

This user guide is for devices with the software version 1.2.0 or newer.

MOUNTING

The device can be installed in dry surroundings (IP20) by screws on the wall surface or on the standard flush mounting box. The recommended installation height is 150...180 cm.

The device position should be selected carefully. All the error factors that can affect to the measurements should be eliminated as well as possible. The following list defines the typical measurement error factors.

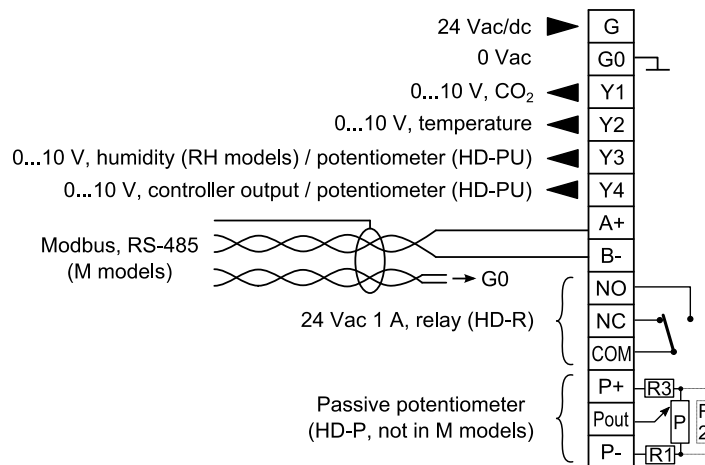
- direct sun light
- occupant proximity
- air flow coming from windows or doors
- air flow coming from ventilation nozzles
- air flow coming from the flush mounting box
- differential temperature caused by external wall

Wiring



Caution

Device wiring and commissioning can only be carried out by qualified professionals. Always make the wirings while the power is switched off.

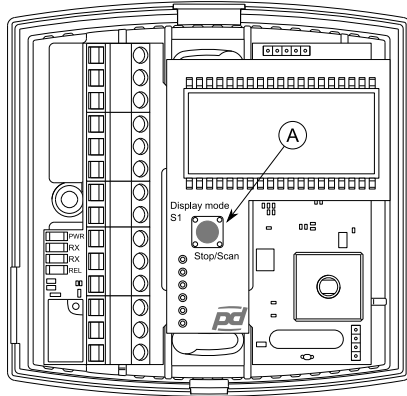


NOTE: CO₂ measurement causes a current peak to the supply voltage. This can produce an error to the analogue outputs when using long and thin cables. It is recommended to increase the wire cross section area in long cable situations (e.g. by using four-wire connection) to ensure reliable measurement signal.

SELECTING THE MEASUREMENT INFORMATION TO BE VIEWED ON THE DISPLAY

The measurement values scroll on the N model display. The wanted value can be locked to view continuously by pressing the S1 button. You resume to the scrolling view by pressing the S1 button again.

NOTE: When the potentiometer (HD-PU) is configured to change the controller set point, the set point is shown on the display when the potentiometer is rotated.



A. S1 button

NOTE: In M models, the shown measurement information can be selected also via Modbus.

ABCLogic™ SELF-CALIBRATION FEATURE

ABCLogic™ (Automatic Background Calibration Logic) is a patented self-calibration technique. ABCLogic™ method eliminates the possible long term drift. ABCLogic™ method can be used when the CO₂ concentration drops at least two times within a week to the level of approx. 400 ppm. Therefore the ABCLogic™ is effective in spaces that are not continuously occupied.

ABCLogic™ can be deactivated in continuously occupied spaces.

Deactivating the ABCLogic™

The ABCLogic™ function can be deactivated by using the ML-SER tool.

CALIBRATION

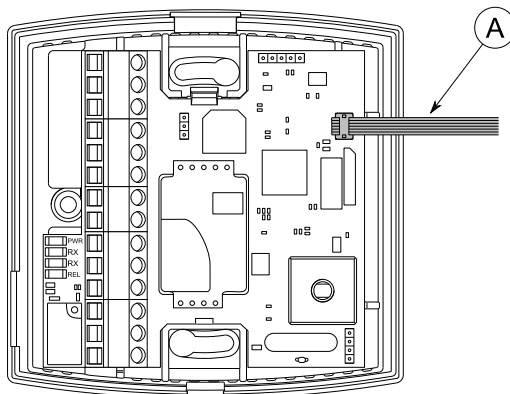
If ABCLogic™ method is not in use, the device should be calibrated every 6-12 months. The recommended calibration interval is 5 years even if the ABCLogic™ is in use.

