SENSOTOX 2
User Manual

READ THE MANUAL BEFORE USING

This manual should be carefully read by those who have or will have responsibility for use, maintenance or repair of the product.

This product will perform properly only if used, maintained and repaired in accordance with the manufacturer's instructions.

CAUTION

Disconnect the power before removing the sensor. Remove the cover and the sensor from the unit only if the work area is known not to be dangerous.

WARNING

Calibration of all new unit should be checked by exposing the sensors to a known gas concentration before putting the instrument into service. For maximum safety, the accuracy of reading of the Sensotox2 should be checked every three months.

Contents

1. INTRODUCTION

Sensotox 2 EC uses an electrochemical sensor to detect oxygen and toxic gases. It works with voltages from 9 to 36 V dc with an analogue (4-20 mA) or digital (RS-485, ModBus) output. Sensotox2 is equipped with flameproof enclosure, and this may be blind or have a window with a display for reading the gas concentration, status LEDs and magnetic keys for configuration.

Sensotox 2 IR uses a non-dispersive infrared sensor to detect combustible gases, carbon dioxide and other gases. It works with voltages from 9 to 36 V dc with an analogue (4-20 mA) or digital (RS-485, ModBus) output. Sensotox2 is equipped with flameproof enclosure, and this may be blind or have a window with a display for reading the gas concentration, status LEDs and magnetic keys for configuration.

Sensotox 2 LIE uses a catalytic sensor with high resistance to contaminants for detecting combustible gases (LEL). It works with voltages from 9 to 36 V dc with an analogue (4-20 mA) or digital (RS-485, ModBus) output. Sensotox2 is equipped with flameproof enclosure, and this may be blind or have a window with a display for reading the gas

concentration, status LEDs and magnetic keys for configuration.

Sensotox 2 PID uses a sensor to detect volatile organic compounds (VOCs). It works with voltages from 9 to 36 V dc with an analogue (4-20 mA) or digital (RS-485, ModBus) output. Sensotox2 is equipped with flameproof enclosure, and this may be blind or have a window with a display for reading the gas concentration, status LEDs and magnetic keys for configuration.

1.1 TECHNICAL SPECIFICATIONS

Sensotox2 EC specifications

Size	190 mm x 150 mm x 140 mm
Weight	1.6 kg
Sensor	Electrochemical
Calibration	2 points
IP	IP-68
Power supply	9-36 V dc, max. 50 mA at 24 V dc
Output	4 – 20 mA RS-485, at 4.8, 9.6 or 19.2 kB/s
Display	7 segments, 4 digits and 6 LEDs (unit with window)
User interface	Magnetic key, non-intrusive access for calibration and adjustment (unit with a window). Internal calibration button (blind unit)
Temperature	-40 a 60 °C
Humidity	0-95% RH (non-condensing)
Pressure	0.9 – 1.1 Atm
Relay contacts*	30 V, 2 A normally open. One for alarm 1 and one for alarm 2.

*** Consult Sensotran for other possibilities.**

Sensotox2 IR specifications

Size	190 mm x 150 mm x 140 mm
Weight	1.6 kg
Sensor	Non-dispersive IR
Calibration	2 points
IP	IP-68
Power supply	9-36 V dc, max. 50 mA at 24 V dc
Output	4 – 20 mA RS-485, at 4.8, 9.6 or 19.2 kB/s
Display	7 segments, 4 digits and 6 LEDs (unit with window)
User interface	Magnetic key, non-intrusive access for calibration and adjustment (unit with a window). Internal calibration button (blind unit)
Temperature	-40 a 60 °C
Humidity	0-95% RH (non-condensing)
Pressure	0.9 – 1.1 Atm
Relay contacts*	30 V, 2 A normally open. One for alarm 1 and one for alarm 2.

*** Consult Sensotran for other possibilities.**

Sensotox2 LIE specifications

Size	190 mm x 150 mm x 140 mm
Weight	1.6 kg
Sensor	Catalytic
Calibration	2 points
IP	IP-68
Power supply	9-36 V dc, max. 50 mA at 24 V dc
Output	4 – 20 mA RS-485, at 4.8, 9.6 or 19.2 kB/s
Display	7 segments, 4 digits and 6 LEDs (unit with window)
User interface	Magnetic key, non-intrusive access for calibration and adjustment (unit with a window). Internal calibration button (blind unit)
Temperature	-40 a 60 °C
Humidity	0-95% RH (non-condensing)
Pressure	0.9 – 1.1 Atm
Relay contacts*	30 V, 2 A normally open. One for alarm 1 and one for alarm 2.

