DETECT IAQ a

Instructions for Use

Symbol explanation

Symbols on the machine.

This product complies with applicable EU directives.

$C\mkern-2mu\epsilon$

Symbols in this user manual

Warning/Caution!

Application area

DETECT IAQ is a controller that has been designed to detect, check, measure and control carbon dioxide accumulations and temperature in room areas or ventilation ducts.

The product may not be used for anything other than its intended use.

General

Read through the entire instructions for use before you install/use the product and save the instructions for future reference. It's not permissible to make changes or modifications to this product other than those specified in this document.

Protective equipment

Always use appropriate personal protective equipment for the work in question, in the form of gloves, respirators and protective glasses during handling, installation, cleaning and service/maintenance.

Electrical safety

Permitted voltage, see "Electrical data". It is not permissible to insert foreign objects into the product's contactor connections or the electronics's ventilation openings; risk for short circuiting.

24 V isolation transformer to be connected should comply with the provisions of IEC 61558-1.

Cable sizing must be carried out for cabling between the product and the power supply source.

Disconnect the power supply when working on products that are not required to run in production.

Always follow the local/national rules for who shall be permitted to carry out this type of electrical installation.

Handling

• The product must be handled with care.

Installation

• Moist, cold and aggressive environments must be avoided.

• Avoid installing the product near a heat source.

• Assemble the product according to applicable industry regulations.

• Install the product for easy access during service/maintenance.

• If the product is mounted above a fixed ceiling, the inspection hatch must be located so that the product is accessible for inspection.

• Check to make sure that the product doesn't have any visible defects.

• Check that the product is properly secured after it has been installed.

• Check that all cables are properly secured in place after installation.

The document was originally written in Swedish

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Installation

DETECT IAQ should ideally be mounted between 1.5 to 1.8 m above the floor on the surface of a wall using screws, see figure 1.

The installation position needs to be selected with care to eliminate fault factors that can affect the measurement.

The sensor should not be exposed to sunlight, draughts or temperature differences caused by external walls.

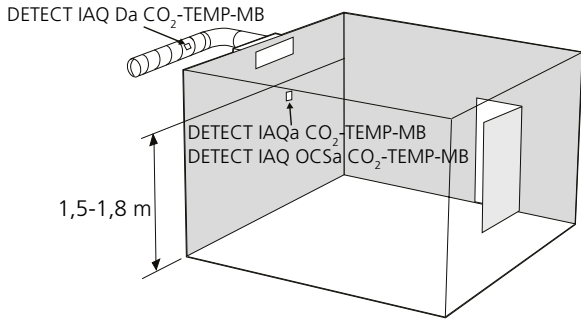DETECT IAQ Da CO_2-TEMP-MB is installed in a ventilation duct.
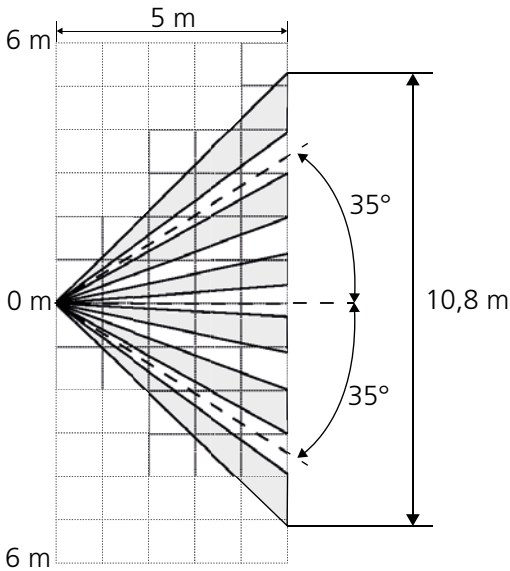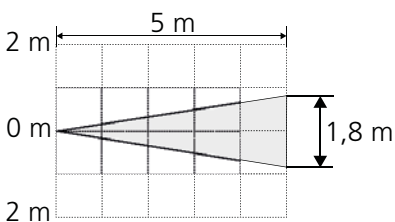

Figure 1. Recommended installation in a room or duct.

