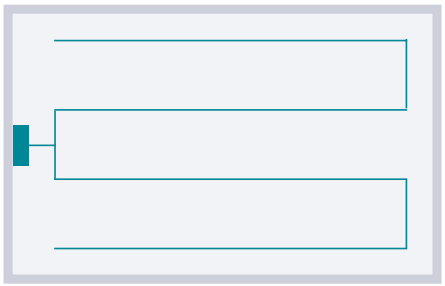
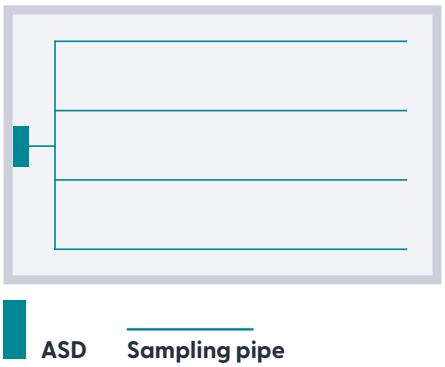


Figure 3. Four-branch system



Secondary detection sampling systems

These systems are arranged such that the air-sampling points are sited and spaced as if they are point type smoke Detectors. They can be positioned to satisfy NFPA 72, NFPA 76, BS 5839-1, BS 6266 and local fire code requirements when the calculated relative sensitivity per air-sampling hole equates to a point Detector. See **Relative sensitivity** below.

Maximum permissible transport time

The time taken for a system to transport a sample from a protected area should not exceed 120 seconds (2 minutes). Transport times in excess of this must be the subject of a variation. Shorter maximum transport times may be desirable in certain applications and should be specified as part of the risk assessment. For example, Class A ASD systems are generally designed with transport times of less than 60 seconds.

Maximum transport time can be directly affected by the installed sample pipe design (see the following figures). The four-branch design will provide the shortest transport time.

Balance

Balance is generally expressed as a percentage. If all the sample points have the same amount of air entering each sample hole then this is invariably described as a system with 100% balance.

Relative sensitivity

The relative sensitivity of each air-sampling hole (assuming that all sampling points have been calculated for an equivalent sensitivity i.e. 100% balance) can be calculated as a simple function of the Detector sensitivity and the number of sample points. For example, a 0.1% high sensitivity detection device connected to pipework containing 40 equivalent air-sampling points is equivalent to a 4%/m system which can be considered as a Class C sensitivity system. Unless otherwise stated in approval documentation a figure of better than 5%/m sensitivity per hole may be applied.

