NAS
Aspirating Smoke Detector

Installation and User Guide
# CONTENTS

## 1 Introduction
1.1 General description ................................................................. 3 
1.2 Package contents .................................................................. 3 
1.3 System requirements .............................................................. 3 

## 2 Installation Guide
2.1 Detection panel installation ....................................................... 4 
2.2 Pipe network installation ......................................................... 7 
2.3 Air flow calibration ................................................................. 10 

## 3 User Guide
3.1 LED indicators ........................................................................ 12 

## 4 Maintenance
4.1 Air flow .................................................................................. 13 
4.2 Air filter ................................................................................. 13 
4.3 Internal detectors .................................................................. 13 

## 5 Troubleshooting ...................................................................... 14 

## 6 Technical Specifications .......................................................... 14
1 INTRODUCTION

1.1 General description

The aspirating smoke detector draws air from the protected area using a network of sampling pipes. The sampled air is then passed through a high sensitivity detector for analysis and alarm indications raised when required.

Aspirating systems are ideal for use in areas where early warning is critical or where individual smoke detectors offer a limited service, such as:

- Areas of limited access where the installation of and/or maintenance of individual detectors may be difficult (tunnels, ventilation systems, excessively high areas etc).
- Areas so large that protection with individual detectors would require an extremely expensive installation (commercial centres, storage areas etc).
- Computer rooms, data storage cabinets, telecommunications and electrical facilities etc.

1.2 Package contents

- 1 x detection panel
- 1 x filter chamber with filter
- 1 x filter connector
- 1 x installation and user guide

1.3 System requirements

- 1 x detection panel
- 1 x filter chamber with filter
- 1 x filter connector
- 2 x smoke detectors
- 1 x pipe network components and accessories
2 INSTALLATION GUIDE

2.1 Detection panel installation

2.1.1 Detection panel layout

Figure 1: Front and interior views of the detection panel


2.1.2 Fixing the panel to the wall

The panel must be installed in a clean, dry place free from vibrations with a temperature between 0º and 60º C. The relative humidity must not exceed 95%. There should be no condensation. The panel should be installed where the risk of fire is minimal and the place is protected by the fire detection system. Risk of mechanical damage must be avoided.

Fix the panel to the wall at an approximate height of 1.5 metres from the floor, in a place with easy access. The panel LED indicators should be at eye-level.

Do not perforate the panel in places other than those indicated. Avoid dropping shavings or pieces of removed casing inside the panel as this may damage the electronic circuits.

The ventilation outlet in the base of the panel housing must not be blocked or obstructed. Ensure the panel installation provides a minimum space of 10cm beneath the outlet to ensure proper ventilation of the panel.
Avoid pressure differences between the air inlet (pipe network) and the ventilation outlet. If pressure differences exist a pipe may be run from the ventilation outlet to the protected area.

2.1.3 Attaching the filter chamber

For best results the filter chamber should be fixed directly to the detector panel (see Figure 1: Front and interior views of the detection panel).

The air filter supplied with the panel improves the accuracy of air analysis by removing dust and other particles from the sampled air prior to analysis. The air filter may be replaced when necessary.

2.1.4 Electrical connections

*Figure 2: PCB layout and electrical connections*

1. VP1, VP2 test connectors, Fan connectors, 24VDC power input (JP4); 2. Fault / Alarm relay connectors (C, NC, NO) (JP3); 3. Zone 1 / Loop 1 connector (JP2); 4. Zone 2 / Loop 2 connector (JP1); 5. Internal detector connectors (JP5); 6. DIP switch; 7. Fault / Alarm relays; 8. Potentiometer (P2); 9. Potentiometer (P1); 10. Fuse (F1).

2.1.4.1 Power supply

The detector panel operates at 24 V supplied by an external 24VDC power supply or the fire panel corresponding to the fire detection system. The power line is connected to the power input terminal of the PCB (JP4).

2.1.4.2 Internal detectors

Detectors installed in the detection panel may be either conventional or analogue depending on your fire system installation. Detector types may not be mixed – use either two conventional or two analogue detectors.