ML-SER TOOL

With the ML-SER tool you can change the device settings, controller and Modbus settings for example.

Connecting ML-SER tool to the device

1. Remove the display / HD-AL3 option.
2. Connect the ML-SER cable to the connector.



A. ML-SER cable

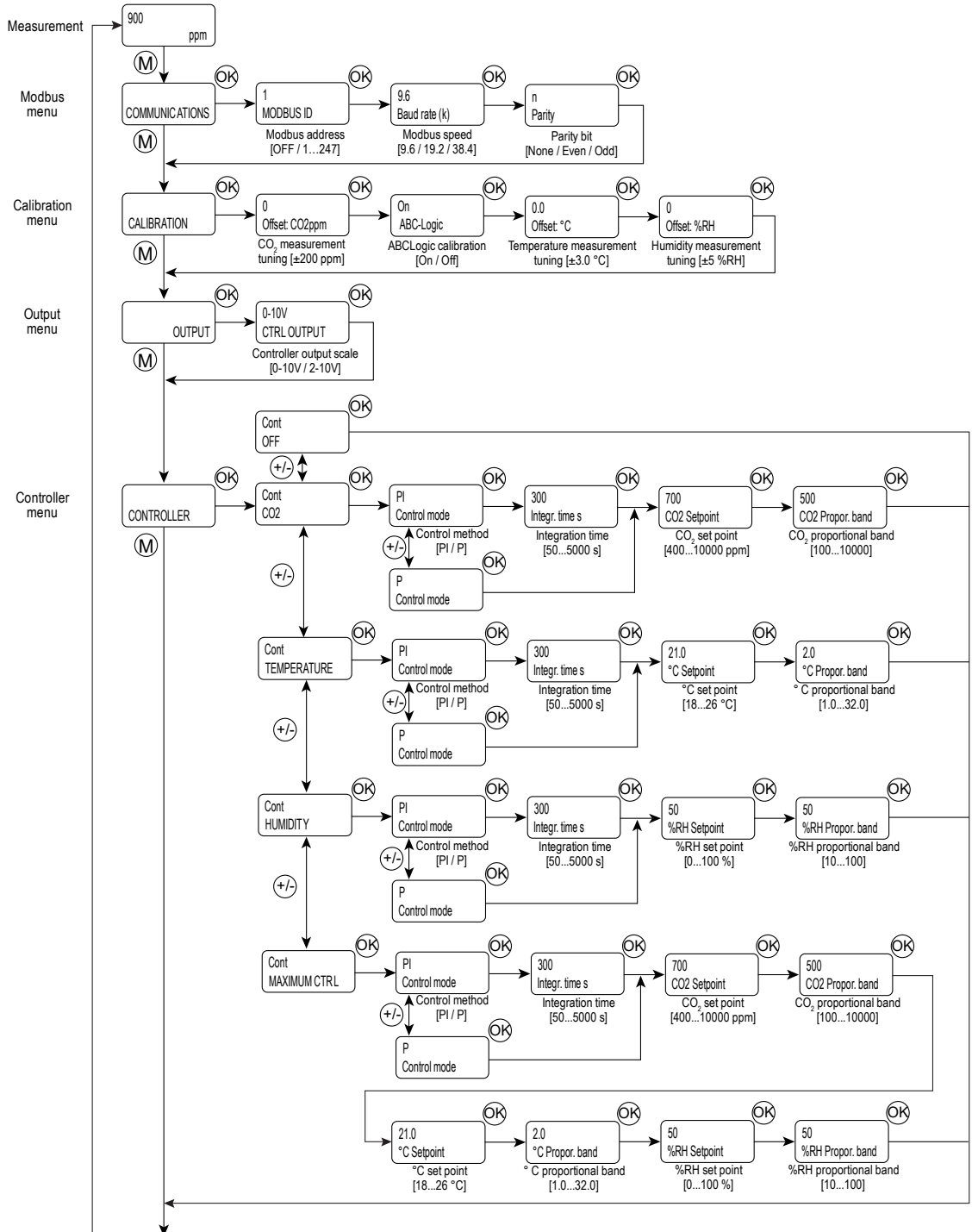
CO₂ measurement value shows on the ML-SER tool display.