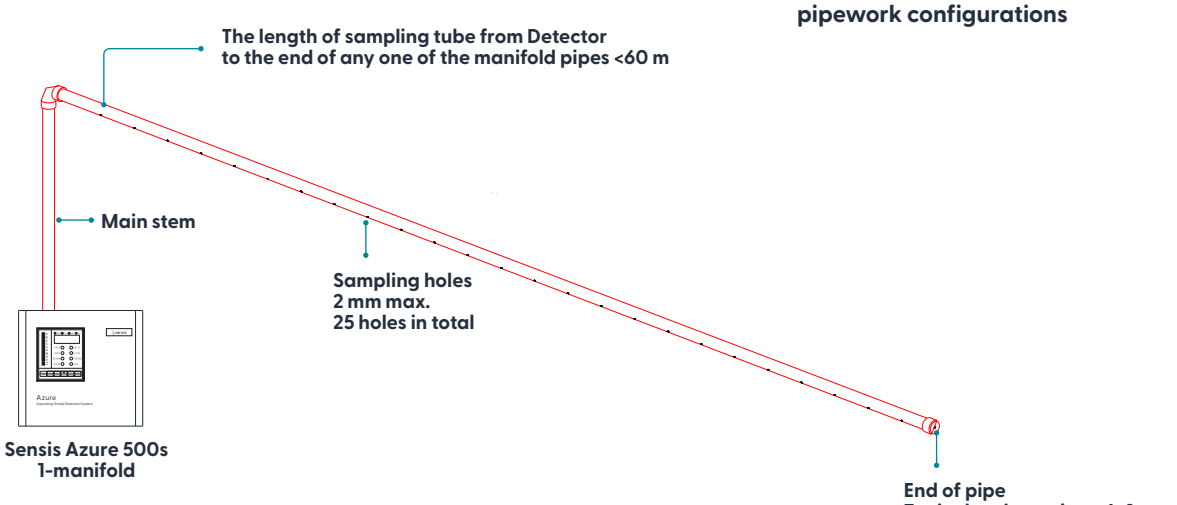
4. Sampling pipework design

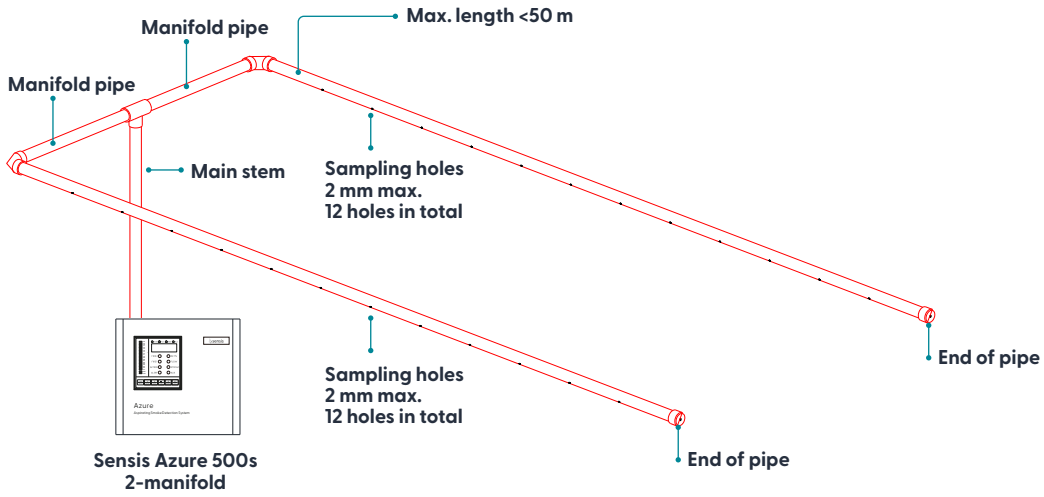
DESIGN GUIDELINES

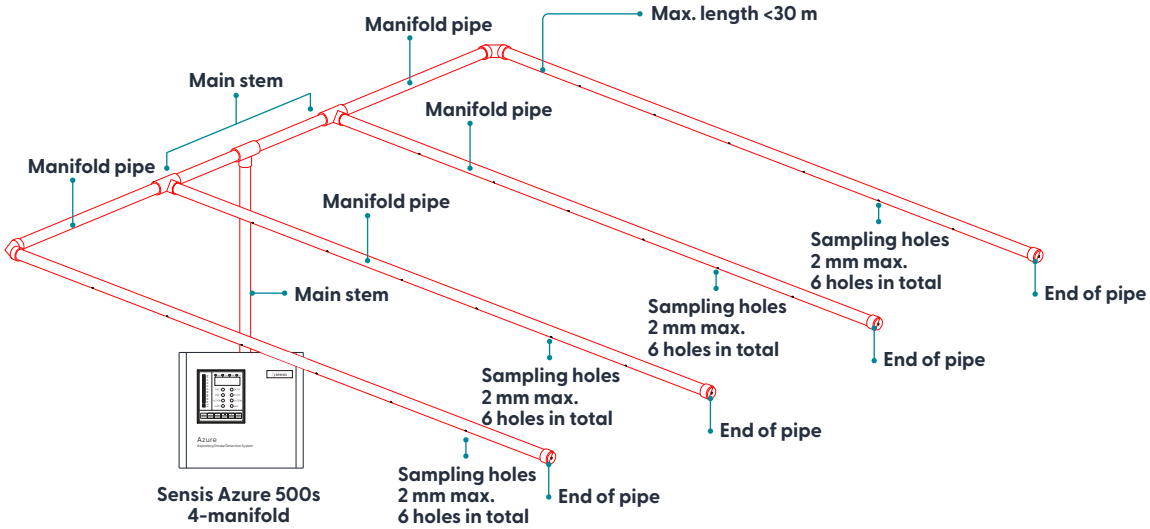
- The ideal diameter of sampling pipes is OD: 25 mm (1") ID: 21 mm (¾"). Other sizes will often work but will provide different response times.
- **Pipework limits with aspirator speed set to 10 and a maximum transport time of 120 s:**
  - 100 m (328 ft) with up to 18 holes (maximum pipe length)
  - 60 m (196¾ ft) with up to 25 holes (maximum number of holes)
- It is not possible to maximise the pipe length and the number of sampling points at the same time. To maximise the pipe length, the number of sampling holes must be reduced. On the other hand, to maximise the number of the sampling holes on the pipe, the pipe length must be reduced.
- Ideally, if the total length of sampling pipe is greater than 50 m (164 ft), then branch pipes should be used. When using branched sampling pipes, care should be taken to achieve a reasonable degree of balance (within 10% of airflow) to ensure even suction from the pipes.
- Sampling pipes must have capped ends. The end cap should be drilled with a sampling hole normally between 4 or 6 mm (⅛" or ¼") diameter and free from burrs.
- Sampling holes should normally be 2-4 mm (0"-⅛") diameter or as calculated by SensisFlow and free from burrs.
- This guide holds true for average sampling pipe lengths, but if using long pipes (typically more than 60 m (196¾ ft) total), performance may be improved by making the sampling holes near the ends slightly larger than those nearer the Detector.
- Although by no means essential, SensisFlow is recommended to ensure that transit times, balance of suction and individual sampling point sensitivity are within desired limits.
- **System sensitivity:** The recommended maximum number of sampling holes on the pipework to achieve desired relative sampling hole sensitivity is as follows:
  – Class A: 40 holes – Class B: 60 holes – Class C: 60 holes
- In consideration of both maximum pipework and system sensitivity, the recommended pipe lengths and number of holes to achieve different sensitivities of the Sensis Azure 500s are illustrated on page 7.

MAXIMUM PIPE LENGTH	
EN54-20 Class A: Maximum 40 holes total	
Single pipe	100 m (328 ft) (18 holes) 60 m (196¾ ft) (25 holes)
Two-branch pipes	2 x 80 m (262½ ft) (2 x 15 holes)
Four-branch pipes	4 x 60 m (196¾ ft) (4 x 10 holes)
EN54-20 Class B & C: Maximum 60 holes total	
Two-branch pipes	2 x 60 m (196¾ ft) (2 x 25 holes)
Four-branch pipes	4 x 60 m (196¾ ft) (4 x 15 holes)

Figure 4. Typical Sensis Azure 500s pipework configurations







5. Mechanical installation

NOTE: It is recommended that the installation is carried out by suitably experienced and trained personnel.

- The mounting holes near each corner of the cabinet are used to mount the device on the wall. It is recommended the device is 1.5 m (5 ft) above the floor. The device location should be considered for easy access and suitable for the temperature and humidity operating conditions mentioned in the specification.

- Ensure that when the Detector is fitted to the wall there is enough space on the right-hand side to allow the front panel to open.

Cable entries are also provided on the side and bottom of the panel. Note that some cable entry holes need to be opened using a punch or other suitable tool.

Sampling pipes

Sampling pipes should be made from a non-hazardous material and should be clearly identified. Typical sampling pipes used in air-sampling systems are ABS/uPVC pipes with 25 mm (1") OD. Pipes should be colored red and suitably marked to identify their usage.

In cases where high temperatures or corrosion are a concern, use suitable materials for the environment.

When drilling holes in the sample pipes, or cutting off lengths of pipe, ensure that all swarf and debris is removed from the pipe.

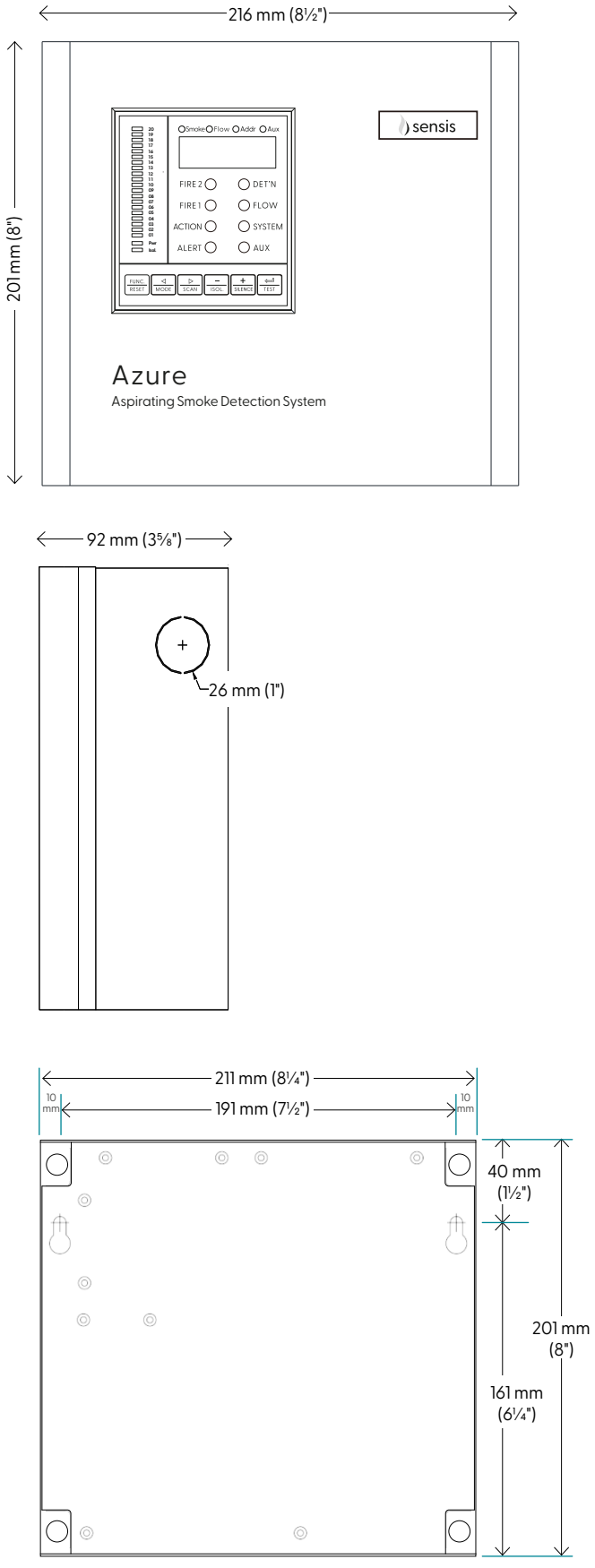


Figure 5. Dimensions

6. Electrical installation

NOTE: It is recommended that the installation is carried out by suitably experienced and trained personnel.

Figure 6 illustrates the internal view of the Sensis Azure 500s.

All the electrical connections should be made to the removable connectors on the termination board or the relay board if it is equipped.

Cables

Power cable should be 2-core 2 mm^2 cable of sufficient current carrying capacity (this depends on the aspirator setting; refer to the specification table on page 4).

Control cable should be 0.75 mm^2 to 1.5 mm^2 stranded cable. RS485 network connection should be via 24 AWG twisted pair shielded cable.

