CO_2 regulation and control probe manual with integrated temperature and relative humidity sensors

SCO2-IAQ

casals

fans of innovation

SCO2-IAQ
CO_2 and control probe with integrated temperature and relative humidity sensors

SPECS

Regulator (pushbuttons +LCD display)

BUTTONS

The probe regulator has 4 buttons: ON/OFF, MODE, UP and DOWN.

Note: If the backlight is off, the first press (on any button) turns on the backlight. With the backlight on, the functions of the pushbuttons are as described below. The backlight turns off automatically after 2 minutes without pressing.

Basic functions:

ON/OFF:
 Short press: Select the on/off status. Manual mode.
 Long press (1s aprox):   Enables and disables the time schedule.
                               Time scheduling off: Manual mode Time scheduling on: Scheduling mode.

MODE:
 Short press: Unused.
 Long press: Access user mode.
        Ajuste de fecha (HOrA).
        Configuration of time schedules (PrOG).
        Visualization of the identifier (id).
        Parameters mode (PAr).
        Reset (rESET).

UPLOAD:
 Short/long press: Increase the CO_2 setpoint.

DOWNLOAD:
 Short/long press: Decrease the CO_2 setpoint.

Notes:
- If mode + continuously up are pressed when giving tension to the probe solver, or after a reset of the same, it returns to the default values (displayed on the dEFEC screen).
- If MODE+ LOWER are pressed continuously when giving tension to the probe regulator, or after a resistor of it, it initiates the calibration process of the internal CO_2 sensor (displayed on the CAL screen).
  Consult the calibration process of the CO_2 sensor (calibration at 400ppm).

User Menu:

- User Menu: With UP and DOWN you select the mode to access. To enter the selected mode, press MODE. To exit, press ON/OFF.

  - Date adjustment (HOrA): With MODE the data to be modified is selected (day / time) and with UP and DOWN the value is modified. With ON/OFF you exit the date setting by returning to normal operating mode.

  - Configuration of time schedules s (ProG): With MODE the data to be modified (day / period) is selected, and with UP and DOWN the value is modified of the corresponding time. To turn off the period, set the time to value -- :-- . With ON/OFF you leave the time schedule settings returning to normal operating mode. See *time schedule of the SCO2-IAQ probe regulator*.

  - Display of the identifier (id): The identifier configured in the slider is displayed by serial communication.

    The visualization is done by 5 digits of 7 segments: 0 1 2 3 4 5 6 7 8 9 A b C d E F

    <div align="center">

    ## 88888
    D1 D2 D3 D4 D5

    </div>

  - Parameter modes (PAr): With MODE the parameter to be displayed is selected, and with UP and DOWN the value of the same is modified. With ON/OFF you exit the parameters mode by returning to normal operating mode . See *parameters of the SCO2-IAQ regulator*.

  - Reset (rESET): When resetting the probe regulator, the display "-----" is displayed on the screen, starting the operation again after a few seconds.

LCD DISPLAY

Note: When giving tension to the probe regulator, or after a reset of the same, it displays on the display the following:

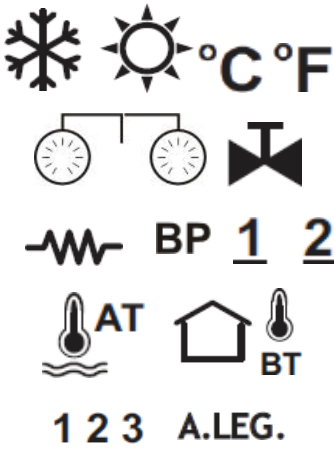r$_c$ 1 5 1 + icon [AUTO] : SCO2-IAQ probe regulator indication.

$_U$ **X.X**: Indication of the firmware version of the probe regulator.

wAit: Indication that the probe regulator is in the process of initialization. In models without a display, the initialization process is indicated by the ignition of the central part of the front.

The indicative values of temperature, relative humidity and CO_2 shall be displayed randomly and continuously on the display during the operating mode.

Icon	Indication

[AUTO]	On/off operating status (automatic fan regulation:
	   Off: relay contact on/off open.
	   On: relay contact on/off closed.
	
	 When changing the on/off operating status, the corresponding indication is displayed for an instant:
	
	 OFF On

[⊓ T]	Remote stop:
	   Off: Remote stop disabled (digital input open contact).
	   Flashing on: Remote stop activated (digital input contact closed).

[fan icon]	Output state regulation CO_2 all/nothing:
	   Off: Output off (open relay contact air quality).
	   On: Output activated (closed relay contact air quality).

[88]	State output regulation CO_2 proportional:0% (0) ...100% (H1) 0 50 H1 These digits indicate the percentage of air renewal required. Its display can be disabled. If the alarm is enabled and active, AL is displayed. In case of alarm, the flashing of the display can be activated. Note: With a regulator in off, it does not signal alarm on the display. AL In parameters mode indicates the parameter number.

Icon	Indication

$888:8.8$	**Measurement and setpoint of CO$_2$ (CO2):**
	Measurement (0ppm... 2000ppm): 800
	Air quality setpoint (400ppm... 1400ppm): c1200
	The air quality locker is moved for 10 seconds after a press of UP or DOWN.
	
	Temperature and relative humidity measurements (t,H):
	Measure T (0,0ºC... 50.0ºC): 23.2
	Measure T (0,0ºC... 50.0ºC): 48
	On /off operating status (manual mode).
	                         OFF On
	Current time (programming mode).
	                    00:00 23:59
	
	In parameter mode indicates the value of the parameter.
	In timed schedule mode, it indicates the time that is scheduled as a start or stop.

PRG PRG	**Manual mode.** Operation according to the on/off and manual setpoint selected. **Hourly programming mode.** Operation according to the schedule.
(1I) (1O)	Programming period 1 (start and end).
(2I) (2O)	Programming period 2 (start and end).
☾★	Stop period.
⏻	In time schedule, indicates the copy of the day.
LUN MAR MIE JUE VIE SAB DOM	**Day of the week.** In time scheduling indicates the day of the week being scheduled.

Icon	Indication
AP	Parameter mode.
	Unused.

CONFIGURABLE PARAMETERS OF THE SCO2-IAQ PROBE REGULATOR

To access the parameters mode, in normal operating mode press MODE continuously (2s aprox) until the user menu appears on the screen (day/time setting HOUr, PrOG time schedule, PAr parameters and reset rESET). With the UP and DOWN keys select PAr and press MODE, accessing at that moment the parameters mode.

   Note: During parameters mode, the probe regulator does not communicate over the serial communication channel.

In parameter mode the functions of the pushbuttons are as follows:
- ON/OFF: Exits parameter mode.
- MODE: Accepts the value of the displayed parameter and moves to the next parameter.
- UPLOAD: Increases the value of the parameter.
- LOWER: Decreases the value of the parameter.

List of parameters

1. MINIMUM SETPOINT CO_2 (outputs "Regulation CO_2") (range: 400ppm to 1400ppm; Default: 400ppm) [Parameter 1 ≤ Parameter 2]
2. MAXIMUM SETPOINT CO_2 (outputs "REGULATION CO_2") (range: 400ppm to 1400ppm; Default: 1400ppm) [Parameter 1 ≤ Parameter 2]
3. HYSTERESIS (output "CO_2 regulation" all/nothing) (range: 50ppm to 400ppm; Default: 200ppm)
4. PROPORTIONAL BAND (output "Co_2 regulation" proportional) (range: 100ppm to 600ppm; Default: 400ppm)
5. INTEGRATION TIME (output "Regulation CO_2" proportional) (range: 0s to 240s; default: 120s)
   =0: Proportional control
   ≠0: Proportional-integral control
   Note: Whenever the parameters mode is accessed, the PI control calculations are initialized.

6. MINIMUM PROPORTIONAL OUTPUT (output "Regulation CO_2" proportional) (range: 0% to 100%; default:0%) [Parameter 6 ≤ Parameter 7]
7. MAXIMUM PROPORTIONAL OUTPUT (output "Co_2 regulation" proportional) (range: 0% to 100%; default:100%) [Parameter 6 ≤ Parameter7]
8. TIME BETWEEN ACQUISITION OF MEASUREMENTS (filtering measurement of CO_2) (range: 1 to 100; default: 10).
   To obtain the time between measurements of CO2, given in ms, multiply this
   parameter by 100. 1:100ms ... 10:1000ms(1s) ... 100:10000ms(10s)
9. LIMITS CONSECUTIVE MEASUREMENT (filtering measure of CO_2) (range: 1 [±1] to 16 [±16]; default: 1 [±1]).
10. DISPLAY IN DIGITS PROPORTIONAL OUTPUT (range: 0 to 1; default: 1).
   0: No display.
   1: With visualization.
11. ENABLE/DISABLE ALARM ON DISPLAY (range: 0 to 2; default: 0).
   0: Alarm disabled on display.
   1: Alarm enabled on display with AL display.
   2: Alarm enabled on display with AL display and with backlight flicker.
12. MINIMUM RENEWAL OPERATING TIMING PER HOUR (range: 0min to 60min; Default: 10min) All/nothing output
   0 min: Permanent off output as long CO_2 is correct.
   >0min and <60min: Auto output depending on CO_2 and timing.
   60min: Departure on permanently.

13. OFFSET MEASURE CO_2 (range: -250ppm to +250ppm; Default: 0ppm)
14. COMMUNICATIONS ADDRESS (range: 1 to 240; Default: 1)

TIME SCHEDULE OF THE SCO2-IAQ PROBE REGULATOR

To access the time scheduling mode, in normal operating mode press MODE continuously (2s approx) until the user menu appears on the screen (day/time setting HOUr, PrOG time schedule, PAr parameters and reset rESET). With the keyboards the UP and DOWN select PrOG and press MODE, accessing at that moment the time programming mode.

Note: During time scheduling mode, the probe regulator does not communicate over the serial communication channel.

In time programming mode the functions of the buttons are as follows:

- ON/OFF:

  Short press: Exits time scheduling mode.