ML-SER menu

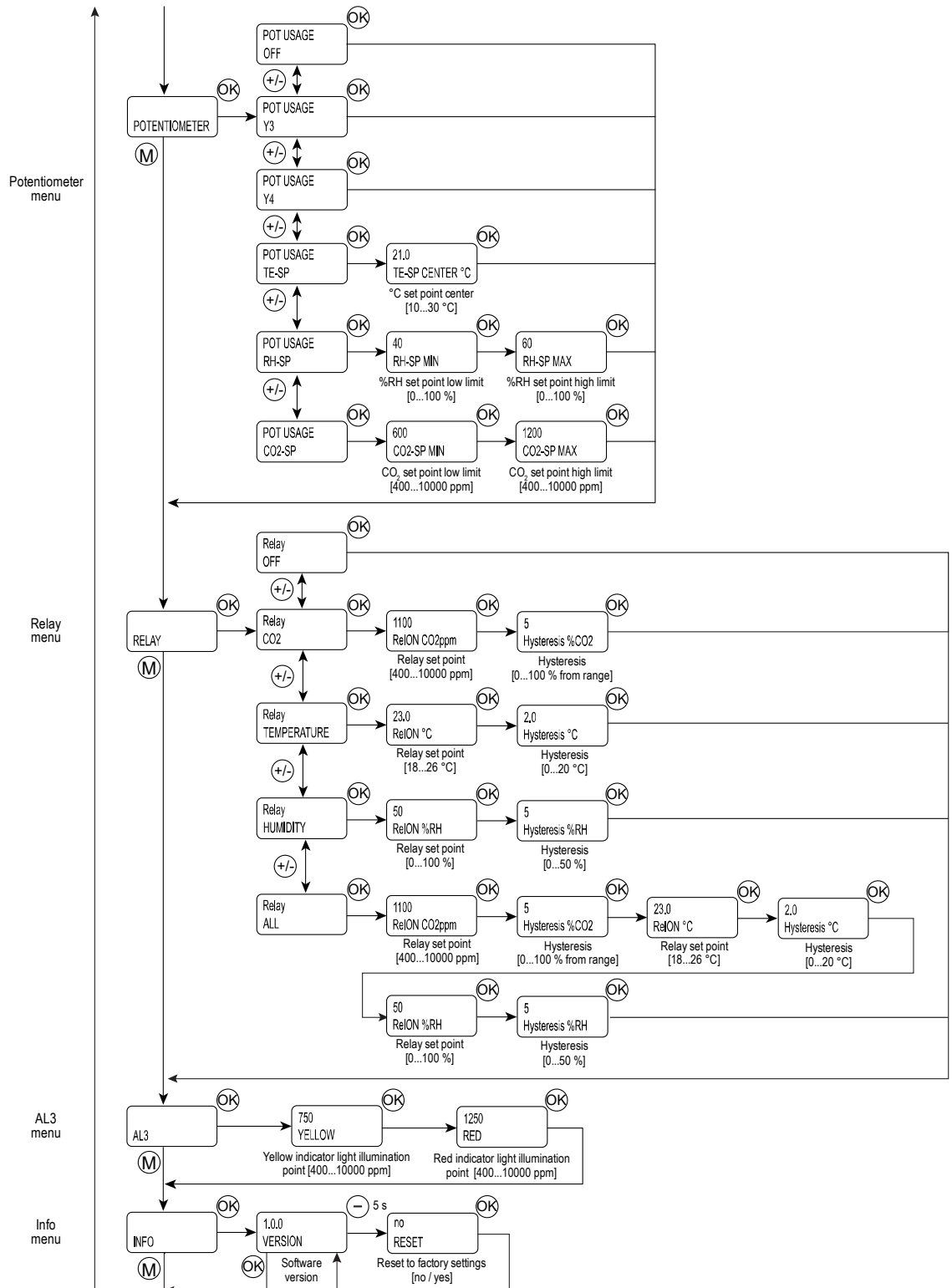
ML-SER menu opens by pressing the M button. The values can be changed with the "+" and "-" buttons. The menu is device-specific and the content depends on the device and installed options.