*** Consult Sensotran for other possibilities.**

Sensotox2 PID Specifications

Size	190 mm x 150 mm x 140 mm
Weight	1.6 kg
Sensor	Photoionization
Calibration	2 points
IP	IP-68
Power supply	9-36 V dc, max. 50 mA at 24 V dc
Output	4 – 20 mA RS-485, at 4.8, 9.6 or 19.2 kB/s
Display	7 segments, 4 digits and 6 LEDs (unit with window)
User interface	Magnetic key, non-intrusive access for calibration and adjustment (unit with a window). Internal calibration button (blind unit)
Temperature	-40 a 60 °C
Humidity	0-95% RH (non-condensing)
Pressure	0.9 – 1.1 Atm
Relay contacts*	30 V, 2 A normally open. One for alarm 1 and one for alarm 2.

*** Consult Sensotran for other possibilities.**

2. OPERATION

The calibration of all new instruments acquired from Sensotran should be checked by exposing the sensor to a known concentration of gas before putting the instrument into service. For maximum safety, accuracy should be checked by exposing the sensor to a known concentration of gas over a period of time.

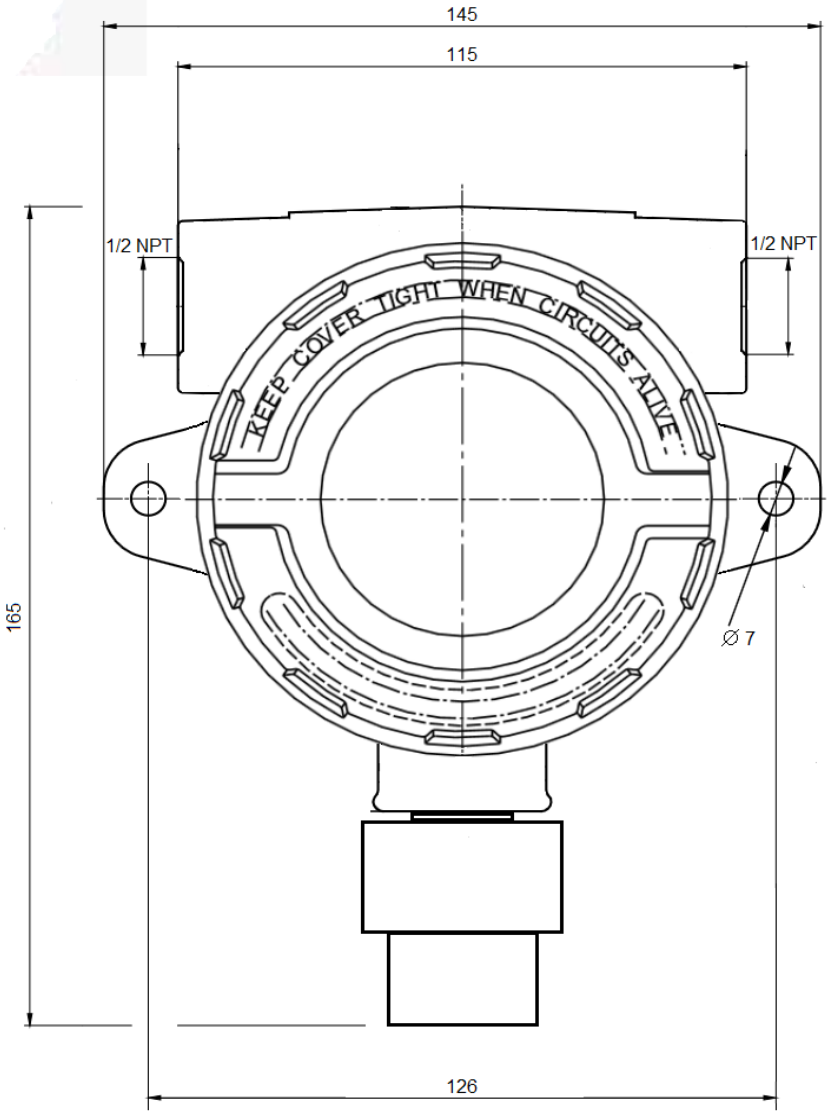
Calibration must be checked daily during the initial period of use to ensure that there are no components in the atmosphere which might contaminate the sensor.

Check the calibration using a known concentration of gas before use. Recalibrate if the error is excessive.

Before shipment, Sensotox 2 instruments are calibrated and checked using Span gas. However, the user should check the operation before first use. Once the unit has been installed, leave it running for 24 hours and check it with gas.

2.1 PHYSICAL DESCRIPTION

The design of Sensotox 2 makes it easy to place and connect at a fixed location to monitor gas.



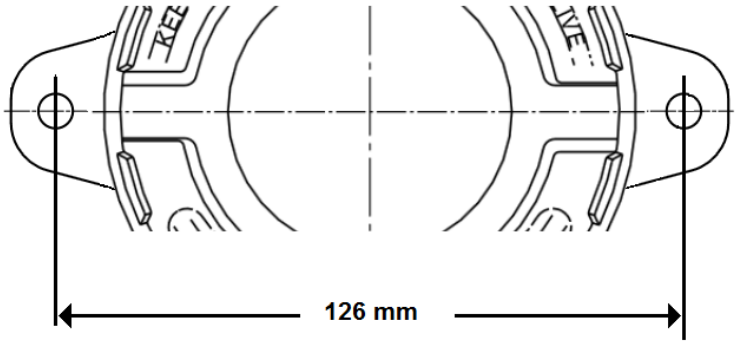
2.2 Installation

ATTENTION

1. **At least 457 mm of armoured cable must be used between group A and B zones.**
2. **To prevent ignition in explosive atmospheres, the area must be free of flammable gases and the power supply to the detector must be disconnected before opening the cover.**
3. **For European applications, the installation must meet the requirements of EN 60079-14.**

2.2.1 Installing

Make 2 holes in the mounting surface 126 mm apart.