  Long press *(~1s):* Copy the schedule from the previous day to the current day. The icon is displayed ⊡ as confirmation of the copy of the day.

- MODE: Select the period (day, periods 1 and 2).

- UP/DOWN: Modifies the value of the corresponding time.

Visualizations in time scheduling mode:
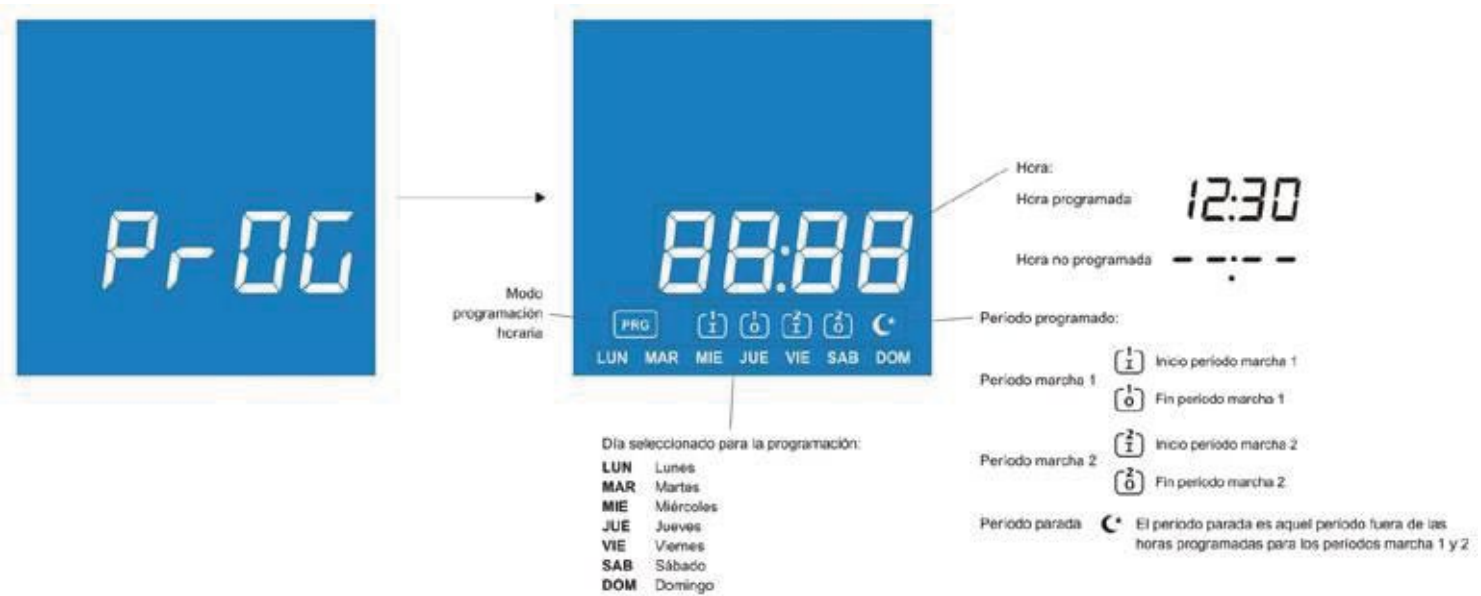
Example of time scheduling:

Schedule and setpoints:

		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
MARCH PERIOD1	Beginning							
	The end							
MARCH PERIOD 2	Beginning							
	The end							

SENSOR REGULATOR SCO2-IAQ

Wiring diagram (Air quality sensor regulator

Sensors integrated: CO₂ temperature & relative humidity

Relays

SERIAL COMMUNICATIONS CHANNEL

Potential-free relay contact outputs

RS-485 Modbus RTU
ISOLATED communication channel
Integration in centralized systems (home automation, BMS ...)

Exit : On/Off

**Exit : CO₂ on/off regulation
Alarm**

Common bias relays /
Común de polarización relés

**L   ELECTRICAL
N   OPERATING VOLTAGE
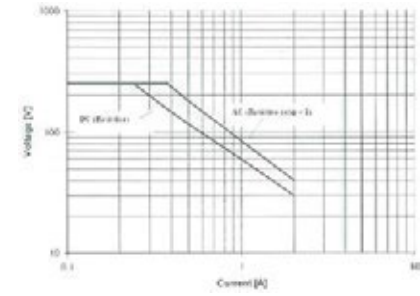100...250V**

Regulator
(pushbuttons + display
LCD)

1 2 3 4 5 6 7 8 9 10
A B

Power supply universal
NOT ISOLATED

OUTPUT 0...10V
OUTPUT 0...10V
GND

11 12 13 14 15 16 17 18 19 20

INTEGRATED
SENSORS
CO₂
T
HR
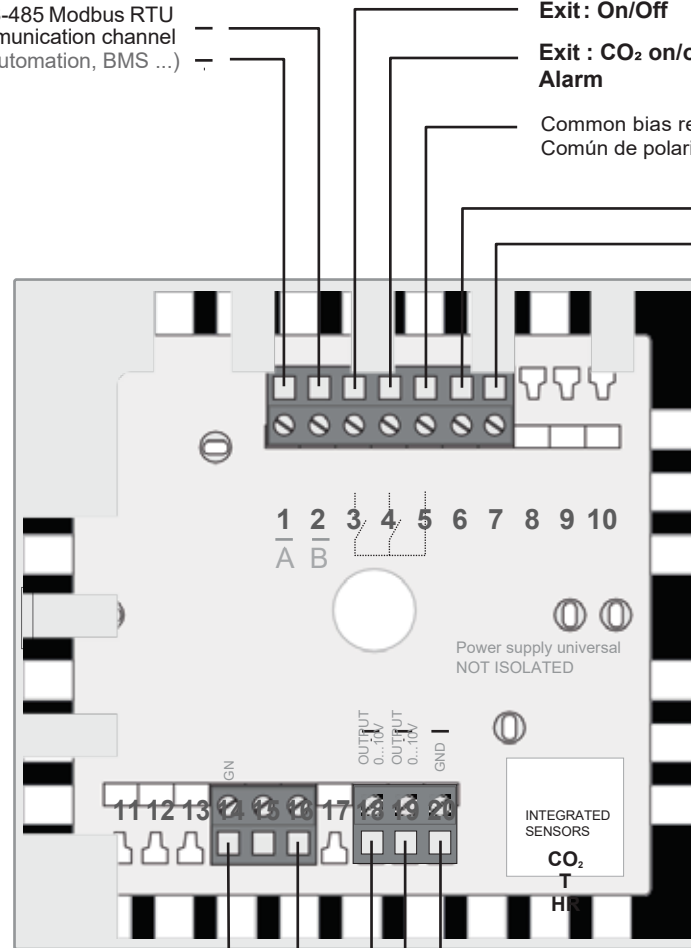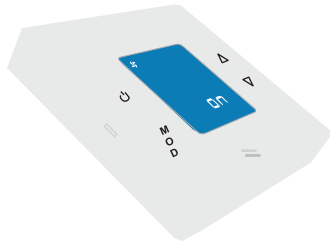
**LCD display with
LED / blacklight**

REMOTE STOP
Voltage-free contact connection

Stop at contact closure

Non-isolated digital input

Non-isolated analog outputs

Common 0 ... 10V

Proportional CO2 regulation output

Control signal 0 ... 10V

CO₂ measured output 0ppm = 0,0V

Signal ...10V 2000ppm=10,0V

IMPORTANT (sensor regulator installation): Locate the sensor regulator in a place where the CO2, T and RH measurements are representative of the controlling environment.

Minimum impedance for analog outputs: 3,9KÙ

Connection detail of a 24V proportional damper with SCO2-IAQ PROBE REGULATOR

Damper 24V with proportional actuator 0 ... 10V (e.g. air exchange damper)

OPERATION AS AN AUTONOMOUS CO₂ REGULATOR

L **TENSIÓN ELÉCTRICA DE FUNCIONAMIENTO /**
N **ELECTRICAL OPERATING VOLTAGE**
230V

1 2 3 4 5 6 7 8 9 10

Transformer /
Transformador
230/24V

| 230 | 0 |
| 24 | 0 |

OUTPUT 0...10V
OUTPUT 0...10V
GND

11 12 13 14 15 16 17 18 19 20

Y

AC 24V   0...10V

G

G0

DAMPER / COMPUERTA

Proportional actuator / Actuador proporcional
Control signal / Señal de control 0...10V (Y-G0).

