Manual for Installation, Function Description and Maintenance Instruction

mSENSE III

CO_2 / CO sensor with built-in general purpose controller

General

The IAQ-sensor product *mSENSE III* is used to measure indoor air carbon dioxide and carbon monoxide concentrations. It is a very flexible controller with programmable outputs for both relay- and linear control of e.g. mixed air dampers, humidifier and fans. The measured values are shown on the display.
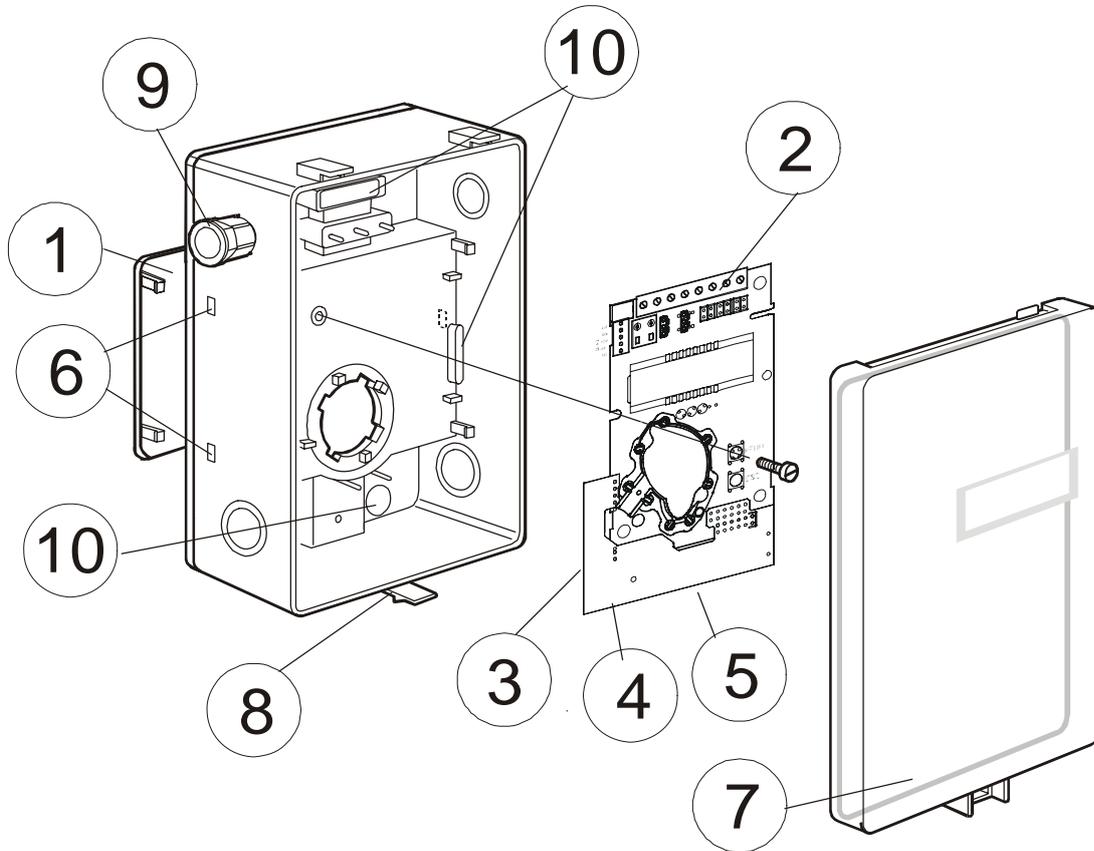
The unit can alternatively be connected to common VAV (Variable Air Volume) controllers, or Direct Digital Control (DDC). The linear output functions are pre-programmed.
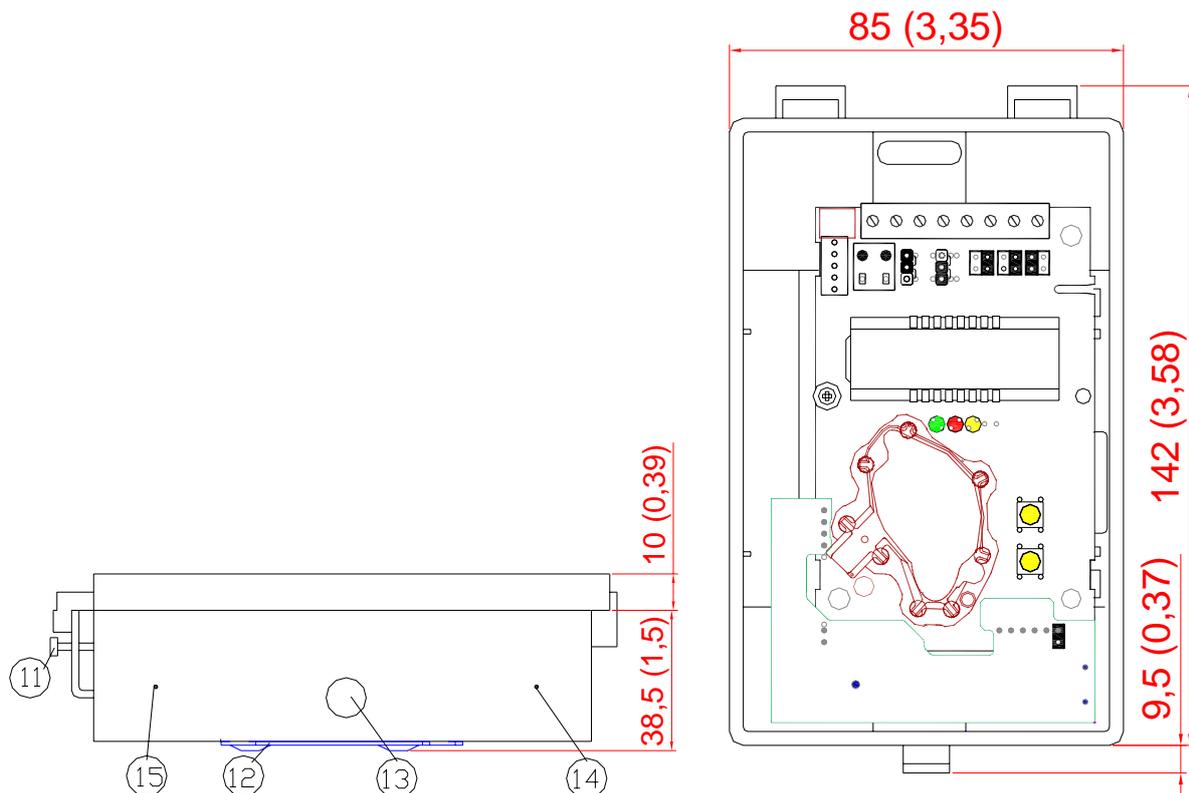

mSENSE III for wall mounting and
UG-mSENSE III for mounting in ventilation ducts

Mounting instruction

Wall mounting of *mSENSE III*, see below.
For electrical installation, see page 4.