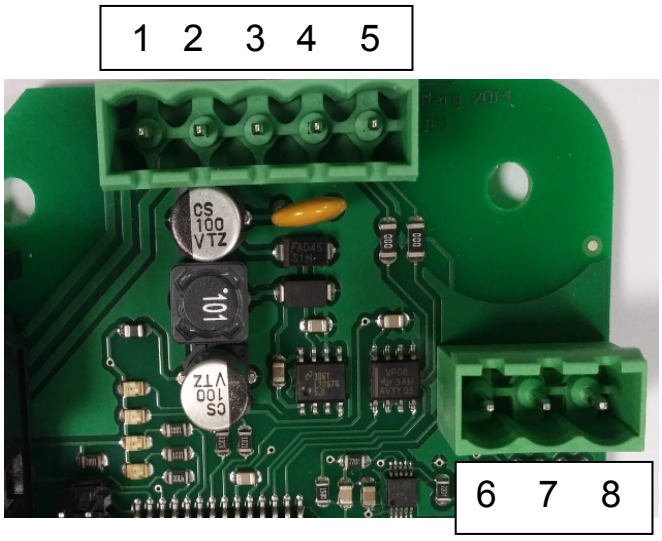
2.2.2 Uninstalling

Before dismantling, make sure that power is disconnected.

1. Unscrew the cover by rotating it anti-clockwise.
2. If the unit has a display, remove the four fixing screws and then the ribbon cable connector of the display.
3. Disconnect the power connectors and communication/relay connectors.
4. Disconnect the sensor connector.
5. Unscrew the four studs on the display.
6. Remove the main board.
7. Unscrew the sensor.

2.2.3 Wiring

1. Disconnect the two green connectors.



2. Connect the Sensotox 2 cables via the connection holes. The pins correspond to the following table:

Terminal	Cable	Pin#
Block 1	Common alarm (*)	1
	High/Low Alarm (*)	2
	Fault (*)	3
	RS485A	4
	RS485B	5
Block 2	4-20 mA output	6
	Power supply -	7
	Power supply + (9 a 36 V)	8

(*) Only detectors with a window.

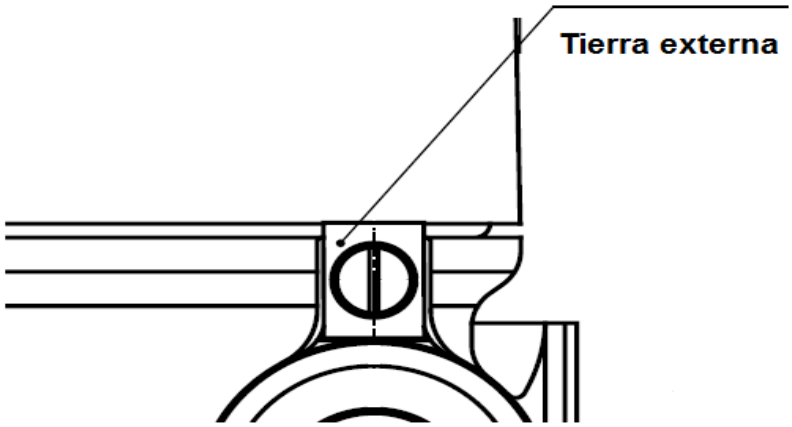
2.2.4 Installing the unit

1. Fit the connectors into their respective locations. Save an extra length of cable to allow mounting on the wall.
2. Screw the sensor into the box and place the 4-pin connector (LIE model) or 6-pin connector for other sensors.
3. On units with a window, fit the 16-contact flat cable and separators.
4. On units with a window, pit the display and relay board using four 4 mm screws.
5. Screw the cover on

2.2.5 Earthing instructions

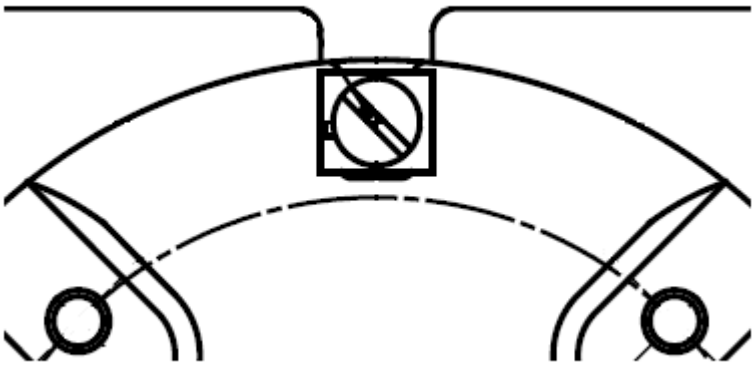
External earth connection

Crimp 4 mm2 cable into a 4 mm connector.