- In a *conventional* system each detector will be connected to a different zone of the conventional fire panel that controls them.
- In an *analogue* system each detector will be connected to the same loop on the analogue fire panel that controls them.
Electrical connections for each system are different. For conventional system connection details see 2.1.4.3 Connecting to a conventional system. For analogue system connection details see 2.1.4.4 Connecting to an analogue system.

The detector panel must also be configured for use with either system using the DIP switch on the main PCB (see 2.1.5 DIP switch configuration).

### 2.1.4.3 Connecting to a conventional system

A conventional installation requires an end-of-line resistor to be installed.

*Figure 3: Conventional system connections*

1. 24VDC power input; 2. Zone 1 in; 3. Zone 1 out; 4. Zone 2 in; 5. Zone 2 out; 6. Detector 2; 7. Detector 1.

### 2.1.4.4 Connecting to an analogue system

*Figure 4: Analogue system connections*

1. 24VDC power input; 2. Loop in; 3. Bridge; 4. Loop out; 5. Detector 2; 6. Detector 1.

### 2.1.5 DIP switch configuration

**Internal detector configuration**

Use DIP switches 1 to 4 to configure internal detectors.

**System Sensor Devices**

---

*For detectors which operate with RI connected to the reference line.*

*For detectors which operate with RI connected to the positive line.*
Alarm relay configuration

Use DIP switches 5 and 6 to configure the alarm relays.

<table>
<thead>
<tr>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Alarm relay active only when BOTH detectors in alarm

<table>
<thead>
<tr>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Alarm relay active when EITHER detector in alarm

DIP switches 7 and 8 are not used.

2.2 Pipe network installation

Read the following carefully before attempting installation of the pipe network.

The pipe network will require:

- 1 x set of standard pipe lengths (25mm diameter) with sampling holes. Pipe lengths and sampling holes will depend on the type of installation used (see 2.2.1 Design considerations).
- 1 x set of standard pipe fittings (25mm diameter) and accessories (elbows, tees, plugs etc.).

2.2.1 Design considerations

Design and installation guidelines are provided for 3 installation types:

- I Type installation.
- U Type installation (symmetrical).
- U Type installation (asymmetrical).

Each installation type has its own characteristics and design considerations, but the following is true for all:

- The pipe network is best installed in the same area as the detector panel to avoid pressure differences.
- The pipe used should be PVC pressure pipe 25/1.0.
- Each sampling hole should monitor an area no larger than 30m².
- The distance between sampling holes should not exceed 5m.
- The pipe network must be airtight - leaks will affect the accuracy and performance of your system.

Variable sampling hole sizes (with the smallest holes closest to the detector panel) are used to ensure uniform air sampling across the pipe length / protected area. The actual diameter of each sampling hole is defined by the number of sampling holes used in the system.

Pipe network sampling holes are critical to detector sensitivity: hole size and spacing guidelines for each type of installation should be followed carefully to ensure maximum performance from your system.
2.2.2 I Type installation

1. Detector panel; 2. Sampling holes 1 to 8 (left to right); 3. Plug.

<table>
<thead>
<tr>
<th>General characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum distance from detector panel to first sampling hole (metres)</td>
</tr>
<tr>
<td>Maximum pipe length (metres)</td>
</tr>
<tr>
<td>Maximum number of sampling holes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sampling hole measurements (mm)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>.7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 sampling holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.7</td>
<td>6.8</td>
</tr>
<tr>
<td>3 sampling holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.2</td>
<td>5.6</td>
</tr>
<tr>
<td>4 sampling holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.4</td>
<td>4.6</td>
</tr>
<tr>
<td>5 sampling holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.4</td>
<td>4.2</td>
<td>4.4</td>
</tr>
<tr>
<td>6 sampling holes</td>
<td></td>
<td></td>
<td>3.4</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7 sampling holes</td>
<td></td>
<td>3.2</td>
<td>3.4</td>
<td>3.4</td>
<td>3.6</td>
<td>3.8</td>
<td>4</td>
<td>4.2</td>
</tr>
<tr>
<td>8 sampling holes</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3.2</td>
<td>3.2</td>
<td>3.4</td>
<td>3.6</td>
<td>3.8</td>
</tr>
</tbody>
</table>

