Installation Handbook

AutroSense Nano
Aspirating Smoke Detector

AUTRONICA

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CE

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EN 54-20:2006
Aspirating smoke detectors
for fire detection and fire alarm
systems for buildings
Class A, B and C

1. Introduction

This aspirating smoke detector is designed to provide reliable performance in a variety of environment and to ensure that installation and commissioning are as simple as possible. An aspirating smoke detector uses a fan to draw samples of air from a network of pipes with sampling holes positioned as if they were point smoke detectors.
The detector incorporates a patented artificial intelligence system which allows the detector to adjust itself to the optimum sensitivity for any environment.
The artificial intelligence system also monitors the detector chamber and air filter, and automatically compensates for contamination. This provides a stable response and signals a fault if the contamination reaches a level that cannot be compensated for.

This smoke detector is Class III as defined in EN60950. It is designed to operate from Safety Extra Low Voltages and does not generate any hazardous voltages.

If this detector is to form part of an approved fire detection system, its power must be supplied from a certified power supply (typically EN 54-4).

In order for the installation to conform to EN 54-20, pipes must conform at least to EN 61386-1 Class 1131.

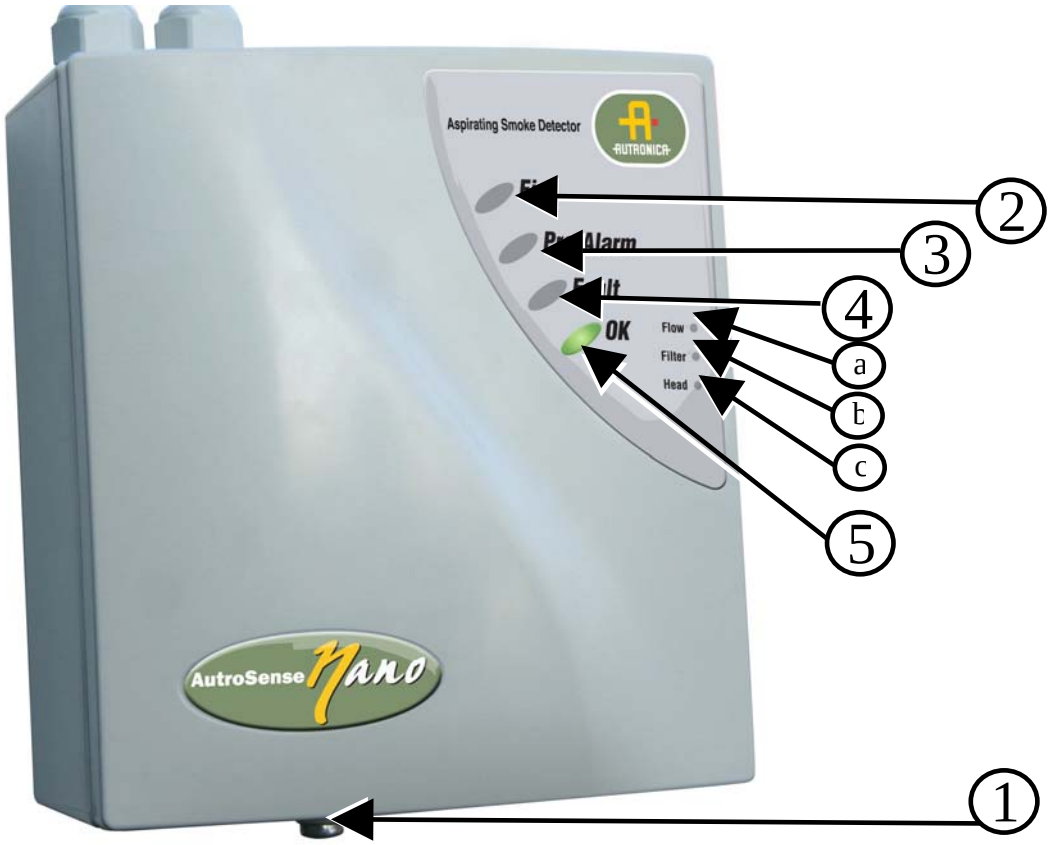
Please note that printed circuit boards are static sensitive and must not be handled without taking proper static precautions.

The detector is a Class 1 laser product as defined in IEC 60825-1. This unit incorporates a Class 3B embedded laser which must not be removed from the detector, as retinal damage may occur if the beam enters the eye.

Every care has been taken to ensure that the detector is as easy to install as possible by trained fire alarm engineers. In case of difficulty, please contact the Help Line in the first instance to ensure trouble free installation and operation.

The manufacturer takes no responsibility for damage or injury occasioned as a result of failing to install or operate or maintain the equipment in accordance with these instructions and other good practices.

2. Outside the Detector



1. **Front Cover Securing Screw:** leave sufficient clearance below the detector to allow screwdriver access to this screw.

2. **Fire Alarm**: illuminates to indicate that the smoke level has passed the detector's Fire 1 threshold, and the normally open FIRE relay contacts have closed.