1 Wall plate
2 PCB (factuary mounted in box)
3 Temperature sensor for internal compensation
4 RH sensor for internal compensation
5 Carbon monoxide sensor (not shown)

6 Hole for wall plate hooks
7 Snap- in lid
8 Lid locking screw
9 PG9 cable entry bushing
10 Air holes

85 (3,35)

142 (3,58)

10 (0,39)

38,5 (1,5)

9,5 (0,37)

11 Lidlocking screw
12 Wall plate
13 Screw to hold the wall plate
14 Marking to drill hole for PG7
15 Marking to drill hole for PG9

Wall Mounting Instruction

1. **Dismount the wall plate.** The sensor is delivered with the wall plate mounted. The wall plate has to be removed before the sensor is mounted onto the wall. Unscrew the screw on the side of the box. See figure 3.
2. **Screw the wall plate onto the wall.** The sensor should be mounted 1 to 1,8 m above the floor. The wall plate has holes for three screws. Drill holes for 3,5mm screws and put dowel into them. Dowels and screws 3,5 x 25mm are included in a plastic bag
3. **Attach the sensor box** to the wall plate. It is done by a snap-in fitting. The wall plate has three hooks that fit in holes in the sensor box. Fasten the screw on the side of the box.
4. **Electrical cable entry.** The box has a factory mounted cable entry bushing in dimension PG9. Never feed more than one cable through each cable entry bushing, or else gas might leak through!
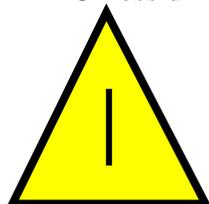
The lid can be locked with the screw (11) at the bottom of the sensor box. The sensor should be mounted 1 to 1,8 m above the floor.

Please note! Normally the PCB should not be removed from the housing. If for some reason the PCB must be removed it must be handled carefully and protected from electrostatic discharge.

Electrical connections

The power supply has to be connected to G+ and G0. G0 is considered as system ground. _The same ground reference has to be used for the mSENSE III unit and for any connected device!_ Unless different transformers are used, special precautions need to be taken.

PLEASE NOTE! The signal ground _is not_ galvanically separated from the mSENSE III power supply!

PLEASE NOTE! The same ground reference has to be used for the mSENSE III unit and for the control system!

#	Connection Terminal	Function	Electrical Data	Remarks
1	G+	Power (+)	24-29 VAC/DC+ (minimum 2 A continuously)	The heater is connected to G+ and G0. Minimum temperature –30 ^{o}C
2	G0	Power ground (-)	24 VAC/DC-	_See note 1!_
3	OUT 1	Analogue Output 1 (+)	0-10 VDC or 0-20 mA, 2-10 VDC or 4-20 mA,	According to positions of OUT1 jumper and start point selection. _See note 2!_
4	OUT 2	Analogue Output 2 (+)	Same as Output 1	According to positions of OUT2 jumper and start point selection. _See note 2!_
5	M	Signal Ground (-)	Connected to G0 via PTC fuse	_See note 1!_
6	Relay	Normally closed	Contact free relay minimum load 1mA/5V rated load 0,5A/125VAC; 1A/24VDC	Triggered by register OUT3
7	Relay	Open at alarm situations and power loss		
8	OUT4	Analogue Output 4 (+) or Open Collector	0-10 VDC Max 0,5A, 55VDC / 40VAC (half-wave rectifier protection)	According to positions of OUT4. _See note 2 & 3!_
9 10	DigIn_1	Digital Input 1	Closed contact current 1mA Open contact voltage max 5V	**Do not apply any voltage on this input!**

Electrical terminal connections for mSENSE III

Note 1:   _The ground terminal is used as negative power supply DC input or AC phase ground G0 (halfwave rectifier). The signal ground M, protected by a PTC resistor, is the same as power ground G0 (permitting a "3-wire" configuration). A single transformer may be used for the entire system._

Note 2: _mSENSE III can deliver both a voltage or a current loop for OUT1/OUT2. For OUT4 a voltage output or an open collector output is selected with jumper OUT4. To change between voltage and current output mode the hardware jumpers are used. There is one jumper for OUT1 and one for_

OUT2, so that one output can be a voltage output and the other a current output. Both, voltage output and current output, can have start points 0 % (0-10 VDC or 0-20mA) or 20% (2-10 VDC or 4-20mA) selected from PC software.

Note 3*: Current of Open Collector is internally returned to G0 terminal.*

If for some reason the PCB must be removed it must be handed carefully and protected from electrostatic discharge! Normally, removing the PCB is not required.

No.	Label	Function (configurable)
3	OUT1	CO-transm. 0…100 ppm
4	OUT2	CO_2-transm. 0…2000 ppm
6, 7	OUT3	Gas alarm CO >35 ppm OR CO_2 >1500 ppm
8	OUT4	Drift disturbing alarm or gas alarm
9, 10	DI 1	Extra terminal. Test function (N.O.)

If more holes are needed the box has several drill markings for holes in two dimensions, PG7 and PG9. Then fasten the cable entry bushing and seal properly. Never feed more than one cable through each cable entry bushing, or else gas might leak through!

The PCB can be removed during the making of holes. The PCB must be handled carefully and protected from electrostatic discharge!

If the PCB is in the housing when the hole is made a background calibration, CALb, using the push buttons should be made. See the function and maintenance description.
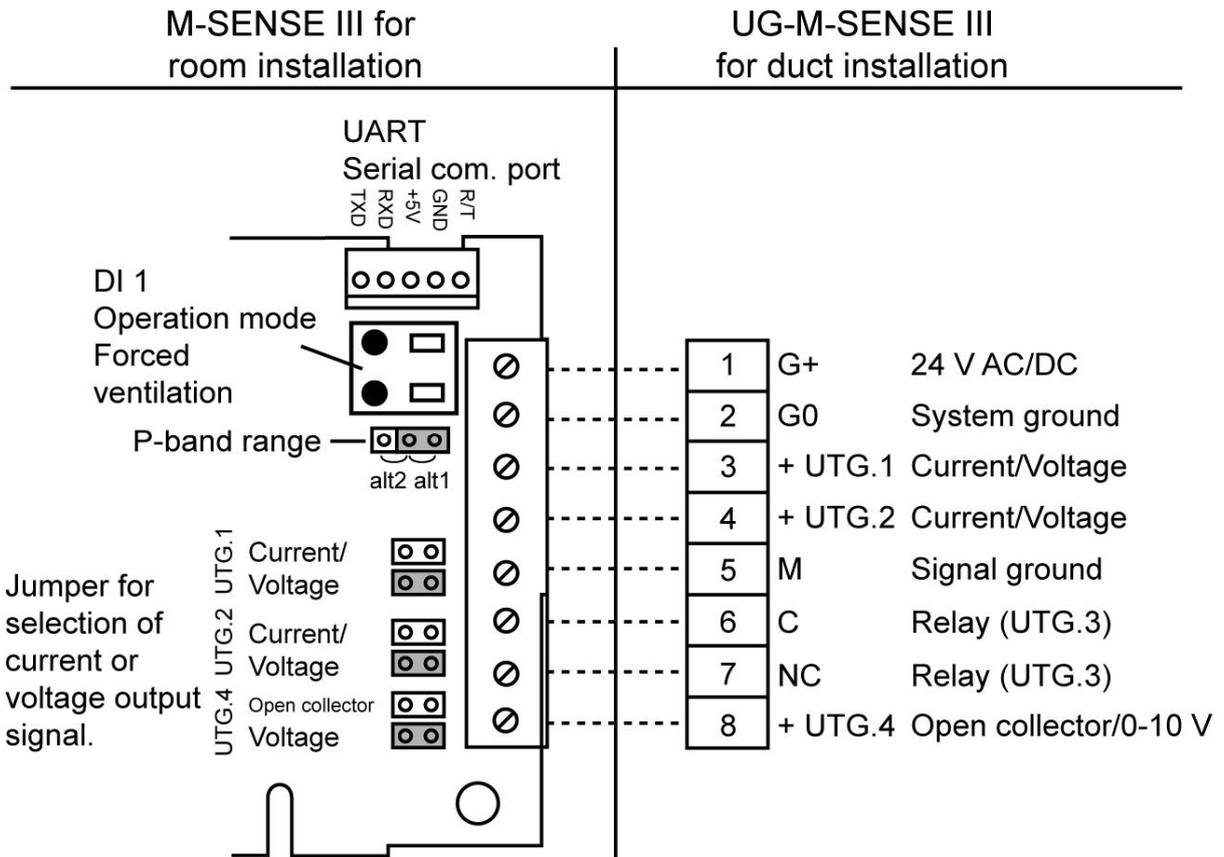
Start-up of the *mSENSE III*

Connect the power directly after mounting. The unit works best if the sensor is continuously powered. The analogue outputs do not need to be connected before use. An internal delay function prevents the alarm functions of the relay and OUT4 output during 15 minutes after power up. After short power failures the CO_2 measurements need this power up time to stabilize. The alarm outputs may be tested after the 15 minutes delay by shorting the switch DI1. After long power failures the sensor may need several days to restore the measuring functions.