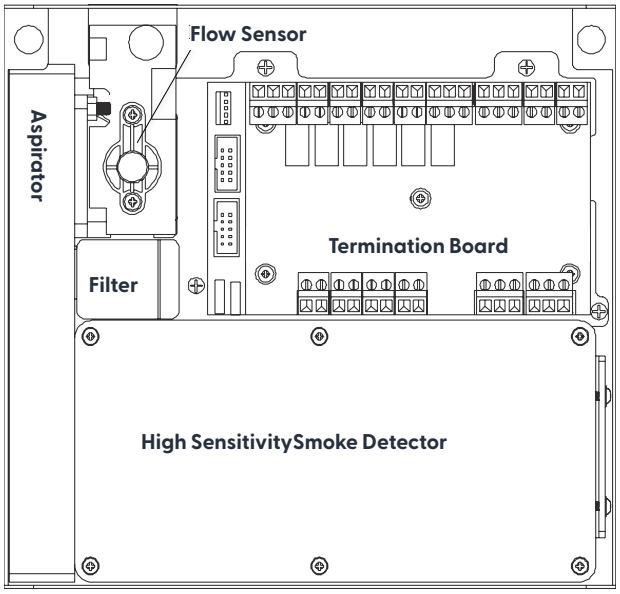


Figure 6. Detector interior

6. Electrical installation

Power supply connections

Connect one of the power terminals to a 24 Vdc +/- 20% (19.6-28.8 Vdc) power supply. The device may be powered by any EN54-4 compliant monitored 24 Vdc power supply of sufficient capacity.

NOTE: The required 24 Vdc primary power and 24-hour standby power for the Detector must be obtained locally from a means suitable for NFPA 72 applications.

Relay connections

There are 7 configurable relays on the termination board.

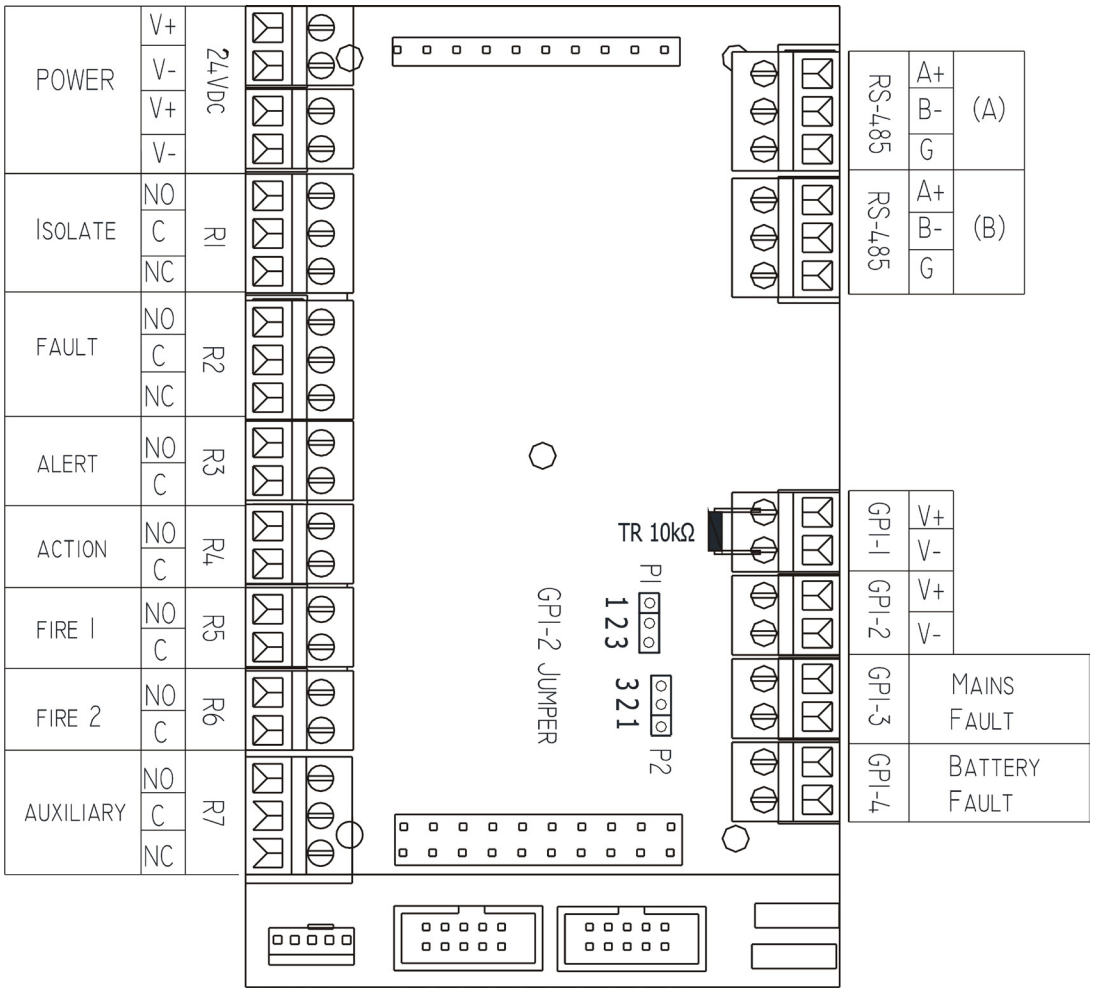
- Isolated (NO/NC)
- Fault (NO/NC)
- Alert (NO)
- Action (NO)
- Fire-1 (NO)
- Fire-2 (NO)
- Aux (NO)

NO=Normally Open
NC=Normally Closed
Com=Common

The relay rating is 2 A @ 30 Vdc. If the connected load is more than the relay rating, a transfer relay suitable for the rating should be used.

Each relay has an LED indicator on the termination board to show its on/off status. Use these for troubleshooting if the relay develops a fault.

All relays are configurable to one of the following functions: Alert, Action, Fire 1, Fire 2, Fault, Isolate, and Auxiliary. The relay output function printed on the termination board is the factory default setting. Users can change the relay function using the LED programmer on the front panel or the SensisTool computer software to change the setting. The fault relay is fail-safe, designed to change state when power is lost.



Termination Board

Figure 7. Terminal connections

6. Electrical installation

GPI, General Purpose Input

There are eight General Purpose Input terminals on the detector termination board (4 on the Azure 500s, 8 on the 2000s range). Those inputs are designed to monitor the status of the connected devices. The connected devices monitored by the GPI can be just a button, a fault relay from the power supply, or an alarm relay from another Detector. Short-circuiting the input pins activates the associated function in the GPI settings. There are 16 possible functions defined in the following categories:

Device control:
Reset, Isolate, Silence, Test, Scan
The GPI terminal can be connected to a remote button, a control/output module of the fire alarm system, or a PLC so these control functions can be performed remotely, or by other systems.

Power fault monitoring:
Mains Fault, Battery Fault, Power Fault
It is sometimes required by local codes that the fault status of the mains and/or battery condition of the Detector's power supply should be monitored. In this case, the Sensis detection device will signal a fault when the connected relay of the power supply is activated. The Sensis fault condition can then be monitored by a fire alarm system when its fault relay is connected to the fire alarm system input module.