3. **Pre-Alarm**: illuminates to indicate that the smoke level has passed the detector's Pre-Alarm threshold, and the normally open PRE-ALARM relay contacts have closed.

4. **Fault**: illuminates to indicate a fault condition and that the normally closed FAULT relay contacts have opened. Three additional LEDs indicate the type of fault:

    a) **Flow:** illuminates to indicate an airflow fault. This may be due to blocked or broken pipes, although it can also occur if, for example, factory warehouse doors are opened on a windy day, or if industrial air conditioning turns on. Another possible cause is that the aspirating fan connection cable is damaged or disconnected.

b) **Filter:** illuminates to indicate that the detector's air filter needs to be changed.

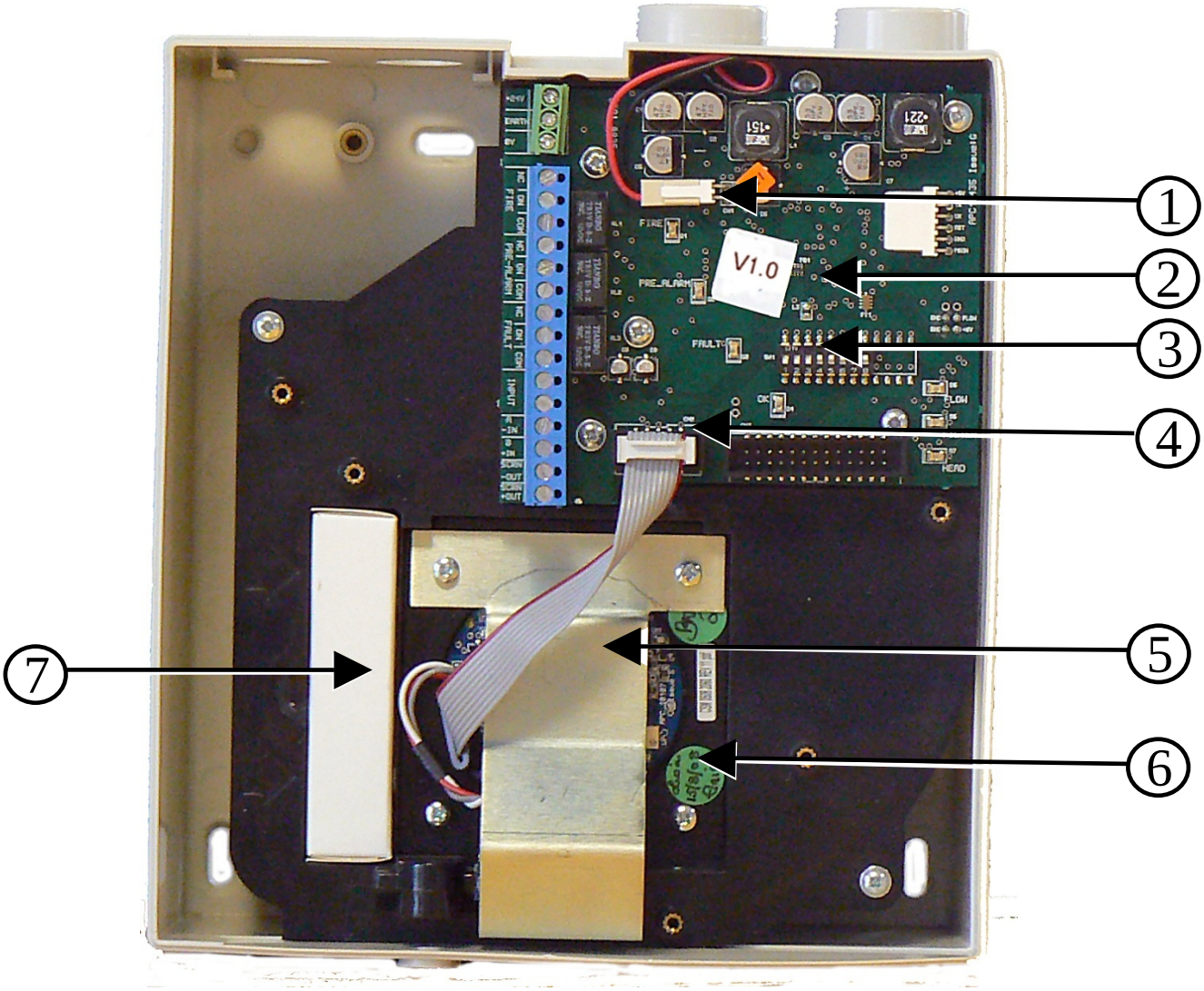
c) **Head:** illuminates to indicate a problem with the detector laser chamber, as might be caused by the laser head connecting cable is damaged or disconnected. It can also be caused by certain kinds of internal systems faults, which appear in the detector's event log as "process errors".

NB: if the FAULT LED is illuminated but none of the additional LEDs are lit, it indicates a problem with the power supply if its fault output is connected to the detector's INPUT terminals.

5. **OK**: illuminates to confirm normal operation.