NOTE! The CO probe gives incorrect readings near some chemicals, e g silicone. This makes certain environments unsuitable for the sensor.
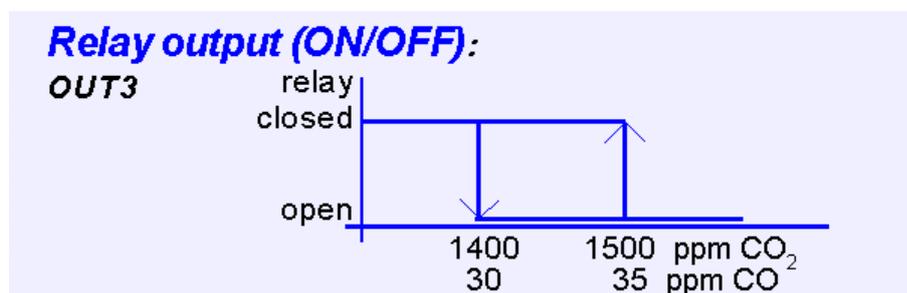
The PCB of **mSENSE III**

Terminals and jumpers on **mSENSE III** *. The darker positions are default settings.*
The terminal DigIn_1 may be used for forced ventilation.

Connection of the *UG-mSENSE III* *via screw terminal at duct mounting.*

The following text appears within the diagram:

M-SENSE III for room installation

UG-M-SENSE III for duct installation

UART
Serial com. port
TXD RXD +5V GND R/T

DI 1
Operation mode
Forced ventilation

P-band range
alt2 alt1

Jumper for selection of current or voltage output signal.

UTG.1 Current/Voltage
UTG.2 Current/Voltage
UTG.4 Open collector / Voltage

#		
1	G+	24 V AC/DC
2	G0	System ground
3	+ UTG.1	Current/Voltage
4	+ UTG.2	Current/Voltage
5	M	Signal ground
6	C	Relay (UTG.3)
7	NC	Relay (UTG.3)
8	+ UTG.4	Open collector/0-10 V

Functional description

Standard configuration: OUT1 is carbon monoxide output, OUT2 is carbon dioxide output and OUT3 is relay output. OUT4 is error status OR OUT3 is open.

- OUT1 = measuring signal for carbon monoxide concentration
- OUT2 = measuring signal for carbon dioxide concentration
- OUT3 = ON/OFF of demand of air quality. The relay is open in alarm situations and at power loss. NOTE! There is a 15 minutes delay after start-up.
- OUT4 = error status OR OUT3 open, carbon monoxide concentration > 35 ppm OR carbon dioxide concentration > 1500 ppm. There is a 15 minutes delay after start-up.

Relay output (ON/OFF):
OUT3

relay closed

open

| 1400 | 1500 ppm CO_2 |
| 30 | 35 ppm CO |

The control signal of air quality

Terminal	Standard configuration	Standard settings	Standard function
G+	Power (+)	24 VAC/DC+ (+-20%), 3W	2W without output load
G0	Power ground (-)	24 VAC/DC-	**The same ground reference has to be used for the** *mSENSE III* **unit and for the control system!**
OUT1	0-10VDC	0-100 ppm CO	Measuring signal carbon monoxide
OUT2	0-10VDC	0-2000 ppm CO_2	Measuring signal carbon dioxide
M	Signal Ground (-)		Connected to G0 via PTC fuse
Relay			Air control Delay 15 minutes after start.
	Closed	< 30 ppm CO < 1400 ppm CO_2	The green LED is lit
	Open	> 35 ppm CO > 1500 ppm CO_2	The relay is open in alarm situations and at power loss. The red LED is lit and the green is not lit.
OUT4 Open collector	Open	No error detected AND normal gas concentrations	Error status Delay 15 minutes after start.
	Closed	Error detected OR high gas concentrations	The red LED is lit if an error OR high gas concentrations are detected. If an error is detected also the yellow LED is lit

Default configuration of *mSENSE III* *.*
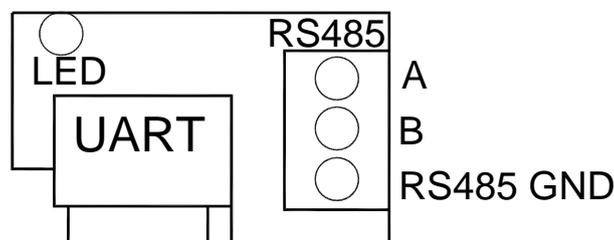
Output Configurations

A label on the outside of the sensor lid shows the configuration of the outputs at the time of product delivery. The sensors/controllers are supplied from the factory (unless otherwise ordered) with 0...10VDC linear outputs for OUT1 and OUT2. OUT4 is an open collector output (see *Table II*). If different output configurations are needed for the application, these have to be reconfigured before the unit is powered up. Default values are 0-10 V.

Jumper	Position	Function
Start point selection jumper	0%	Jumper top position provides 0Vdc or 0mA start point for OUT1, OUT2 (0-20mA or 0-10V).
	20%	Jumper bottom position provides 2Vdc or 4mA start point for OUT1, OUT2 (4-20mA or 2-10V).
Communi-cation selection jumper	MB	Jumper top position provides Modbus communication protocol
	SA	Jumper bottom position provides SenseAir communication protocol
OUT1	Current	Connection in position "Current" provides 0/4-20mA output range for OUT1.
	Voltage	Connection in position "Voltage" provides 0/2-10VDC output range for OUT1.
OUT2	Current	Connection in position "Current" provides 0/4-20mA output range for OUT2.
	Voltage	Connection in position "Voltage" provides 0/2-10VDC output range for OUT2.
OUT4	Voltage	Connection in position "Voltage" provides 0-10VDC for OUT4.
	Open collector	Connection in position "Open collector" provides an open collector output. Max 0,5A, 55VDC / 40VAC (half-wave rectifier).

Configuration jumpers for mSENSE III

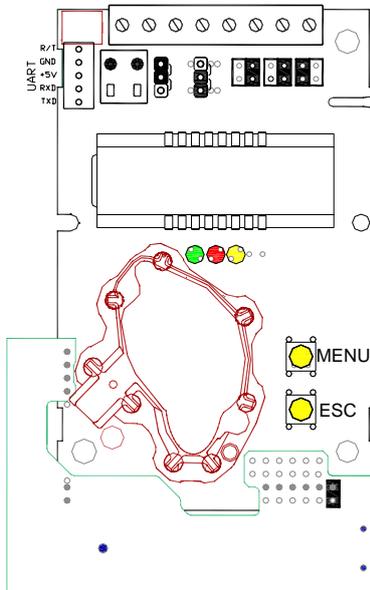## Option Network Adapter for Connection to RS-485-Network
The network adapter to RS-485-network can be mounted on the PCB. The green LED flashes every time the adapter answers calls from the network master.
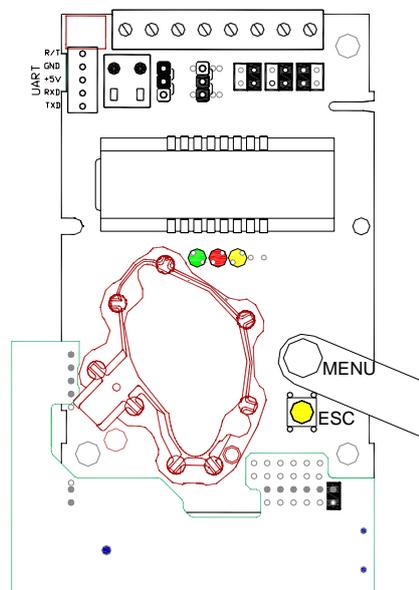

