MORLEY IAS

FIRE SYSTEMS

by Honeywell

SAT-1u

air sampling system

Installation and User Guide

doc. MIE-MI-550I rev.001

CONTENTS

1 INTRODUCTION

1.1 General description

The SAT-1u has been designed to provide all the benefits of aspirating smoke detection, including very early warning. This has been achieved through the combination of the highest approved MI-LZR detection technology and an effective aspirator.

Analogue sensors have up to 9 alarm and pre-alarm sensitivity levels programmable at the control panel to be adaptable to any kind of application. Thus, the aspiration system can be integrated in MorleyIAS analogue control panel (Dimension, with software version 2.0 or higher and zx2/5, with software version 8.xx.

Control panels make their own drift compensating algorithms which allows maintenance to be prolonged.

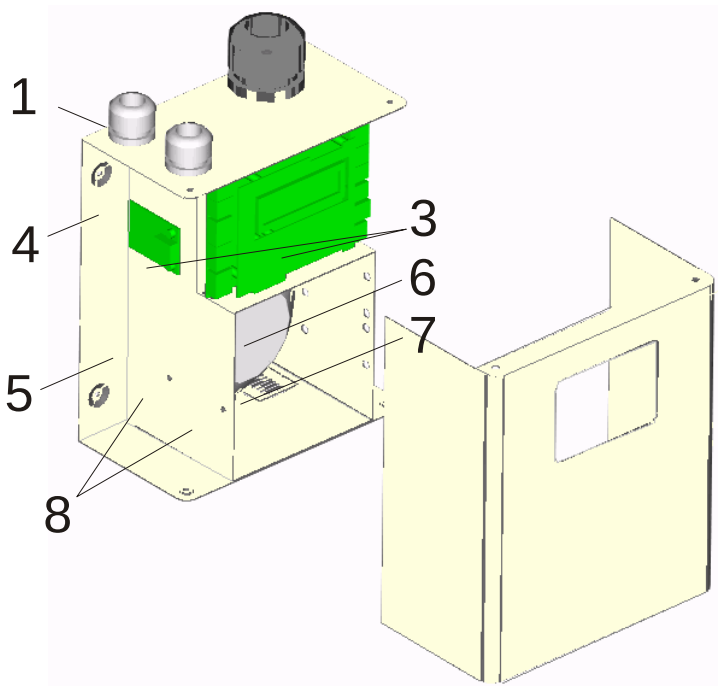
It is recommended to consult the guides published by BFPSA. Two flow levels (high and low) can be set at the SAT-1u detector after the normal flow level has been reached, thus a fault will be indicated in case the flow changes +/-20%, according to EN54-20 point 5.10.

FEATURES

- Metal cabinet. Simple mounting design.
- Maximum recommended sampling pipe length of 50 meters.
- Using MI-LZR sensors, the Alarm sensitivity range starts at 0.1% obs /meter. Thus, in the worst conditions, with 10 sampling holes, the sensitivity (which is 1% osc/m in each hole) is higher than standard photoelectrical detectors (5% obs/meter).
- Maximum sensitivity resolution – 0,021% obs/meter.
- Normal Supply voltage 21-29Vdc (allowed 17-32Vdc) from a power supply in compliance with EN54-4 as required by EN54-20 point 5.11.
- LCD display with 2 lines of 16 characters.
- 3 status Leds: fault, alarm and power.
- User may select that the Alarm led will be flashing to indicate communication with the control panel or steady to indicate an alarm.
- 5 Configuration Keys.
- Operating hours, unit voltages and sampled air temperature will be displayed by pressing one key.
- Air flow continuous monitoring.
- User-configurable indication for minimum and maximum flow levels.
- Four flow levels displayed: Current, minimum, maximum and saved in the configuration.
- An alarm relay.
- Normally energized fault relay contact (SAT-1u power and airflow level).
- A sampling air inlet for 20-27 mm tubes. (Compatible 3/4”).

- Two Air exhaust options using the same unit.
  - Lower Exhaust Option to return the air in the same area (usual option in most installations).
  - Lower Exhaust Option with cable gland and a pipe to return the air to the monitored area to avoid different air pressure levels (optional).
- B501 Base included.
- 9 Alarm levels and 9 Pre-alarm Levels per detector selected at the control panel.
- Internal log of the latest 50 events. Events reported and saved immediately at the control panel.
- Removable terminal blocks for MI-DMMI monitor module. This connection allows a second way of reporting fault and fire events in the SAT-1u and coincidence alarms in the control panel.
- Fault and fire events may be set with automatic or manual reset on SAT-1u. That is, in case of manual reset, the SAT-1u reset pushbutton should be pressed for the event to be reset.
- Photoelectric laser detection of smoke using the forward scattered light principle.
- Dust discrimination principle - control panel with AWACS algorithms.

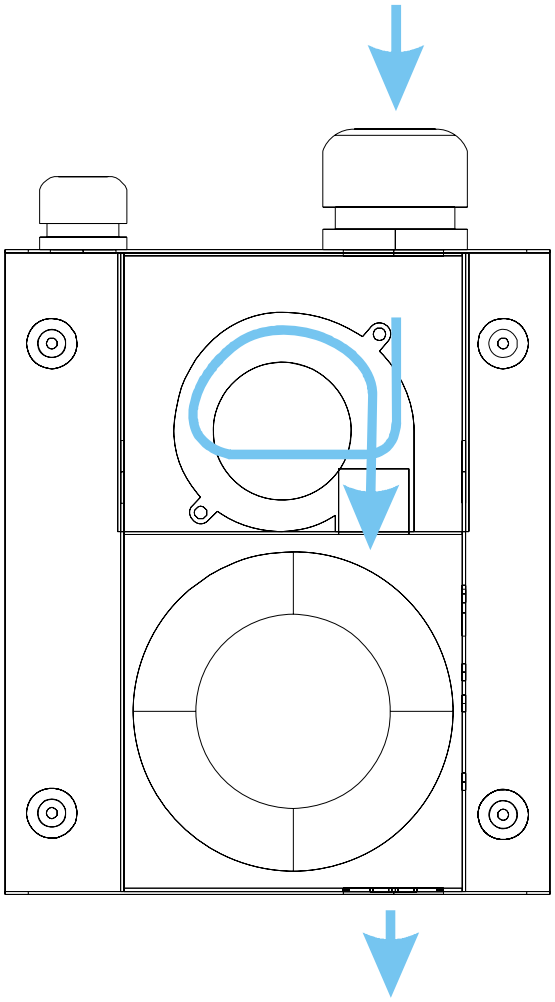
1.2 SAT-1u Components



1. Power cable/loop inlets PG13,5
2. Sampled air inlet.
3. Main PCB.
4. Fan chamber.
5. Analysis chamber and sensor.
6. Detector base location.
7. Configurable air output.
8. Monitor module fixing.

1.3 System operation

The aspirating smoke detector draws air from the protected area using a network of sampling pipes. The sampled air is then passed through a detecting chamber where it is analyzed by a very high sensitive detector. This detector will transmit the smoke concentration value to the control panel that will decide whether an alarm should be indicated. If there is a real fire alarm, the control panel will activate the sensor leds, and the sensor will activate the alarm relay and the alarm indication on the aspirating system display.