Internal earth

Use the same terminal as for the external earth connection.



2.3 Display and User Interface

2.3.1 User interface

All Sensotox 2 devices with a window are equipped with four status LEDs, a four-digit LCD display and three magnetic keys [+], [MODE] and [-].

2.3.2 Magnetic key

The Sensotox 2 with a window has no external keys, but uses the magnet to activate the keys inside the unit. Place the magnet over the key to activate the desired button.

2.3.3 Using the magnet

Briefly touch the magnet onto the MODE circle or the [+] and [-] triangles.

Important! Do not drag the magnet, since two functions might be activated.

2.3.4 Starting up the unit

Both the detector with a window and the blind one require a start-up time that depends on the built-in sensor.

" in it" is displayed on the detector with a window, alternating with a countdown. When the count reaches zero, the detector is operative.

In both the detector with a window and the blind one, the analogue output current is 2 mA during the start-up time. When the start-up time has elapsed, and provided there is no fault condition, the 4/20 mA analogue output current will be proportional to the sensor reading.

2.3.5 Display readout

In the detectors with window, once the detector goes into read mode, it starts an automatic check for possible faults and alarm conditions. If there is no fault or alarm condition, the green "Ok" LED is activated and the gas concentration is shown.

If a fault is shown, the "FAuL" LED will lit. Each alarm condition has a corresponding LED.

2.3.6 Alarm contacts

The alarm contacts or alarm relays can be used to activate acoustic or luminous alarms. External alarms have normally open contacts which close when there is an alarm.

	External alarm	**LED**	**LCD**	**Analogue output**
Exceeds the low alarm threshold	Alarm ALM1	Low	Reading	Based on reading
Exceeds the high alarm threshold	Alarm ALM1	High	Reading	Based on reading
Out of range	Alarm ALM2	High	8888	22 mA
Calibration fault	Alarm ALM2	Fault	E003 flashing	2 mA
Sensor drift	Alarm ALM2	Fault	E004 flashing	2 mA
ADC saturated	Alarm ALM2	Fault	E005 flashing	2 mA

2.4 Calibration

ATTENTION

The calibration of all unit purchased from Sensotran should be tested by exposing the sensor to a known concentration of gas before putting the instrument into service. For maximum safety, the accuracy of Sensotox 2 should be checked by exposing the sensor to a known concentration of gas over a period of time

Sensotox 2 units are calibrated using a two point calibration process. First, use the "Zero calibration", then the "SPAN calibration" exposing the sensor to a reference gas concentration to establish the second calibration point.

Note: "Zero calibration" must be carried out before "Span Calibration".

The calibration requires a zero cylinder, a Span cylinder and a calibration adapter.

Sensotox 2 connected to a calibration gas cylinder with an adapter.

2.4.1 Calibrating the blind unit

The blind unit has four LEDs on the main board. The first LED indicates the calibration of "Zero", the second indicates "Span" calibration and the third indicates "Span" modification. These options change sequentially every two seconds while the button is held down, so that when the button is released the option shown by the LED is carried out.

Calibration LEDs Sensotox 2 blind.

I - Zero calibration

1. Ensure that there are no flammable gases or gases that might interfere with the sensor reading in the area where the detector is located. Suspected that the atmosphere is not clean, use a zero gas such as Nitrogen 5.0
2. Open the cover and locate the button on the main board.
3. In atmosphere with pollutants, connect the calibration ZERO cylinder to the sensor head of the Sensotox 2 using the calibration adapter and apply the gas flow.
4. Press the button until the Zero LED lights and then release it.

II - Span calibration

1. Connect the SPAN calibration cylinder to the sensor Sensotox 2 head using the calibration adapter and applying a flow of gas.

   Note: For proper calibration it would be best to apply gas flow for long enough to obtain a stable reading from the sensor. This can be achieved by measuring 4/20 analogue output until the current remains stable.
2. Press the button until the Span LED lights and then release it.

III - Changing Span value

1. Press the button until the LED indicating Span modification (Cal. V) lights and then release it.
2. The span value is shown on the LEDs starting sequentially with units, so that first the units are displayed, then the tens and finally the hundreds.
3. Each press of the button increases the Span by one. Once the new value has been set it will be automatically saved if the button is not pressed again

2.4.2 Calibrating the display unit

I - Zero calibration

1. Ensure that there are no flammable gases or gases that might interfere with the sensor reading in the area where the detector is located. Suspected that the atmosphere is not clean, use a zero gas such as Nitrogen 5.0
2. To accede to Calibration Menu, Press [MODE] from the actual reading screen. A "ZEr0" message appears on the screen.