Coverage for PIR detection in DETECT IAQ OCSa CO_2-TEMP-MB

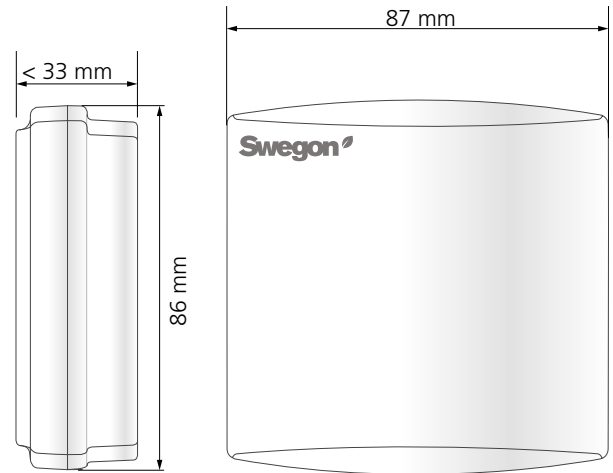**Horizontal**

Vertical

Dimensions

Figure 2. Dimensions, DETECT IAQa CO_2-TEMP-MB and DETECT IAQ OCSa CO_2-TEMP-MB.
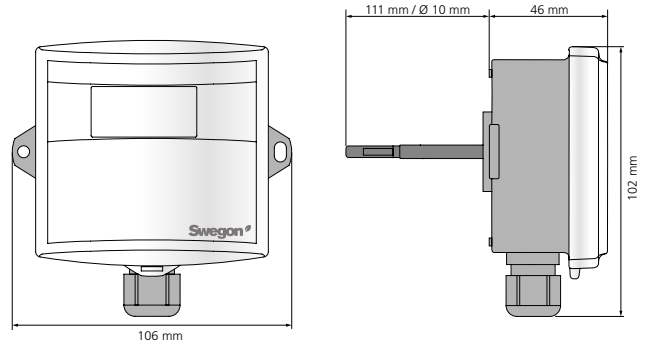

Figure 3. Dimensions, DETECT IAQ Da CO_2-TEMP-MB.

Connections

24 Vac/dc → G
0 Vac — G0
0... 10 V, CO_2 0-2000ppm ◄ Y1
0... 10 V, temperature, 0-50 °C ◄ Y2
— Y3
0... 10 V, controller output 700ppm, 22°C ◄ Y4
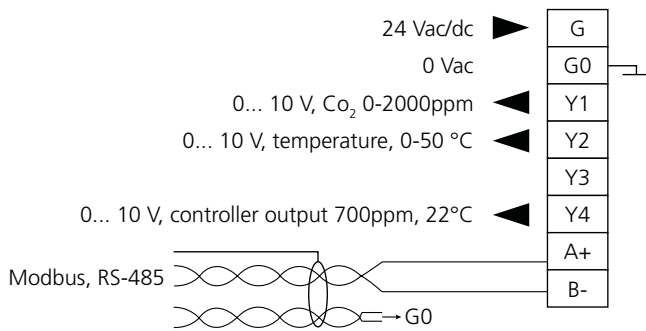— A+
Modbus, RS-485 — B-
→ G0

Figure 4. Connection.

Note: The CO_2 measurement causes a current peak for the power supply voltage. This can result in faults in the analogue output signal when using long and thin cables. It is recommended to increase the cable cross-section when using long cables (for example by using more strands) to guarantee a reliable measurement signal.

Calibration

ABCLogic™ (Automatic Background Calibration Logic) is a patent-protected technology for self-calibration. The ABCLogic™ method eliminates drifting of the measurement value in the event of long-term operation. The ABCLogic™ method can be used when the CO_2 content falls at least twice within a week, to a level of approx. 400 ppm. For this reason, ABCLogic™ is effective in areas that are not in constant use.

ABCLogic™ can be disabled in areas that are used continuously with the aid of DETECT IAQa TOOL. If the ABCLogic™ method is not used, the device should be calibrated at 6-12 month intervals.

The recommended calibration interval is 5 years, even when using ABCLogic™.

DETECT IAQa TOOL

Using DETECT IAQa TOOL, it is possible to change the product's settings, such as the controller and Modbus settings.

Connection to DETECT IAQa TOOL

1. Open the lid.
2. Connect the cable for DETECT IAQa TOOL to the connector, see figures 5 and 6 below.
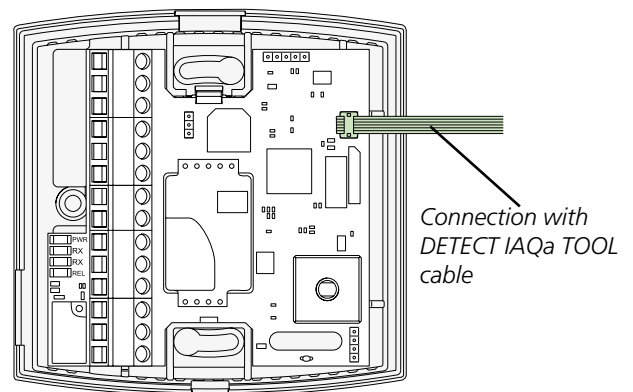