The following menu structure contains the factory settings.

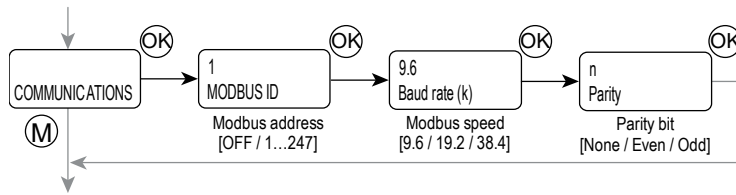
NOTE: The default relay CO₂ set point is 2500 ppm in 10K models.



The diagram continues on the next page.

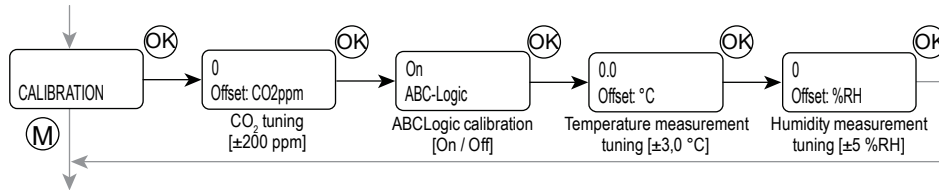


Modbus menu



Modbus menu is available in M models. The bus settings can be changed through the menu.

Calibration menu

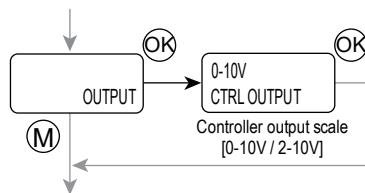


All the measurements can be tuned through the calibration menu. The humidity tuning is available only in RH models.

- The CO₂ value can be adjusted by 10 ppm steps.
- The temperature value can be adjusted by 0.1 °C steps.
- The humidity value can be adjusted by 1 % steps.

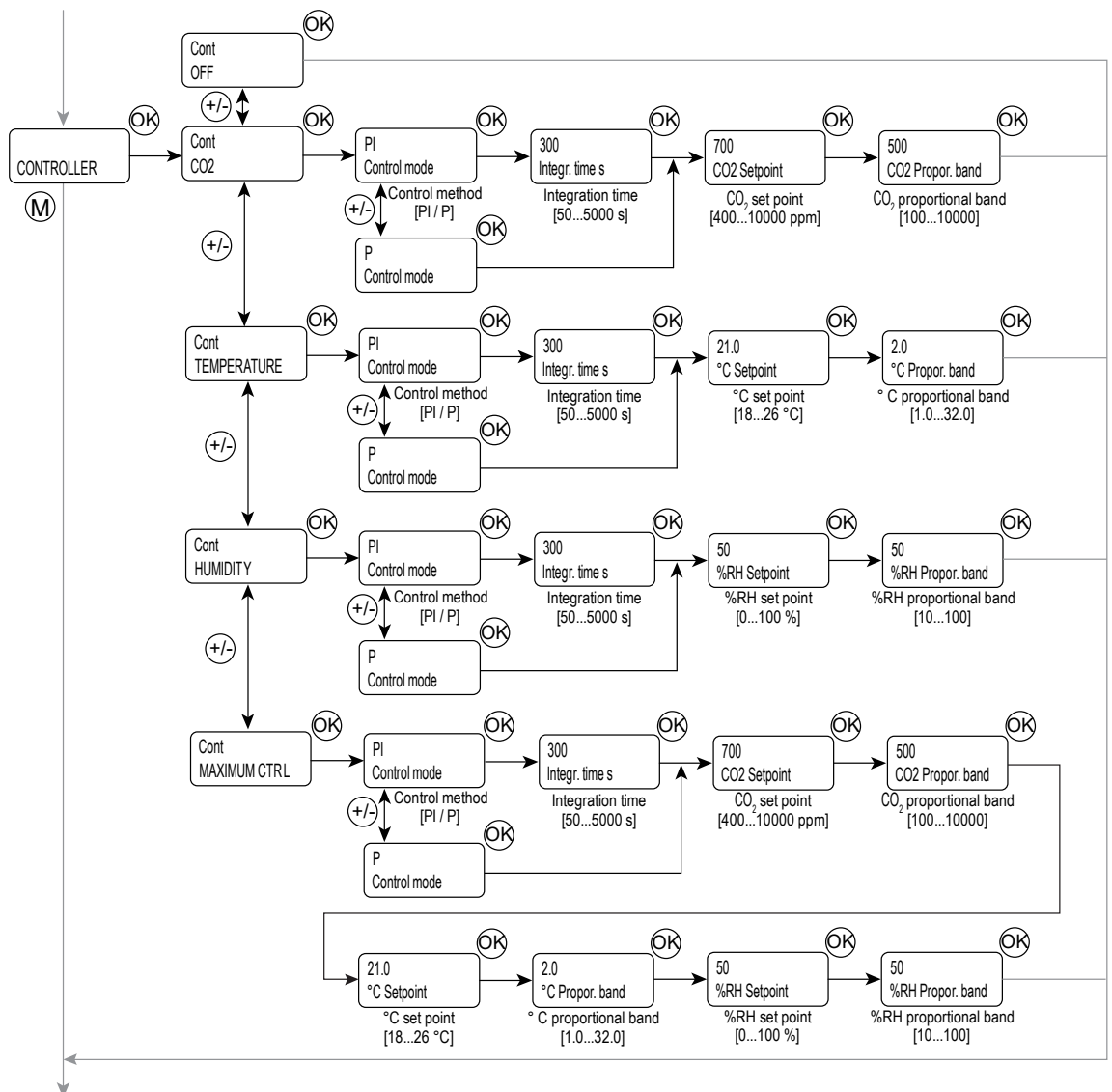
ML-SER tool display shows how much the current value is tuned.