   Tip: To pass to Span Calibration, press [MODE].

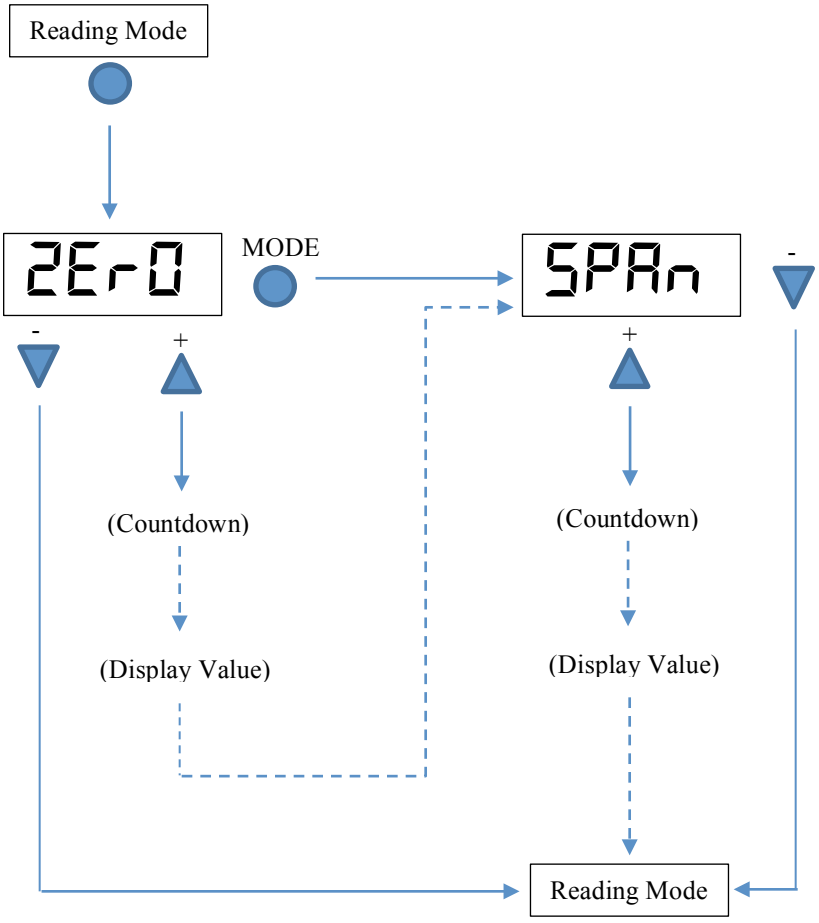
   To return to actual reading press [-].

3. In atmosphere with pollutants, connect the calibration ZERO cylinder to the sensor head of the Sensotox 2 using the calibration adapter and apply the gas flow.
4. Press [+] to start calibration. Zero LED will lit and "2Er0" message will be displayed alternatively with a countdown.

   Tip: Before countdown will finish, you can cancel calibration by pressing any key.
5. When countdown will be completed, LED and "2Er0" disappears and calibration data will be saved.

   Note: The machine returns to reading the display after 60 seconds of inactivity.

   When Zero Calibration will be finished, instrument will advance to Span Calibration.



II - Span calibration

1. Connect the SPAN calibration cylinder to the sensor Sensotox 2 head using the calibration adapter and applying a flow of gas.

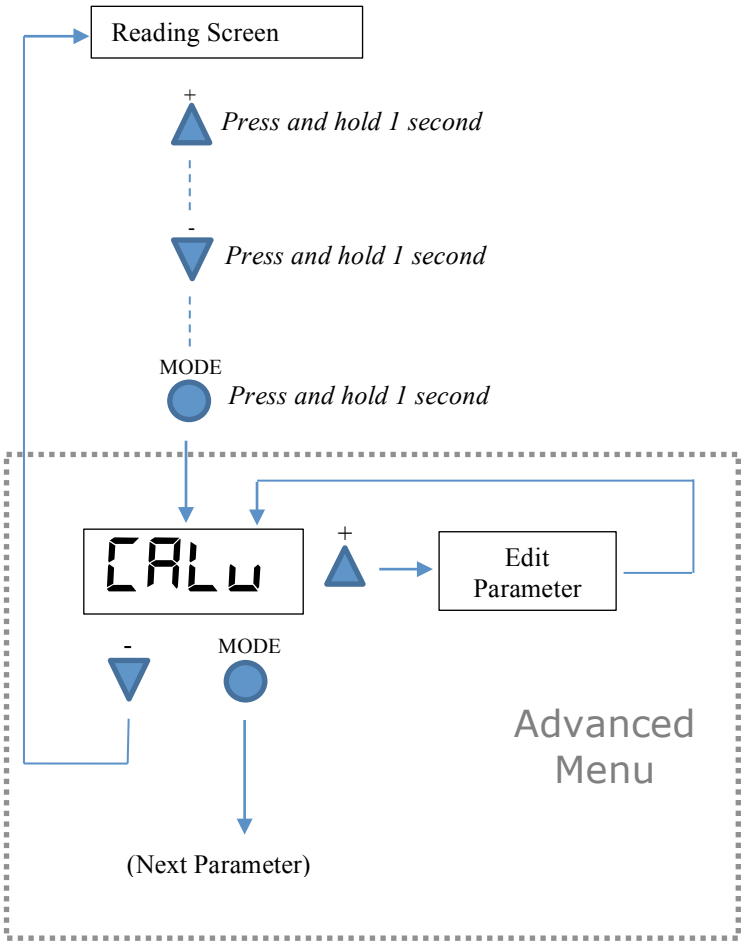
   Tip: To accede the Span Calibration from reading display, press [MODE]. When "2Er0" appears, press [MODE] again to go to "SPan".