Connection with DETECT IAQa TOOL cable

Figure 5. Connection of DETECT IAQa TOOL to DETECT IAQa CO_2-TEMP-MB and DETECT IAQ OCSa CO_2-TEMP-MB. Note: For connection to DETECT IAQ OCSa CO_2-TEMP-MB, remove the circuit board for the occupancy sensor.
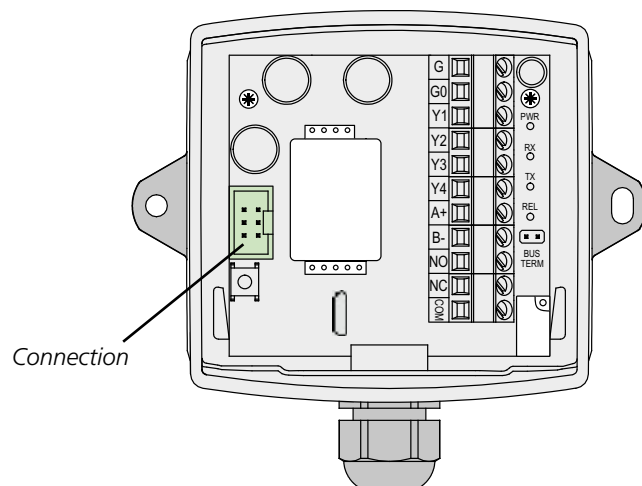
Connection

Figure 6. Connection of DETECT IAQa TOOL to DETECT IAQ Da CO_2-TEMP-MB.

DETECT IAQ

DETECT IAQa TOOL menu

The menu is opened by pressing the M-button on DETECT IAQa TOOL. Change the values using the "+" and "-" buttons. Note that the menu is specific for each unit and that the content is dependent on the unit and the installed options.

The following menu structure contains the factory settings.

Measurement — 900 ppm

Modbus menu — COMMUNICATIONS → 1 MODBUS ID → 19.2 Baud rate (k) → E Parity

Calibration menu — CALIBRATION → 0 Offset: CO2ppm → On ABC-logic → 0.0 Offset: °C

Output menu — OUTPUT → 0-10V Y1-Y4 range → Direct Output mode → OFF Fixed output → 100% Fixed output → 12h Deactivation

PIR menu* — PIR SENSOR → Enabled PIR-Control → 3 Act.delay (m) → 15 Deact.delay (m)

Controller menu — CONTROLLER → Cont OFF / Cont CO2 → PI Control mode / P Control mode → 300 Integr. time s → 700 CO2 Setpoint → 500 CO2 Propor. band

Cont TEMPERATURE → PI Control mode / P Control mode → 300 Integr. time s → 22.0 °C Setpoint → 2.0 °C Propor. band

Cont MAXIMUM CTRL → PI Control mode / P Control mode → 300 Integr. time s → 700 CO2 Setpoint → 500 CO2 Propor. band → 22.0 °C Setpoint → 2.0 °C Propor. band

Info menu — INFO → 1.0.0 VERSION → (−) 5 s → no RESET?

*DETECT IAQ OCSa CO_2-TEMP-MB

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Communications menu

The menu is used to change the Modbus settings.

```
┌──────────────┐  OK   ┌──────────────┐  OK   ┌──────────────┐  OK   ┌──────────────┐  OK
│              │──────▶│ 1            │──────▶│ 19.2         │──────▶│ E            │──────┐
│ COMMUNICATIONS│       │ MODBUS ID    │       │ Baud rate (k)│       │ Parity       │      │
└──────────────┘       └──────────────┘       └──────────────┘       └──────────────┘      │
    M                   Modbus address         Modbus speed (kbit/s)  Parity bit [N/E/O]
                        [OFF / 1…247]          [9.6 / 19.2 / 38.4 / 56.0 / 57.6   [None/Even/Odd]
                                               / 76.8 /115.2]
```
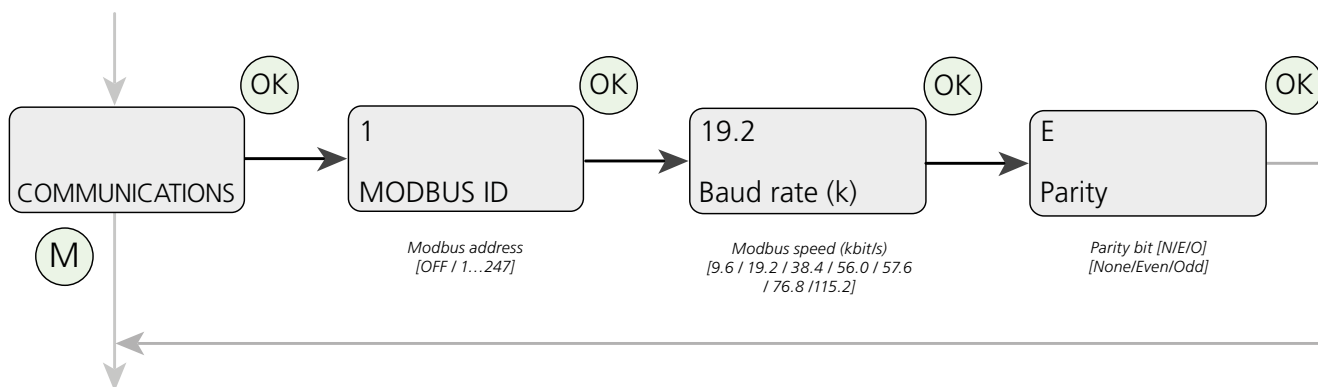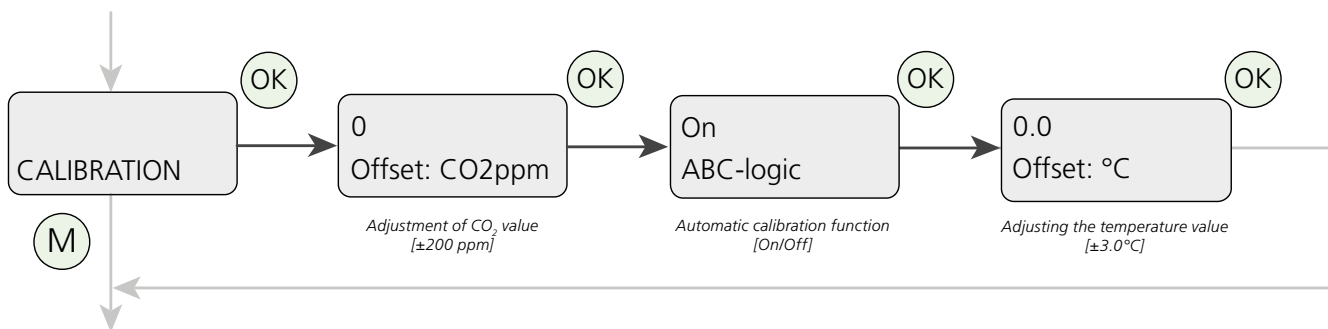
Calibration menu