Output menu



You can change the controller output (Y4) scale through the output menu.

Controller menu

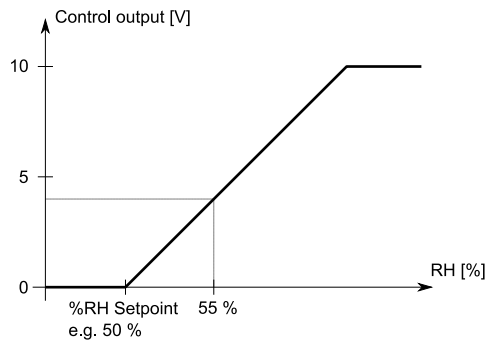
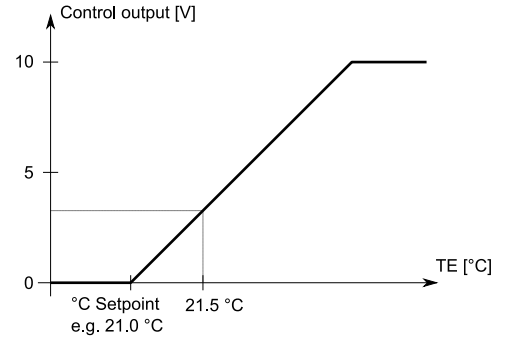
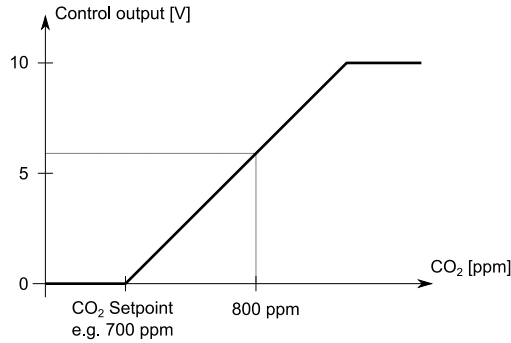


The control output can be controlled either according to a one measurement value or according to the maximum selection of all values. Humidity related settings are only available in RH models.

- The CO₂ values can be adjusted by 10 ppm steps.
- The temperature values can be adjusted by 0.1 °C steps.
- The humidity values can be adjusted by 5 % steps.