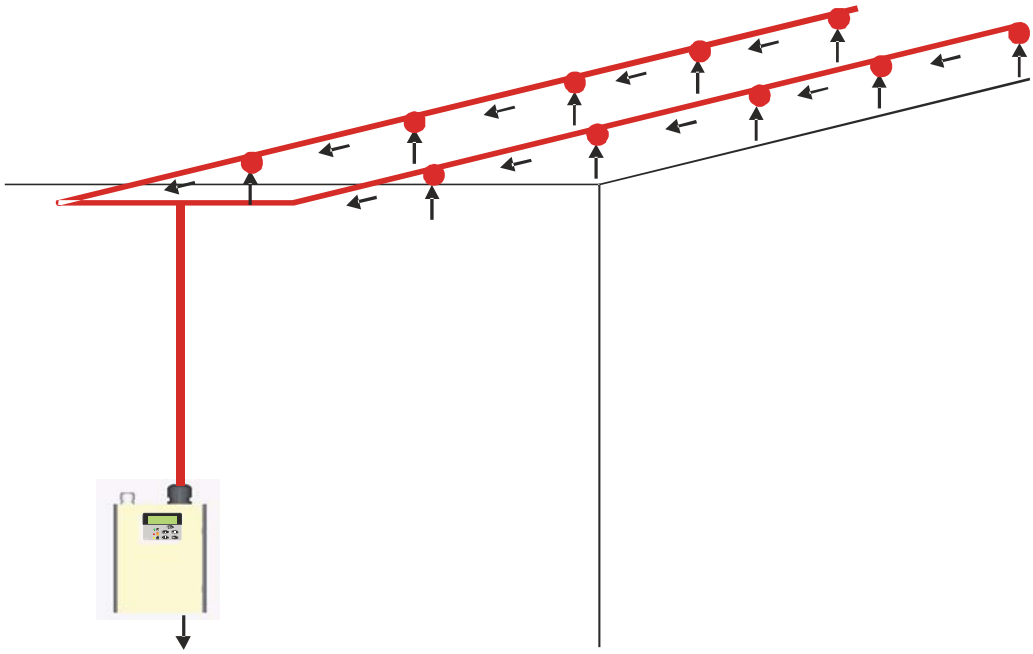


Aspirating systems are ideal for use in areas where early warning is critical or where individual smoke detectors offer a limited service, such as:

- Areas of limited access where the installation of and/or maintenance of individual detectors may be difficult (tunnels, ventilation systems, excessively high areas etc).
- Large buildings with possibility of stratification.
- Hyperventilated areas, such as computer rooms, etc.

1.4 System requirements

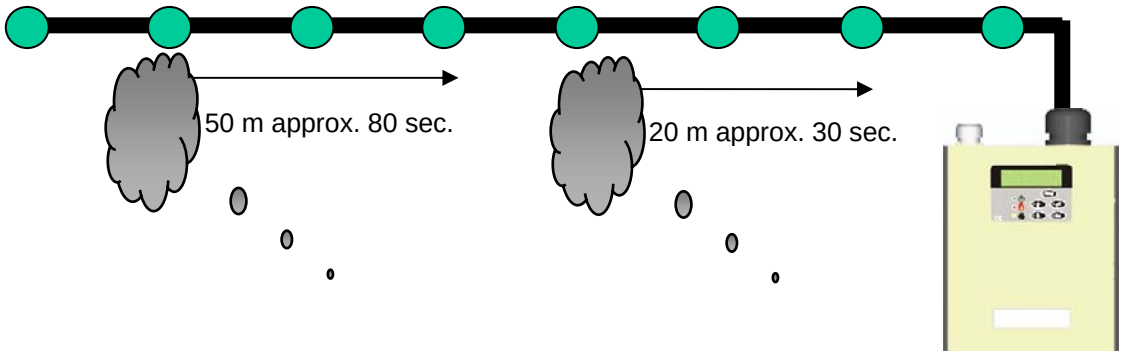
- MorleyIAS analogue control panel (Dimension, with software version 2.0 or higher and zx2/5, with software version 8.xx) compatible with **MI-LZR** sensor.
  - MI-DMMI monitor module inside SAT-1u to provide remote indication of faults.
  - Powered from a 24 Vdc (500 mA) EN54-4 power supply unit.
  - One or two pipe branches with 20 to 27 mm outer diameter and 21 mm inner diameter, with a maximum length of 50 meters in order to assure a maximum response time of 120 seconds.



2 BASIC INFORMATION ABOUT ASPIRATING SYSTEMS

The Aspirating System Detection consists of a cabinet with one detector mounted inside. This detector receives air samples from the protected area through sampling holes (2-8 mm size) drilled in the pipe.

The maximum pipe length depends on the maximum response time that LPCB/BASEFA, EN54-20 and CEA 4022 limit to 120 seconds (this period of time includes the verification time in the control panel) and the aspiration capacity of the air sampler system.



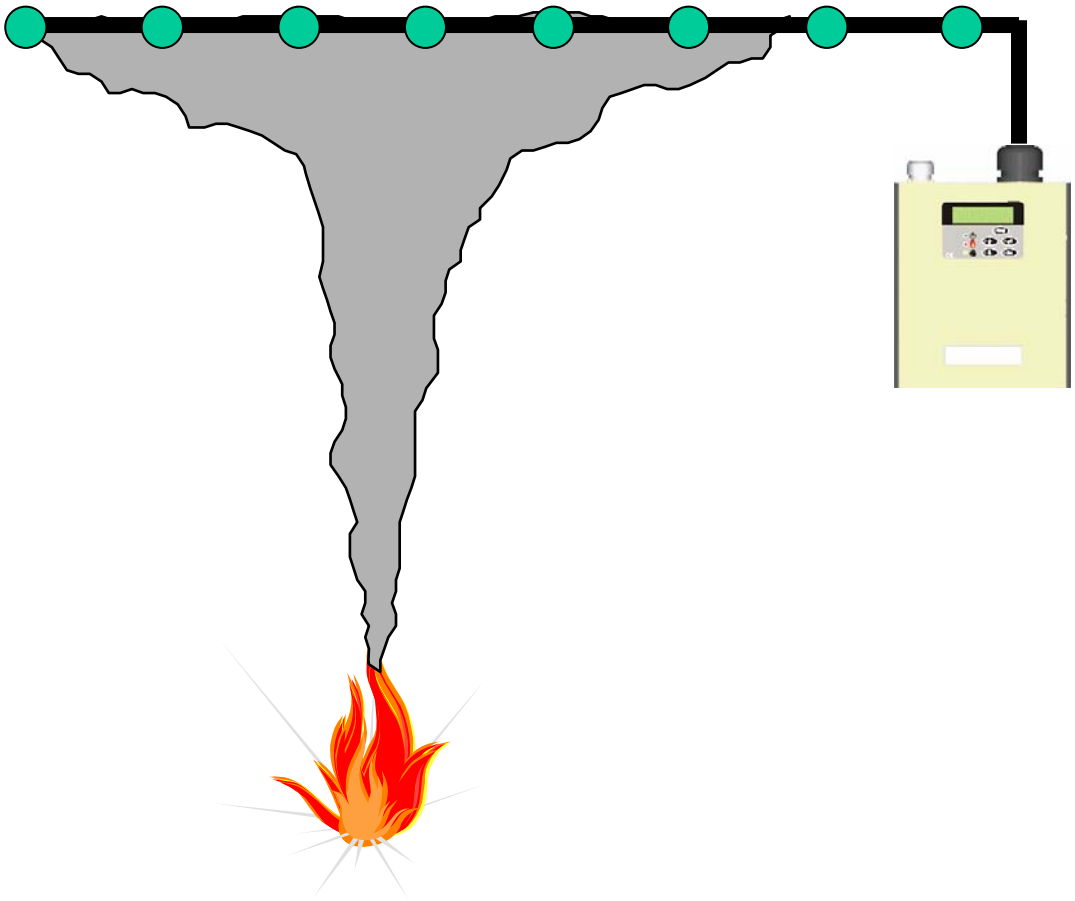
Why MI-LZR and no other sensor?