The Calibration menu can be used to adjust all the values.

- Adjusting the CO_2 value is performed in steps of 10 ppm.
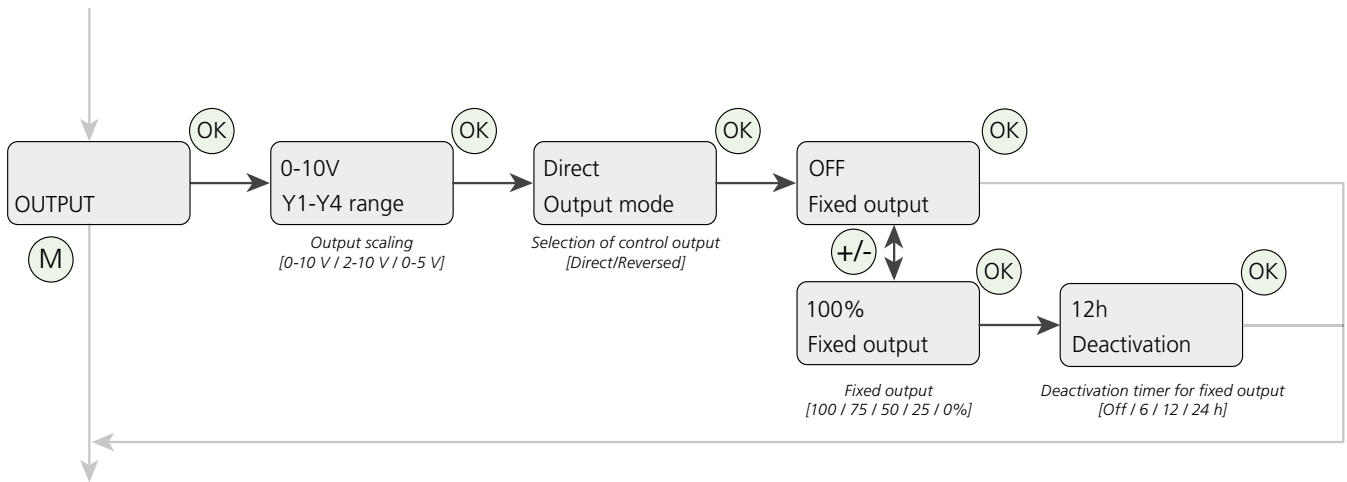- Adjusting the temperature value is performed in steps of 0.1°C.

The DETECT IAQa TOOL tool's display shows how much the relevant value has been adjusted.