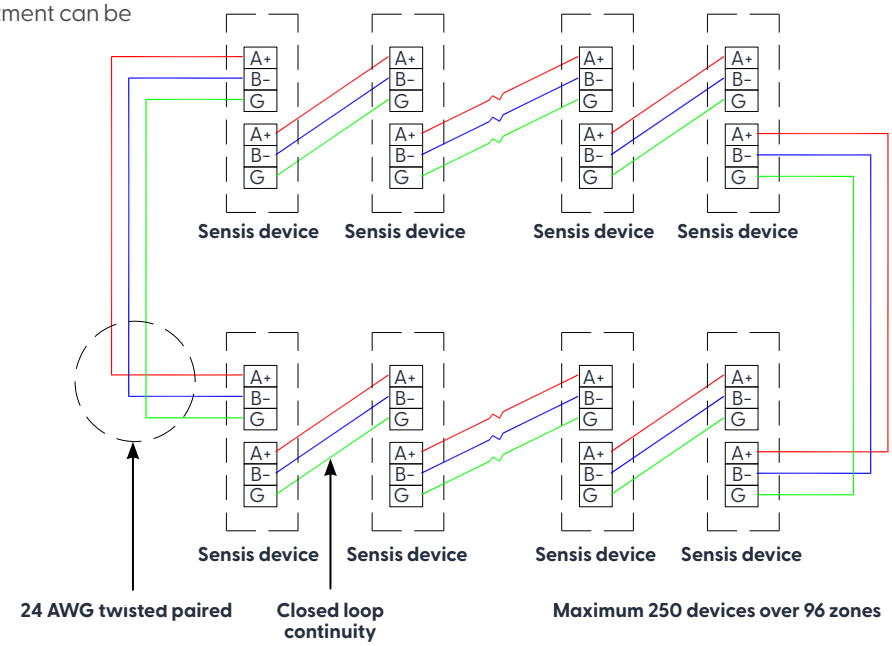
Sensitivity change:
Sensitivity Mode 1, Sensitivity Mode 2
In some applications, the detection area environment background smoke level varies throughout the day. For example, during work hours the background smoke level is usually higher than during non-working hours. Sometimes, outside pollutants in the detection area can generate false alarm. As a result, the sensitivity may need to be decreased (to prevent false alarms) or increased (to improve fire protection) depending on the conditions. In such cases, the GPI can be connected to a button, a timer, a PLC or even a relay output of another Sensis detector sensing the pollutant level from outside, so that the sensitivity adjustment can be made manually or locally.

User defined device monitoring:
UDI-1, UDI-2, UDI-3, UDI-4, UDI-5
The UDI, User Defined Input is usually used to monitor the status (relay) of other detection devices, like gas sensors, temperature sensors, or other aspirating smoke Detectors.

GPI-1 on the termination board is a monitored contact with a 10 KΩ terminal resistor connected at the factory. When GPI-1 is used, the terminal resistor needs to be moved to the end of the line. When the line connected to GPI-1 is shorted, the device reports a GPI-1 alarm; when the line connected to GPI-1 is open, the device reports a GPI-1 fault.

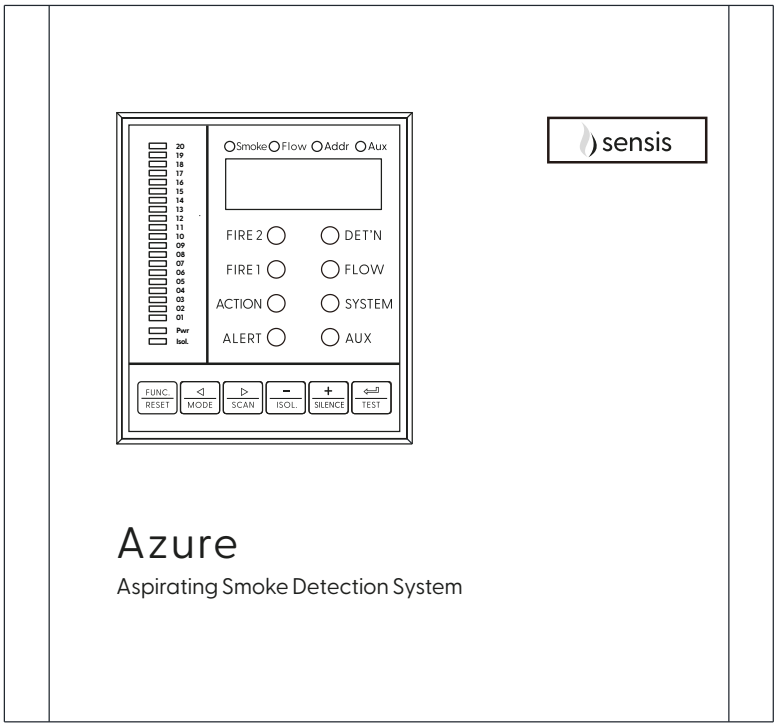
GPI-2 on the terminal board is an active input with monitoring contact and is disabled by default. To enable GPI-2, mount both the P1 and P2 jumpers on pins 2 and 3 and set the corresponding GPI function. When the external active input is disconnected for less than 3 seconds, the corresponding GPI-2 function is activated and when the GPI-2 connection line is disconnected or open for more than 6 seconds, the GPI-2 fault is reported.

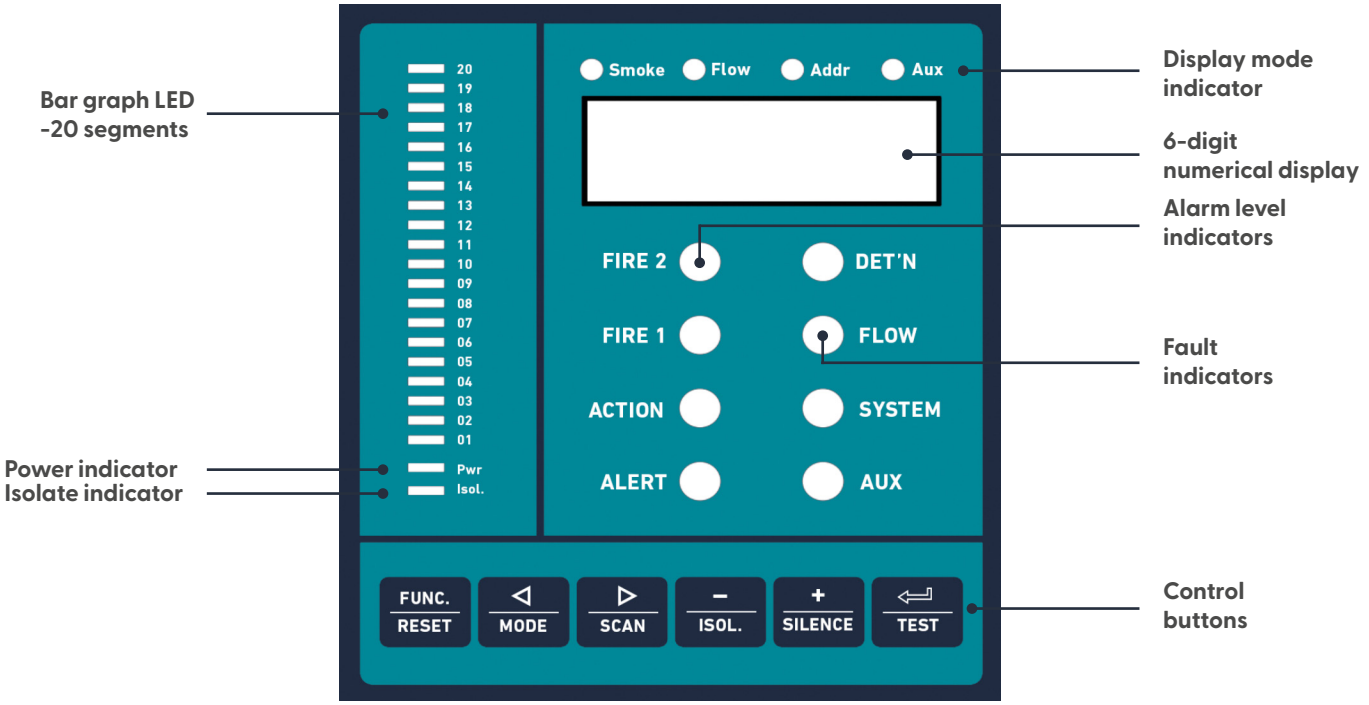
RS485
- Two RS485 Terminals
- Built-in RS485 repeater, the cable length can be extended to an adjacent device up to 1.2 km away.
- RS485 Network can be configured in closed loop for better communication reliability. The communication can switch direction to communicate with devices behind the failure point when there is a device failure, line break or line short circuit.
- SensisNet Management System (software) can monitor all devices on the network.
- SCADA/HM pen protocol can communicate with Sensis devices.