   NB: during initial setup, the OK LED will flash for 15 minutes while the detector learns its operating environment. This does not indicate a problem with the detector.

3. Inside the Detector



1. **Aspirating Fan Connector Lead:** If this lead is broken or not connected, the fan will not turn and the detector will indicate a FLOW fault.

2. **Main PCB:** No user-serviceable parts. *NB: The PCB is fixed in place with 5 off M3 x 6 screws. The detector must not be operated with any of the screws missing, as this may cause air leaks and unreliable operation.*

3. **DIP switch:** used to configure user-selectable detector functions

4. **Detector Head Ribbon Connector:** If this lead is broken or not connected, the detector will indicate a HEAD fault.

5. **Detector Head Cover Plate.** This protects the laser head. The plate should not be removed from the detector.

6. **Detector Head Assembly:** No user-serviceable parts. Do not remove this from the detector due to the risk of exposure to the laser.

7. **Replaceable Dust Filter:** This simply slides in and out of its mounting. The filter and its replacement have IN written in red on one side, and OUT on the other to allow correct orientation. The part number for ordering spare dust filters is 116-5861-018.9028. *NB: as viewed above, IN should be on the left and OUT should be on the right, as indicated by the moulded-in arrows next to the filter slot.*

4. Installation: Mechanical

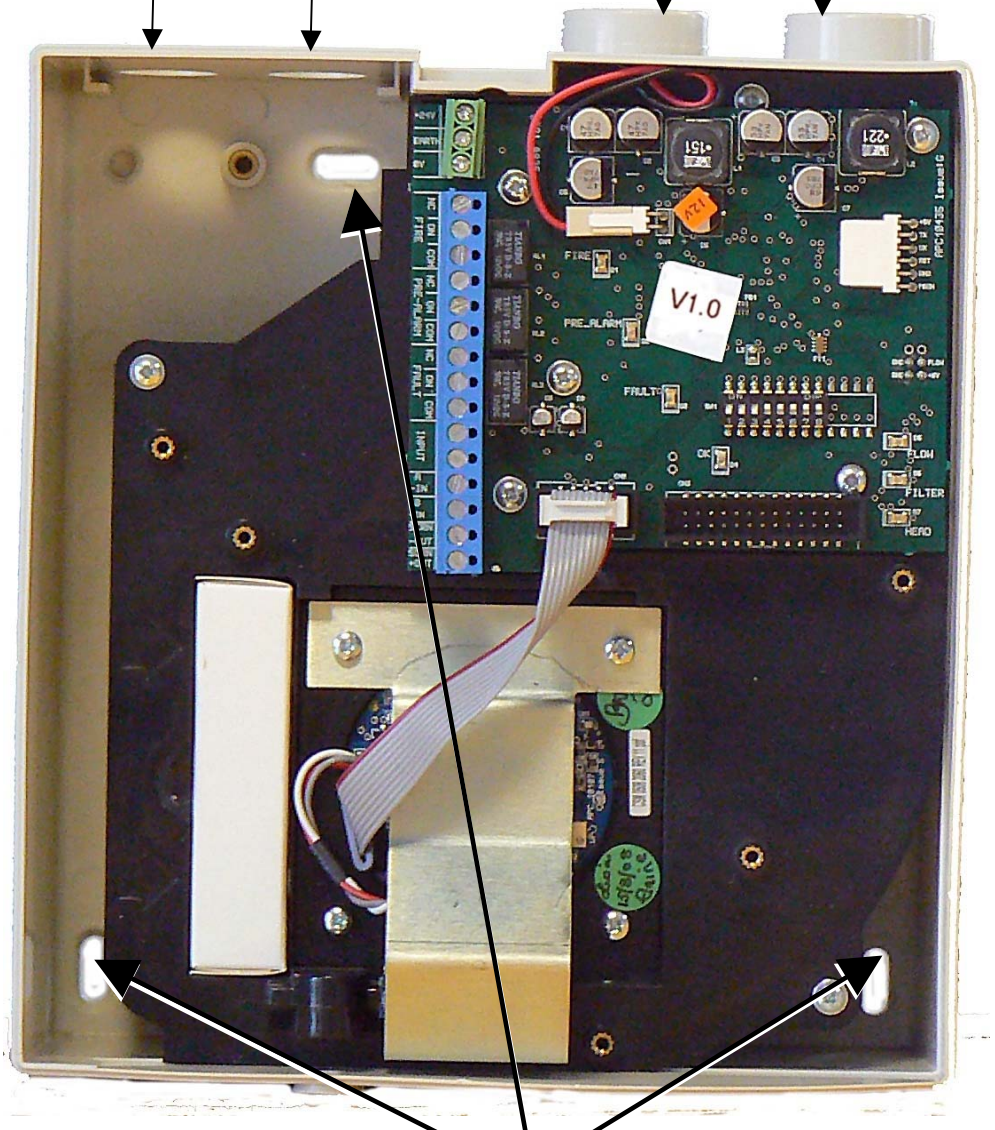
Cable Entries

- 2x 20mm Conduit Holes, e.g for 20mm packing glands.
- Drilling guides are provided for drilling two additional 2x 20mm holes in the top and 1x 20mm hole in the bottom if needed.