2. Press [+] to start calibration. "Span" LED will lit and "SPAn" will be displayed alternatively with a countdown. Calibration can be cancelled by pressing any key.
3. When countdown will be completed, LED and "SPAn" disappears and calibration data will be saved. If the sensor does not have sensitivity enough for being calibrated, "FA iL" and "SPAn" messages will be displayed alternatively; that can suggest than sensor needs to be replaced.
4. To quit the Menu and return to actual reading screen, press [+]. If not, the instrument will return automatically to actual reading screen after a short period.
5. Close the gas valve.

2.5 Advanced Menu

Sensotox2 Advanced Menu let you modify several configuration parameters. To enter into Advanced Menu, press the sequence [+], [-] and [MODE]. Display will show then CALu.

- Pressing [MODE] will move to the next function.
- Pressing [+] will enter into the setting and show the actual value.
- Pressing [-] will leave the Advanced Menu.



After 60 seconds without activity, detector returns to actual reading screen.

Advanced Menu

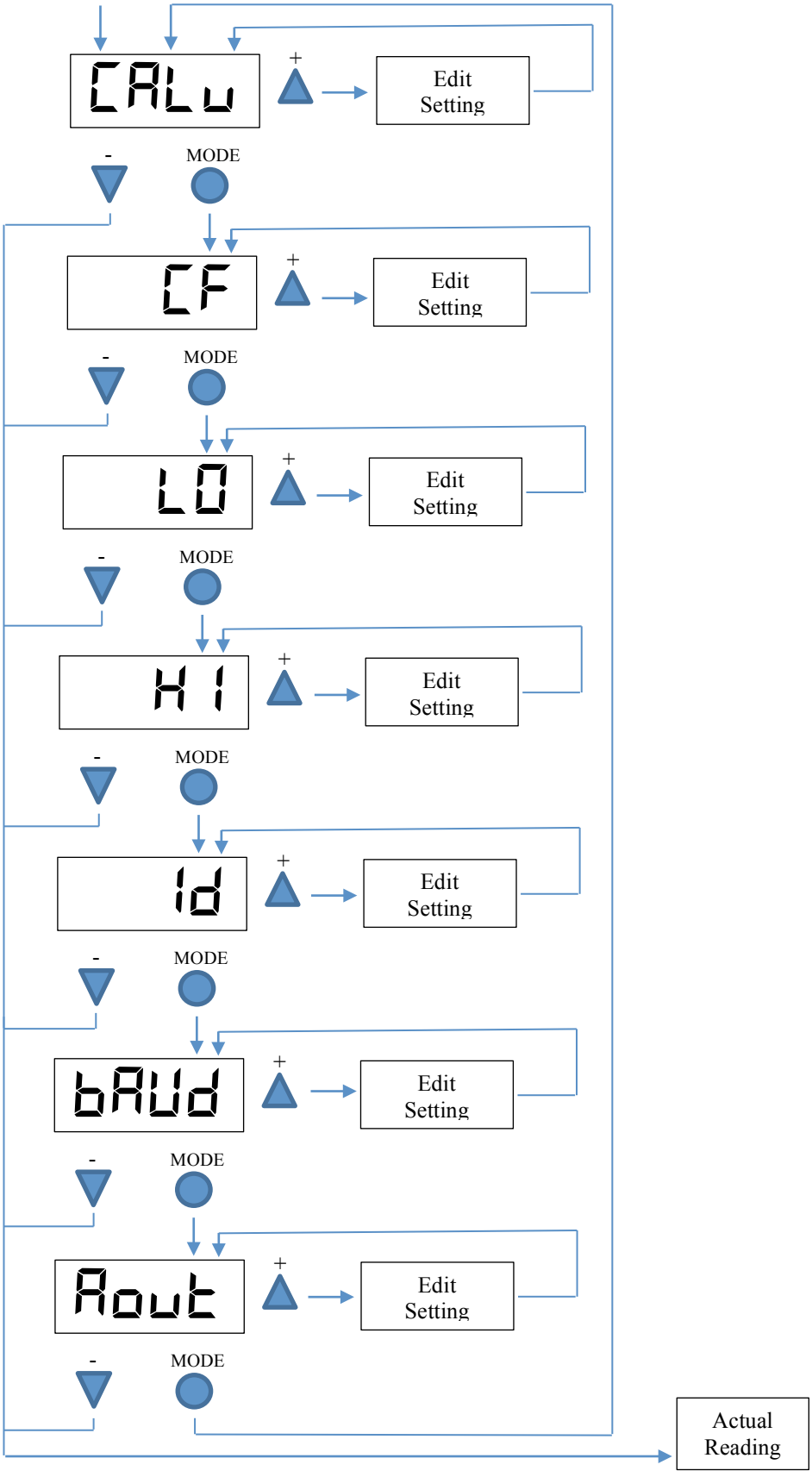
Display	Setting
CALu	Span Calibration value
FC	Correction Factor (for LEL & VOC only)
LO	Low Alarm
HI	Hi Alarm
Id	Instrument ID
bAUd	Transmission Speed (19200, 9600 or 4800)
LitE	Backlight
Aout	Analogue output (4 / 20 mA)