The MI-LZR sensor has a very high sensitivity and is able to activate an alarm at 0.1% obs/m. These sensitivity levels may be improved if sensor cooperation is programmed. However, a standard sensor has an alarm level close to 5% obs/m.

If standard sensors are to be used (without high sensitivity) and there is only one sampling point, the sensor sensitivity inside SAT-1u would be the same as point detector's sensitivity. However, if there are a number of sampling points, each new point reduces the sensitivity, as they receive clean air samples as well. When there are 2 sampling points, the sensitivity per point is half reduced. In the case of 10 sampling points, the sensitivity in each sampling point is a tenth part of the sensitivity (in a well-balanced system).

For a typical installation, the coverage and layout of sampling points is made like standard smoke point detector arrangement. Following the above example, with 10 sampling points, the sensitivity per point in the MI-LZR sensor will become 1% (0.1 x 10) obs/meter. However, with standard optical sensors, the sensitivity will be 50% (5 x 10) obs/meter. This effect is especially unsuitable when the system is to be used in compartmentalized areas. **Obviously, the use of detectors without high sensitivity, in this kind of applications, is absolutely inappropriate because an effective alarm warning is not guaranteed.**

The picture bellow shows how the fire makes the smoke arrive to 6 out of 8 sampling points, thus the sensitivity will be 6/8 of sensors' sensitivity. When using a MI-LZR, the alarm sensitivity is 0.1% obs/m; therefore, the SAT-1u will indicate an alarm when there is a smoke concentration of 8/6 of 1 % obs/m (that is 0,133) and, as a result, the sensitivity when the smoke has reached the chamber is 0,1 obs/m.



PIPE EFFECT

The tubing will normally be PVC or ABS and have an inner diameter of 21 mm and an outer diameter of 25 mm. This diameter can be reduced in some points of the pipe and the transport time is reduced as well, however the sensitivity balance by point is adversely affected, that is, the sensitivity in the different sampling points will not be the same.

The bend radius affects the air speed and, therefore, no more than three bends are recommended, because, even though bends with high radius increase the pipe distance, they reduce the transport time as well.

WHEN TO USE THE AIR RETURN PIPE

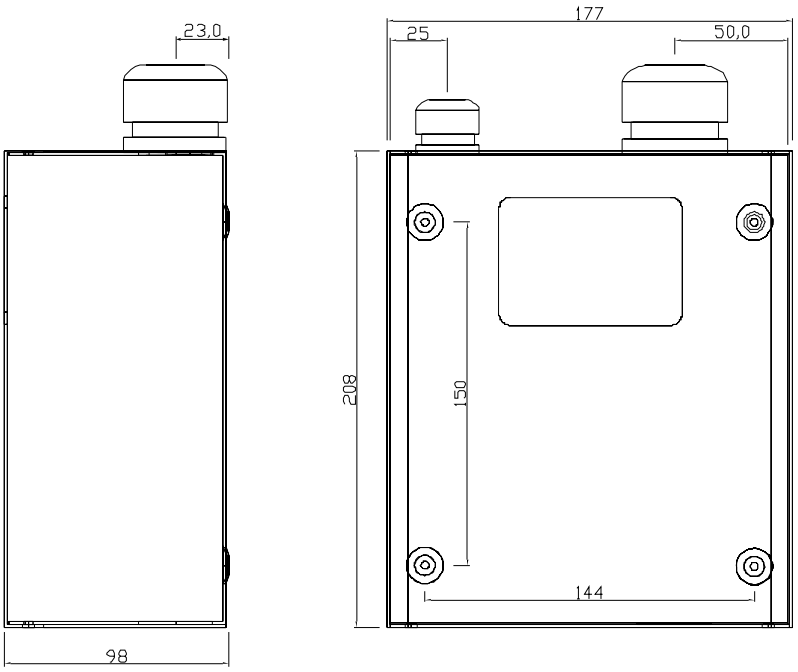
When the pressure of the protected area is the same as the one present at the SAT-1u location, SAT-1u default outlet can be used. When the difference between pressures is more than 25 Pascals, the outlet option with lower tube and cable gland must be used and it is necessary to run a return air pipe to the monitored area.

INSTALLATION WITH CAPILLARY TUBES

Capillary tubes are available at MorleyIAS (ref.: 510-KIT) in order to make pipe extensions at intermediate points, usually in ceiling voids, at 1 meter from the pipe. The flexible nylon tube includes a bracket for ceiling void and a T-junction to be connected to the aspirating pipes net. Moreover, a capillary sampling point for the end of the pipe (ref.: 510-FIN) is available.

3 INSTALLATION

3.1 Panel Installation



Dimensions in millimetres

3.2 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 35º 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.