The adapter is put on the UART connector with all five pins connected. All five pins of the UART must be connected. The adapter should be mounted with the RS-485 terminal facing the other terminals and the LED facing the display.
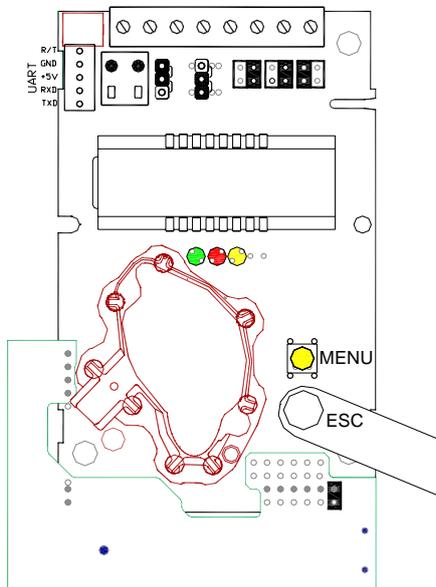
Push Button Operation

This sensor has two push buttons, MENU and ESC. The YELLOW LED will acknowledge a successful push by a short flash. The push button MENU is available for selection of display value or maintenance commands, whereas ESC is available to escape back from a selected level.
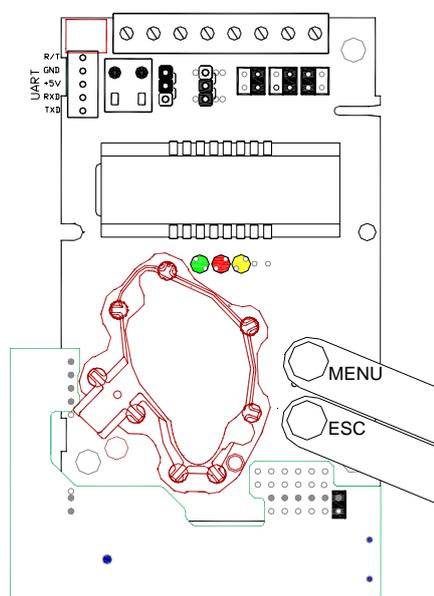