Operating voltage / Tensión de funcionamiento
24VAC (G-G0).
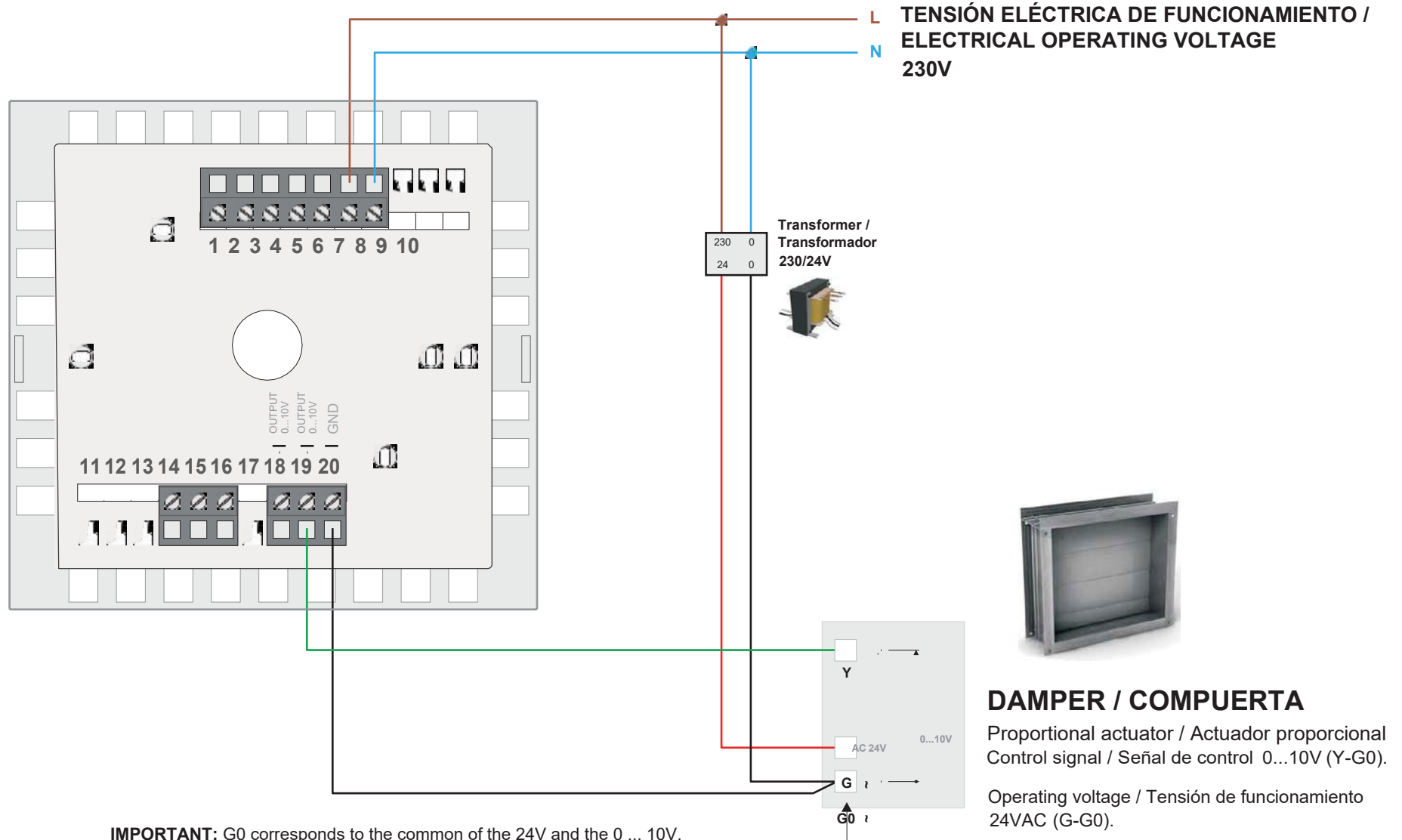
IMPORTANT: G0 corresponds to the common of the 24V and the 0 ... 10V.
IMPORTANTE: G0 corresponde al común de los 24V y los 0 ... 10V.

Connection detail of a 24V proportional damper with SCO2-IAQ PROBE REGULATOR

Gate 24V proportional actuator 0...10V （ e.g.air renewal gate ）

OPERACIÓN CON REGULADOR AUTÓNOMO DE CO2

L — OPERATING
ELECTRICAL VOLTAGE
N — 230V

1 2 3 4 5 6 7 8 9 10

230 0
24   0

Transformer 230/24V

OUTPUT 0...10V
OUTPUT 0...10V
Gnd

11 12 13 14 15 16 17 18 19 20

And

AC 24V   0...10V

G

G0

GATE
 Proportional actuator
Control signal 0...10V (Y-G0).
Operating   voltage 24VAC (G-G0).
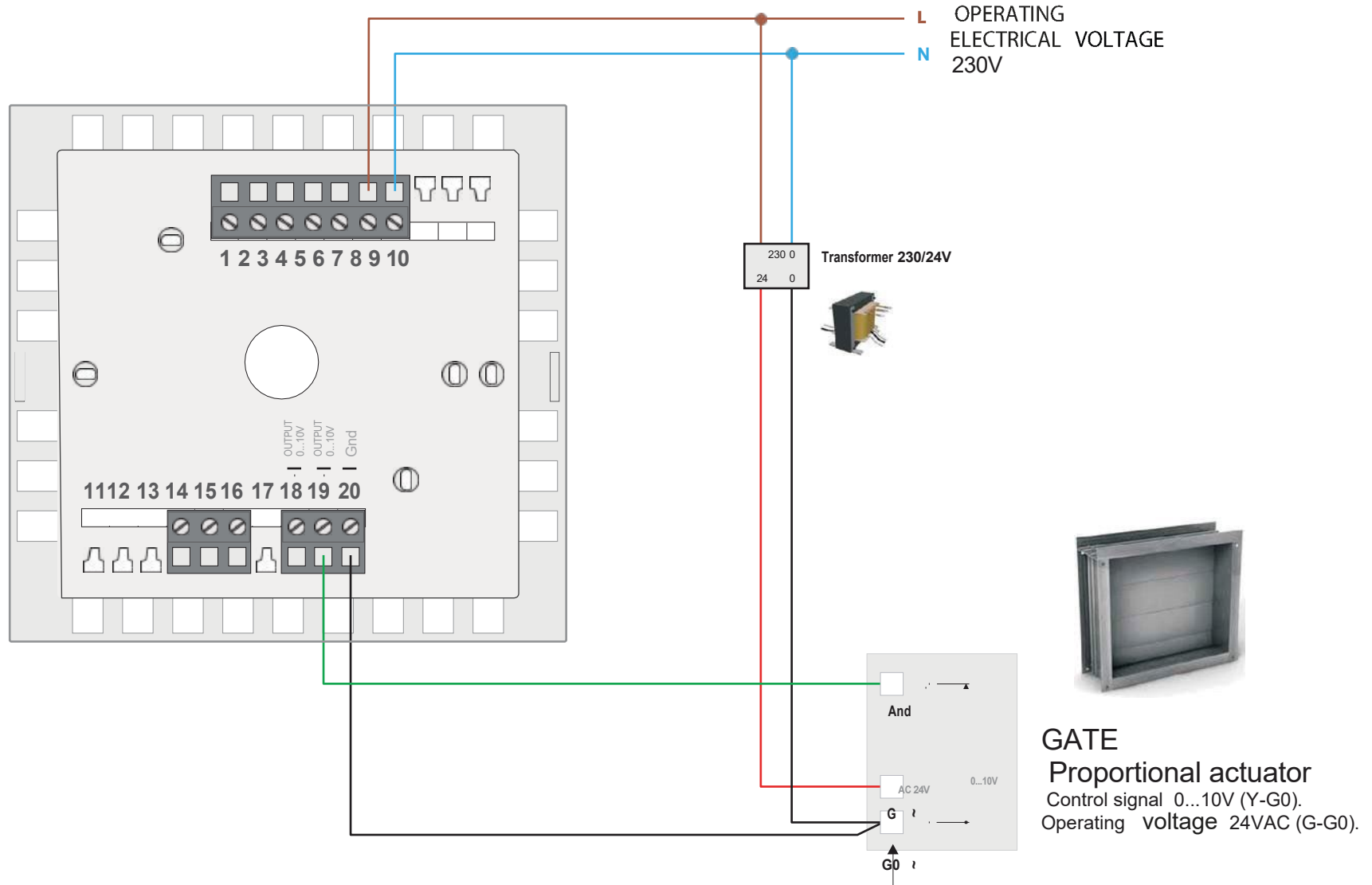
IMPORTANT:G0 corresponds to the common 24Vy 0...10V.

Connection detail of a 230V fan with SCO2- IAQ PROBE REGULATOR

EC fan with 0...10V control signal for speed regulation (e.g. extraction/impulsion of outdoor air in school classrooms)
FUNCTIONING OR AS AN AUTONOMOUS CO2 REGULATOR

FAN
All/nothing regulation

L OPERATING
ELECTRICAL VOLTAGE
230V

N

1 2 3 4 5 6 7 8 9 10

OUTPUT 0..10V
OUTPUT 0..10V
Gnd

11 12 13 14 15 16 17 18 19 20

L   N
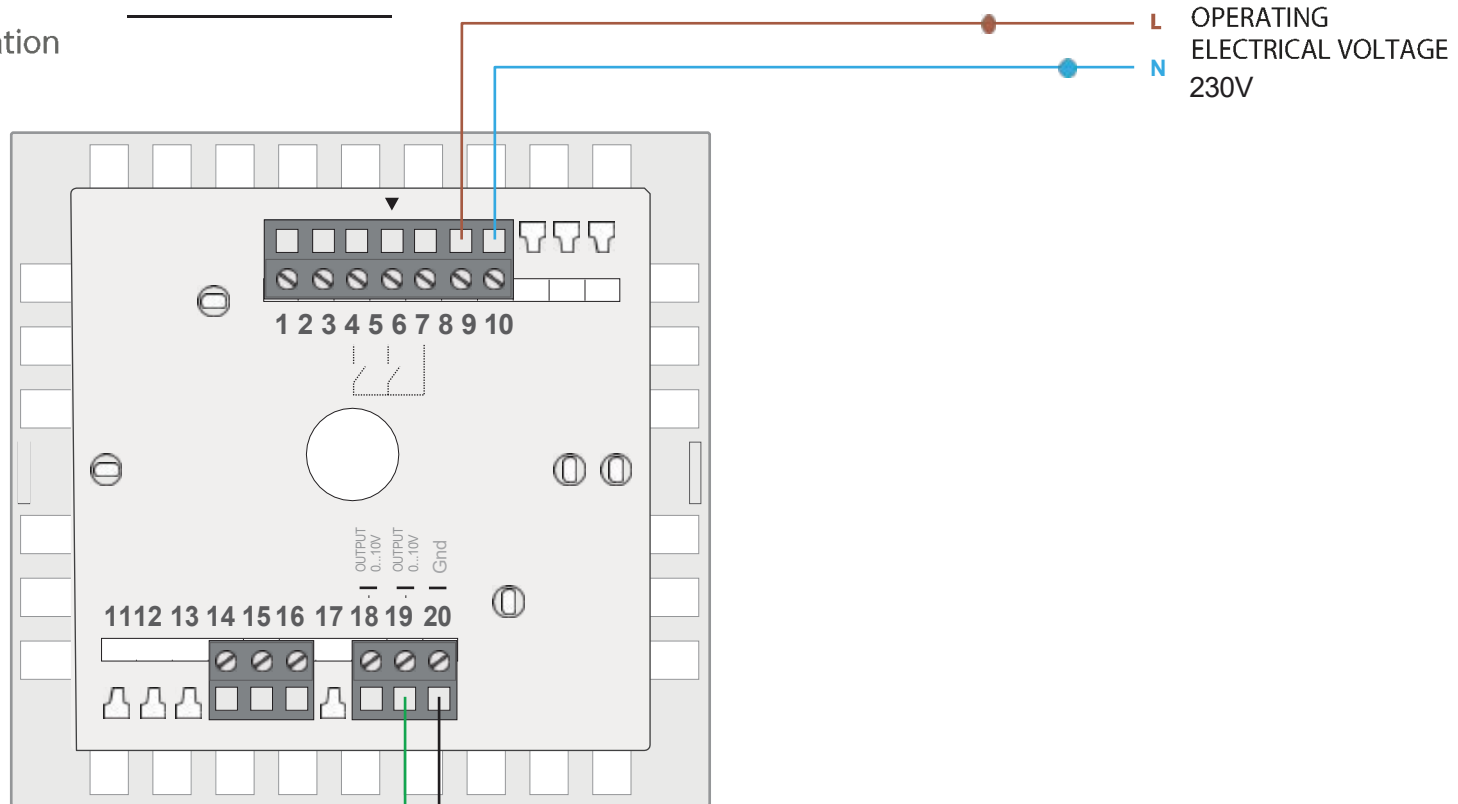
FAN WITH MOTOR EC (KUVIO EEC)