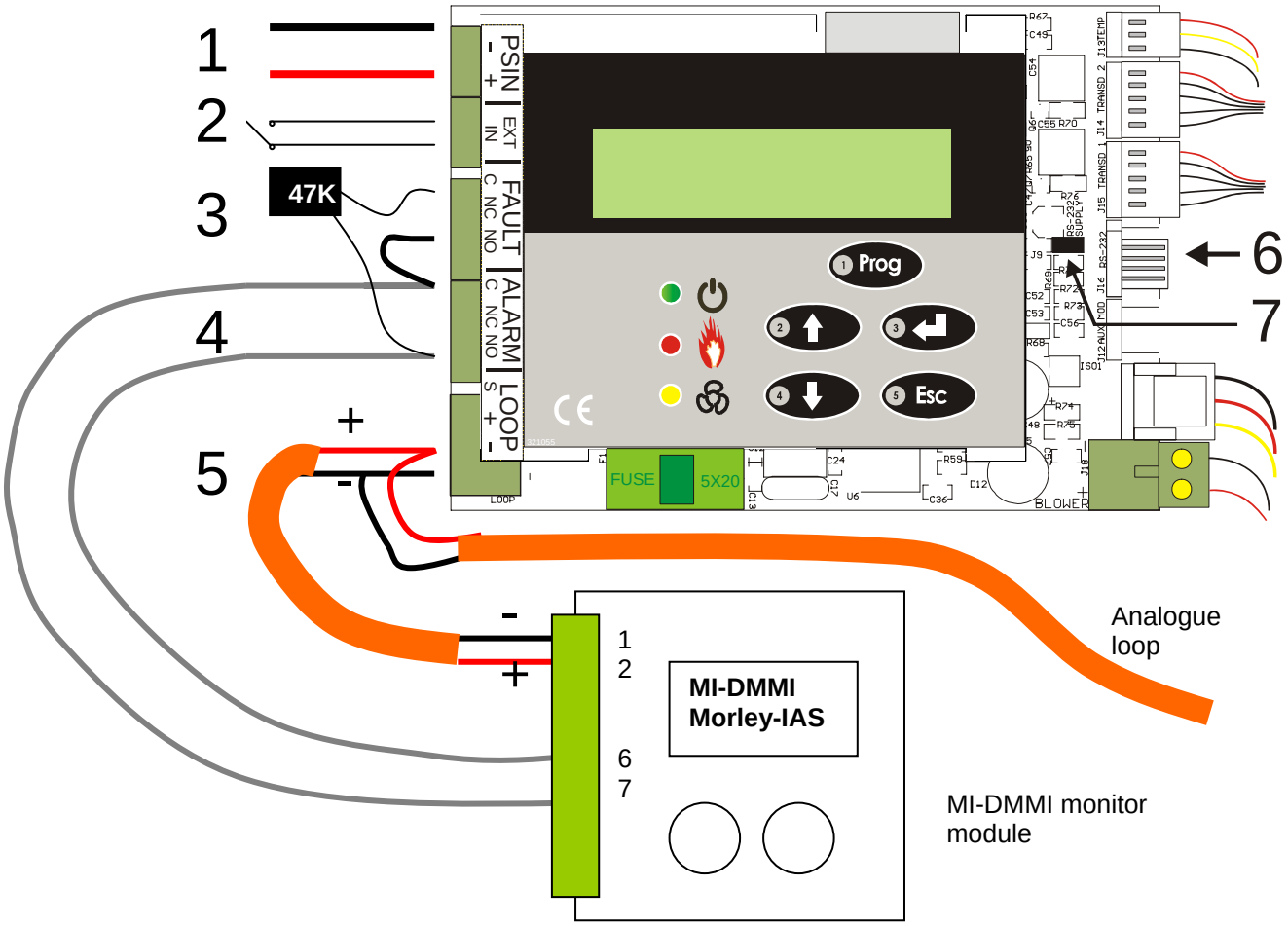
The ventilation outlet of the box should not be blocked. When installing the unit, make sure that there are 10 cm minimum under the exhaust in order to guarantee the correct ventilation.

Different pressure levels between the air inlet (pipes) and ventilation outlet should be avoided. In case there are different pressure levels, a pipe can be mounted between the ventilation outlet and the protected area.

DO NOT use the panel as a guide when drilling. Avoid dropping shavings or pieces of removed casing inside the panel as this may damage the electronic circuits.

3.3 Electrical connections

PCB layout and electrical connections



1. 24 Vdc power input from an EN54-4 power supply;
2. External input (NO/NC fault) to monitor, for example, heaters (FRIGO);
3. Fault relay contacts (energized in normal condition);
4. Alarm relay contacts linked to sensor;
5. Analogue loop input to sensor;
6. RS232 connection (through VSN-RS232);
7. Disconnection RS232 jumper (only for VSN-232 installation)

3.4 Power supply

The detector panel operates at 21-29 V supplied by an external EN54-4 power supply (such as MPS15, MPS25, MPS50), according to EN54-20 standard about aspirating systems, paragraph 5.11.

The two power inputs are monitored by the aspiration system and they will indicate a fault if the voltage is lower than 21Vdc.

If voltage is higher than 29Vdc and lower than 31Vdc (max operating voltage), SAT-1u will indicate that the voltage is HIGH.

3.5 Pipe network installation

Read the following carefully before attempting to install 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.
- 1 x set of standard pipe fittings (25mm diameter) and accessories (elbows, tees, plugs etc.).

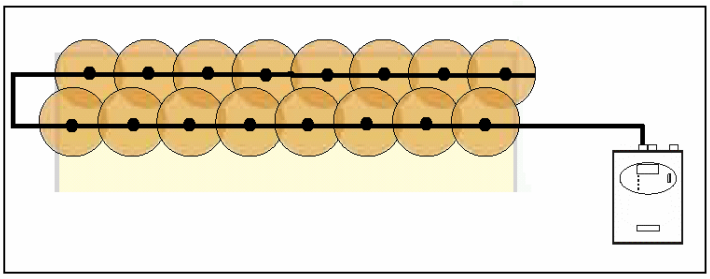
3.5.1 Design considerations

Design and installation guidelines are provided for 3 installation types:

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

Each installation type has its own characteristics and design considerations, but the following is applicable to them all:

- The pipe network is best installed in the same area as the detector panel to avoid pressure differences.
- The pipe used should be ABS red 25/1.0.
- Each sampling hole should control an area smaller than 80m^2, according to UNE 23007-14. Usually, an area of 500m^2 is monitored by 50m pipe line.



- 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 and the tube distance.

- The use of external filters is recommended for dirty environments.
- Special measures should be taken regarding the system design in very wet environments. Please contact MORLEYIAS for more information.

IMPORTANT NOTES:

The use of more than 10 sampling holes is NOT recommended (A, B, C, …..J). The distance between holes should not exceed 5 m.

The maximum distance between the aspirating system and the first sampling hole is 25 m.

After finishing the installation, check that the pipe is not blocked in either end by means of a smoke test in the sampling holes of each pipe end. The test will be successful if an alarm is activated after 2 minutes (120 sec.).

I Type Installation

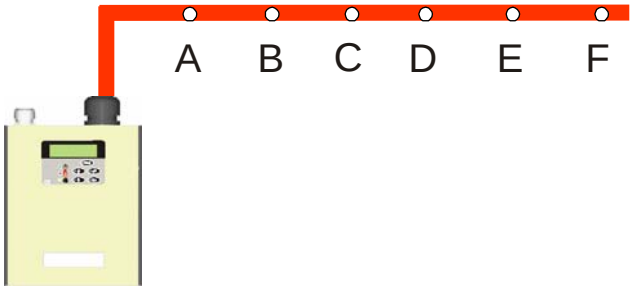


Table 1. Sampling holes size

Number of sampling points in each pipe branch	Location of sampling points * (A = nearest to the aspirating system)									
	A	B	C	D	E	F	G	H	I	J
2	3.5	4	-	-	-	-	-	-	-	-
3	3.5	4	4.5	-	-	-	-	-	-	-
4	3.5	3.5	4	4.5	-	-	-	-	-	-
5	3.5	3.5	4	4	4.5	-	-	-	-	-
6	3.5	3.5	4	4	4.5	4.5	-	-	-	-
7	3.5	3.5	3.5	4	4	4.5	4.5	-	-	-
8	3.5	3.5	3.5	4	4	4	4.5	4.5	-	-
9	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	-
10	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	4.5