Note: The adjustment value for CO_2 is not reset when the ABCLogic calibration is turned on or off.

```
┌──────────────┐  OK   ┌──────────────┐  OK   ┌──────────────┐  OK   ┌──────────────┐  OK
│              │──────▶│ 0            │──────▶│ On           │──────▶│ 0.0          │──────┐
│ CALIBRATION  │       │ Offset: CO2ppm│       │ ABC-logic    │       │ Offset: °C   │      │
└──────────────┘       └──────────────┘       └──────────────┘       └──────────────┘      │
    M                   Adjustment of CO₂ value  Automatic calibration function  Adjusting the temperature value
                        [±200 ppm]             [On/Off]               [±3.0°C]
```

Output signal

Output scaling for all outputs and the direction of the controller's output (Y4) can be changed with the aid of the output menu. The controller's fixed output signal value and the output signal's length can also be selected with the menu.
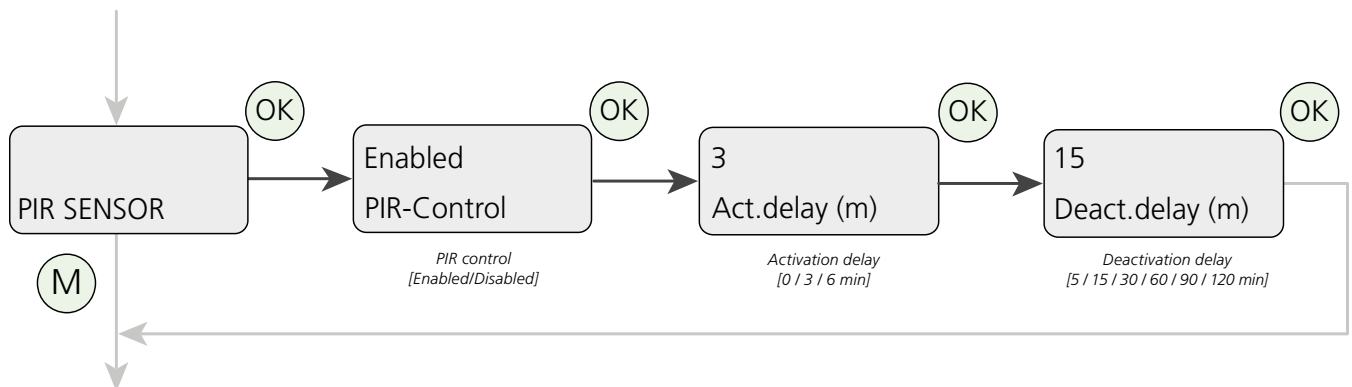
```
         OK              OK              OK              OK
OUTPUT ──▶  0-10V    ──▶  Direct    ──▶  OFF       ──▶
           Y1-Y4 range    Output mode     Fixed output
  M
           Output scaling   Selection of control output        +/-
           [0-10 V / 2-10 V / 0-5 V]   [Direct/Reversed]
                                                        100%      ──▶  12h          ──▶
                                                        Fixed output    Deactivation
                                                                                         OK        OK

                                                        Fixed output          Deactivation timer for fixed output
                                                        [100 / 75 / 50 / 25 / 0%]      [Off / 6 / 12 / 24 h]
```

PIR menu

The PIR menu is available to DETECT IAQ OCSa CO_2-TEMP-MB.

When the PIR Control parameter is enabled, the controller's output signal works if occupancy is detected. If no occupancy is detected, the controller's output signal is 0%.

You can also adjust the delay for PIR activation and deactivation using the menu.

```
             OK                OK                OK                  OK
PIR SENSOR ──▶  Enabled    ──▶  3          ──▶  15              ──▶
                PIR-Control     Act.delay (m)    Deact.delay (m)
  M
                PIR control      Activation delay        Deactivation delay
                [Enabled/Disabled]   [0 / 3 / 6 min]      [5 / 15 / 30 / 60 / 90 / 120 min]
```

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Controller menu

It is possible to regulate the output signal control, either according to a measurement value or according to a maximum number of values.