Pipe Entries

- ¾" ABS Pipe.
- Use a 3/3" male to 25mm female adaptor (AirSense part no. 116-5861-018.9032) if 25mm pipe is used.

NB: Do not glue pipes into detector to facilitate future removal.

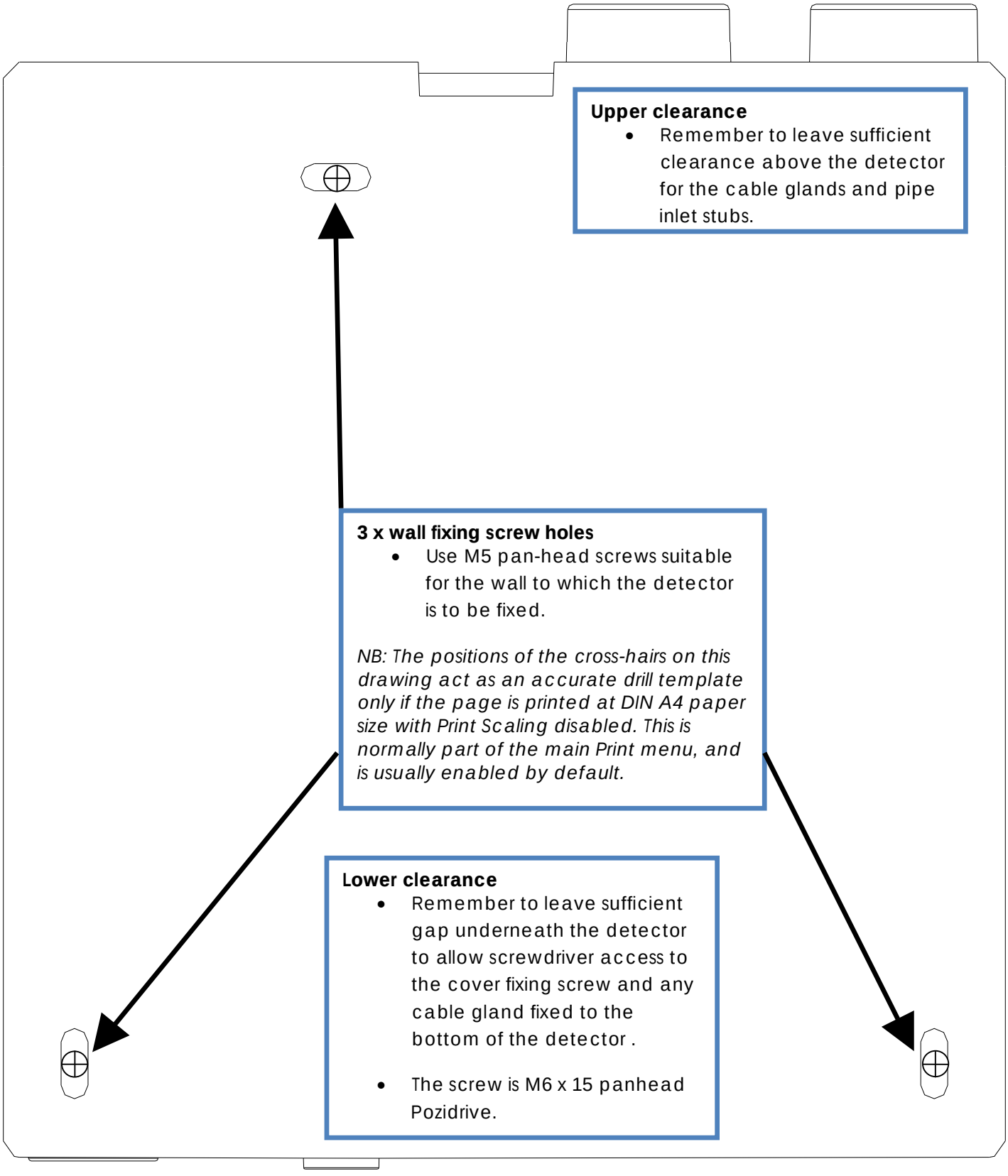


Fixing Holes (3 x M5 x 13 slots)

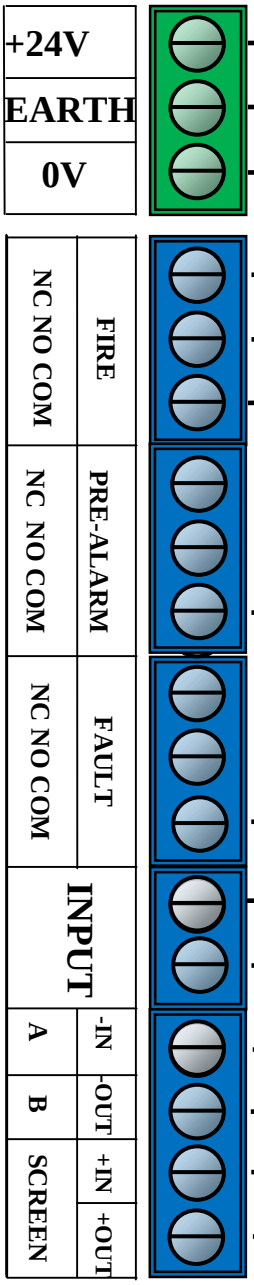
- Refer to printable drilling template on next page for accurate positioning

NB: Ensure the detector is fixed to a flat surface – otherwise the enclosure will twist.