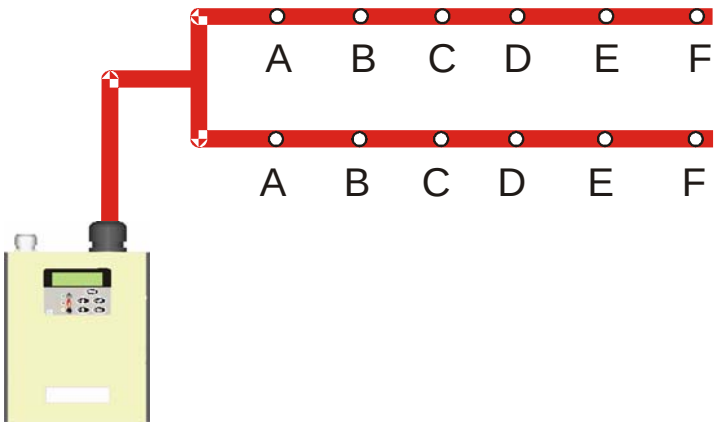
**** Hole's diameter in mm***

For example, the diameter of the first and second sampling points (A, B) in a pipe branch with 6 sampling points, will be 3.5 mm. The third and fourth hole (C, D) diameter will be 4 mm, and the fifth and sixth hole (E, F) diameter will be 4.5 mm.

Table 1. Sampling holes size

Number of sampling points in each pipe branch	Location of sampling points * (A = nearest to the aspirating system)									
	A	B	C	D	E	F	G	H	I	J
2	3.5	4	-	-	-	-	-	-	-	-
3	3.5	4	4.5	-	-	-	-	-	-	-
4	3.5	3.5	4	4.5	-	-	-	-	-	-
5	3.5	3.5	4	4	4.5	-	-	-	-	-
6	3.5	3.5	4	4	4.5	4.5	-	-	-	-
7	3.5	3.5	3.5	4	4	4.5	4.5	-	-	-
8	3.5	3.5	3.5	4	4	4	4.5	4.5	-	-
9	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	-
10	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	4.5

U type installation (symmetrical)



- In order to calculate the correct hole's diameter, refer to Table 1.

For example, In a U type installation where one pipe branch has 3 sampling points and the other branch has 4, the holes' diameter will be:

Branch 1: The size of the sampling point nearest to the aspirating system (A) will be 3.5 mm, the diameter of the second sampling point (B) will be 4 mm and the last one (C), 4.5 mm.

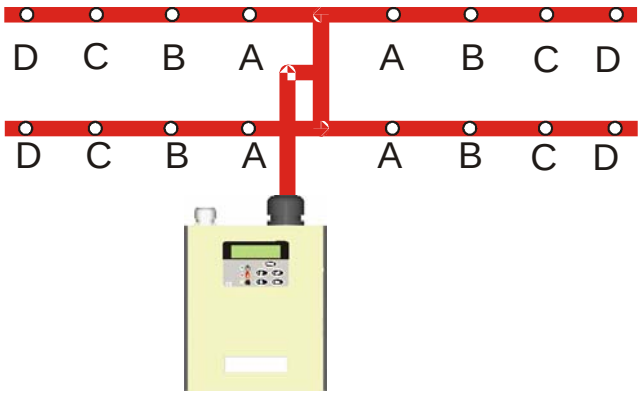
Branch 2: The diameter of the first (A) and second (B) sampling points will be 3.5 mm, the size of the third (C) will be 4 mm and the size of the last one (D), 4.5 mm.

Table 1. Sampling holes size

Number of sampling points in each pipe branch	Location of sampling points * (A = nearest to the aspirating system)									
	A	B	C	D	E	F	G	H	I	J
2	3.5	4	-	-	-	-	-	-	-	-
3	3.5	4	4.5	-	-	-	-	-	-	-
4	3.5	3.5	4	4.5	-	-	-	-	-	-
5	3.5	3.5	4	4	4.5	-	-	-	-	-
6	3.5	3.5	4	4	4.5	4.5	-	-	-	-
7	3.5	3.5	3.5	4	4	4.5	4.5	-	-	-
8	3.5	3.5	3.5	4	4	4	4.5	4.5	-	-
9	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	-
10	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	4.5

**** Hole's diameter in mm***

H type installation (symmetrical)



- In order to calculate the correct hole's diameter, refer to Table 1.

For example, In an H type installation where one pipe branch has 2 sampling points, another branch has 3 sampling points, and the other 2 branches have 4 sampling points each one, the holes' diameter will be:

Branch 1: The size of the sampling point nearest to the aspirating system (A) will be 3.5 mm and the diameter of the second (B) will be 4 mm.

Branch 2: The diameter of the first sampling point (A) will be 3.5 mm, the size of the second (B) will be 4 mm and the size of the last one (C), 4.5 mm.

Branches 3 and 4: The diameter of the first and second sampling points (A, B) will be 3.5 mm, the size of the third (C) will be 4 mm and the size of the last one (D), 4.5 mm.

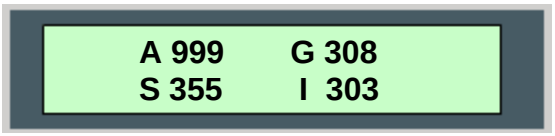
Table 1. Sampling holes size

Number of sampling points in each pipe branch	Location of sampling points * (A = nearest to the aspirating system)									
	A	B	C	D	E	F	G	H	I	J
2	3.5	4	-	-	-	-	-	-	-	-
3	3.5	4	4.5	-	-	-	-	-	-	-
4	3.5	3.5	4	4.5	-	-	-	-	-	-
5	3.5	3.5	4	4	4.5	-	-	-	-	-
6	3.5	3.5	4	4	4.5	4.5	-	-	-	-
7	3.5	3.5	3.5	4	4	4.5	4.5	-	-	-
8	3.5	3.5	3.5	4	4	4	4.5	4.5	-	-
9	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	-
10	3.5	3.5	3.5	4	4	4	4.5	4.5	4.5	4.5

**** Hole's diameter in mm***

3.6 Checking air flow calibration

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



To check **blockage** threshold, block 20% of sampling holes and check that the system indicates a fault condition.

To check **breakage** threshold, open the pipe at the end and make sure that the system indicates a fault condition.