The sensor with push buttons
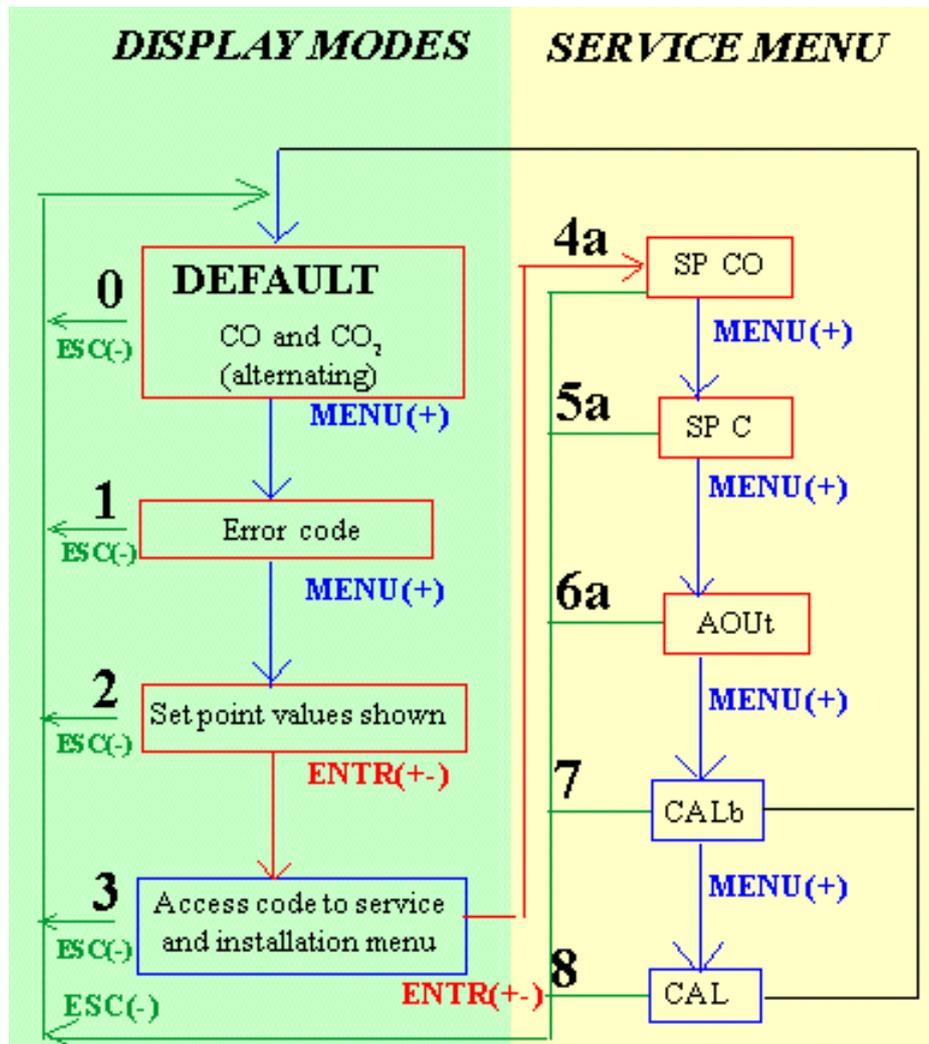

The push button MENU is pushed

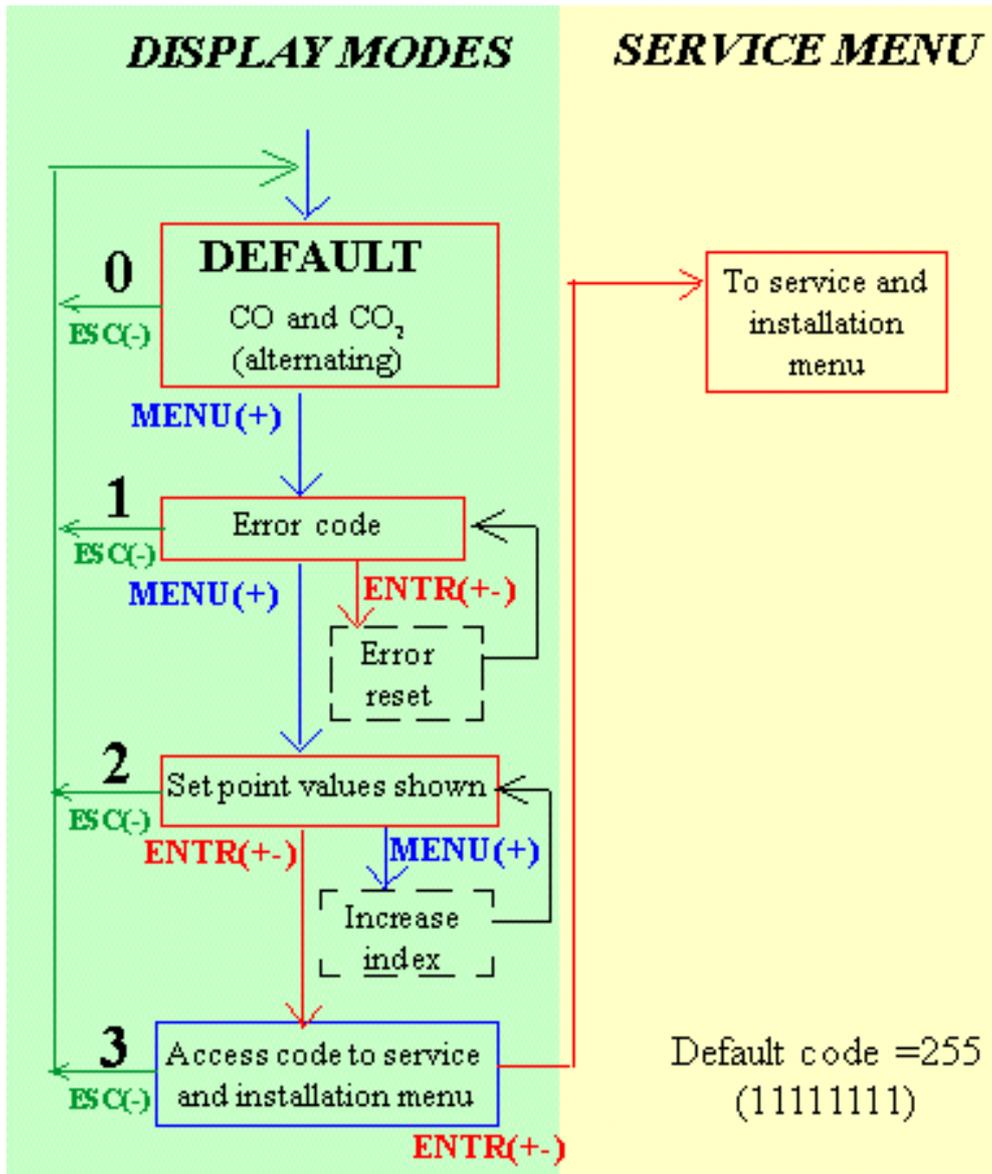*The push button MENU is pushed*

The ENTER command is done by pushing buttons MENU and ESC at the same time for about 14 seconds

Display modes

In DISPLAY MODE the *DEFAULT* operation is that the sensor alternates between *carbon dioxide and carbon monoxide readings* presentation. The push button MENU(+) is used to select the indicated value on the display to be *the error code* or *the set points of temperature and CO$_2$* After power up the display will always return to the Default display mode. If a *permanent change* of default values is requested the PC software is to be used.

Main steps of the push button menu
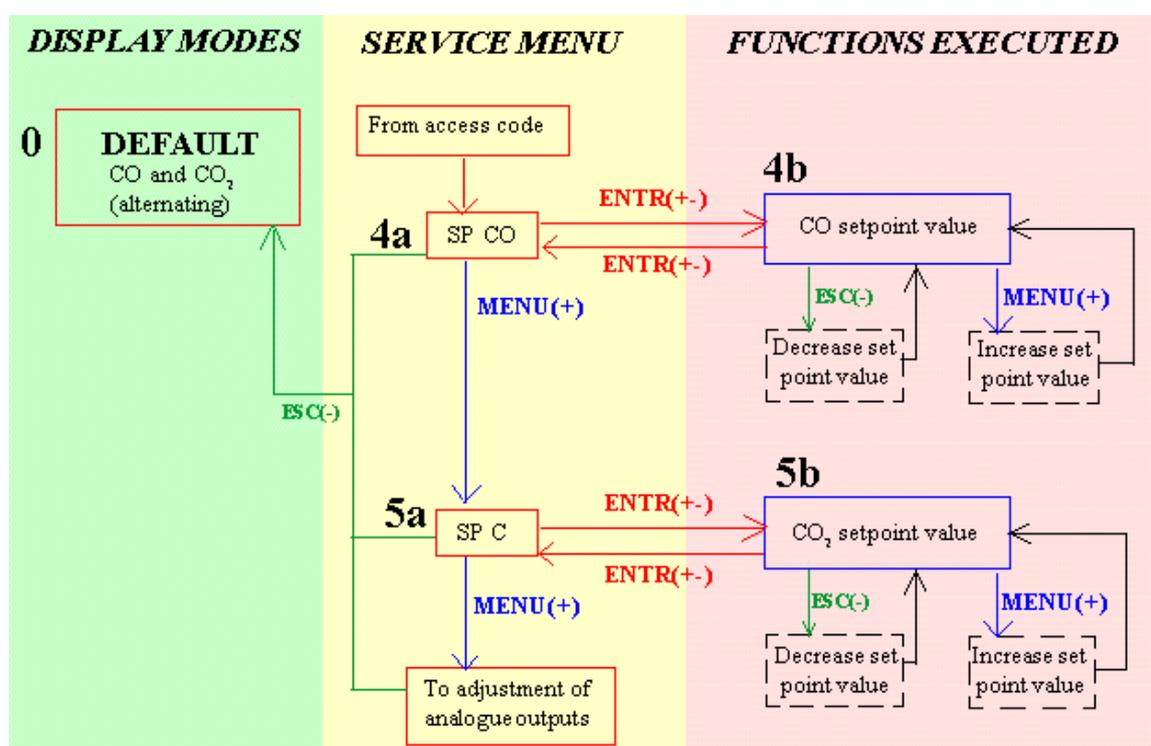
The display menu without code

Function Line	Display	Time limit	Function description
0	CO / CO_2	no	DEFAULT - Normal operation
1	Exxx	yes	Error code. If no error has been detected the code E0 is shown. The error code is reset with Entr(+-).
2	Present CO and CO_2. set points	no	Toggle between display of temperature and CO_2 set point with MENU(+).
3	ECxx	yes	Access code to the **service menu** The default value of the code is 255 (=11111111, that is eight presses on MENU(+)). Press down MENU(+) and let it scroll until it stops. The last two digits of the code are shown. Then ENTER to accept the selected code.