5. Installation: Drilling Template



6. Installation: Electrical



Power Supply connections

- Connect to 24V DC 1A PSU.
- Do not connect 0V to EARTH.
- Use screened cable with screen connected to the detector EARTH terminal.

Volt-free relay contacts rated at 1A maximum at 24VDC.

NB: All relay diagrams are shown in their contact states with the detector powered up and operating normally.

- Contacts will change over on fire or fault, as appropriate.
- The NO/NC (normally open/closed) terminal legends for this relay refer to the contact state in the power-off/fault condition, not to the "normal operation" condition. Fault relay contacts will also change over on power-down.
- Use screened cable with screen connected to the detector EARTH terminal.

- **DIP Switch 7 OFF:** connect to PSU fault relay Normally Closed contacts for PSU monitoring.*
- **DIP Switch 7 ON:** ClassiFire® Override will reduce detector sensitivity by 50% while the input terminals are shorted together, e.g. by a key switch.
- Use screened cable with screen connected to detector EARTH terminal.

Optional communications card fitted (RS485 serial communications mode):

- Connect Command Module or detector RS485 (SenseNET) serial bus to A and B.
- Set communications card address switches to identify detector.
- Use screened cable. Connect screen to SCREEN terminal(s). Earth the screen at one end ONLY (if using a chain of detectors connected to a Command Module, earth the cable screen at the Command Module only).

Optional APIC card fitted (addressable communications mode):

- Connect + and – IN and + and -OUT terminals to fire panel with a communications protocol compatible with the APIC. Set APIC address switches to identify detector.
- In a chain of detectors linked to a Command Module, use a serial communications card in each Stratos-Nano detector, each set to an individual address, and communicate with the fire panel via a single APIC in the Command Module
- Use screened cable with screen connected to the detector EARTH terminal.

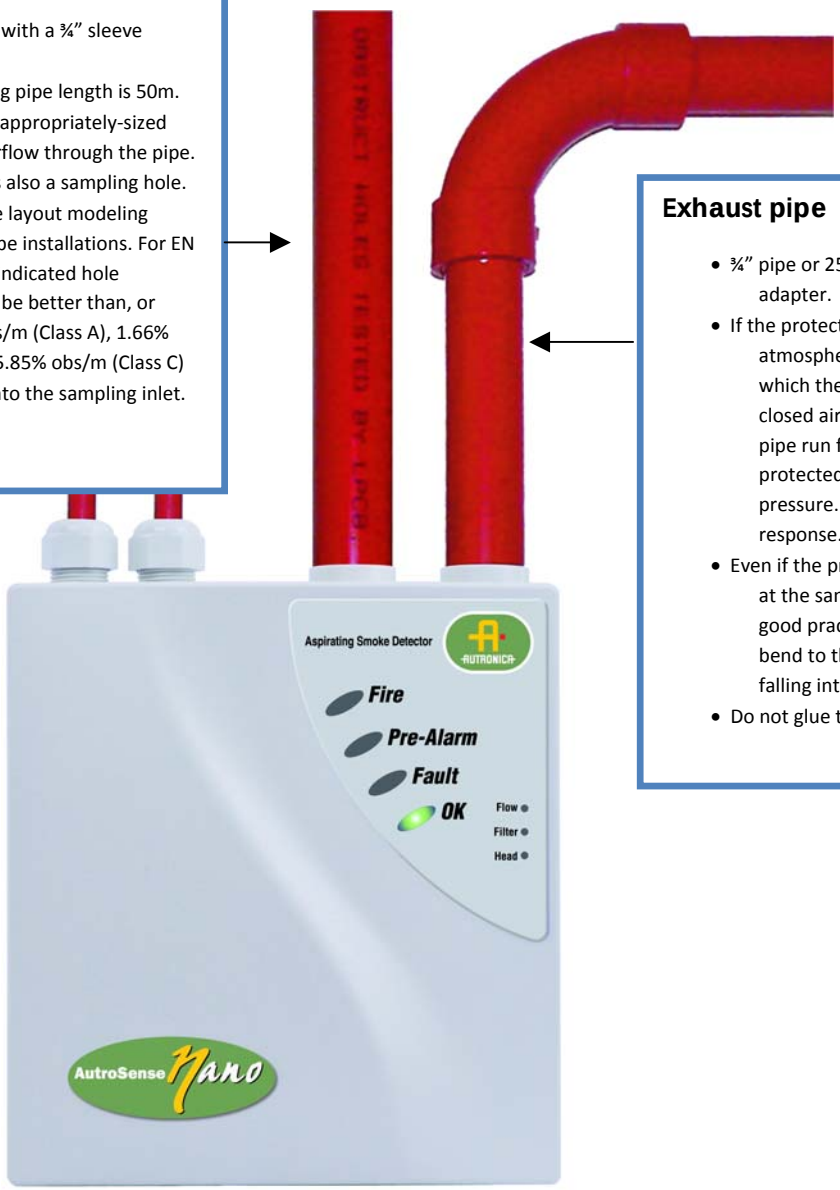
In accordance with good wiring practice, keep cables and individual bared conductors as short as possible while allowing stress-relieving cable forming. Power cables should be screened and current-rated at 1A or greater. Signal cable should be 120Ω screened twisted pair, such as Belden 9841 24AWG.