3.7 Internal detectors

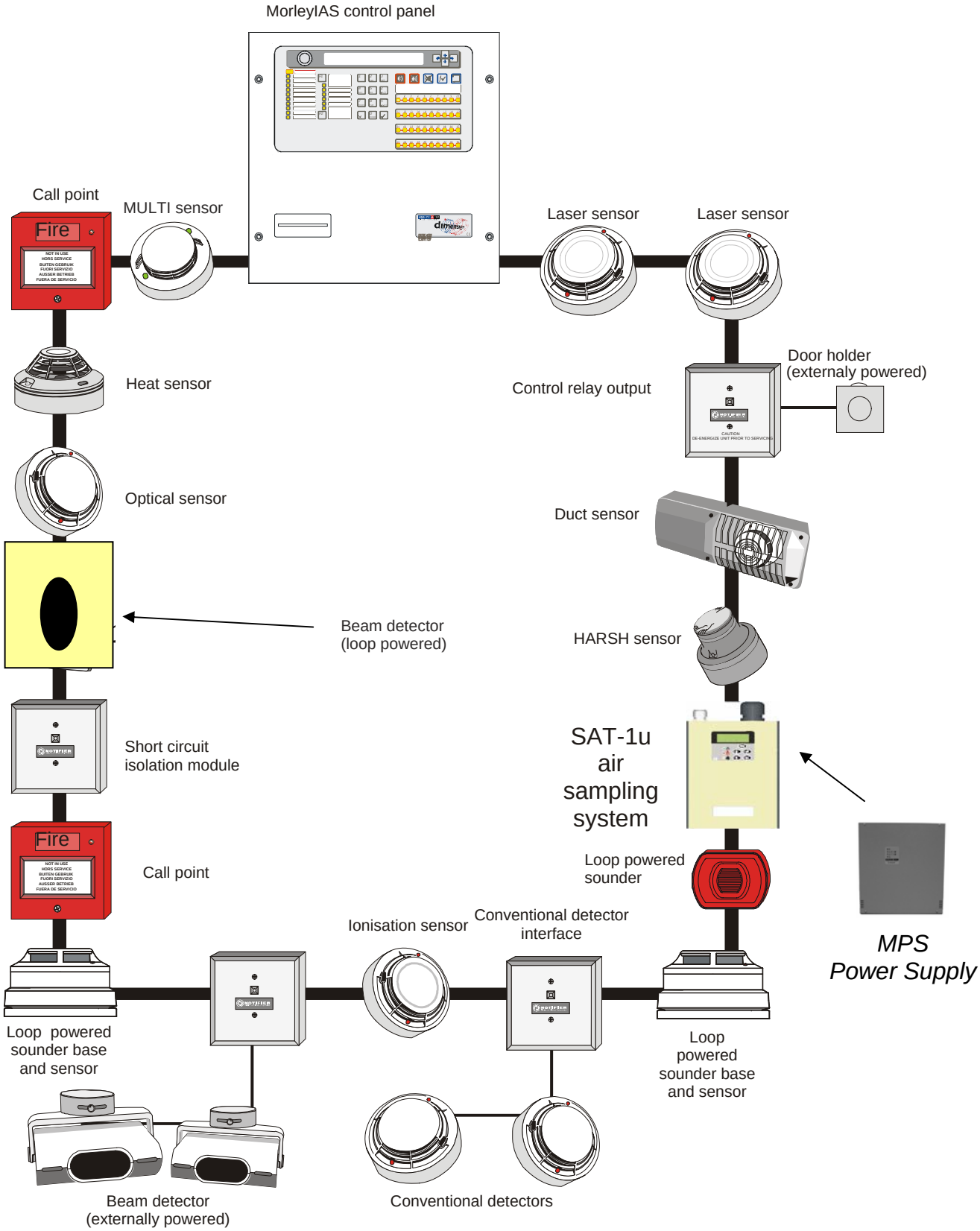
MorleyIAS recommends the use of MI-LZR sensors inside the SAT-1u aspirating system, because their sensitivity makes them suitable for this kind of applications.

The remote indicator of the sensor activates the fire alarm in an aspirating system. When the sensor goes into alarm, the sensor alarm led is activated together with the alarm relay.

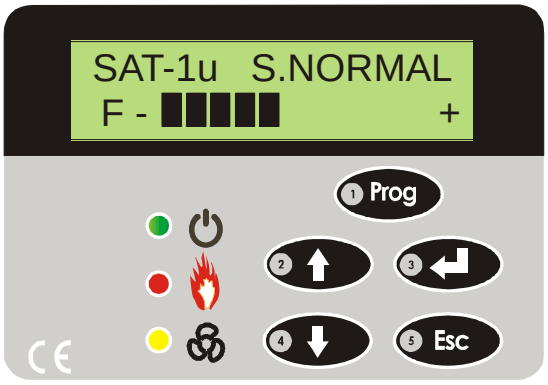
MI-LZR analogue sensor can be configured to briefly activate the alarm led (blinking mode) at the SAT front panel, when the system is in normal condition and when MI-LZR sensor is polled by the control panel.

Refer to section 4 for configuration procedure.

3.8 Connecting to a fire alarm system



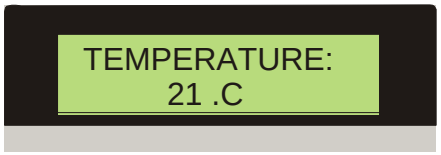
4 PANEL FUNCTIONS & INDICATORS



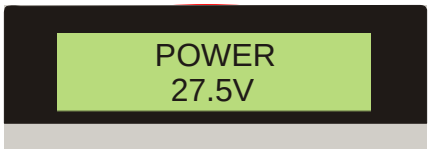
4.1 Control Keys Operation

SAT-1u detector has 5 control keys to configure the flow levels, alarms and faults that are manually or automatically resettable from the control panel, display operating hours, etc.

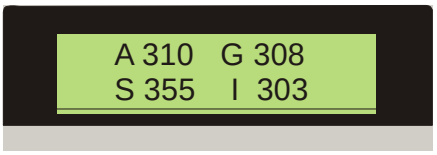
Press the up-arrow key (2), when you are outside the Configuration Menu, to display sampling air temperature.



Press the down-arrow key (4), when you are outside the Configuration Menu, to display the power input voltage with +/- 100mV resolution.



Press ESC (5) key to display the configured flow levels and the current value.



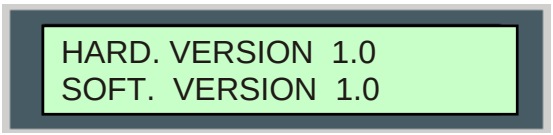
It the above example, on pressing ESC key, the display shows that the current value is 310, the HIGH FLOW value is 355 and the LOW FLOW value is 303. The value saved on configuration was 308.

4.2 Aspirating system configuration

Press key **Prog (1)**  to access the Configuration menu and key in the correct password.

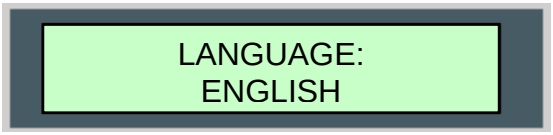
By pressing **Prog,** SAT-Iu will activate the fault relay, indicating to the remote system that someone is configurating the system.

The first display indicates the Hardware and Software version:



Then, you are asked to enter the password to be able to programme the system. The default password is 4422, that is, you should press down-arrow key **(4)** twice and up-arrow key **(2)** twice as well.

The first menu is for language selection. There are eight languages available: Spanish, Swedish, French, English, Italian, Portuguese, German and Dutch.