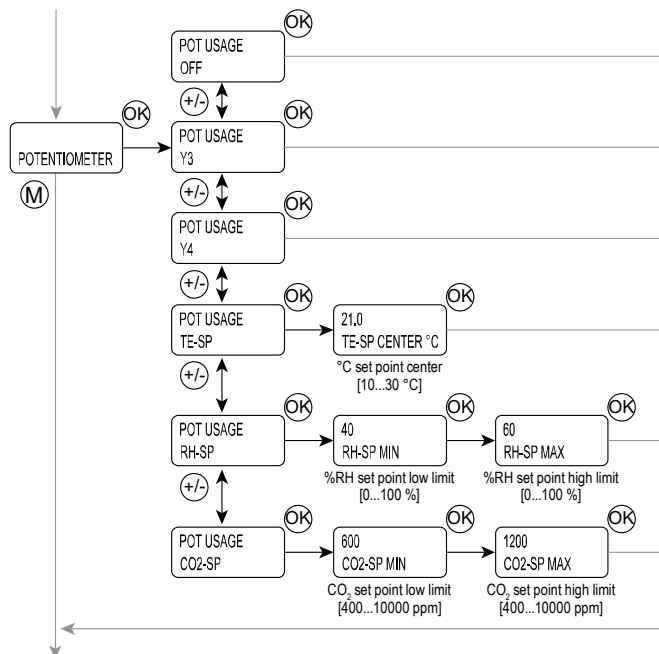
In the maximum selection control, the control output signal is formed according to the measurement that causes the largest control signal value. The following situation is in the example figure:

- Carbon dioxide concentration is 800 ppm
- Temperature is 21,5 °C
- Humidity is 55 %



CO₂ = 6 V
Temperature = 3 V
Humidity = 4 V } → Control output = 6 V

Potentiometer menu



Potentiometer menu is available if HD-PU option is installed. You can select the potentiometer output connector and disable the potentiometer through the menu. You can also set the potentiometer for the set point adjustment purposes. The potentiometer is connected to the Y3 output (Y4 in RH models) as factory setting.

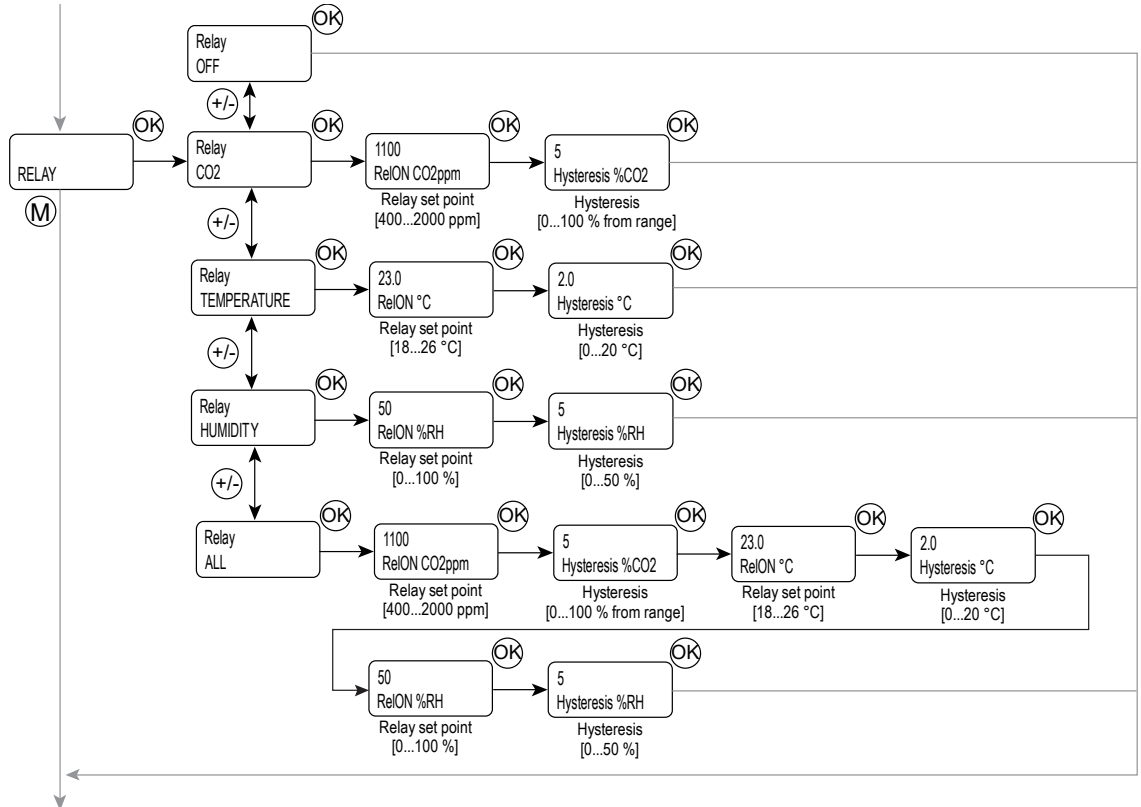
- The CO₂ values can be adjusted by 10 ppm steps.
- The temperature value can be adjusted by 0.1 °C steps.
- The humidity values can be adjusted by 1 % steps.