***The INPUT terminals are set by default to monitor the power supply. If power supply monitoring and ClassiFire Override are not required, fit a wire link across the two terminals to prevent a fault condition on power-up.**

7. Installation: Pipework

Sampling pipe

- ¾" pipe or 25mm pipe with a ¾" sleeve adapter.
- The maximum sampling pipe length is 50m.
- Fit an end cap with an appropriately-sized hole to optimize airflow through the pipe. This end cap hole is also a sampling hole.
- Use the PipeCAD® pipe layout modeling software to plan pipe installations. For EN 54-20 compliance, indicated hole sensitivities should be better than, or equal to: 0.80% obs/m (Class A), 1.66% obs/m (Class B) or 5.85% obs/m (Class C)
- Do not glue the pipe into the sampling inlet.



Exhaust pipe

- ¾" pipe or 25mm pipe with a ¾" sleeve adapter.
- If the protected area is at a lower atmospheric pressure than the location in which the detector is installed (e.g. a closed air-conditioned room), fit a return pipe run from the detector exhaust to the protected area, in order to equalise the pressure. This will improve detector response.
- Even if the protected area and detector are at the same atmospheric pressure, it is good practice to fit a pipe stub with a bend to the exhaust, to prevent debris falling into the detector.
- Do not glue the pipe into the exhaust outlet.

8. Configuration

Configuration is carried out via the DIL switch mounted on the Main PCB.

	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
Set Detector Sensitivity								
Alarm Factor 6	Off	Off						
Alarm Factor 7	On	Off						
Alarm Factor 8	Off	On						
Alarm Factor 9	On	On						
ClassiFire On Fixed Alarms			Off					
			On					
Flow Limit Offset								
±40				Off	Off			
±20				On	Off			
±5				Off	On			
±3				On	On			
Flow Delay								
240sec						Off		
30sec						On		
Input Select								
PSU Fault							Off	
ClassiFire Override							On	
Auto Calibration								
Enable								Off
Disable								On

NB: Denotes EN 54-20 test configuration (factory default) settings

Alarm Factor: the detector calculates sensitivity relative to the ambient pollution level. Higher Alarm Factors provide reduced sensitivity (the alarm threshold is maintained further away from the ambient level). Refer to the remote software manual for further details. *NB: Changing the Alarm Factor starts a new FastLearn cycle: during the initial 15 minute learning period, the detector is incapable of reporting an alarm, and will take 24 hours to achieve optimum performance, based on the ambient conditions.*

ClassiFire® On: allows the artificial intelligence system to continuously adjust alarm thresholds in order to avoid unwanted alarms from environmental changes (recommended). *NB: Disabling this feature means that nuisance alarms due to fluctuations in ambient pollution levels become more likely.*

Fixed Alarms: switches the artificial intelligence system off, locking sensitivity to that set at initial setup. This de-activates the dust filter monitoring system (not recommended). *NB: Enabling this feature means that nuisance alarms due to fluctuations in ambient pollution levels become more likely.*

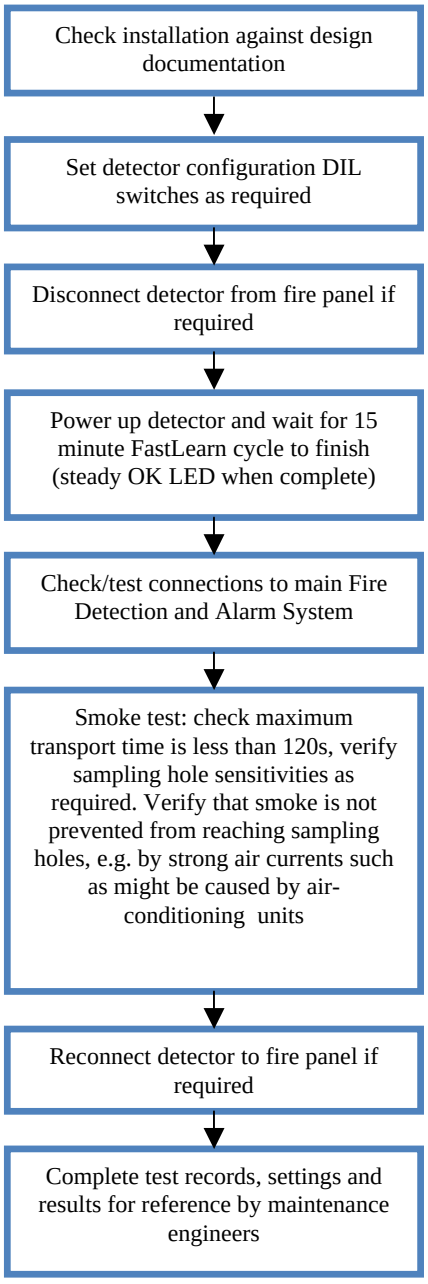
Flow Limit Offset: sets the sensitivity of the airflow monitoring system. A small offset makes the system very sensitive to air flow changes. EN 54 systems must react to ±20% changes in airflow, which equates to a change in flow sensor reading of ±5. Areas with fluctuating air pressures may require a less sensitive setting.