Table III. *On the display without entering the maintenance menu*
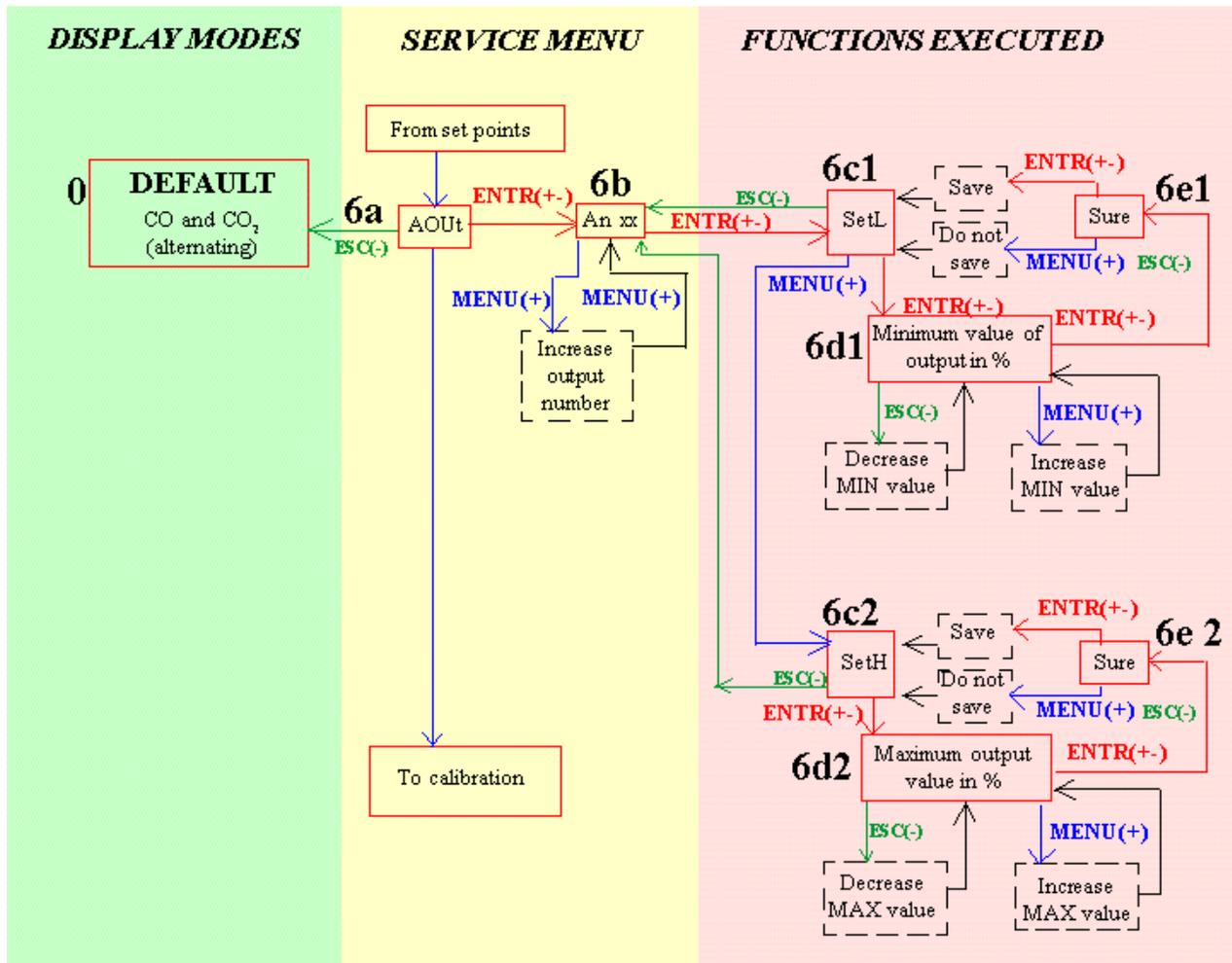
Maintenance level

A number of execution options are available from the MAINTENANCE MENU (see Table IV). This level is accessed only from the display mode in the **set points of CO and CO$_2$** selection. A two buttons push and an access code restricts access, intended for competent trained service personnel only. The Entr(+-)command is done by PUSHING MENU AND ESC AT THE SAME TIME (hold down for about 10 seconds). The access code has eight binary digits; one press at MENU(+) equals 1 and one press at ESC(-) equals 0. The code value can be changed for your personal choice from the software UIP 4.0.

Always use the ESC button to return to the DEFAULT mode. Several pushes of the ESC button may be needed to return to the DEFAULT mode. The **Entr(+-)** push (MENU & ESC) eventually leads to execution of functions, which causes temporary or permanently change of any parameter, that affects the system outputs!

Function Line	Display	Time limit	Function description
4a	SPCO	yes	For setting the **set point** of the **CO** concentration.
4b	The present CO set point	yes	For **increase / decrease** of the **CO set point.** The set point is increased by stepping with MENU(+) button. Decreasing is done by stepping with the ESC(-) button.
5a	SPc	yes	For setting the **set point** of the **CO$_2$** concentration
5b	The present CO$_2$ set point	yes	For **increase / decrease** of the **CO$_2$-concentration set point** The set point is increased by stepping with MENU(+) button. Decreasing is done by stepping with the ESC(-) button.

Table IV. *Maintenance functions available on mSENSE III to set output limits. Time limit refers to an internal time-out that returns the LCD and maintenance function back to normal. ENTER is a simultaneous pressing on MENU and ESC.*

Part of the service menu for setting the MAX and MIN values.

6a	AOUt	yes	First step of adjusting the analogue outputs MAX and MIN values
6b	An xx	no	Select analogue output by stepping with MENU(+) button
6c1	SetL	no	Leads to adjustment of the MIN value.
6d1	The present MIN value in % of FS	no	Increase the MIN value by stepping with the MENU(+) button. Decrease by stepping with the ESC(-) button. The output is set to the MIN value and can be checked with a multimeter.
6e1	Sure	no	The adjustment is saved by pressing Entr(+-). Press ESC to return without saving.
6c2	SetH	no	Leads to adjustment of the MAX value
6d2	The present MAX value in % of FS	no	Increase MAX value by stepping with the MENU(+) button. Decrease by stepping with the ESC(-) button. The output is set to the MAX value and can be checked with a multimeter.
6e2	Sure	no	The adjustment is saved by pressing Entr(+-). Press ESC to return without saving.

PLEASE NOTE! If a power failure happens when the sensor has OUT1...4 locked to min/max limits, then the sensor will have this output locked when the power returns. It is necessary to enter this menu item and release the output manually!
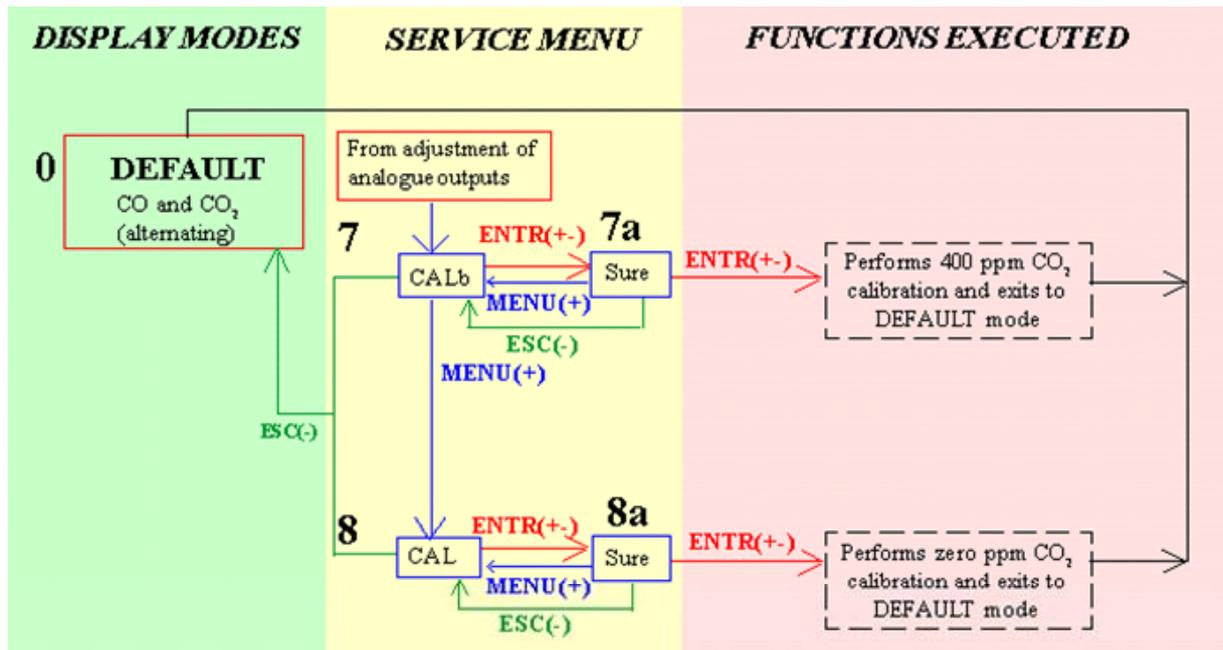
<u>EXAMPLE I:</u>

Setting of the MAX value of the analogue outputs

The access code is time limited. If the time limit is exceeded the sensor returns to DEFAULT.

ENTR =MENU(+) and ESC(-) are pushed simultaneously.