Proportional regulation
Control signal 0... 10V.
Operating voltage 230VAC.

Non-isolated analog output.
The 0...10V input of the fan must
be insulated.

Detail of connection of a 230V fan with SCO2- PROBE REGULATOR IAQ

AC Fan

OPERATION AS AN AUTONOMOUS CO2 REGULATOR

FAN WITH AC MOTOR (KUBALIK)

L ELECTRICAL VOLTAGE
OPERATING

N 230V

1 2 3 4 5 6 7 8 9 10

OUTPUT 0...10V
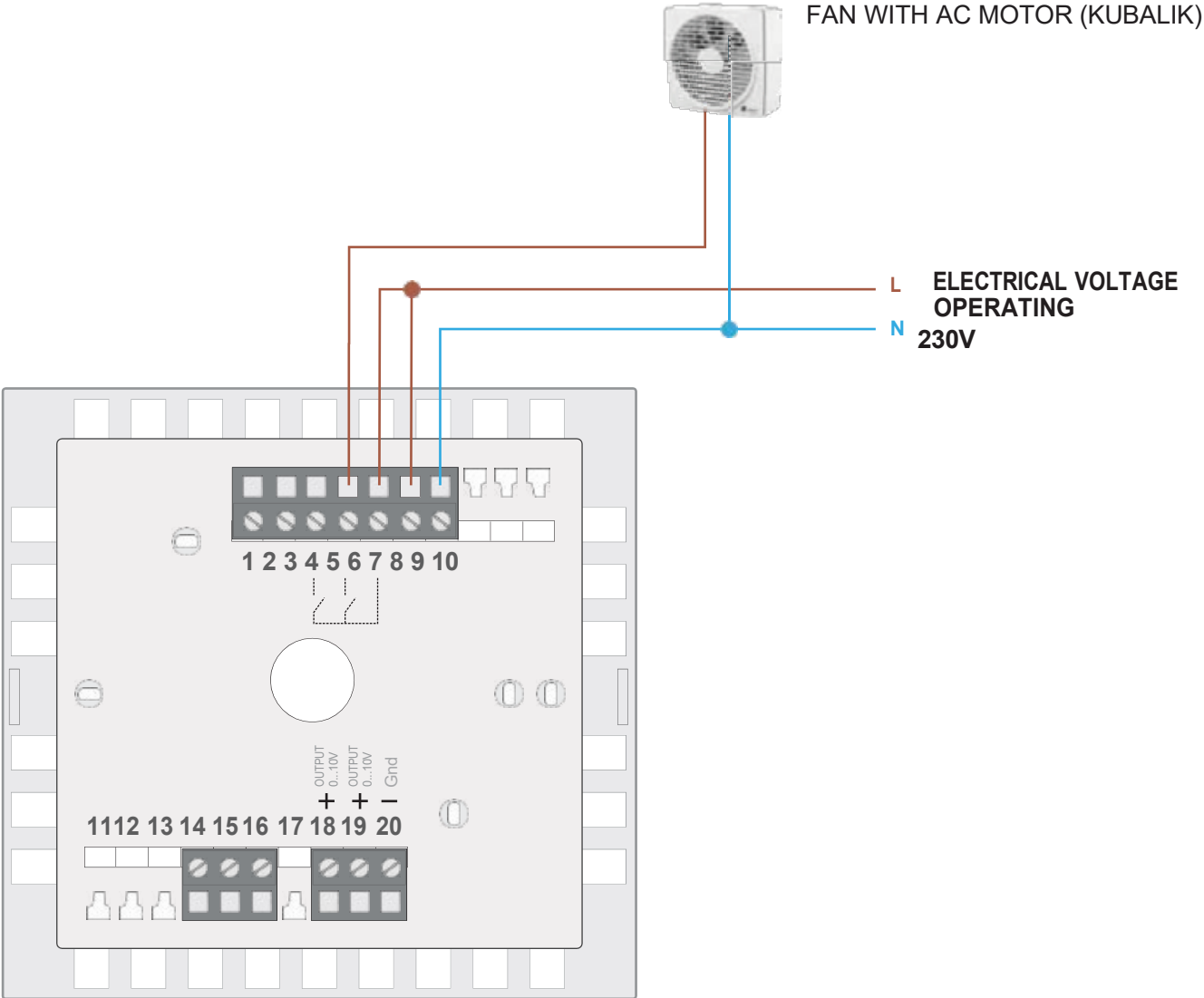OUTPUT 0...10V
Gnd
+ + −
11 12 13 14 15 16 17 18 19 20

Connection detail of the SCO2- IAQ PROBE REGULATOR with a controller

Controller with analog input 0...10V OPERATION AS CO2
PROBE

ELECTRICAL VOLTAGE

N OPERATING VOLTAGE
230V

1 2 3 4 5 6 7 8 9 10

OUTPUT 0...10V
OUTPUT 0...10V
Gnd

11 12 13 14 15 16 17 18 19 20

Controller supply | voltage

Non-isolated analog output.
The analog input of the controller
must be isolated.

CONTROLLER
Entryanalogicalparassignal0... 10VdeCO2

And

0...10V

G0
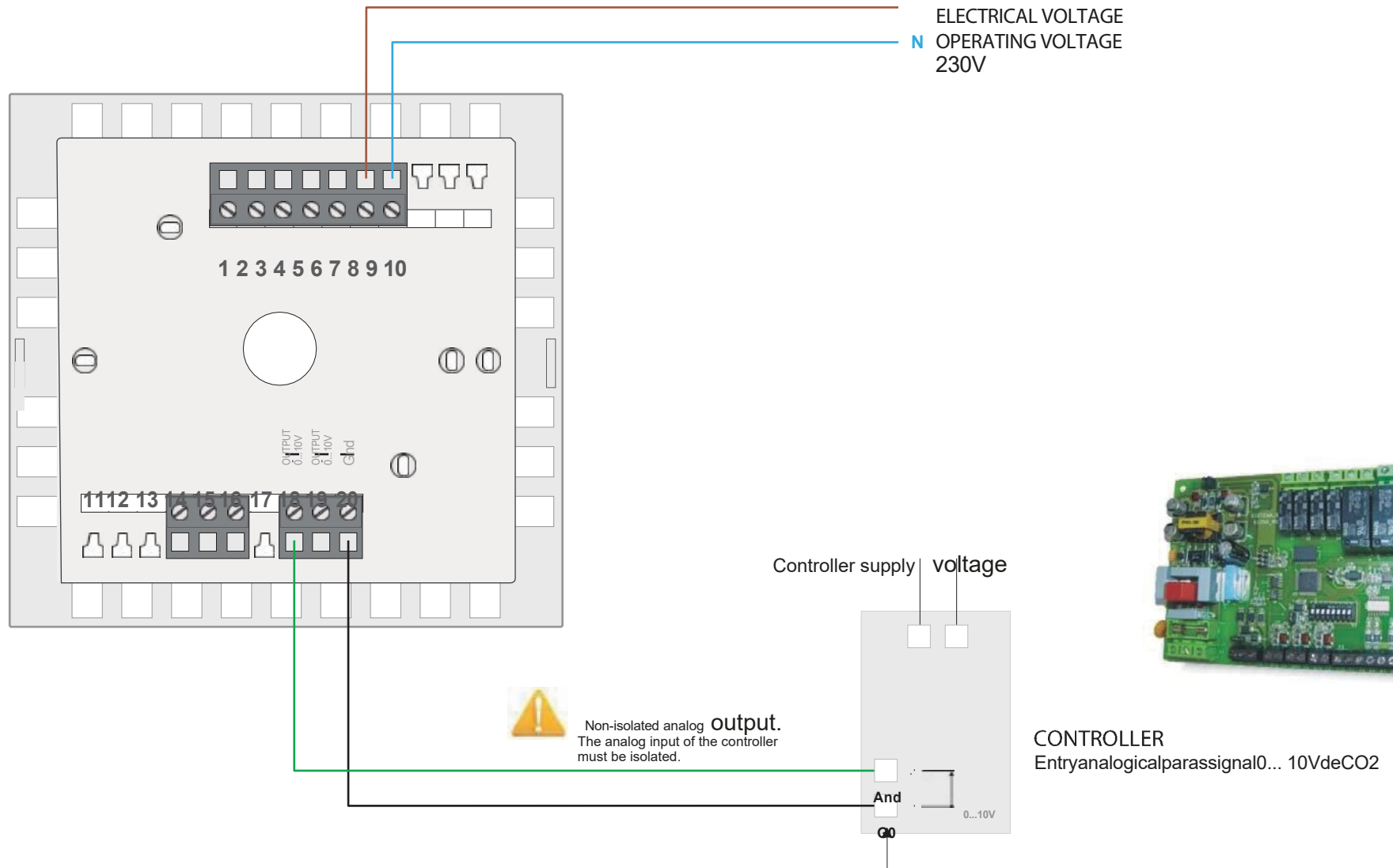
IMPORTANT : G0 corresponds to the common 0...10V.