7. Front panel

The Sensis Azure 500s front panel is a Control/Display/ Programmer 3-in-1 LED display.





8. Control and display

Control

KEY	ACTION	DESCRIPTION
RESET	Press once	Reset, press this key to clear alarms or faults.
ISOLATE/ DE-ISOLATE	Press and hold for 2 seconds	The device will be isolated when it was not isolated. It will be de-isolated if it was isolated.
SILENCE	Press and hold for 2 seconds	The beeper will be silenced.
TEST	Press and hold for 2 seconds	All LED indicators on the display will come on for 3 seconds and go off for two seconds as a cycle. The cycle repeats twice for the user to check for any malfunctioning LEDs.

Pressing **SILENCE** disables the beeper for the current alarm or fault only. The beeper will sound again when the another alarm or fault occurs.

Pressing **ISOLATE** prevents any alarm or fault outputs being generated until the system is de-isolated.

Press and hold **RESET** for 2 seconds to enter program mode. For all functions in program mode please see the parameter setting section.

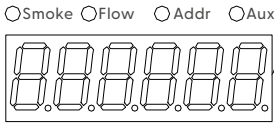
Display indicators

INDICATOR (COLOUR)	DESCRIPTION
PWR (Green)	When the device is powered.
ISOL (Yellow)	When the device is isolated.
ALERT (Red)	When the Alert Threshold has been reached and the appropriate time delays have expired. The Detector will generate Alert Alarm.
ACTION (Red)	When the Action Threshold has been reached and the appropriate time delays have expired. The Detector will generate Action Alarm.
FIRE 1 (Red)	When the Fire 1 Threshold has been reached and the appropriate time delays have expired. The Detector will generate Fire 1 Alarm.
FIRE 2 (Red)	When the Fire 2 Threshold has been reached and the appropriate time delays have expired. The Detector will generate Fire 2 Alarm.
DET'N (Yellow)	Smoke detection fault.
FLOW (Yellow)	Airflow High/Low fault, air flow sensor fail, aspirator fail.
SYSTEM (Yellow)	All faults that are not DET'N or FLOW faults.
AUX (Yellow)	Any one of the GPI points on terminal board is in action.
Bar graph (Yellow)	Display the real-time smoke level, with full scale of Fire 1 Level. In program mode, individual bar graph LED flashing indicates current parameter number.

NOTE: The status of the alarm and fault LEDs might not represent current device status. This is because the alarm/ fault output will be maintained even when the alarm/fault condition no longer exists if the Alarm Latch or Fault Latch function is enabled. A manual reset will be needed to clear the alarm or fault.

8. Control and display

6-digit numerical LED display



In normal operation, the 6-digit numerical LED displays real-time smoke level, airflow level, device address and current event in occurrence. Press the ◁▷ buttons to switch the item displayed in sequence as follows: Smoke(S) ⇄ Flow(F) ⇄ Address (Addr) ⇄ Auxiliary (Aux)

The four indication LEDs above the numerical display indicate which item is displayed. Press ▷ key to switch rightward; press ◁ key to switch leftward.

When switching to Aux, the total number of active events will be displayed first. Press <+> <-> keys to show the detailed event message, including date, time and event code. For example, if the log contains two active events, code E11 followed by code A0, then pressing <+> repeatedly will display the following in turn: 2 (the number of events), the A0 event message, the E11 event message and then 2 again. Pressing <-> displays this sequence in the reverse order. If no active events exist, the display shows NONE.

The numerical LED default display is smoke level. If the display is switched to another item and then no buttons are pressed for a further 10 minutes, it will switch back to the default item.

The default display item can be changed by pressing and holding **MODE** key for 2 seconds.

The four indication LEDs above the numerical display will flash during the flow or smoke learning cycle. You can scroll through these LEDs as needed without interrupting the learning cycle, which continues in the background until it is completed.

NUMERICAL LED INDICATOR	DESCRIPTION	
SMOKE	In normal operation, indicates the reading on numerical display is current smoke concentration.	ON
	In program mode, indicates current displayed function is smoke related parameters.	ON
	Executing smoke learning function.	Flashing
FLOW	In normal operation, indicates the reading on numerical display is current airflow percentage.	ON
	In program mode, indicates current displayed function is airflow related parameters.	ON
	Executing flow normalization.	Flashing
ADDR	Displays the RS485 address of the device.	ON
AUX	Displays code of current event and code.	ON

DISPLAY ITEM	NUMERICAL LED	UNIT	REMARKS
Smoke (S)	0.000~25.00	%/m	
Airflow (F)	0~200	%	
Address (Addr)	0~255		In setting other parameters, all indicators will go off (except smoke learning or air flow labeled flashing condition)
Auxiliary (Aux)	NONE A1~A14 E0~E33		

8. Control and display

Beeper

MODE	BEEPER ACTION
0	Disable the beeper.
1	In Alarm, beeps 1 second in every 10 seconds. In Fault, no beep.
2	In Alarm or Fault, beeps 1 second in every 10 seconds.
3	In Alarm, beeps continuously. In Fault, it beeps 1 second in every 10 seconds.
4	In Alarm or Fault, beeps continuously.

The beep frequency is different when the device is in alarm or fault status. Users can change the beeper mode according to their application.

Event code

TYPES	CODE	DESCRIPTION
Smoke Alarm	A1	Alert
	A2	Action
	A3	Fire 1
	A4	Fire 2
Auxiliary Sensor Alarm	A5	Sensor 1 High Alarm
	A6	Sensor 1 Low Alarm/High High Alarm
	A7	Sensor 2 High Alarm
	A8	Sensor 2 Low Alarm/High High Alarm
	A9	Sensor 3 High Alarm
	A10	Sensor 3 Low Alarm/High High Alarm
	A11	Sensor 4 High Alarm
	A12	Sensor 4 Low Alarm/High High Alarm
	A13	Sensor 5 High Alarm
	A14	Sensor 5 Low Alarm/High High Alarm
Smoke Detection Fault	E1	Smoke Detector Failed
	E2	Smoke Detector Service Required
	E3	Smoke Level High
	E4	Smoke Level Low
Flow Fault	E5	Aspirator Failed
	E6	Flow Sensor Failed
	E7	Pipe Flow High Fault
	E8	Pipe Flow Low Fault
	E9	Normalization Failed
	E17	Filter Blockage
	E18	Filter Removed
	E19	Filter Due
Comms. Fault	E10	Programmer Not Found
	E11	Fan Board Not Found
	E12	Zone Relay Board Not Found
	E13	HSSD Not Found
	E14	Auxiliary Sensor Board Not Found
System Fault	E20	Power Fault
	E21	Battery Fault
	E22	Mains Fault
	E23	RTC Fault
	E24	Sensitivity Mode Conflict (outside spec)
Auxiliary Sensor Fault	E25	Sensor 1 Failed
	E26	Sensor 2 Failed
	E27	Sensor 3 Failed
	E28	Sensor 4 Failed
	E29	Sensor 5 Failed
Learning	E31	Flow Normalization
	E32	Smoke Background Learning
Isolation	E30	Device Isolated
	E33	Zone Isolated

8. Control and display

Summary of key functions under operating mode

KEY PAD	KEY ACTION	DESCRIPTION
FUNC.	Press and hold for 2 seconds	In operating mode, enter into program mode.
RESET	Press once	Reset.
◁	Press once	Numerical LED display item switches leftward.
MODE	Press and hold for 2 seconds	Numerical LED display default item. The default item will be switched rightward to the next item.
▷	Press once	Numerical LED display item switches rightward.
SCAN	Press and hold for 2 seconds	Reserved.
+		
ISOL	Press and hold for 2 seconds	Isolated.
-		
SILENCE	Press and hold for 2 seconds	Mute.
↵		
TEST	Press and hold for 2 seconds	Display LED test.