1.   At the start of the setting the sensor is in DEFAULT.

2.   Push MENU(+) once to reach the error code. The display shows E + the error code number. No error is shown as E000.

3.   Push MENU(+) once. The display shows the CO set point e.g. 35.

4.   Push ENTR(+-) once. The display shows EC and two digits. Enter the access code to the service menu. If the default code is used do like this: Push MENU(+) until the digits stop. The display shows EC55. If the correct code is not entered before the time limit exceeds the sensor returns to DEFAULT.

5.   Push ENTR(+-) once. The display shows SPCO to set the CO set point.

6.   Push MENU(+) once to reach the carbon dioxide set point. The display shows SP C.

7.   Push MENU(+) once to reach the setting of analogue outputs. The display shows AOUt.

8.   Push ENTR(+-) to reach the output to be set. The display shows An and two digits e.g. An 01. Step to the requested output by pushing MENU(+).

9.   Push ENTR(+-) to reach the setting of the MIN value. The display shows Set L.

10.   Push MENU(+) to reach the setting of the MAX value. The display shows Set H.

11.   Push ENTR(+-) to set the MAX value of the output. The display shows the numerical value in % e.g. the standard setting100.0 % or previously set value. Push MENU(+) to increase the MAX value. Push ESC(-) to decrease the MAX value. Push ENTR(+-). The display shows Sure. Push ENTR(+-) to save the setting and return to Set H. Push MENU(+) or ESC(-) to return to Set H without saving the new setting. Push ESC(-) to return to the output to be set, item 12.Push ESC(-) once again to return to the setting of analogue outputs item 11.

The calibration part of the service menu.

7	CALb	yes	**Background calibration of the CO sensor and the CO_2-sensor with fresh air**. An easy way to correct the zero point error. The sensor needs fresh air (380-420 ppm CO_2). The calibration must be confirmed by pressing Entr(+-). The CO_2 sensor is calibrated to 400 ppm CO_2 and the CO sensor to 0 ppm CO.
7a	Sure	yes	Confirm that a background calibration shall be done.
8	CAL	yes	**Zero point calibration** of the CO sensor and the CO_2 sensor. The sensor needs zero gas. See the zero point calibration instruction. The calibration must be confirmed by pressing Entr(+-).
8a	Sure	yes	Confirm that a zero point calibration shall be done.

EXAMPLE II:

Setting of set points for carbon monoxide concentration and carbon dioxide concentration, the MAX and MIN values of the analogue outputs and calibration of the sensor

The access code and the recalibration of the sensor are time limited. If the time limit is exceeded the sensor returns to DEFAULT.

ENTR =MENU(+) and ESC(-) are pushed simultaneously.

1.   At the start of the setting the sensor is in DEFAULT.

2.   Push MENU(+) once to reach the error code. The display shows E + the error
        code number. No error is shown as E000.
        (Push ESC(-) to return to DEFAULT if requested

3.   Push MENU(+) once. The display shows the CO set point e.g.
        35 ppm and the carbon dioxide set point e.g. 750ppm.
        (Push ESC(-) to return to DEFAULT if requested.)

4.   Push ENTR(+-) once. The display shows EC and two digits. Enter the access
        code to the service menu. If the default code is used do like this:
        Push MENU(+) until the digits stop. The display shows EC55.
        If the correct code is not entered before the time limit exceeds the sensor returns
        to DEFAULT.

5.   Push ENTR(+-) once. The display shows SPCO to set the carbon monoxide set point.

6.   Push ENTR(+-) once. The display shows the carbon monoxide set point e.g. ex 35
        ppm. Push MENU(+) to increase the set point value in steps of 1 ppm.
        Push ESC(-) to decrease the set point value in steps of 1 ppm.

7.   Push ENTR(+-) once when the set point is set. The display shows SPCO.
        Push ESC(-) to return to DEFAULT.

8.   Push MENU(+) once to reach the carbon dioxide set point.
        The display shows SP C.

9.   Push ENTR(+-) once. The display shows the carbon dioxide set point e.g. 750 ppm.
        Push MENU(+) to increase the set point value in steps of 50 ppm.
        Push ESC(-) to decrease the set point value in steps of 50 ppm.

10.   Push ENTR(+-) once when the set point is set. The display shows SP C.
        Push ESC(-) to return to DEFAULT.

11.   Push MENU(+) once to reach the setting of analogue outputs.
        The display shows AOUt.

12.   Push ENTR(+-) to reach the output to be set. The display shows An and two digits e.g.
        An 01. Step to the requested output by pushing MENU(+).

13.   Push ENTR(+-) to reach the setting of the MIN value. The display shows Set L.

14.   Push ENTR(+-) to set the MIN value of the output. The display shows the numerical
        value in % e.g. the standard setting 0.0 % or previously set value. Push MENU(+) to
        increase the MIN value. Push ESC(-) to decrease the MIN value. Push ENTR(+-). The
        display shows Sure. Push ENTR(+-) to save the setting and return to Set L. Push
        MENU(+) or ESC(-) to return to Set L without saving the new setting.

15.   Push MENU(+) to reach the setting of the MAX value. The display shows Set H.

16.   Push ENTR(+-) to set the MAX value of the output. The display shows the numerical
        value in % e.g. the standard setting 100.0 % or previously set value. Push MENU(+)
        to increase the MAX value. Push ESC(-) to decrease the MAX value. Push ENTR(+-).
        The display shows Sure. Push ENTR(+-) to save the setting and return to Set H. Push
        MENU(+) or ESC(-) to return to Set H without saving the new setting. Push ESC(-) to

return to the output to be set, item 12.Push ESC(-) once again to return to the setting of analogue outputs item 11.

17. Push MENU(+) to reach the calibration with fresh air. The sensor needs fresh air, air with 400 ppm carbon dioxide. The display shows CALb. Push ENTR(+-). The display shows Sure. Push ENTR(+-) to confirm that a background calibration should be done. After completed background calibration the sensor returns to DEFAULT. If a background calibration should not be executed push MENU(+) or ESC(-). The background calibration has a time limit.

18. Push MENU(+) to reach the zero point calibration. The sensor needs carbon dioxide free air or gas. . The display shows CAL. Push ENTR(+-). The display shows Sure. Push ENTR(+-) to confirm that a zero point calibration should be done. After completed zero point calibration the sensor returns to DEFAULT. If a zero point calibration should not be executed push MENU(+) or ESC(-). The zero point calibration has a time limit.

Functional test

The unit has three LED's – green, yellow and red. These LED's indicate the status of the controller. An internal delay function prevents the alarm functions of the relay and OUT4 output during 15 minutes after power up. The alarm outputs may be tested after the 15 minutes delay

Green LED - "No alarm situation" is lit, when the relay is contact closed.

Yellow LED - "Call for maintenance" is lit, if an error flag is set or the measurement is out of range. This information is also shown on the display by the wrench icon. Any push button press, or executed maintenance function, is acknowledged by emission from this LED. If an error has been detected both the yellow and red LEDs are lit.

Red LED - "Alarm high gas concentrations" is lit, when the open collector output is activated (contact closed). The CO concentration is 35 ppm or more OR the CO_2 concentration is 1500 ppm or more OR if the yellow LED is lit.

A simple and visual functional test can easily be performed. Take a breath and blow the air from a distance of a few centimetres on the sensor. The sensor will detect a rapid increase in the carbon dioxide concentration.

If cigarette smoke is blown into the sensor there is also a registration of increased CO level. The CO sensor reacts much slower (several minutes).