Connection detail of the SCO2-IAQ PROBE REGULATOR for viewing air quality

OPERATION AS A CO2 PROBE WITH ALARM

CALITY OF **GOOD** AIR

Relay coil 230VAC 1
contact NO+NC

POOR AIR QUALITY

L   OPERATING
    VOLTAGE
N   230V

1 2 3 4 5 6 7 8 9 10

OUTPUT 0...10V
OUTPUT 0...10V
Gnd

11 12 13 14 15 16 17 18 19 20
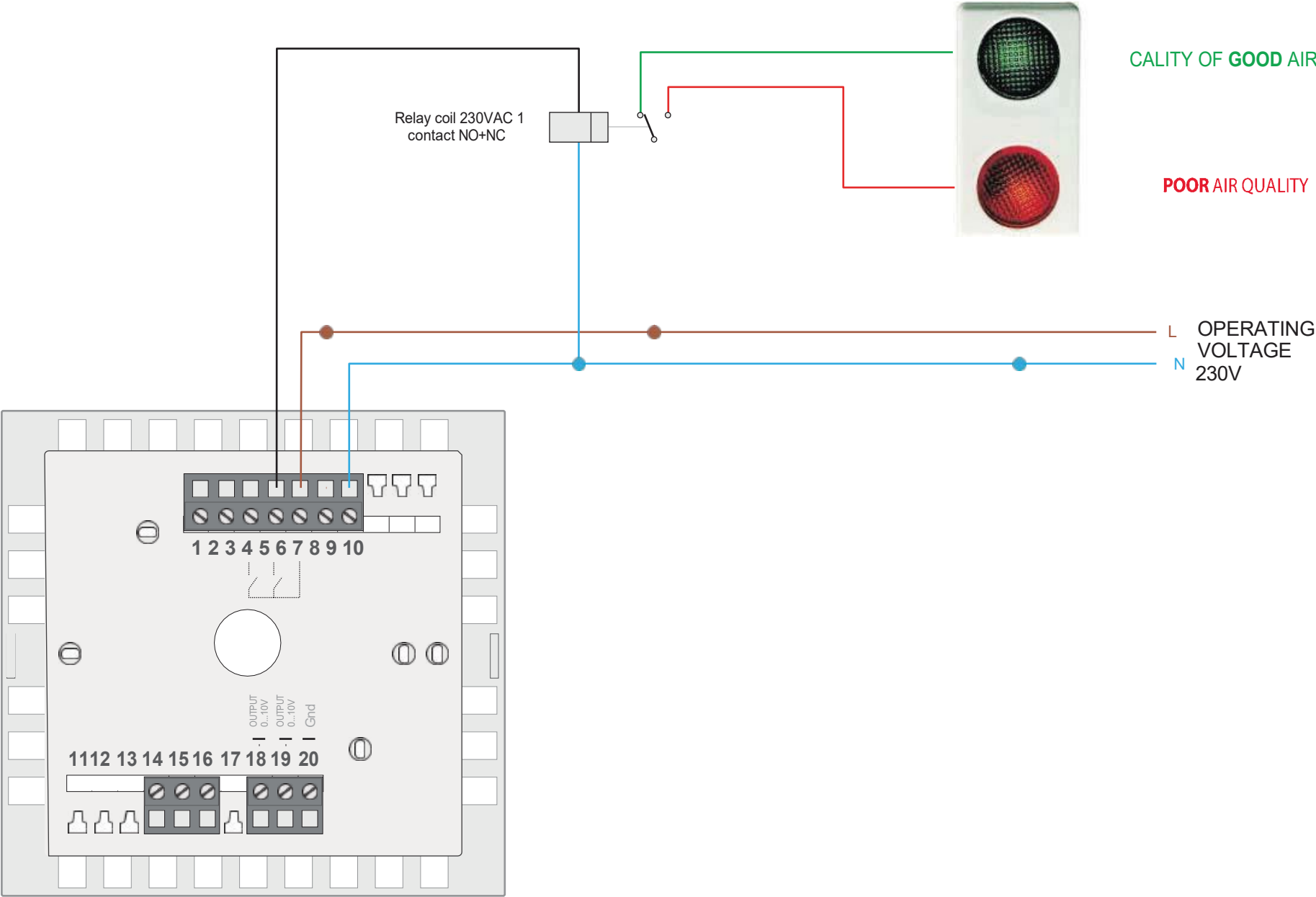
SCO2-IAQ PROBE REGULATOR dimensions

93mm

101mm

24mm

21

21

34,5

26

34,5

21

21
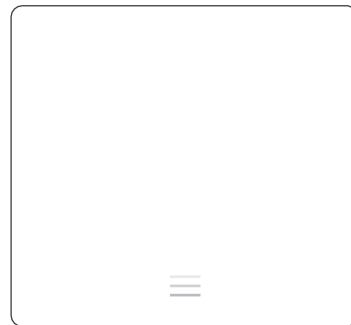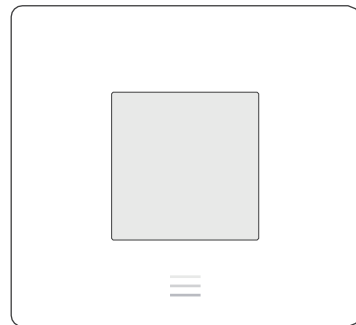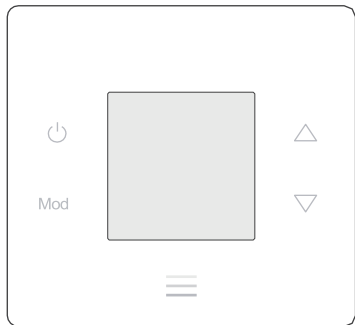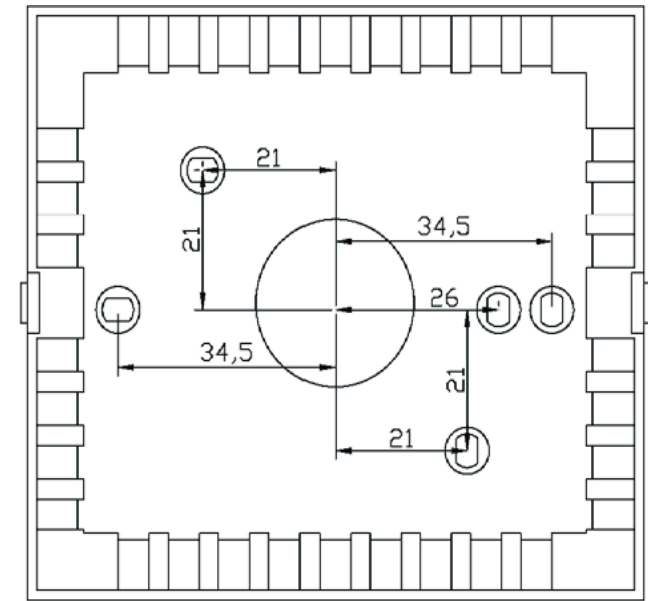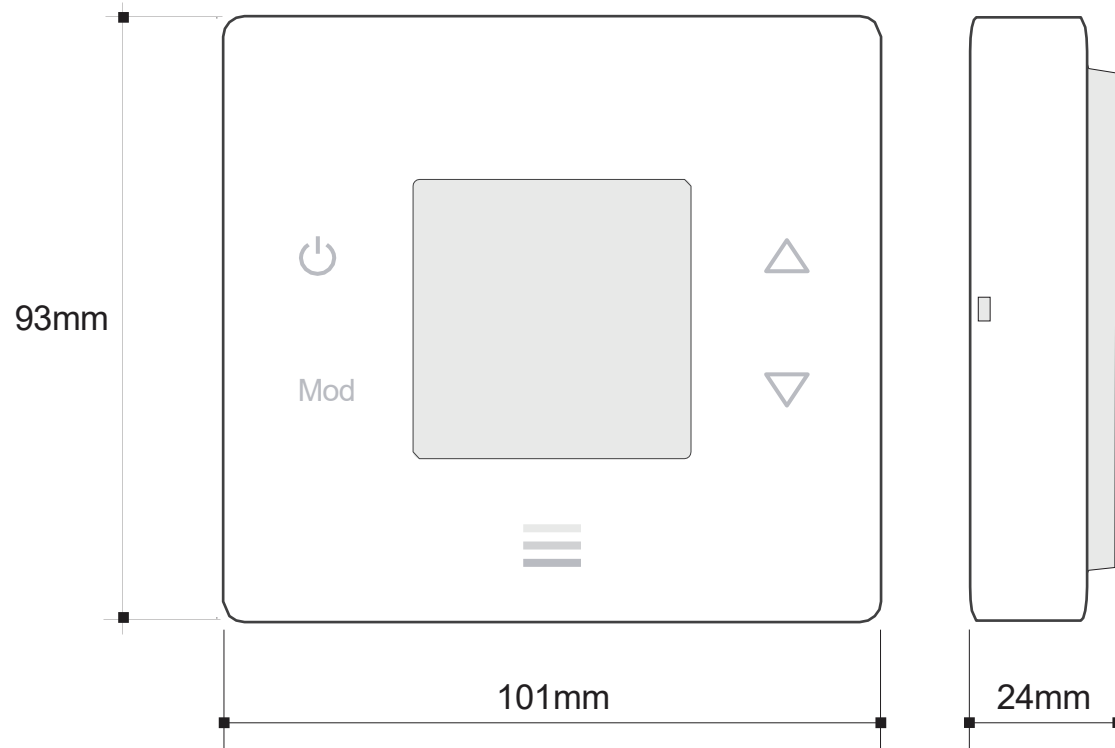
SCO2-IAQ SENSOR REGULATOR assembly
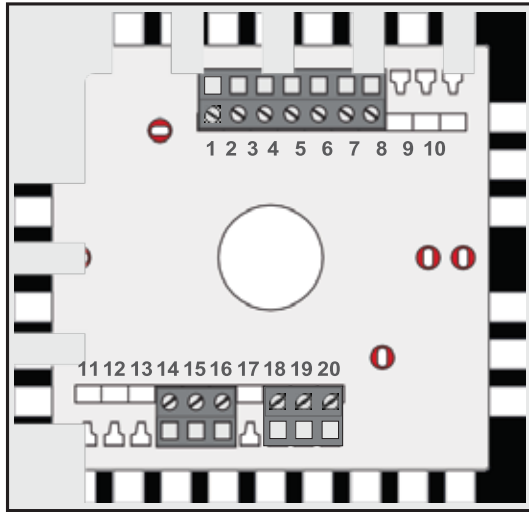
Holes to screw the mounting base to the wall