The display panel has an integrated 3-in-1 control panel. When in operating mode, the panel can execute the **RESET**, **ISOLATE**, **SILENCE** and **TEST** functions, and display Smoke, Flow, Addr and Aux data via the numerical LEDs. When in setting mode, the operating parameters of the Detector can be changed using the keypad, bar graph or numerical LED display.

NOTE: The **ISOLATE** button is disabled by default. To enable it, log in to parameter setting mode and change the **ISOLATE** button setting in the front panel menu (item 7) from N to Y.

9. Parameter setup

- Press and hold the **FUNC.** key for 2 seconds while in operating mode to enter parameter setting mode. The bar graph 01 indicator flashes and the numerical LEDs display the parameter value.
- If the parameter password function is set to 1 (ON), then you must enter the password before you can edit the parameter. If the password function is set to 0 (OFF), you can immediately edit the parameter value.
- Editing parameters: press +/-key to alter parameter value; adjust it to the proper figure and press and hold return key for 2 seconds to store; the numerical tube display will flash 3 times if successfully stored.
  NOTE: If the password function is set to 1 (ON) but either the incorrect password or no password is entered, pressing +/- will have no effect.
- Each segment (numbered 1-20) on the bar graph grid represents a different parameter that can be changed. For example, segment 1 on the bar graph represents the "Alarm Level" parameter, while segment 2 represents the "Time Delay" parameter. To identify which parameter setting is currently being displayed, the related segment on the bar graph will flash. Please refer to Parameter Functions on page 18 to 22 for further information.
- If the setting value exceeds the range permitted, the Detector will automatically use the maximum value allowed for the setting.
- Press and hold **FUNC.** key for 2 seconds to exit the setting mode.
- If no action has been taken for 1 minute, a 10 second countdown will initiate before the system leaves parameter setting mode.

Key function under program mode

KEY PAD	KEY ACTION	EXECUTION
FUNC.	Press and hold for 2 seconds	In program mode, exit program mode.
RESET		
◁	Press once	Return to previous parameter.
▷	Press once	Move to next parameter.
-	Press once	Reduce displayed value. When the value reaches the minimum, press <-> key will to to the maximum value.
	Press and hold	Fast reducing displayed value.
ISOL		
+	Press once	Increase the displayed value. When the value reaches the maximum, pressing <+> key will jump to the minimum value.
	Press and hold	Rapidly increases displayed value.
SILENCE		
	Press and hold for 2 seconds	Save setting, the numerical LED will flash 3 times if successfully saved.
TEST		

10. Parameter functions

ITEM	MENU	PARAMETER	LEAD NO.	MIN	MAX	DFT	DESCRIPTION	ACCESS LEVEL
1	Alarm Level	Full Scale Sensitivity	AF.	0.01	20.0	0.20	The Detector smoke level in %/m for the bar graph reaching its full scale (20 bars). The smaller the value, the higher the sensitivity is and vice versa.	ADM
		Alert Bar graph Level	A1.	2	20	10	When the alert bar graph level has been reached and the appropriate time delays have expired. The Detector will generate Alert Alarm. The Alert Smoke Level (%/m) = Full Scale Level/20 x Alert Bar graph Level. For example, by the default settings, the alert level is 0.2/20x10=0.1%/m.	
		Action Bar graph Level	A2.	3	20	15	When the action bar graph level has been reached and the appropriate time delays have expired, the Detector will generate Action Alarm. The Action Smoke Level (%/m) = Full Scale Level/20 x Action Bar graph Level. For examples, by the default settings, the action level is 0.2/20x15=0.15%/m.	
		Fire 1 Bar graph Level	A3.	20	20	20	When the fire 1 bar graph level has been reached and the appropriate time delays have expired, the Detector will generate Fire 1 Alarm. This setting is fixed at 20 and cannot be modified.	
		Fire 2 Level	A4.	0.10	20.0	2.00	When the smoke level has been reached and the appropriate time delays have expired, the Detector will generate Fire 2 Alarm.	
2	Time Delay	Alert Delay	t1.	0	60	30	The alarm delay is the number of seconds that an alarm level has to be continuously sensed before the alarm is initiated. Each alarm level has a programmable delay of between 0 and 60 seconds.	ADM
		Action Delay	t2.	0	60	20		
		Fire 1 Delay	t3.	0	60	10		
		Fire 2 Delay	t4.	0	60	10		
3	Pipe Flow	Pipe Used	U.	0	1	1	Used to enable or disable flow sensing on the specified pipe inlet of the Detector. If any pipe inlets are unused, set the relevant flow sensor function for the pipe inlet to No to avoid unwanted flow faults.	ADM
		Pipe Flow High	H.	101	200	120	Flow high is the level above which airflow needs to increase to trigger a fault indication (which may indicate a loose or damaged inlet pipe).	
		Pipe Flow Low	L.	0	99	80	Flow low is the level below which airflow needs to be reduced to trigger a fault reading (which may indicate a blocked pipe).	
		Pipe Fan Speed	F.	0	10	5	The value entered sets the aspirator in the Detector to one of a range of predetermined speeds. The lower the number entered, the lower the airflow rate and the lower the power consumption.	
		Flow Sensitivity	S.	0	5	3	The flow detection sensitivity increases as the value increases.	DET

10. Parameter functions

ITEM	MENU	PARAMETER	LEAD NO.	MIN	MAX	DFT	DESCRIPTION	ACCESS LEVEL
4	Normalise Flow	Normalise	NF.	N	Y	N	Setting this function to Y puts the Detector into automatic flow normalization process. This takes a few minutes to normalize the flow to 100% based on the current flow rates. During normalization, the green flow indicator (LED) will flash or a normalize flow event will be shown. After normalization, a flow reading greater than 100 means the current flow is bigger than normal condition, a sign of pipe breakage. On the other hand, a flow reading less than 100 means the current flow is smaller than normal condition, a sign of pipe or sampling port blockage. **NOTE:** It is crucial to make sure there is no breakage or blockage on the pipe before setting the device into normalization process. Otherwise the system will see the abnormal condition as a normal condition.	DST
		AutoNorm.	NA.	N	Y	N	Setting this function to Y will automatically start the normalization process when the device is powered on.	
5	Alarm Action	Cascade Alarm	CA.	N	Y	Y	Setting this function to Y means that only when the Detector's controller has gone into Alert does the controller start counting down the Action delay i.e. the time delays on Alert and Action are cumulative (as are the following Fire 1 and Fire 2 delays). Enabling this function ensures that the alarms occur in the correct order even if the smoke level increases rapidly, which can cause the high level alarm to occur first in some situations.	ADM
		Alarm Latch	AL.	N	Y	N	When this function is set to Y it requires a reset on the front panel or a remote reset to clear an alarm condition. This means the alarms must be confirmed and reset manually even if the smoke level has decreased below the alarm level. This is the factory default setting. When this function is set to N, the alarm will be reset automatically when the smoke level is below the alarm threshold.	
		Fault Latch	FL.	N	Y	N	When this function is set to Y it requires a reset from the front panel or a remote reset to clear fault indications. If this function is set to N, the fault will be reset automatically when the fault condition is cleared.	
		Fault Delay	Ft.	0	60	10	The fault delay is the number of seconds that a fault condition has to be continuously sensed before the fault is initiated.	
6	Filter	Filter Status	Fs.	0	100		Read only.	
		Filter Due	Fd.	0	730		Read only.	
		New Filter	FN.	N	Y	N	Setting this function to Y will start a new filter life cycle when a new filter has been installed.	DST