2.2.3 U Type installation (symmetrical)

1. Detector panel; 2. Sampling holes 1 to 6 (left to right); 3. Plugs.
General characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum distance from detector panel to pipe T junction (metres)</td>
<td>20</td>
</tr>
<tr>
<td>Maximum pipe length (total both sides) (metres)</td>
<td>100</td>
</tr>
<tr>
<td>Maximum number of sampling holes (total both sides)</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sampling hole measurements (mm)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 sampling holes (1 each side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 sampling holes (2 each side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 sampling holes (3 each side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 sampling holes (4 each side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 sampling holes (5 each side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 sampling holes (6 each side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.2.4  U Type installation (asymmetrical)

1. Detector panel; 2. Short pipe length with sampling holes 1 to 2 (left to right); 3. Long pipe length with sampling holes 1 to 6 (left to right); 4. Plugs.

When calculating sampling hole measurements in an asymmetrical U type installation each side is treated as a symmetrical installation. In this example the shorter pipe length with two sampling holes is treated as being part of a symmetrical system with a total of four sampling holes. In the same way the longer pipe length with 6 sampling holes is treated as being part of a symmetrical system with twelve sampling holes.
### General characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum distance from detector panel to pipe T junction (metres)</td>
<td>20</td>
</tr>
<tr>
<td>Maximum pipe length (total both sides) (metres)</td>
<td>100</td>
</tr>
<tr>
<td>Maximum number of sampling holes (total both sides)</td>
<td>12</td>
</tr>
</tbody>
</table>

### Sampling hole measurements (mm)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short pipe length</td>
<td>5</td>
<td>5.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long pipe length</td>
<td>3</td>
<td>3</td>
<td>3.2</td>
<td>3.2</td>
<td>3.4</td>
<td>4</td>
</tr>
</tbody>
</table>

### 2.3 Air flow calibration

The aspirating detector has a built-in flow sensor whose task is to monitor the stability of air flow in the pipe network. Once electrical connections and pipe installation is complete the air flow sensor must be calibrated.

#### 2.3.1 Calibration of air flow standstill value

The standstill value of the air flow measurement (zero point) must be calibrated for each detector panel. To do this:

1. Start-up the aspirating smoke detector and leave until the air flow is steady (five to ten minutes).
2. Connect a multimeter (set to measure DC tension) to the VP1 terminal on the PCB (JP4). The tension value is measured between the adjusting point (VP1) and the reference point (GND). The multimeter negative line should be connected to GND.
3. Adjust tension to 5VDC using the potentiometer P1.
4. Wait a few minutes and check that the set value of 5V is maintained. If this value is not maintained check your installation thoroughly and repeat calibration as required.

#### 2.3.2 Calibration of air flow blockage threshold adjustment

The default threshold level to indicate pipe clogging is 6V (to indicate failure with an increment of 1V).

If required this can be modified after calibration of airflow standstill value.

1. Start-up the aspirating smoke detector and leave until the air flow is steady (five to ten minutes).
2. Block the quantity of sampling holes that you wish to indicate pipe network blockage (this will vary from installation to installation).
3. Connect a multimeter (set to measure DC tension) to the VP1 terminal on the PCB (JP4). The tension value is measured between the adjusting point (VP1) and the reference point (GND). The multimeter negative line should be connected to GND.
4. Adjust potentiometer P2 so that VP2 terminal voltage is approximately 50 – 100 mV less than the multimeter value given in step 3.
5. Wait a few minutes and unblock all sampling holes. Check that the VP1 reading remains stable at 5V. If this value is not maintained check your installation thoroughly and repeat calibration.