Wall
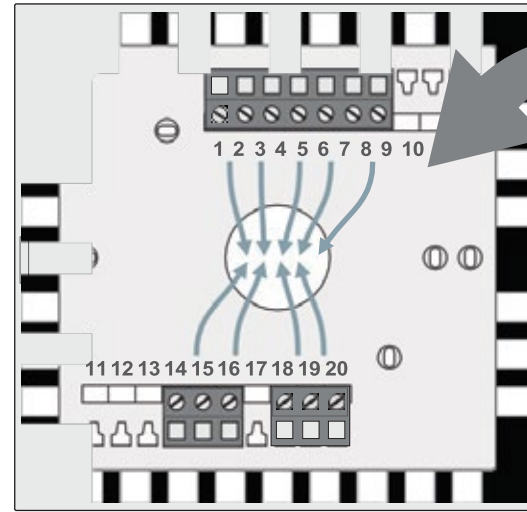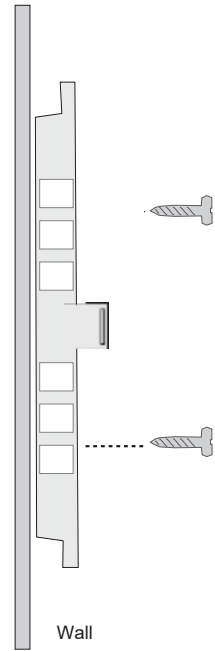
Connect the cables to the terminals of the mounting base

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20
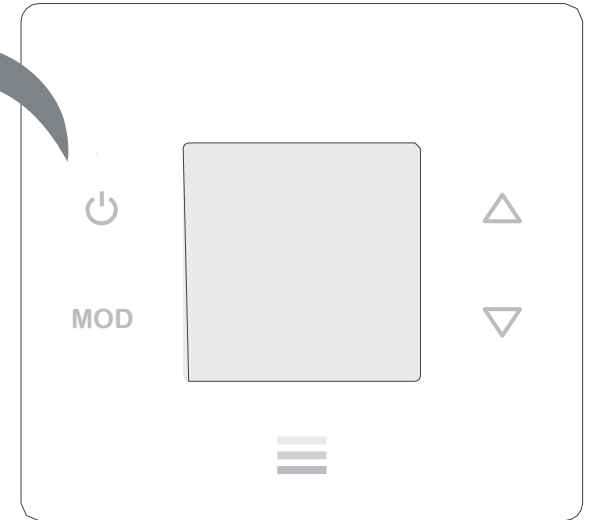
Snap the front cover onto the mounting base

BE CAREFUL WITH THE MOUNTING POSITION
DO NOT MOUNT IT BACKWARDS, THE REGULATOR MAY BE DAMAGED

MOD

Holes

MOUNTING BASE /
BASE DE MONTAJE

COVER / TAPA

Side holes in the lid for pressing mounting base tabs

MOD

Mounting base tabs

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20
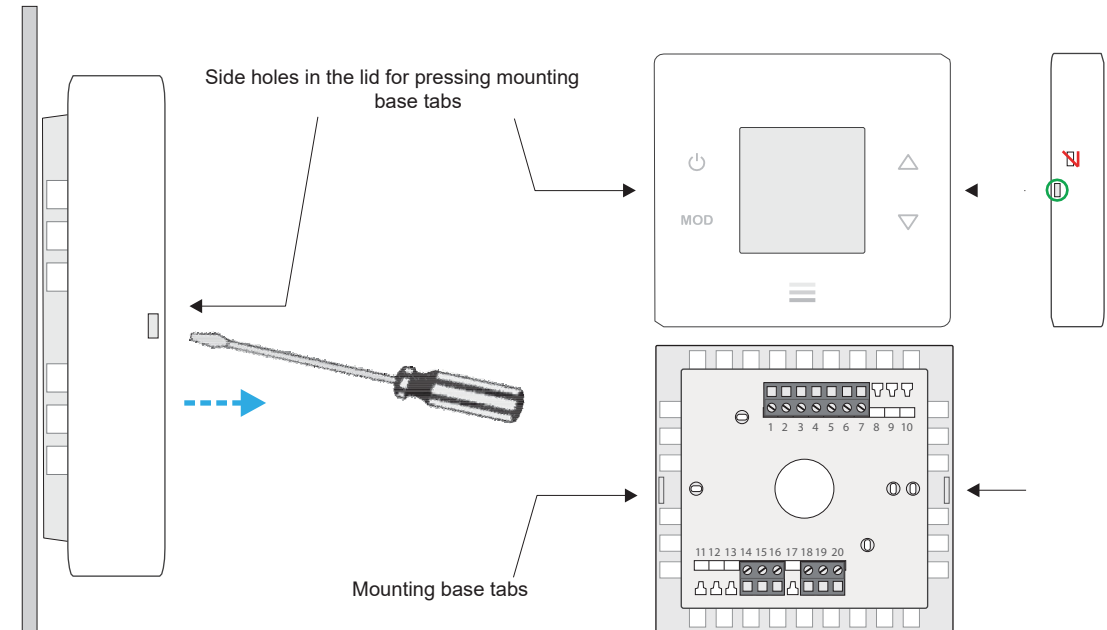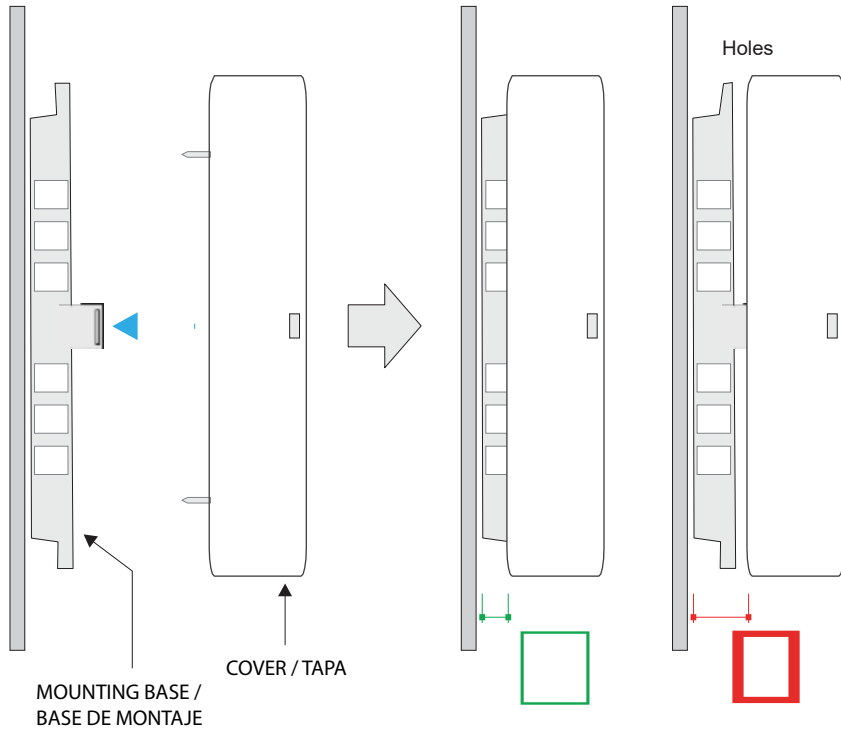
PROTOCOL Of COMMUNICATIONS Of the REGULATOR PROBE SCO2-IAQ

The protocol used is MODBUS RTU mode with the following characteristics:
RS-485 (2 wire). Maximum number of items on the bus: 32 (1 master + 31 slaves)

- Communication speed: 9600 baud.
- Data format:
  - ➢ 8 bits.
  - ➢ No parity.
  - ➢ 1 stop bit.
- 16-bit (2-byte) registers.
  Variable format: High Word First [H/L].
- CRC according to polynomial $x^{16} + x^{15} + x^2 + 1$.

Note: It is recommended to retry communications. Timeout:

1sec. Note: Minimum recommended *Wait to Send* time: 100ms.