- Adjusting the CO_2 values is performed in steps of 10 ppm.
- Adjusting the temperature values is performed in steps of 0.1°C.
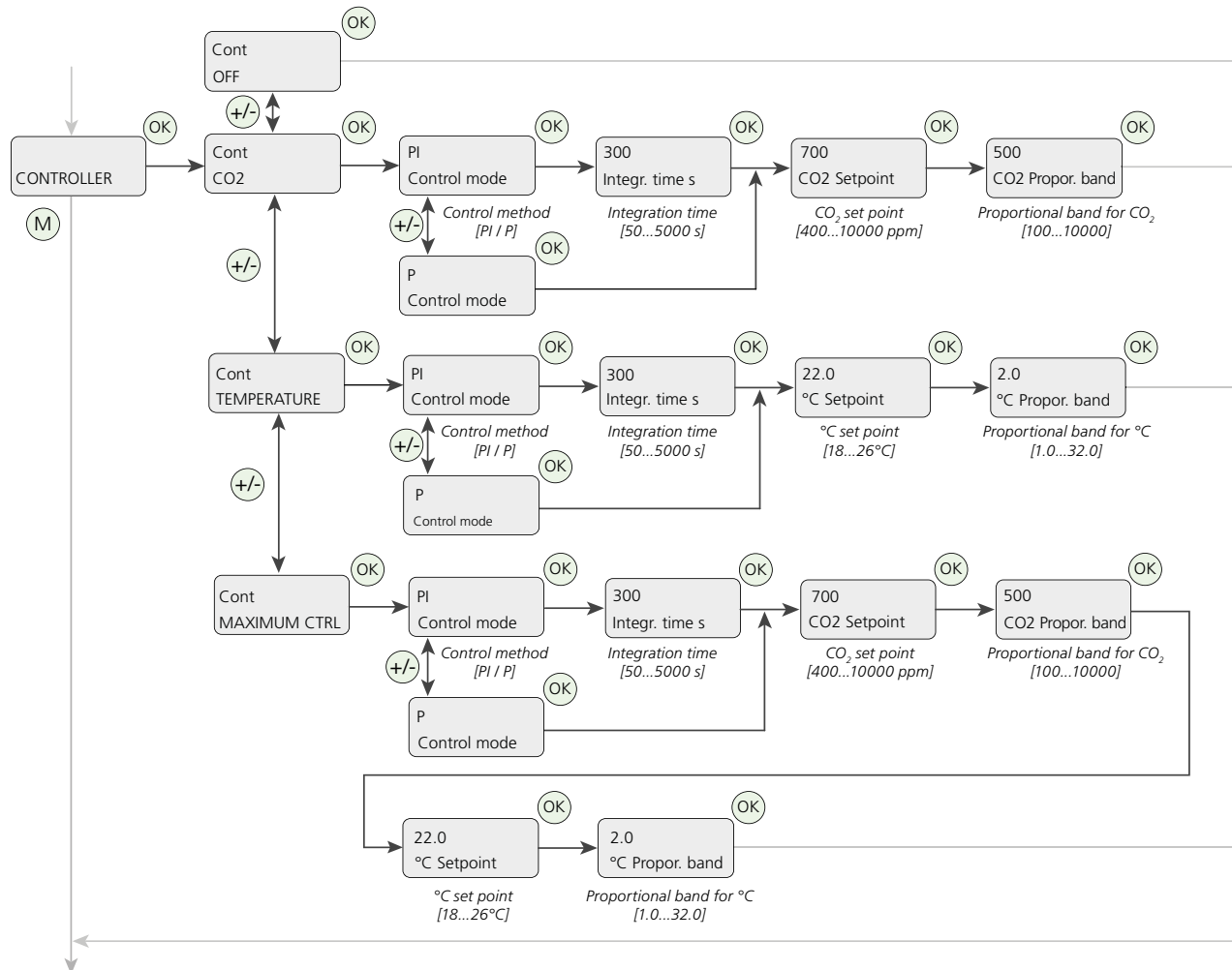
In the maximum option regulation, the controller's output signal is formed according to the dimensions that cause the largest value for the controller's output signal. For example:
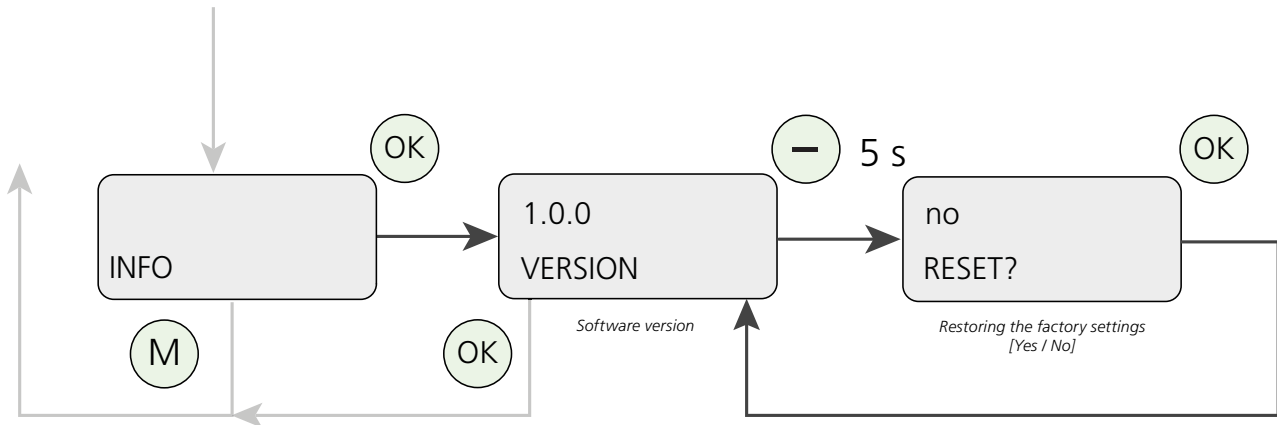
- The carbon dioxide concentration is 800 ppm.
- The temperature is 22.5°C.
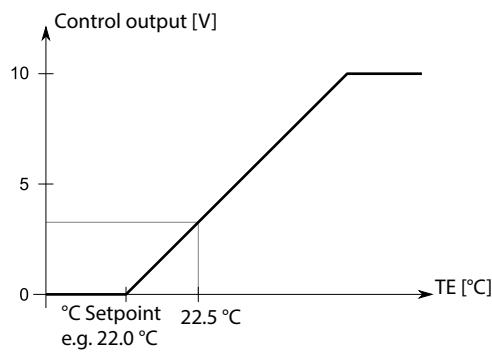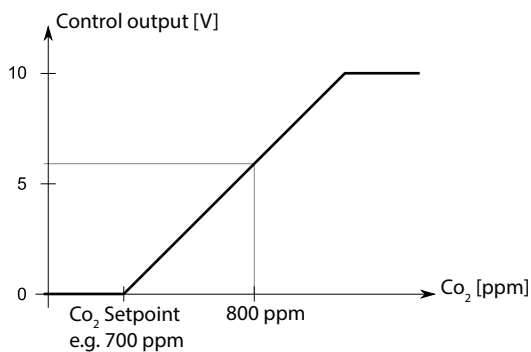
CO_2 = 6 V
Temperature = 3 V ⟫ ⟹ Control output = 6 V