- To modify a setting, press [MODE] until desired value appears.
- Press [+] to enter into the setting.
- Press [+] to increase/change the value.
- Press [-] to decrease/change the value.
- When finished, press [MODE].

If the setting has been modified, new value will blink.

- Press [-] or [MODE] to dismiss modifications and go to next setting.
- Press [+] to save changes.

"SAvE" will be displayed to confirm changes have been stored.


CALu
+
Edit Setting
-
MODE
CF
+
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-
MODE
LO
+
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MODE
H1
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MODE
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bAUd
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Edit Setting
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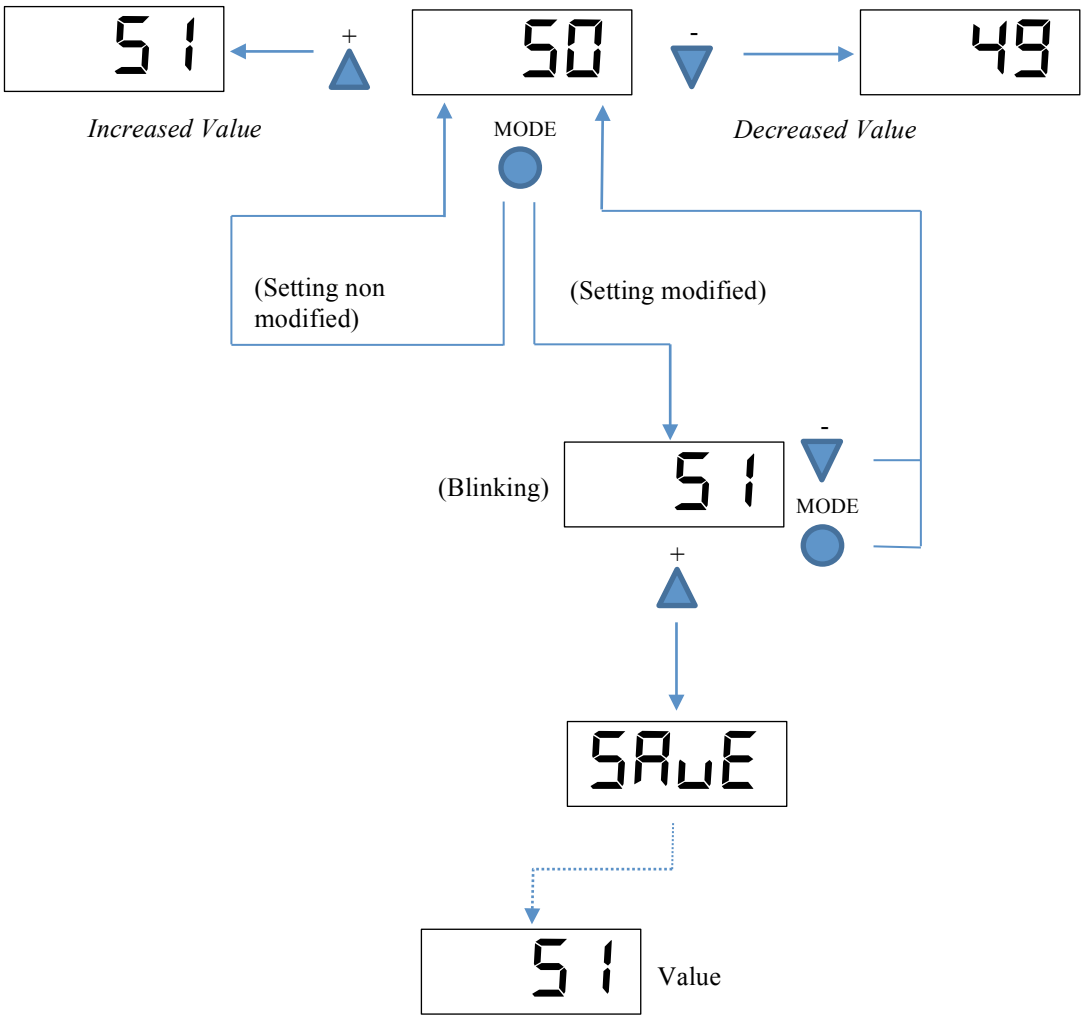
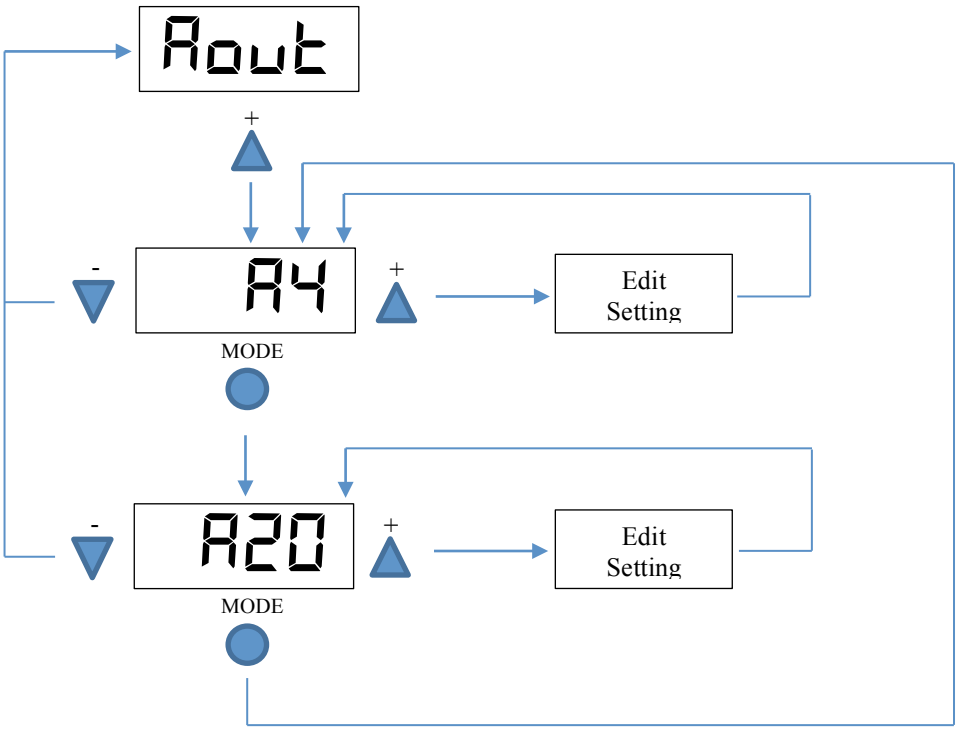
MODE
Aout
+
Edit Setting
-
MODE
Actual Reading