READING LOGS

For the reading of Registers it is possible to use <u>command codes 3 or 4</u> with the following message structure:

> **Slave number (1 byte) – Code (03 or 04) (1 byte) – Address of the 1st Register to be read (00-XX) (2 bytes) – Number of Registers to be read (00-YY) (2 bytes) – CRC16 (2 bytes)**
>
> *Maximum number of Registers to read in the same message = 55 (from Register 0 to Register 54)*

The probe regulator response has the following message structure:

> **Slave number (1 byte) – Code (03 or 04) (1 byte) – Number of data bytes (XX) (1 byte) – Data (AA-BB-CC-DD...) (2 bytes for each Register) – CRC16 (2 bytes)**
>
> Number *of data bytes = 2 * Number of Registers to read*

WRITING REGISTERS

Command <u>code 6</u> is used to write Registers with the following message structure :

> **Slave number (1 byte) – Code (06) (1 byte) – Address of the Register to be written (00-XX) (2 bytes) – Data to be written to the register (AA-BB) (2 bytes) – CRC16 (2 bytes)**

The probe regulator has the following message structure:

> **Slave number (1 byte) – Code (06) (1 byte) – Address of the written Register (00-XX) (2 bytes) – Data written to the Register (AA-BB) (2 bytes) – CRC16 (2 bytes)**

ERRORS

If a code other than the indicated read or write code is used, the response received is:

> **Slave No. – OR Code 80Hex – Error Code (1) – CRC16 (2 bytes)**

If you try to read or write access a Register with a non-existent address, the response you receive is:

> **Slave No. – OR Code 80Hex – Error Code (2) – CRC16 (2 bytes)**

If you try to write to a read-only Register or attempt to write an illegal value to a Register, the response you receive is:

> **Slave # – CODE OR 80Hex – Error code (3) – CRC16 (2 bytes)**

LOG MAP

The unused bits in the following registers are 0.

Note: In some communications programs the first word address is set to 400001, so the register 0 of the probe regulator corresponds to the word address 400001. In summary, the word address to which the probe regulator Register cad corresponds is calculated by adding 1 to the Register number of the Register map described below.

Device ID Register

- **Register 0**: 151 [read only].
  - ➢ The probe regulator always responds 151 as a sentinel point in 16-bit binary.

Read/write logs

- **Register 1**: Communications address [read/write].
  - ➢ The value that is sent is the value of the address (1 to 240) in 16-bit binary.
    Default value: 1 [1].
    If the controller is connected to a serial communications network, it is not possible to configure any equipment on the network at address 245, as the regulator also responds to that address.
    BROADCAST ADDRESS: Address 250 (the regulator receives the communication but does not respond). All write registers are broadcast.

- **Register 2**: On /off (manual mode) [read/write] operating status.
  - ➢ 0: Off.
    1: On.
    Default value: 0 [0ff].
    Off: Relay on/off disabled (contact open).
    On: Relay on/off activated (contact closed).
    =240 (0xF0): Default values.
    =247 (0xF7): CO_2 sensor calibration. IMPORTANT: Consult calibration process.
    =255 (0xFF): Reset.

- **Register 3**: Set-up CO_2 (outputs "CO_2 regulation") [read/write].
  - ➢ The value that is sent is the value of the setpoint (400ppm to 1400ppm) in 16-bit binary.
    Default: 800 [800ppm]. [Register 4 ≤ Register 3 ≤ Register 5]
    This slogan also corresponds to the alarm setpoint if enabled.

- **Register 4**: Minimum set-up CO_2 (outputs "CO_2 regulation") [read/write].
  - ➢ The value that is sent is the value of the minimum setpoint (400ppm to 1400ppm) in 16-bit binary.
    Default value: 400 [400ppm]. [Register 4 ≤ Register 5]

- **Register 5**: Maximum set-line CO_2 (outputs "CO_2 regulation") [read/write].
  - ➢ The value that is sent is the value of the maximum setpoint (400ppm to 1400ppm) in 16-bit binary.
    Default value: 1400 [1400ppm]. [Register 4 ≤ Register 5]

- **Register 6**: Hysteresis (output "CO_2 regulation" all/nothing) [read/write].
  - ➢ The value that is sent is the value of hysteresis (50ppm to 400ppm) in 16-bit binary.
    Default value: 200 [200ppm].

- **Register 7**: Proportional band (output "Co_2 regulation" proportional) [read/write].
  - ➢ The value that is sent is the value of the proportional band (100ppm to 600ppm) in 16-bit binary.
    Default value: 400 [400ppm].

- **Register 8**: Integration time (output "CO_2 regulation" proportional) [read/write].
  - ➢ The value that is sent is the value of the integration time (0s to 240s) in 16-bit binary.
    =0s: Proportional control.
    ≠0s: Comprehensive proportional control.
    Default value: 120 [120s: Integral proportional control].

PROPORTIONAL-INTEGRAL CONTROL (proportional output):

- **Proportional control:** The equipment regulates the proportional output 0... 10V according to the graphs included in this document.
- **Integral control:** In case during a time interval (integration time), the error (difference between setpoint and air quality measurement) remains constant or is not reduced, the equipment automatically increases the output 0... 10V, with the aim that the air quality measure reaches the setpoint established in the equipment.
- Note: In case any of the Registers 7 or 8 is modified, the calculations of the PI control are initialized.

![casals logo]

- **Register 9**: Minimum proportional output (output "Co_2 regulation" proportional) [read/write].
  - ➢ The value that is sent is the value of the minimum proportional output (0% to 100%) in 16-bit binary.
    Default value: 0 [0%]. [Register 9 ≤ Register 10]

- **Register 10**: Maximum proportional output (output "Co_2 regulation" proportional) [read/write].
  - ➢ The value that is sent is the value of the maximum proportional output (0% to 100%) in 16-bit binary.
    Default value: 100 [100%]. [Register 9 ≤ Register 10]

  - **Register 11**: Filtering measurement of CO_2 [read/write].
  - ➢ High byte: Time between acquisition of measurements.
    The value that is sent is the filtering value (1 to 100) in 8-bit binary.
    To obtain the time between measurements of CO_2, given in ms, multiply this parameter by 100.
    Default value: 10 [1000ms].

    | 1 | 100ms | 0x0001 |
    | ...10 | 1000ms(1s) | 0x000A |
    | ...100 | 10000ms(10s) | 0x0064 |

  - ➢ Low byte: Limits measured consecutively.
    The value that is sent is the limit value (±1 to ±16) in 8-bit binary.
    Default value: 1 [±1].

- **Register 12**: Display in digits proportional output [read/write].
  - ➢ 0: No display.
    1: With visualization.
    Default value: 1 [With display in digits proportional output].

- **Register 13**: Enable/disable alarm on display [read/write].
  - ➢ 0: Alarm disabled on display.
    1: Alarm enabled on display with ⊓∟ display. Lorem ipsum
    2: Alarm enabled on display with ⊓∟ display and with backlight flicker.
    Default value: 0 [Alarm disabled on display].
    Notes:
    - With a regulator in off, no alarm is signaled on the display.
    - Relay alarm remains enabled regardless of the value of this Register.

- **Register 14**: Minimum renewal operating timing per hour (output "CO_2 Regulation" all/nothing) [read/write].
  - ➢ The value that is sent is the value of the timing (0min to 60min) in 16-bit binary.
    Default: 10 [10min].
    0min: Permanent off output as long CO_2 is correct.
    >0min and <60min: Auto output depending on CO_2 and timing. 60min:
    Output on permanently.

- **Register 15**: Offset measured CO_2 (calibration measured by CO_2) [read/write].
  - ➢ The value that is sent is the value of the offset (-250ppm to +250ppm) in 16-bit binary.
    Default value: 0 [0ppm].
    Negative values are sent in complement to 2 in 16-bit binary.

    | -250ppm | 0xFF06 |
    | 0ppm | 0x0000 |
    | +250ppm | 0x00FA |

- **Register 16**: Time schedule [read/write].
  - ➢ 0: Time schedule disabled. Manual mode.
    1: Time scheduling activated. Programming mode.
    Default value: 0 [Time schedules off].

CV092022-1

- **Register 17**: Day (current date) [read/write].
  - ➢ The value that is sent is the value of the day (0 to 6) in 16-bit binary.
    - 0 Monday
    - 1 Tuesday
    - 2 Wednesday
    - 3 Thursday
    - 4 Friday
    - 5 Saturday
    - 6 Sunday

    Default value: 0 [Monday].
    This Register is not saved in EEPROM, although it remains in the RTC for about 1 week without voltage (the regulator integrates a supercap that acts as a temporary battery to save the time).

- **Register 18**: Time: Minutes (current date) [reading/writing].
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h) in 8-bit binary.
    Default value: 0 [0h].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min) in 8-bit binary.
    Default value: 0 [0min].
    This Register is not saved in EEPROM, although it remains in the RTC for about 1 week without voltage (the regulator integrates a supercap that acts as a temporary battery to save the time).

- **Register 19**: Start time schedule period 1 MONDAY (hour: minutes) [read/write].
    0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA [170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA [170dec] [Not defined].

- **Register 20**: End time schedule period 1 MONDAY (hour: minutes) [read/write].
    0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA [170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA [170dec] [Not defined].

- **Register 21**: Start time schedule period 2 MONDAY (hour: minutes) [read/write].
    0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA [170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA [170dec] [Not defined].

- **Register 22**: End of time schedule period 2 MONDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  ➢ High byte: Time.
  The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].
  ➢ Low byte: Minutes.
  The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].

- **Register 23**: Start time schedule period 1 TUESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  ➢ High byte: Time.
  The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].
  ➢ Low byte: Minutes.
  The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].

- **Register 24**: End of time schedule period 1 TUESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  ➢ High byte: Time.
  The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].
  ➢ Low byte: Minutes.
  The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].

- **Register 25**: Start time schedule period 2 TUESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  ➢ High byte: Time.
  The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].
  ➢ Low byte: Minutes.
  The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].

- **Register 26**: End of time schedule period 2 TUESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  ➢ High byte: Time.
  The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].
  ➢ Low byte: Minutes.
  The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
  Default: 0xAA[170dec] [Not defined].