Information menu

The menu is used to check the unit's software version and
to reset the unit's factory settings.

Modbus

Modbus properties

Protocol	RS-485 Modbus RTU
Modbus speed	9600/**19200**/38400/56000/57600/76000/115200 bps
Data bits	8
Parity	none/odd/**even**
Stop bits	1
Network size	up to 128 units per segment

The parameter memory's service life allows at least 1 million write cycles.

Termination of Modbus

Modbus is terminated through the placement of an MBUS
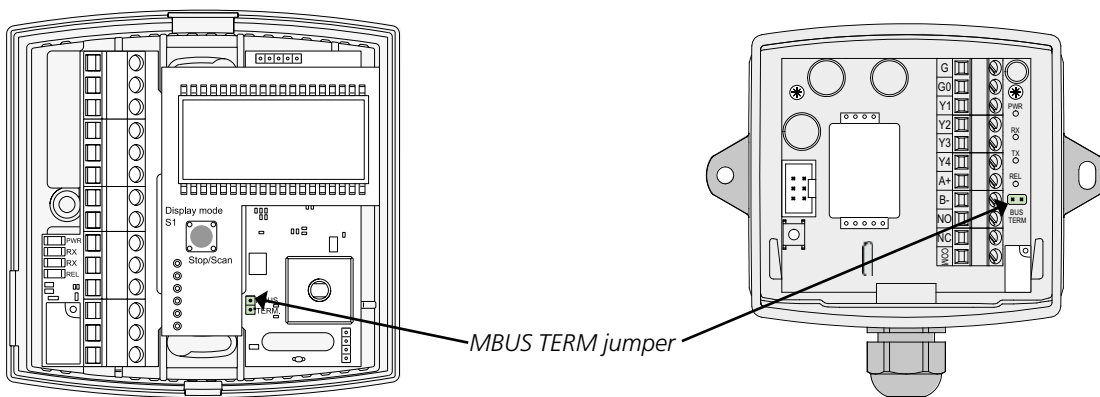TERM jumper, see figures 7 and 8 below.

Figure 7. Termination of Modbus in DETECT IAQa CO_2-TEMP-MB
and DETECT IAQ OCSa CO_2-TEMP-MB.

Figure 8. Termination of Modbus in DETECT IAQ Da CO_2-TEMP-MB.

Function codes for Modbus

The product supports the following function codes for Modbus.

0x01	Read coils
0x02	Read discrete inputs
0x03	Read holding registers
0x04	Read input registers
0x05	Write single coil
0x06	Write single register
0x0F	Write multiple coils
0x10	Write multiple registers
0x17	Read/write multiple registers

Modbus register

Note: If a parameter value is entered that exceeds the range for the parameter values, the value will be replaced with the nearest acceptable value.

For example: If 270 is entered in register 40011, the value will be replaced with 260.