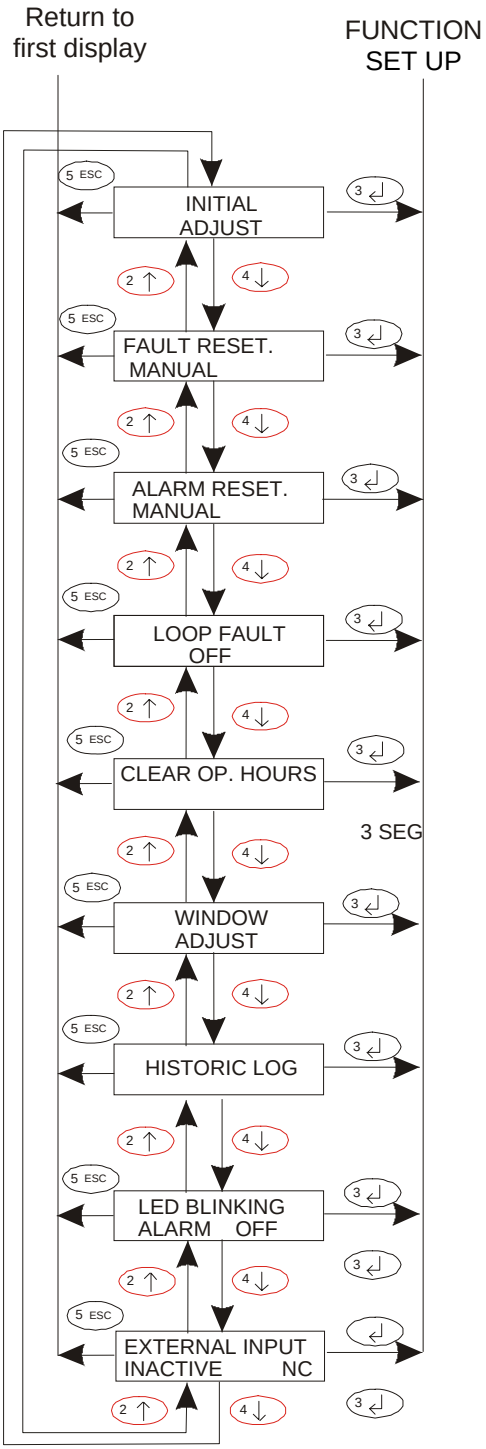
The rest of menus appear by pressing down-arrow key **(4).** To leave the programme process at any moment, press **PROG** key again.

In order to modify parameters, press **Enter (3)** key and then, press down-arrow key **(4)** to display the different options.

Press again **Enter (3**) key to go to the following menu.

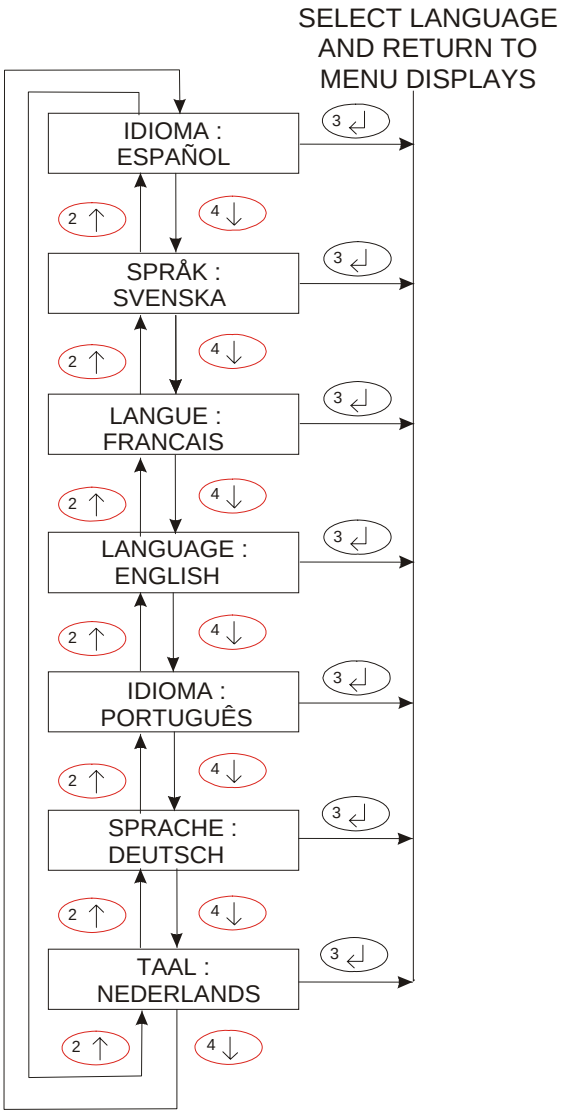
General Menus:

After entering the correct Password, the first menu will be displayed (language display) and, then, the rest of general menus by pressing down-arrow (4) key, in the following order:



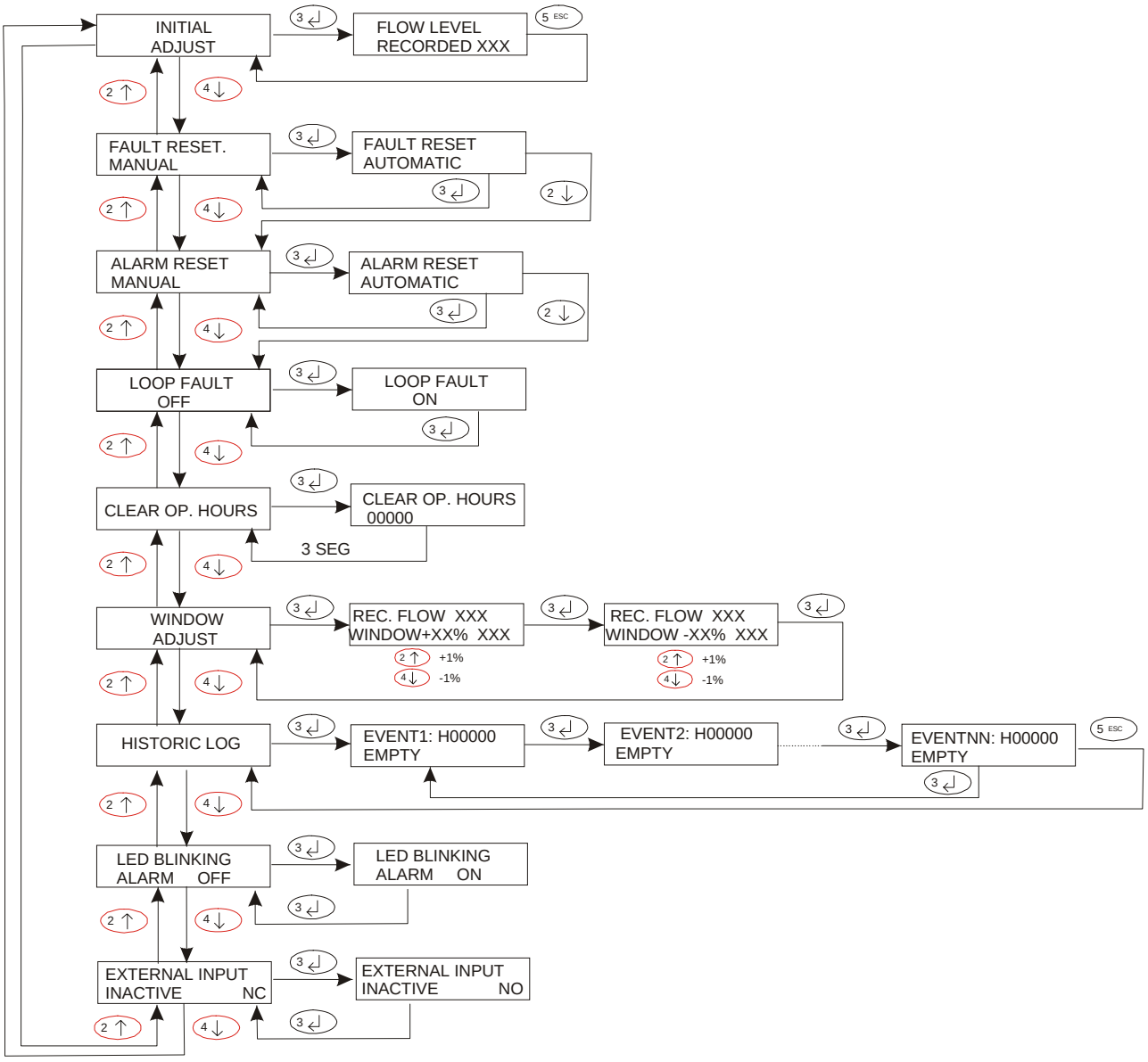
Language Menu

Press the **Enter** key to change the language when any of the languages available are displayed and, then, press the down-arrow **(4)** key to see all of them.



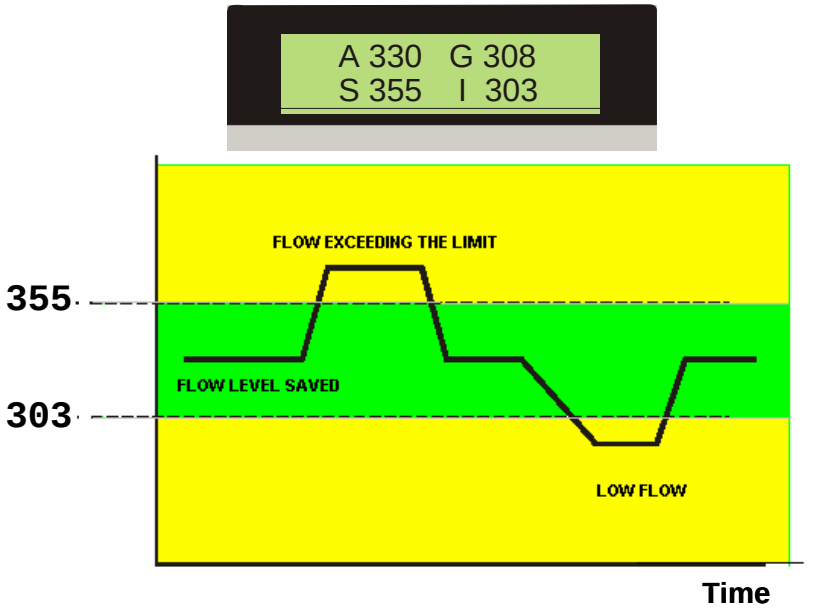
The rest of menus:

The flow level is saved in the *Initial Adjust* at the end of the installation.



4.3 SAT-1u Alarm and Fault Indication

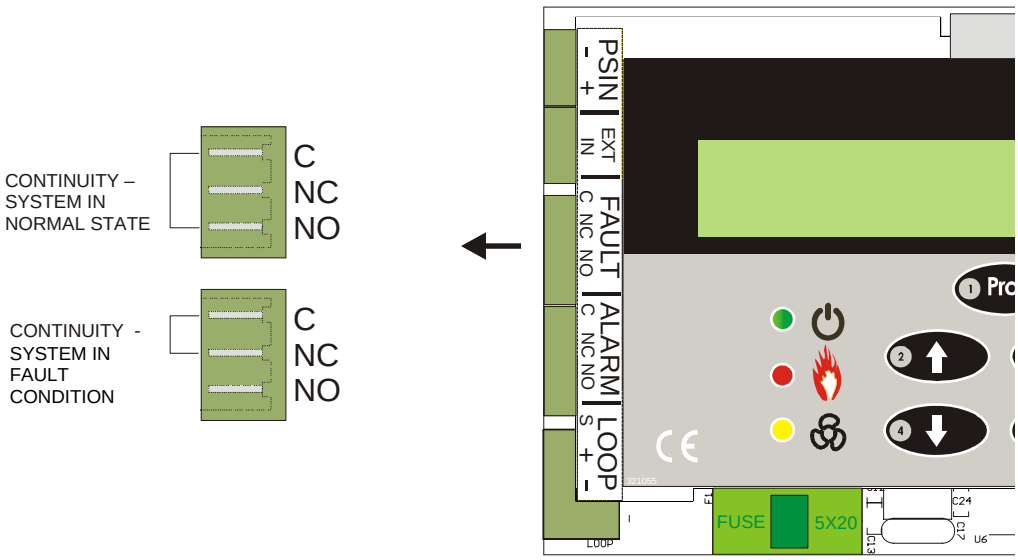
The aspirating system has a fault relay with C, NC and NO contacts (J5) which indicates any system trouble due to a power fault (21-29 Vdc) or because of low and high flow thresholds are out of range. (Note that flow levels are user-configurable).



In the above example, the flow level value saved is 308, the high flow threshold is set to 355 and the low flow threshold is set to 303. The current flow value is 330.

Fault relay operation

When the system is powered and no faults present, that is, in normal condition, the relay is energized with continuity between C and NO terminals.
In case of fault, the continuity is between C and NC terminals.



5 TECHNICAL SPECIFICATIONS

Material: ..... cream-colored metal cabinet

Display: ..... LCD with 2 x 16 characters

State indicators: ..... 3 leds: fault, alarm and power

Relays ..... 1 alarm relay + 1 general fault relay

Maximum current consumption at 24Vdc 250mA

Voltage range of remote indicator to signal the alarm condition..... 3-30Vdc
(This range allows the use of analogue and conventional detectors)

Cable inlets ..... 1 x PG13.5

Sampling pipe inlets 20-27mm

Pipe installation: ..... ABS red 25/1.0

Maximum pipe length recommended..... 50m

Fan type ..... Radial

Fan life ..... 65,000 hours at 40 ºC

Dimensions: ..... 250 x 177 x 98 mm (including input cable conduits)

Weight ..... 3 Kg

Alarm levels:

ALARM LEVEL	% OBSCURATION/METER
1	0.06
2	0.09
3	0.15
4	0.30
5	0.60
6	1.50
7	3.00
8	4.50
9	6.00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