The red LED is lit and the green LED is turned off when the CO or CO_2 concentration goes above the pre-set value. If the sensor is connected to a controller, the flow of the ventilation system will eventually increase by change of the fan speed or opening of a damper actuator.
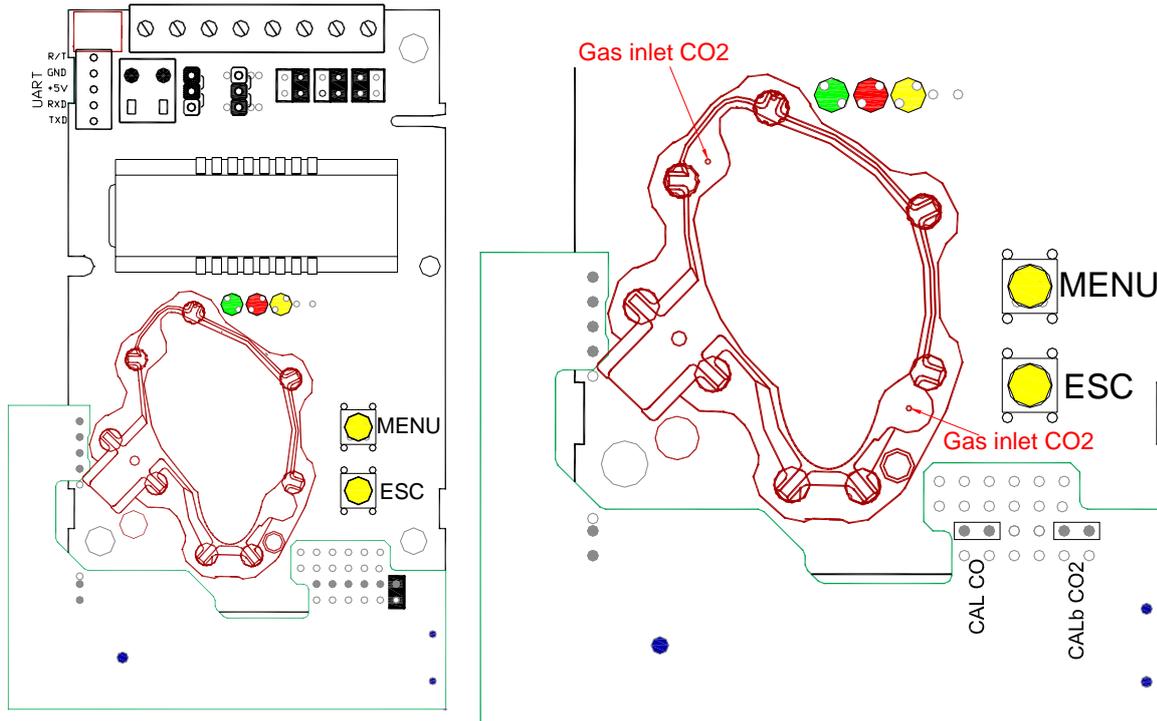
Test gas verification

If the measurement of a sensor is to be verified, a test gas with carefully determined concentration of CO and CO_2 must be used. For zero calibration pure nitrogen or air that has passed through a chemical absorber should be used. In fresh air the carbon monoxide concentration is nearly zero. The Zero calibration bag can be used to produce carbon dioxide free air. Check the CO and CO_2 values of the display or the voltage of the output 1 for CO and the voltage of the output 2 for CO_2 with a multimeter when the values have stabilized.

When a zero calibration shall be executed a plastic tube with 2,2 mm outer diameter and 0,8 mm inner diameter shall be inserted in marked holes of the sensor. A plastic tubing is connected to the tube. The gas flow should be between 0,3 and 1,0 l/min.

When a calibration is executed the yellow LED flashes. A calibration will only be executed if the gas concentration is stable. If the yellow LED does not flash after 8 seconds no calibration has been executed. Then try to do another calibration.

Marking	Function
CALb CO2	**Background calibration = CO_2 sensor calibration with fresh air**. An easy way to correct the zero point error. The sensor needs fresh air (380-420 ppm CO_2). The CO_2 sensor is calibrated to 400 ppm CO_2.
CAL CO	**Zero point calibration** of the CO sensor with fresh air. The CO sensor is calibrated to 0 ppm CO

Gas inlet CO2

R/T
GND
UART +5V
RXD
TXD

MENU

ESC

MENU

ESC

Gas inlet CO2

CAL CO

CALb CO2

PLEASE NOTE!
The sensor accuracy is defined at continuous operation (at least 3 weeks after installation)

Self diagnostics

The system contains complete self diagnostic procedures. A full system test is executed automatically every time the power is turned on. For *mSENSE III* the internal voltage regulators and outputs are checked. In addition, constantly during operation, the sensor probes are checked against failure by checking the valid dynamic measurement ranges. These different system checks return error bytes to the system RAM. If any error is detected, the yellow LED will be lit until the error has vanished and the error flag is reset. "Warm up" and "Out of Range" are the only bits that are reset automatically after return to normal state. All other error bits have to be reset manually after return to normal state – either by pushing MENU & ESC buttons simultaneously for (=Entr(+-) or by power off and restart.

By pushing the push button "MENU" the error code *number Exxx* is shown on the LCD. Descriptions of the different codes are listed below.

Error code and action plan

Bit #	Error code	Error description	Suggested action
0	N/A	**Fatal Error** Yellow LED continuously flashes. Push buttons are not operating.	Try to restart sensor by power OFF/ON. Contact local distributor
1	2	**Reserved**	
2	4	**Algorithm Error**. Indicate wrong EEPROM configuration.	Try to restart sensor by power OFF/ON. Check detailed settings and configuration with UIP software version 4.3 and higher. Contact local distributor
3	8	**Output Error** Detected errors during output signals calculation and generation.	Check connections and loads of outputs. Check detailed status of outputs with UIP software version 4.3 and higher.
4	16	**Self Diagnostic Error**. May indicate the need of zero calibration or sensor replacement.	Check detailed self diagnostic status with UIP software version 4.3 and higher. Contact local distributor
5	32	**Out Of Range Error** Accompanies most of other errors. Can also indicate overload or failures of sensors and inputs. Resets automatically after source of error disappearance.	Try sensor in fresh air. Check connections of temperature and relative humidity probe. Check detailed status of measurements with UIP software version 4.3 and higher. ***See Note 1**!*
6	64	**Memory Error** Non fatal error during memory operations.	Check detailed settings and configuration with UIP software version 4.3 and higher.
7	128	**Warm Up state** Is always set after power up or power failure. Resets after restart sequence	If it doesn't disappear in half a minute, check power stability.

Table V. *Error codes*

Note 1. *Any probe is out of range. Occurs, for instance, during over exposure of CO_2 sensor, in which case the error code will automatically reset when the measurement values return to normal. Could also indicate the need of zero point calibration. A background calibration using push button function "bCAL" will cure this error (a more exact zero calibration using "CAL" may be performed later, if required). If the CO_2 readings are normal, and still the error code remains, the temperature or relative humidity sensor can be defect or the connections to these are broken.*

**Please remark*: If several errors are detected at the same time the different error code numbers will be added together into one single error code!*

Maintenance

The *mSENSE III* is basically maintenance free. An internal self adjusting calibration function takes care of normal long term drift associated to the CO and CO_2 sensor. To secure the highest accuracy, a time interval of five years is recommended between CO_2 calibrations, unless some special situations have occurred. A zero calibration can be performed by use of the push button functions, or for a complete overview by use of a PC together with the *UIP software version 4.3* (or higher). This software can be obtained from Calectro free of charge. The RS232-cable, article code *A232 CABLE*, is needed and can be ordered from Calectro. The cable is to be connected to the UART port slide connector. For change of control parameters and re-calibration (CO_2 and temperature) this PC tool has to be used. The check can be done on site without interfering with the ventilation system.

This product is in accordance with the EMC 2004/108/EC, 92/31/EEG including amendments by the CE-marking Directive 93/68/EEC
The product fulfils the following demands: EN 61000-4-2 level 2, EN 61000-4-3 level 2,
EN 61000-4-4 level 4, EN 61000-4-6, EN 61000-4-8 level 4, EN 55022 class B

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