NB: Changing the flow limit offset starts a new flow calibration set up.

Flow Delay: sets the time for which a flow fault must continue before a fault is signalled.
Input Select: the detector input terminal may be used to either monitor an associated power supply for faults, or for ClassiFire® Override (reduces normal sensitivity by 50%). *NB: in the factory default condition, the switch is set to OFF (power supply monitoring). This will give a fault condition if there is an open circuit on the INPUT terminals, so fit a wire link if power supply monitoring is not required.* ***If a wire link is fitted across the INPUT terminals, it is important that this switch be set to OFF, since otherwise the detector sensitivity will be dramatically and permanently reduced by the ClassiFire Override function.***
Auto Calibration: automatically starts a new FastLearn cycle when the detector is powered up. This may be disabled if the previous settings need to be retained.

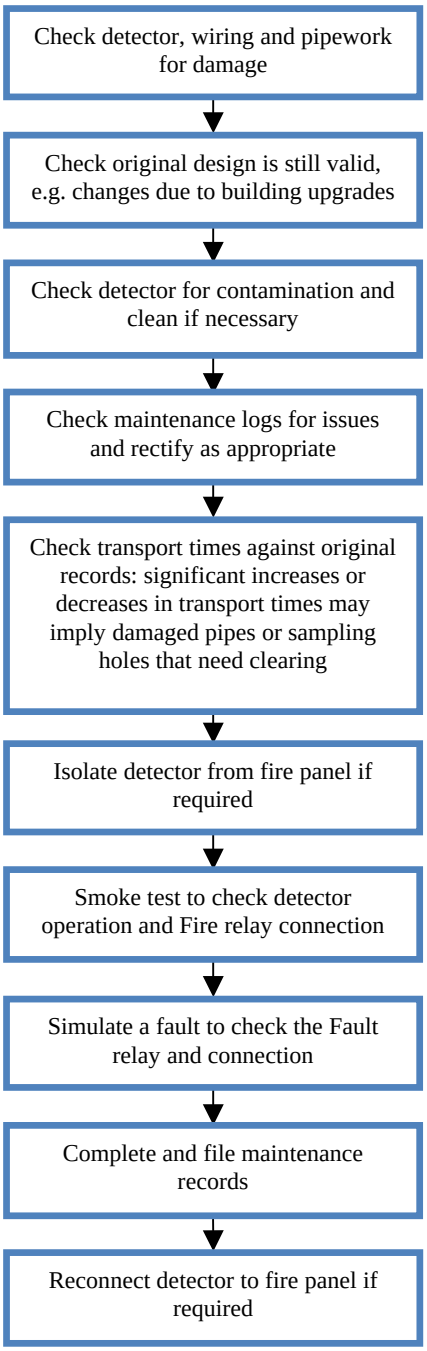
9. Commissioning

Local standards and specification requirements must be adhered to. A typical commissioning procedure might entail the following steps:



10. Maintenance

Local standards and specification requirements must be adhered to. A typical maintenance procedure could entail the following steps:



Notes:

- It is prudent to disconnect or isolate the detector from the fire panel during maintenance to prevent unintentional alarm activations.
- The detector should be powered down during internal cleaning (use an air duster can or dry air gun).

11. Troubleshooting

Nuisance alarms:

- This normally indicates that the detector is set at an Alarm Factor inappropriate to the installed environment.

  Increase the Alarm Factor to reduce sensitivity.

- The sensor chamber may be contaminated.

  Return the sensor chamber for factory cleaning and recalibration.

Detector will not pass smoke a test:

- Detector may be in a FastLearn cycle.

  Check green OK LED is not flashing.

- The detector FastLearn cycle may have been carried out during or immediately after smoke tests.

  Reinitiate FastLearn with the detector in a clean environment.

- The Alarm Factor is too high.

  Change the Alarm Factor to a lower, more sensitive, setting.

Nuisance flow faults:

- Flow monitoring is too sensitive for the environment.

  Increase the flow limit offset.

- Airflow may be subject to temporary changes (spikes).

  Increase flow delay.

Long transport times:

- Sampling pipe may be too long or have too many sampling holes/capillaries or incorrect hole sizes.

Check design with pipe modelling software.