Coils

Register	Parameter description	Data type	Values	Range	Default
1	Y1 output overdrive activation	Bit	0 - 1	0: OFF, 1: ON	0
2	Y2 output overdrive activation	Bit	0 - 1	0: OFF, 1: ON	0
3	Y3 output overdrive activation	Bit	0 - 1	0: OFF, 1: ON	0
4	Y4 output overdrive activation	Bit	0 - 1	0: OFF, 1: ON	0
7	Controller output direction	Bit	0 - 1	0: Direct 1: Reversed	0
8*	PIR controller	Bit	0 - 1	0: PIR controller off 1: PIR controller on	1

*DETECT IAQ OCSa CO_2-TEMP-MB

Discrete inputs

Register	Parameter description	Data type	Values	Range
10002*	PIR sensor state (immediate)	Bit	0 - 1	0: No detection 1: Detection
10003*	PIR sensor state (control)	Bit	0 - 1	0: OFF, 1: ON

*DETECT IAQ OCSa CO_2-TEMP-MB

Input registers

Register	Parameter description	Data type	Values	Range
30001	CO_2 measurement	Signed 16	400…10000	400…10000 ppm
30002	Temperature measurement	Signed 16	0…500	0.0…50.0°C
30004	Y1 output voltage	Unsigned 16	0…1000	0.00…10.00 V
30005	Y2 output voltage	Unsigned 16	0…1000	0.00…10.00 V
30006	Y3 output voltage	Unsigned 16	0…1000	0.00…10.00 V
30007	Y4 output voltage	Unsigned 16	0…1000	0.00…10.00 V

Holding registers

Register	Parameter description	Data type	Values	Range	Default
40001	Y1 output overdrive	Signed 16	0…1000	0…10.00 V	0
40002	Y2 output overdrive	Signed 16	0…1000	0…10.00 V	0
40003	Y3 output overdrive	Signed 16	0…1000	0…10.00 V	0
40004	Y4 output overdrive	Signed 16	0…1000	0…10.00 V	0
40005	CO_2 measurement tuning (offset)	Signed 16	-200…200	-200…200 ppm	0
40006	Temperature measurement tuning (offset)	Signed 16	-30…30	-3.0…3.0°C	0
40008	Control method	Signed 16	0 - 1	0: P 1: PI	1
40009	Controller output	Signed 16	0 - 1 - 2 - 3 - 4	0: OFF 1: CO_2 2: TEMPERATURE 4: MAXIMUM CTRL	4
40010	Set point, CO_2	Signed 16	400…10000	400…10000 ppm	700
40011	Set point, temperature	Signed 16	180…260	18.0…26.0°C	210
40013	Proportional band, CO_2	Signed 16	100…10000	100…10000 ppm	500
40014	Proportional band, temperature	Signed 16	10…320	1.0…32.0°C	20
40016	Integration time	Signed 16	50…5000	50…5000 s	300
40035[*]	PIR activation delay	Signed 16	0 - 1 - 2	0: 0 min 1: 3 min 2: 6 min	1
40036[*]	PIR deactivation delay	Signed 16	0 - 1 - 2 - 3 - 4 - 5	0: 5 min 1: 15 min 2: 30 min 3: 60 min 4: 90 min 5: 120 min	1
40038 / 40027[**]	Y1…Y4 output range	Signed 16	0 - 1 - 2	0: 0…10 V 1: 2…10 V 2: 0…5 V	0
40039 / 40028[**]	Fixed control output	Signed 16	0 - 1 - 2 - 3 - 4 - 5	0: OFF 1: 100% 2: 75% 3: 50% 4: 25% 5: 0%	0
40040 / 40029[**]	Fixed control output timer	Signed 16	0 - 1 - 2 - 3	0: 6 h 1: 12 h 2: 24 h 3: Manual	1

[*]DETECT IAQ OCSa CO_2-TEMP-MB

[**]DETECT IAQ Da CO_2-TEMP-MB

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Technical data

Power supply:	24 VAC/DC (22…28 V) < 2 VA
Output:	0…10 V / 2…10 V / 0…5 V, < 2 mA
Screw terminals:	1.5 mm^2
Cable gland:	M16 (DETECT IAQ Da CO_2-TEMP-MB)

Carbon dioxide measurement

Range of measurement:	0…2000 ppm
Accuracy (25°C):	type ±40 ppm +3% from read value (ABCLogic™)
Long-term stability/year:	< 2% FS (ABCLogic™)
Time constant:	< 2 min

Temperature measurement

Range of measurement:	0...50 °C
Accuracy (25°C):	±0.5°C

IP class

DETECT IAQa CO_2-TEMP-MB/ DETECT IAQ OCSa CO_2-TEMP-MB:	IP20
DETECT IAQ Da CO_2-TEMP-MB:	IP54

Operating conditions

Temperature:	0...+50°C
Humidity	0...85% RH, non-condensing

Standards and directives

The following standards have been observed:

2014/30/EU	Electromagnetic compatibility (EMC).
2011/65/EU	The Restriction of Hazardous Substances Directive (RoHS2).
EN 61000-6-2:2006	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments.
EN 61000-6-3:2007/A1:2011	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emissions from equipment in homes, offices, shops and similar environments.