The set point that is adjusted with the potentiometer cannot be adjusted via Modbus.

NOTE: When the potentiometer is used for setting the internal controller's temperature set point (TE-SP), the potentiometer adjustment range is ± 3 °C around the set point centre.

NOTE: You have to set the controller off, if the potentiometer is configured to Y4 output.

Relay menu



Relay menu is available if HD-R option is installed. The relay switching point and hysteresis can be changed through the menu.

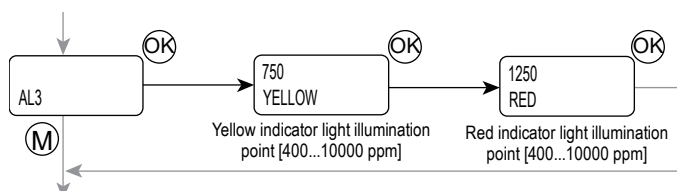
NOTE: The default relay CO₂ set point is 2500 ppm in 10K models.

The relay output can be controlled either according to a one measurement value or according to the all values. Humidity related settings are only available in RH models.

- The CO₂ values can be adjusted by 10 ppm steps.
- The temperature values can be adjusted by 0.1 °C steps.
- The humidity values can be adjusted by 1 % steps.

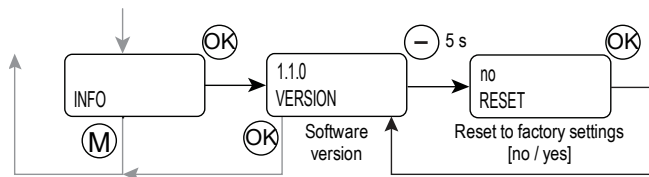
When the output is controlled according to the all values, the relay activates when one measured value exceeds the set point.

AL3 menu



AL3 menu is available if HD-AL3 option is installed. The indicator light limits can be changed through the menu. The hysteresis is 50 ppm.

Info menu



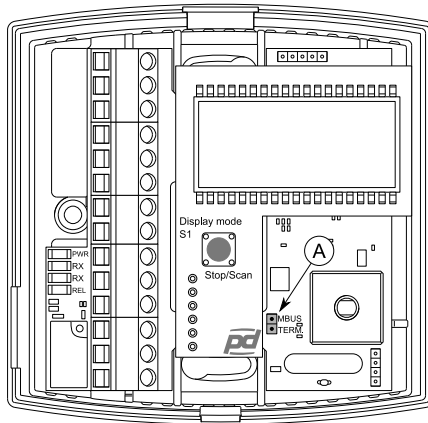
You can check the device software version and reset the device to factory settings through the Info menu.

MODBUS

The parameter memory durability allows at least 1 million writing cycles.

Bus termination

The Modbus can be terminated by placing the MBUS TERM. jumper.