2.3.3 Checking air flow calibration

To check breakage behaviour open pipe network and check the system indicates a fault condition.

To check blockage threshold block 50% of sampling holes and check the system indicates a fault condition.

2.3.4 Indication of flow failure in fire panel

If a flow failure is required to indicate as a fault in the fire panel the loop should be connected in series through the fault relay.
3 USER GUIDE

3.1 LED indicators

Figure 5: Detector panel LED indicators

1. Service
2. Flow failure
3. Alarm 1
4. Alarm 2

3.1.1 Service

The detector panel is powered up. This LED indicator will remain lit when the system is switched on.

If the detector panel is turned off the fire panel will detect the failure in the power supply because the flow failure relay is energised.

3.1.2 Flow failure

An air flow failure (pipe network blockage / breakage) has been detected.

3.1.3 Alarm 1 / Alarm 2

The detector corresponding to the activated LED is in alarm. To see how the alarm relay is activated see 2.1.5 DIP switch configuration.
4 MAINTENANCE

4.1 Air flow

The pipe network air flow should be checked periodically:

1. Check that the tension value of the air flow sensor is 5VDC (see 2.3.1 Calibration of air flow standstill value).
2. If this is not the case check and clean all pipe network sampling holes in the installation.
3. Reset the tension value to 5VDC.

The installed air flow sensor is highly susceptible to sudden pressure variations. The sensor should be protected (by a valve etc.) when the pipe network is cleaned by compressed air.

In addition to the above the detector panel fault indication should be checked:

- To check breakage behaviour open pipe network and check the system indicates a fault condition.
- To check blockage threshold block 50% of sampling holes and check the system indicates a fault condition.

4.2 Air filter

The air filter must be changed periodically. The useful life of a filter will vary depending on the environment and air quality of the installation. The filter may need to be changed when:

- Detector panel behaviour is unpredictable and no faults are found in the pipe installation, detector panel or internal detectors.
- A visual inspection of the air filter indicates it is exhausted (excessive dirt).
- The filter reference is FIL-NAS.

4.3 Internal detectors

Standard smoke detector maintenance and testing as indicated in the product instruction manual.
5 TROUBLESHOOTING

Table 1: Detector panel troubleshooting

<table>
<thead>
<tr>
<th>Indication</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The service indicator on the detector is not lit.</td>
<td>The detector is not powered up.</td>
<td>Check the 24V power inlet. Check fuse (F1).</td>
</tr>
<tr>
<td>The flow failure indicator is lit.</td>
<td>The system has not been calibrated.</td>
<td>Calibrate air flow (see 2.3 Air flow calibration). Check for plugs at the end of the pipes. Check sampling hole diameters are correct (see 2.2 Pipe network installation). Follow standard maintenance procedure (see 4 Maintenance).</td>
</tr>
<tr>
<td></td>
<td>The system cannot be calibrated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is a blockage or an opening in the piping system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An individual detector detects an alarm condition but the detection panel does not.</td>
<td>Incorrect connection.</td>
<td>Check electrical connections (see 2.1.4.2 Internal detectors).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The control panel detects a cut-off failure.</td>
<td>The end-of-line resistor is missing (conventional systems only).</td>
<td>Install end-of-line resistor. (Conventional systems only).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 TECHNICAL SPECIFICATIONS

Dimensions ............................................................................................................ 314 x 254 x 115 mm
Weight .................................................................................................................... 4 Kg

Input voltage ......................................................................................................... 24 VDC
Standby current ...................................................................................................... 250 mA
Maximum current .................................................................................................... 320 mA
Fuse (F1) .................................................................................................................... 500 mA

External wiring connection .................................................................................. PG13
Internal wiring connection .................................................................................. Connecting strip. Maximum wire section 1.5 mm²

Pipe installation ................................................................................................... PVC pressure pipe 25/1.0

Internal detectors ................................................................................................ 2 x analogue or 2 x conventional smoke detectors
Fan type ................................................................................................................ Radial
Fan life ................................................................................................................... 65,000 hours at 40°C