- **Register 27**: Start time schedule period 1 WEDNESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 28**: End of time schedule period 1 WEDNESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 29**: Start time schedule period 2 WEDNESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 30**: End time schedule period 2 WEDNESDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 31**: Start time schedule period 1 THURSDAY (hour: minutes) [read/write].
  0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 32**: End of time schedule period 1 THURSDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 33**: Start time schedule period 2 THURSDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 34**: End of time schedule period 2 THURSDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 35**: Start time schedule period 1 FRIDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 36**: End time schedule period 1 FRIDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 37**: Start time schedule period 2 FRIDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 38**: End of time schedule period 2 FRIDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 39**: Start time schedule period 1 SATURDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 40**: End time schedule period 1 SATURDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 41**: Start time schedule period 2 SATURDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 42**: End of time schedule period 2 SATURDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 43**: Start time schedule period 1 SUNDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 44**: End of time schedule period 1 SUNDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

- **Register 45**: Start time schedule period 2 SUNDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
   *Default: 0xAA[170dec] [Not defined].*

- **Register 46**: End of time schedule period 2 SUNDAY (hour: minutes) [read/write].
  - 0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 8-bit binary.
    Default: 0xAA[170dec] [Not defined].

Note [EEPROM]: The values of the read/write logs are saved in EEPROM each time you write to them.

- **Register 48**: Start time schedule period 2 SUNDAY (hour: minutes) [read/write].
    0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 16-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 16-bit binary.
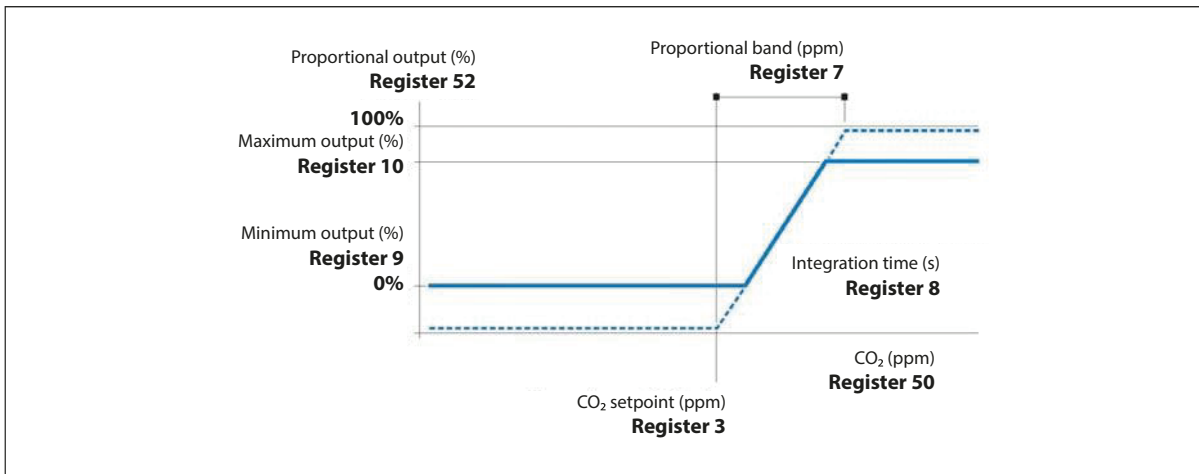   *Default: 0xAA[170dec] [Not defined].*

- **Register 49**: End of time schedule period 2 SUNDAY (hour: minutes) [read/write].
    0xAAAA: Undefined time (– –: – –).
  - ➢ High byte: Time.
    The value that is sent is the value of the time (0h to 23h, 0xAA [170dec]: Not defined) in 16-bit binary.
    Default: 0xAA[170dec] [Not defined].
  - ➢ Low byte: Minutes.
    The value that is sent is the value of the minutes (0min to 59min, 0xAA [170dec]: Not defined) in 16-bit binary.
    Default: 0xAA[170dec] [Not defined].

Note [EEPROM]: The values of the read/write logs are saved in EEPROM each time you write to them.

Read-only logs

- **Register 47**: CO_2 [read only].
  - ➢ The value that is sent is the value of the measure of CO_2 (0ppm to 2000ppm) in16-bit binary.
    Proportional analog output 0... 10V: Output "Measure CO_2".
    Measuring range: 0ppm [0x0000] to 2000ppm [0x07D0]. Another range on request.
    CO2 sensor integrated into the regulator.

- **Register 48**: State relay outputs [read only].
  - ➢ High byte: Output regulation CO_2 all/nothing.
    0: Output off (open relay contact).
    1: Output activated (relay contact closed). The fan can also be activated by time (see log 14).
    All/nothing output by potential-free relay contact. Output "CO_2 regulation" all/nothing.

All/nothing output regulation (alarm on/off)
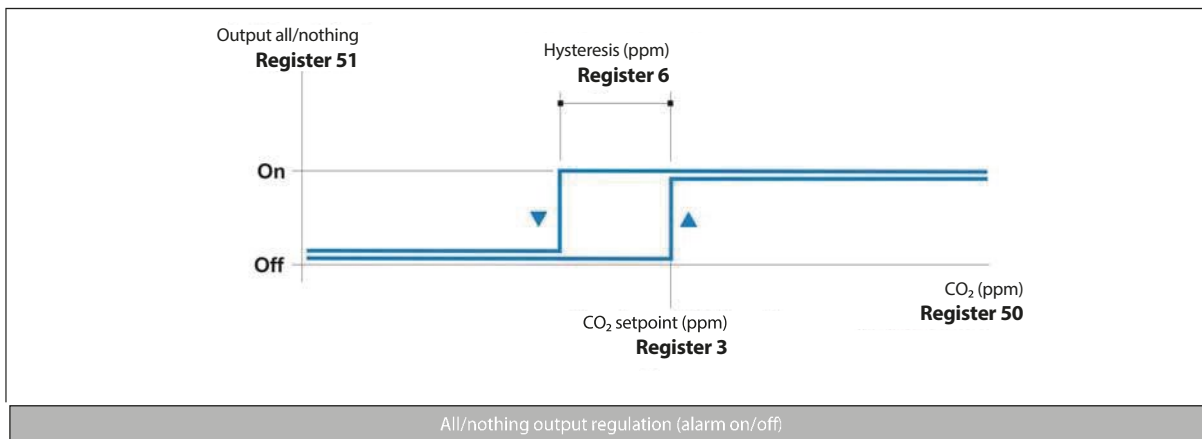
- **Register 49**: State output regulation CO_2 proportional [read only].
  - ➤ The value that is sent is the value of the output percentage (0% to 100%) in 16-bit binary.
    Proportional analog output 0... 10V: Output "$CO_{2\ regulation}$" proportional.

Proportional output (%)
Register 52

100%
Maximum output (%)
Register 10

Minimum output (%)
Register 9
0%

Proportional band (ppm)
Register 7

Integration time (s)
Register 8

CO_2 (ppm)
Register 50

CO_2 setpoint (ppm)
Register 3

Proportional output regulation (air renewal)

- **Log 50**: Remote stop [read only].
  - ➤ 0: Remote stop off (digital input open).
  - ➤ 1: Remote stop activated (digital input closed).

- **Register 51**: Temperature [read only].
  - ➤ The value that is sent is the value of the temperature (0.0^oC to 50.0^oC) multiplied by 10 in 16-bit binary.
    0.0^oC 0x0000
    50.0^oC 0x01F4
    Temperature sensor integrated in the regulator.

- **Register 52**: Relative humidity [read only].
  - ➤ The value that is sent is the value of the relative humidity (0.0% to 100.0%) multiplied by 10 in 16-bit binary.
    0.0%   0x0000
    100.0%   0x03E8
    Relative humidity sensor integrated in the regulator.

- **Register 53**: Time schedule status [read only].
  - ➤ High byte: Time schedule on/off.

    0: Time schedule off.
    1: Time scheduling activated.
  - ➤ Low byte: Programming period.
    The programming period is calculated regardless of the activation or deactivation of the time schedule.
    0: Stop period.
    1: Walking period 1.
    2: Walking period 2.

- **Register 54**: Firmware version [read only].
  - ➤ The value that is sent is the value of the regulator software version (XX.X) multiplied by 10 in 16-bit binary.
    Note: When giving tension to the regulator, or after a reset of the same, it displays on the display the firmware version (v X.X).

End-of-line resistance configuration

End-of-line resistor (pin block JP6):
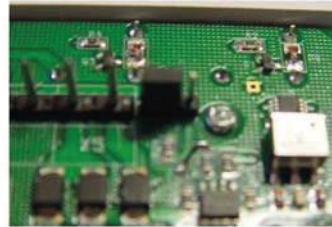
● Jumper in **NR** position   LINE END RESISTANCE **NOT CONNECTED** (default)

● Jumper in **R** position   LINE END RESISTANCE **CONNECTED**

End-of-line resistance

NOTE

VORTICE GROUP COMPANIES / COMPANIES OF THE VORTICE GROUP

VORTICE S.P.A

Strada Cerca, 2
Frazione di Zoate
20067 Tribiano
(Milan) Italy
Tel. (+39) 02 906991
Fax (+39) 02 90699625
vortice.com

VORTICE LIMITED

Beeches House-Eastern
Avenue Burton upon
Trent DE13 0BB United
Kingdom Tel. (+44) 1283
492949
Fax (+44) 1283 544121
vortice.ltd.uk

VORTICE INDUSTRIAL S.R.L.

Via B. Brugnoli 3,
37063 Isola della
Scala (Verona) Italy
Tel. (+39) 045 6631042
Fax (+39) 045 6631039
vorticeindustrial.com

CASALS VENTILACIÓN AIR INDUSTRIAL S.L.

 Ctra. Camprodon, s/n
17860 Sant Joan de les
Abadesses
(Girona) Spain
Tel. (+34) 972720150
casals.com

VORTICE LATAM S.A.

Winery #6
Zona Franca Este
Alajuela, Alajuela 20101
Costa Rica
Phone (+506) 2201
6934
vortice-latam.com

VORTICE VENTILATION SYSTEM

(Changzhou) Co.LTD
No. 388 West Huanghe Road
Building 19, Changzhou
Post Code: 213000 China
Tel. (+86) 0519 88990150
Fax (+86) 0519 88990151
vortice-china.com