- Sampling pipes, sampling holes and/or the exhaust pipe may be partially blocked by dust or debris.

  Clean pipe work with dry compressed air and/or clean the sampling holes.

- Fan may be defective.

  Send detector for repair.

- Fan lead may be disconnected

  Reconnect lead.

12. Optional: Communications Card

Board locating post

Detector address DIP switch

- *The detector address is set using a reverse binary code, i.e. switch 1 is the least significant bit and switch 8 is not used.*
- *Set to address from 001 to 127 in order to identify the detector to the remote*

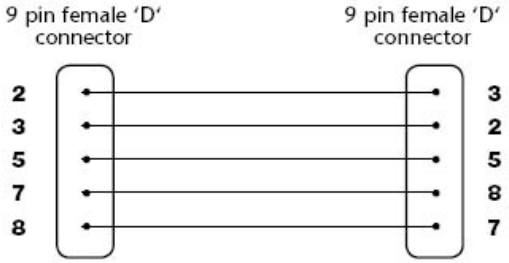
2 off M3 x 6 fixing screws

- *Provided with board.*

RS-232 serial port

- *Use 9-pin D-type null modem cable to connect to PC*

A Communications Card may be fitted inside the detector. Direct connection of a PC to the Communications Card is via a 9-pin RS-232 interface on the Communications Card, using a Null Modem cable configuration, as shown in the diagram below.



A connected PC may access the detector event memory to review previous or current events such as detector sensitivity. The detector internal Chart Recorder may also be accessed for analysis of detector behaviour (see separate Remote Software Manual for further information). The PC cannot be used to

configure the detector except to enter time and date settings for the detector event log and chart recording to be viewed in the Remote Software. The detector does not incorporate a real time clock, so the time and date need to be re-entered if the detector is powered down for any reason.

Installation of the Communications Card also provides the detector with RS-485 network communication via the A, B and SCREEN terminals on the detector main board. This can be used for simple remote display indication or integration into a larger site wide management and display system, separate from the local Fire Detection and Alarm system connection. The Communications Card has short circuit bus isolation but does not have an RS485 repeater

13. Technical Data

SELV Rating……..EN 60950 Class III

Supply Voltage……...21.6v – 26.4v DC

Current Consumption……..350mA

Electrical Safety……Complies with EN 610190-1

Size (mm)……190w x 230h x 110d

Weight……1.2kg

Operating Temperature Range……..0°C to 38°C (UL 268)

-10°C to 60°C (EN 54-20)

Operating Humidity Range……..0 to 90% Relative Humidity, Non-Condensing

EN61010-1 Pollution Degree 1

EN61010-1 Installation Category II

IP Rating……...IP50

Sensitivity Range……...0.4% to 25% obscuration/metre

Detection Principle……Laser Light Forward Scattering Mass Detection

Maximum Number of Sampling Holes……..Class A: 2

Class B: 4

Class C: 10

Maximum Sampling Pipe Length……50m

Sampling Pipe Inlets……..2 off ¾”pipe inlets (sampling pipe and exhaust)

Alarm / Fault Relays……..Pre-Alarm / Fire / Fault

Relay Contact Rating (Changeover)……..1A @24V DC resistive load

Programming……...Internal DIL Switches

PC Interrogation……Via optional Communications Card

APIC Compatible……Yes

Notes:

- Some devices such as sounders and beacons have high inrush currents on activation, which can damage relay contacts. It is good practice to consider fitting a suitable current limiting resistor in series with the load to avoid this potential problem.

14. Reader's Comments

Please help us to improve the quality of our documentation by returning your comments on this manual:

Title: *Installation Handbook, AutroSense Nano*

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Your information on any inaccuracies or omissions (with page reference):

Please turn the page

Suggestions for improvements

Thank you! We will investigate your comments promptly.

Would you like a written reply? θ Yes θ No

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www.autronicafire.com

Autronica Fire and Security AS is an international company, headquartered in Trondheim, one of the largest cities in Norway. The company is owned by United Technologies Corporation and employs more than 319 persons with experience in developing, manufacturing and marketing of fire safety equipment. Our products cover a broad range of systems for integrated solutions, including fire detection systems, integrated fire and gas detection systems, control and presentation systems, voice alarm systems, public address systems, emergency light systems, plus suppression systems.

All products are easily adaptable to a wide variety of applications, among others, hospitals, airports, churches and schools, as well as to heavy industry and high-risk applications such as power plants, computer sites and offshore installations, world wide.

The company's strategy and philosophy is plainly manifested in the business idea:
Protecting life, environment and property.

Quality Assurance

Stringent control throughout Autronica Fire and Security ASsures the excellence of our products and services. Our products are CE marked and developed for worldwide standards and regulations, and conform to the CEN regulation EN54. Our quality system conforms to the Quality System Standard NS-EN ISO 9001:2000 and is valid for the following product and service ranges: marketing, sales, development, engineering, manufacture, installation, commissioning and servicing of suppression, integrated fire and gas detection and alarm systems, plus petrochemical, oil and gas instrumentation systems for monitoring and control.

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