How to edit and modify Settings.



4-20 mA Analogue Output adjustment.



3. Troubleshooting

Error	Description and solution
E003	**Description**: Calibration error **Solution**: Make sure there is gas flow circulation and repeat calibration. If still fails, replace the sensor.
E004	**Description**: Zero Drift **Solution**: Make sure sensor is in a clean ambient or alternatively, use Nitrogen to do zero calibration.
E005	**Description**: Sensor Over range **Solution**: Call an Authorized Service Center.
E006	**Description**: Wiring Error **Solution**: Verify wiring
E007	**Description**: EEPROM Error **Solution**: Replace main board. Call an Authorized Service Centre.

4. MODBUS/RS-485

Retrieving gas concentration data from Sensotox 2 through RS-485.

The Sensotox 2 communicates by means of MODBUS RTU. All monitors provide 4-byte register value. Note: Gas concentration is the only value that can be retrieved.

As example 34 hex = 52 decimal.

1. **Communication Setting**

   Transmission MODE:RTU

   Controller: PC or GasVisor Controller.

   Baud Rate: 4800, 9600, 19200 bps.

   Client ID: 1 to 32

2. **Message Frame/Communication Procedure**

   Sensotox 2 only support function code 0x03 (read holding registers), which only supports the "Get Reading Value" from the detector.

Requesting Message:

Device Address	**Function Code**	**Register Address High Byte**	**Register Address Low Byte**	**Quantity of Registers High Byte**	**Quantity of Registers Low Byte**	**CRC Low Byte**	**CRC High Byte**
Client ID	03	00	02	00	02	CRC	CRC

Answering Message:

Device Address	**Function Code**	**Byte Count**	**Register Value**				**CRC Low Byte**	**CRC High Byte**
Client ID	03	04	Reading byte 4	Reading byte 3	Reading byte 2	Reading byte 1	CRC	CRC

Note: Detector data length is 4 bytes.

Example:

Request: 01 03 00 02 00 02 CRC CRC

Answer: 01 03 04 **00 00 00 3A** 7A 20

Note: The maximum distance should be less than 1 Km when using a 1.5 mm^2 cable.

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