A. MBUS TERM. jumper

Modbus function codes

The device supports the following Modbus function codes.

| | |
|------|-------------------------------|
| 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 registers

NOTE: If you try to write a parameter value that is beyond the parameter value range, the value will be replaced by the nearest acceptable value. For example, if you write 270 to the register 40011, the value will be replaced by 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 |
| 5 | Relay overdrive activation | Bit | 0 - 1 | 0: Off, 1: On | 0 |

| Register | Parameter description | Data type | Values | Range | Default |
|----------|--------------------------|-----------|--------|---------------|---------|
| 6 | Relay overdrive | Bit | 0 - 1 | 0: Off, 1: On | 0 |
| 7 | 2-10 V controller output | Bit | 0 - 1 | 0: Off, 1: On | 0 |

Discrete inputs

| Register | Parameter description | Data type | Values | Range |
|----------|-----------------------|-----------|--------|---------------|
| 10001 | Relay status | Bit | 0 - 1 | 0: Off, 1: On |

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 |
| 30003 | Humidity measurement | Signed 16 | 0...100 | 0...100 % |
| 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 |
| 30008 | Active potentiometer value | Unsigned 16 | 0...1000 | 0.0...100.0 % |
| 30009 | Potentiometer set point value | Unsigned 16 | variable | variable |

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 |
| 40007 | Humidity measurement tuning (offset) | Signed 16 | -5...5 | -5...5 % | 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 3: humidity 4: maximum selection | 1 ¹⁾ |
| 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 |
| 40012 | Set point, humidity | Signed 16 | 0...100 | 0...100 % | 50 |
| 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 |
| 40015 | Proportional band, humidity | Signed 16 | 10...100 | 10...100 % | 50 |
| 40016 | Integration time | Signed 16 | 50...5000 | 50...5000 s | 300 |
| 40017 | Active potentiometer usage | Signed 16 | 0 - 1 - 2 - 3 - 4 - 5 | 0: OFF 1: Y3 2: Y4 3: TE-SP 4: RH-SP 5: CO ₂ -SP | 1 ¹⁾ |
| 40018 | Relay set point, CO ₂ | Signed 16 | 400...10000 | 400...10000 ppm | 1100 ²⁾ |

| Register | Parameter description | Data type | Values | Range | Default |
|----------|--|-----------|-------------------|---|---------|
| 40019 | Relay hysteresis, CO ₂ | Signed 16 | 0...100 | 0...100 % | 5 |
| 40020 | Yellow AL3 indicator light illumination limit | Signed 16 | 400...10000 | 400....10000 ppm | 750 |
| 40021 | Red AL3 indicator light illumination limit | Signed 16 | 400...10000 | 400....10000 ppm | 1250 |
| 40022 | Value shown on the display | Signed 16 | 0 - 1 - 2 - 3 | 0: CO ₂ 1: temperature 2: humidity 3: scrolling | 3 |
| 40023 | Not in use | Signed 16 | - | - | 1 |
| 40024 | Not in use | Signed 16 | - | - | 0 |
| 40025 | Relay set point, temperature | Signed 16 | 0...500 | 0.0...50.0 °C | 230 |
| 40026 | Relay set point hysteresis, temperature | Signed 16 | 0...200 | 0.0...20.0 °C | 20 |
| 40027 | Relay set point, humidity | Signed 16 | 0...100 | 0...100 % | 50 |
| 40028 | Relay set point hysteresis, humidity | Signed 16 | 0...50 | 0...50 % | 5 |
| 40029 | Relay function | Signed 16 | 0 - 1 - 2 - 3 - 4 | 0: OFF 1: CO ₂ 2: temperature 3: humidity 4: all | 1 |
| 40030 | Potentiometer temperature set point centre | Signed 16 | 100...300 | 10.0...30.0 °C | 210 |
| 40031 | Potentiometer humidity set point low limit | Signed 16 | 0...100 | 0...100 % | 40 |
| 40032 | Potentiometer humidity set point high limit | Signed 16 | 0...100 | 0...100 % | 60 |
| 40033 | Potentiometer CO ₂ set point low limit | Signed 16 | 400...10000 | 400....10000 ppm | 600 |
| 40034 | Potentiometer CO ₂ set point high limit | Signed 16 | 400...10000 | 400....10000 ppm | 1200 |

¹⁾ With RH option the register 40009 default value is 0 and register 40017 default value is 2.

²⁾ The default relay CO₂ set point is 2500 ppm in 10K models.