10. Parameter functions

ITEM	MENU	PARAMETER	LEAD NO.	MIN	MAX	DFT	DESCRIPTION	ACCESS LEVEL
7	Front Panel	Reset Button	dr.	N	Y	Y	The front panel buttons may be enabled or disabled individually by setting these functions to Y or N.	ADM
		Isolate Button	dI.	N	Y	N		
		Silence Button	dS.	N	Y	Y		
		Test Button	dt.	N	Y	Y		
		Beeper	db..	0	4	3	Controls the behaviour of the front panel beeper: **0:** Disables the beeper, no sound in case of alarm or fault. **1:** In alarm, the beeper sounds one second in every 10 seconds. In fault, the beeper will not sound. **2:** In alarm and fault, the beeper sounds one second in every 10 seconds. **3:** In alarm, the beeper sounds consistently. In fault, the beeper sounds one second in every 10 seconds. **4:** In alarm and fault, the beeper sounds consistently.	ADM
8	Control	RESET	Cr.	N	Y	N	This has the same effect as pressing the **RESET/ ISOLATE/SILENCE/TEST** buttons on the front panel.	ADM
		ISOLATE	CI..	N	Y	N		
		SILENCE	CS.	N	Y	N		
		TEST	CT.	N	Y	N		
9	GPI	GPI-1	I1.	0	15	0	Sets the GPI terminals to one of the following functions: 0: NOT USED 1: RESET 2: ISOLATE 3: SILENCE 4: TEST 5: MAINS FAULT 6: BATT. FAULT 7: POWER FAULT 8: SENSITIVITY MODE 1 9: SENSITIVITY MODE 1 10: SCAN (Azure 2000s only) 11: UDI-1 12: UDI-2 13: UDI-3 14: UDI-4 15: UDI-5	DST
		GPI-2	I2..	0	15	0		
		GPI-3	I3.	0	15	5		
		GPI-4	I4.	0	15	6		
10	Device Relay Configuration	Relay 1	r1..	1	7	1	Sets the termination board relays to one of the following outputs: 1: ISOLATE 2: FAULT 3: ALERT 4: ACTION 5: FIRE 1 6: FIRE 2 7: AUXILIARY **NOTE:** Relay 2 is Normally Closed, the others are Normally Open.	DST
		Relay 2	r2.	2	2	2		
		Relay 3	r3.	1	7	3		
		Relay 4	r4.	1	7	4		
		Relay 5	r5.	1	7	5		
		Relay 6	r6.	1	7	6		
		Relay 7	r7.	1	7	7		
11	Reserved						NA	
12	Device Relay Test	Relay 1	r1..	N	Y	N	When the selected relay is set to Y or N, the relay will be activated or de-activated to check if the relay connected device action is correct. For example, if relay 5 is set to Fire 1 and connected to the fire alarm system, then setting the relay value to Y should cause the fire alarm panel to signal a fire. Setting All (All Relays) to Y will activate all relays. **NOTE:** Y = On, N = Off	ADM
		Relay 2	r2.	N	Y	N		
		Relay 3	r3.	N	Y	N		
		Relay 4	r4.	N	Y	N		
		Relay 5	r5.	N	Y	N		
		Relay 6	r6.	N	Y	N		
		Relay 7	r7.	N	Y	N		
		All	AL.	N	Y	N		

10. Parameter functions

ITEM	MENU	PARAMETER	LEAD NO.	MIN	MAX	DFT	DESCRIPTION	ACCESS LEVEL
13	Reserved						NA	
14	Date & Time	YYYY/Year	yy.	2000	2099	2010	It is important that the time and date be set up correctly on the controller's internal calendar/clock because it uses this information to store events in the event log.	ADM
		MM/Month	NN.	01	12	05		
		DD/Day	dd.	01	31	18		
		HH/Hour	HH.	01	23	19		
		MM/Minute	nn.	00	59	36		
		SS/Second	SS.	00	59	0		
15	System	Address	Ad.	1	250	250	Each device must have a unique address on the network.	ADM
		Factory Default	dF.	N	Y	N	Setting the function to Y will restore the device to the factory default settings. However, the device address will not be affected to prevent unwanted network errors.	DST
		Password	PS.	N	Y	Y	Setting the function to Y forces a password to be entered when changing settings in program mode. Setting this function to N allows settings to be changed without entering a password first.	
		Reference Detector Address	rA.	0	250	0	Set the reference Detector address number between 1 and 250 to enable referencing. When this function is set to 0 the referencing is disabled.	
		Reference Zone	rP.	1	8	1	The zone (Detector) number of the above reference Detector address.	
		Reference Dilution	rd.	1	100	100	The value set with this function is the percentage reference signal subtracted from the Detector's signal, if a reference device has been allocated.	
		Reference Delay	rt.	0	100	0	This value is the delay time (in seconds) between a build up of pollution being seen by the reference (if used) and the pollution being seen by the Detector.	
16	Log	Smoke Log Enable	SN.	N	Y	Y	Set Smoke Log Enable or Flow Log Enable to Y to monitor each of these parameters. Set the Log Mode for each parameter to 1 to record the rate values, and then select the time interval between measurements (maximum 3600 seconds). Set the Log Mode to 0 to record changes in the values only, and then select the percentage of the full scale measurement which is recorded as a change (maximum 5%). **NOTE:** For changes in the smoke value, the full scale measurement is the same as for the bar graph and Fire 1 level. For changes in flow, the full scale measurement is 200% of the flow rate.	ADM
		Smoke Log Mode	SL.	0	1	0		
		Smoke Change/ Rate	SC./ St.	0.01/ 1	5/ 3600	5/ 3600		
		Flow Log Enable	FN.	N	Y	Y		
		Flow Log Mode	FL.	0	1	0		
		Flow Change/ Rate	FC./ Ft.	0.01/ 1	5/ 3600	5/ 3600		

10. Parameter functions

ITEM	MENU	PARAMETER	LEAD NO.	MIN	MAX	DFT	DESCRIPTION	ACCESS LEVEL
17	Scale	Mean Period	rt.	15	480	60	This value is the period used to calculate the mean smoke background level in this period. The mean period is selectable between the following values in minutes: 15, 60, 120, 240, 480.	DST
		Sensitivity Mode 1	S1.	0.1	10.0	1.0	When a GPI is set to Sensitivity Mode 1 or 2, use this function to adjust the Detector's sensitivity (>1 reduces sensitivity, <1 increases it). This is useful if certain situations require different detection sensitivity values. For example, in work hours the smoke background level increases due to all kinds of production activities. It may be desirable to have lower sensitivity in work hours and have higher sensitivity in non-working hours. Or when there are pollutants outside the detection zone causing false alarms, this can be solved by decreasing the sensitivity by using another Sensis device to detect the pollutant level and connect its relay to the GPI to the Sensis device in the detection zone.	
		Sensitivity Mode 2	S2.	0.1	10.0	1.0		
18	SW Version.	Controller	SC.				Read only.	USR
		Display	Sd.				Read only.	
		Serial No.	SN.				Read only.	
19	Reserved						NA	
20	Optional Module	Zone Used	OP.	OFF	ON	ON		DST
		Display Used	Od.	OFF	ON	OFF		
		Filter Used	OF.	OFF	ON	OFF		
		Sensor Used	OS.	OFF	ON	OFF		

11. Commissioning

Before commissioning the Detector the local standards for aspirating detection systems must be consulted. These standards differ widely throughout the world and specific advice for the market in one country may not be applicable
to another.

Commissioning strategy will initially depend upon the environment in which the Detector is installed. For instance, the test for a computer room (which should be a relatively clean environment) would be very different from, say, a tobacco factory, which would probably have a high level of airborne particulate content.

Widely accepted standards for computer rooms/IDC areas are British Standard BS6266 and NFPA 76, which involve early detection at the incipient or pre-flame stage of a fire.To perform the test, electrically overload a 1-meter length of PVC insulated wire of 10/0.1mm gauge for one minute using an appropriate power supply. The Detector has two minutes from the end of the wire burn to give an alarm indication.

For areas with higher levels of background particulate matter, the testing methodology would be similar to that of standard point detectors.

Commissioning check list
The following brief checklist allows quick setup of the Detector. This procedure will be adequate for most standard installations.

COMMISSIONING CHECK LIST	
✔	Before powering up the Detector, visually check all cabling to ensure correct connection. If wire identification is not immediately clear (e.g. by use of different colored wires or wire identification sleeves) an electrical check should be made. Any damage caused by misconnection of the Detector is not covered by warranty.
✔	Power up the unit and enter the engineering access code.
✔	Enter the Setup menu and verify that the time and date are correct.
✔	Set the appropriate alarm levels and time delays for the protected environment.
✔	Modify necessary settings in your application and exit program mode.
✔	Introduce smoke to every pipe end to make sure the maximum transport time is within specification. Typical maximum transport time per NFPA 72 is 120 seconds. Other transport time requirements should be specified considered in the design stage.
✔	Perform any necessary smoke tests, like Hot Wire performance test or Potassium Chlorate / Lactose performance test, ensuring that the Detector reacts appropriately, and let the smoke fully dissipate.

NOTES:

1. If the device is connected to SensisNet Management System, the date and time can be synchronized to the computer date and time. All the devices on the network can be synchronized by the Alarm Management System (AMS). at the same time.

2. Set the time delays to 0 seconds during testing of the transport time so that the alarm delay time does not affect the results. After testing, reset the time delays to the appropriate values for your system.

3. The maximum transport time may be set to 90 or 60 seconds when the system is required to provide early warning or very early warning fire detection.

12. Maintenance

Filter maintenance and replacement

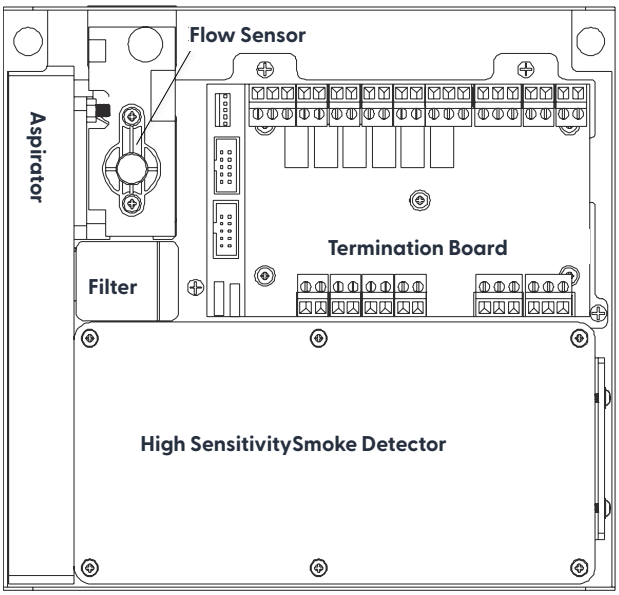
The Sensis Aspirating Smoke Detector is a very low maintenance detection system. If required, external cleaning of the unit should be performed using a damp (not wet) cloth. Do not use solvents as these may chemically attack the display screenl. The only part that may require field replacement during servicing is the dust filter. The filter condition can be checked from the Status Screen, which gives a percentage reading of filter efficiency and the filter expiry date. When the level drops to 70% or the date is due the Detector will signal a Filter renew fault and the filter will need replacing.

Figure 6 shows the location of the dust filter.

Open the front cover using the key provided, and locate the filter at the bottom of the Detector as shown in figure 6. Untighten the screw in the middle of the filter to remove the filter. Fit a new filter, make sure to push the filter fully home and tighten the screw.

When the replacement filter is fitted, enter the Setup menu to set a new filter, at which point a filter flow calibration process will be initiated to measure the flow rate passing through the new filter. The filter due date will also be set to two years from the date of changing the filter.

Figure 6.
Detector interior



Preventive maintenance

To guarantee the best performance of the Sensis aspirating detection system, a periodic preventive maintenance is required. The PM schedule is as follows:

CONTENT	MONTHLY	QUARTERLY	EVERY 6 MONTHS	EVERY YEAR	EVERY 2 YEARS
Power supply check	V	V	V	V	V
Display check	V	V	V	V	V
Air flow check	V	V	V	V	V
End cap test		V	V	V	V
Sampling pipes inspection			V	V	V
Signaling inspection				V	V
Clean sampling pipework					V

There are monthly, quarterly, half-yearly, annual and biannual inspection schedules for the Sensis aspirating smoke detection systems. It is recommended that monthly inspection is done by the user and all the others are performed by competent, qualified engineers.

During inspections, check that there have been no unauthorized changes to the system configuration (e.g. Sensitivity). If changes are required or have taken place, then these must be documented.

WARNING: During maintenance, the Sensis ASD unit may trigger alarms and faults. To avoid accidentally setting off alarms throughout the building, consider isolating the ASD zone on the Fire Panel.

12. Maintenance

Check the power supply (UPS)

a. Check the DC input voltage using a meter to make sure the power is within normal range.

Check the device display

a. Press the <Test> button (if enabled) to check if all the LEDs and Numerical LED display on the display illuminate normally.

Check the airflow

a. Use Sensis front panel display or SensisNet Management System computer software to check and record the airflow readings.

b. Compare the current reading to the previously recorded values to check for any significant change. Airflow reading during maintenance should be confirmed as ± 20% of the values measured at commissioning.

c. If there is a significant change in the airflow, inspect the sampling pipes for breakages or blockages.

End cap smoke test

a. Introduce smoke to the pipe end.

b. Check the response time is within specification (typically 120 seconds) and compare this to the values previously measured. Measurements of transport time from the furthest hole during maintenance should be confirmed to be within ± 15% or ± 3 seconds, whichever is the greater, of the same measurement taken at commissioning.

c. Inspect the pipework if there is significant change in the response time.

Sampling pipes inspection

a. Check there are no obstructions affecting sampling pipework, sampling points or remote capillaries.

b. Visually check there is no pipe breakage or sampling point blockage.

c. Check remote sampling points to make sure that capillary tubes are securely connected.

Signaling inspection

To verify the connections between the Aspirating Smoke Detection system and other connected systems (e.g. CIE, BMS).

a. Activate the fire relays in the relay test menu or introduce smoke to put the Detector into alarm to check if an alarm is generated on the fire alarm panel (if the Detector is connected to the fire alarm system).

b. Activate the fault relay in the relay test menu or put the Detector into fault (e.g. pull out the sampling pipe to generate flow fault) to check if a fault is generated on the fire alarm panel, if it is connected to the fire alarm system.

c. Shut down the main power supply. Check if the power supply backup output and its display function correctly. Check if there is a fault generated on the Sensis device if the mains or power fault monitoring GPI is connected. Check if there is a fault generated on the fire alarm panel and if the fault relay is connected to the fire alarm system.

d. Disconnect the negative wire (black) of the power supply batteries. Check if the power supply and its display function correctly. Check if there is a fault indicated on the Sensis device, and if the battery or power fault GPI is connected.

Clean the sampling pipework

a. The sampling point can be cleaned using a proper tool (e.g. a tooth pick or sharp needle) to remove the dust build-up on the sampling hole.

b. To clean the capillary tube, remove the tube from the pipe and use compressed air to blow the dust away.

c. To clean the whole sampling pipework system, a pipe must be removed from the pipe inlet and a high airflow introduced by a compressor into the sampling pipe to remove any dust particles found inside the pipework and/or within the sampling holes. Alternatively, for ease of maintenance, install a three-way valve upstream of the pipe inlet. During normal operation, ensure that the valve connects the Detector pipe and the sampling pipe. Connect the compressor to the third inlet of the valve, so that the high airflow can be directed to the sampling pipe during maintenance.

NOTE: Do not introduce compressed air directly into the Sensis Detector.

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