RDCV | RESIDENTIAL HVAC CONTROLLER

Mounting and operating instructions

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SAFETY AND PRECAUTIONS

Read all the information, the datasheet, Modbus maps, mounting and operating instructions and study the wiring and connection diagram before working with the product. For personal and equipment safety, and for optimum product performance, make sure you entirely understand the contents before installing, using, or maintaining this product.

For safety and licensing (CE) reasons, unauthorised conversion and / or modifications of the product are inadmissible.

The product should not be exposed to abnormal conditions, such as: extreme temperatures, direct sunlight or vibrations. Long-term exposure to chemical vapours in high concentration can affect the product performance. Make sure the work environment is as dry as possible; avoid condensation.

All installations shall comply with local health and safety regulations and local electrical standards and approved codes. This product can only be installed by an engineer or a technician who has expert knowledge of the product and safety precautions.

Avoid contacts with energised electrical parts. Always disconnect the power supply before connecting, servicing or repairing the product.

Always verify that you apply appropriate power supply to the product and use appropriate wire size and characteristics. Make sure that all the screws and nuts are well tightened and fuses (if any) are fitted well.

Recycling of equipment and packaging should be taken into consideration and these should be disposed of in accordance with local and national legislation / regulations.

In case there are any questions that are not answered, please contact your technical support or consult a professional.

PRODUCT DESCRIPTION

The RDCV series are residential HVAC controllers used to control EC fans, actuators, lighting or other applications with an analogue (0—10 VDC / 0—20 mA / PWM) signal. They feature a wide supply voltage range 110—230 VAC ±10 % / 50—60 Hz and a variable control output signal between an adjustable minimum and maximum level. The controller can work in 2 modes. In Automatic mode it is a demand-based controller with adjustable setpoint that can be connected to a broad range of Sentera sensors. In Manual mode, the RDCV works as a full-featured potentiometer. The settings are easily adjustable either via a 3-button interface equipped with a 7-Segment LED display, via our 3SModbus software application or via the Sensistant configurator.

ARTICLE CODES

Code	Power supply	Enclosure
RDCV9-AD-WH	110—230 VAC ±10 % / 50—60 Hz	white-ivory (ASA LURAN 757, RAL 9010)
RDCV9-AD-BK		anthracite (ABS - copolymer, RAL 7021)

INTENDED AREA OF USE

- Manual control for HVAC applications
- Demand based control for HVAC applications
- For indoor use only

TECHNICAL DATA

- Supply voltage: 110—230 VAC ±10 % / 50—60 Hz
- Inrush current:
  - Max. 15 A (100 VAC)
  - Max. 25 A (240 VAC)
- No-load (stand-by) power:
  - 110 VAC / 60 Hz < 1,1 W
  - 240 VAC / 50 Hz < 1,2 W
- Load resistance:
  - 0—10 VDC mode ≥ 10 kΩ
  - 0—20 mA mode ≤ 500 Ω
  - PWM mode ≥ 10 kΩ
- Minimum and maximum output settings: Umax ≥ Umin + 20 %

0—10 VDC	Min: 0—8 VDC
	Max: 4—10 VDC
0—20 mA	Min: 0—16 mA
	Max: 8—20 mA
0—100 % PWM	Min: 0—80 % PWM
	Max: 40—100 % PWM

- Selectable PWM output: open collector or internally supplied (12 VDC)
- 3-digit, 7-segment LED display with a 3-button keyboard interface
- Extended menu via 3SModbus software application or Sensistant configurator
- Selectable output: analog / digital (PWM)
- Adjustable minimum and maximum output values

- Suitable for inset (IP30) or surface (IP40) mounting
- 2 operating modes: Automatic (Master / Slave) or Manual (Standalone)
- Operating ambient conditions:
  - temperature: -10—40 ºC
  - rel. humidity: 5—80 % rH (non-condensing)
- Storage temperature: -20—50 ºC

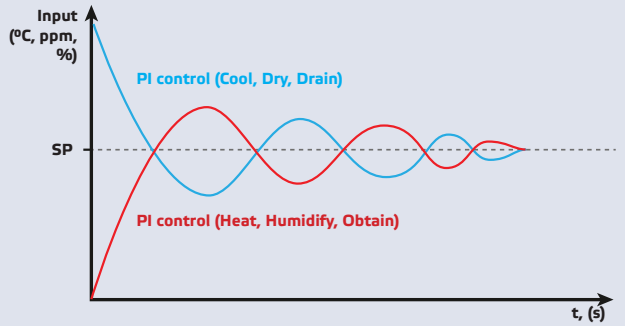
STANDARDS

CE

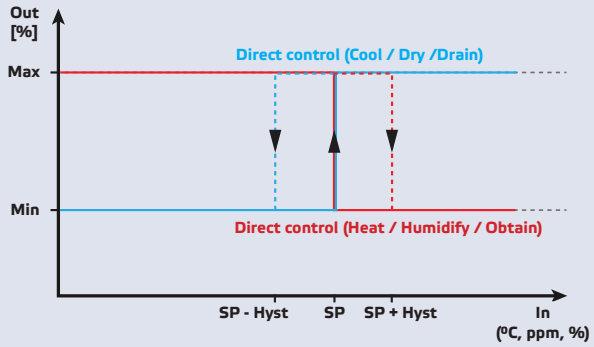
- Low Voltage Directive 2014/35/EC
- EMC Directive 2014/30/EC: EN 61000-6-2: 2005/AC:2005, EN 61000-6-3:2007/A1:2011/AC:2012, EN 61326-2-3:2013
- WEEE Directive 2012/19/EC
- RoHs Directive 2011/65/EC

OPERATIONAL DIAGRAMS

Automatic mode

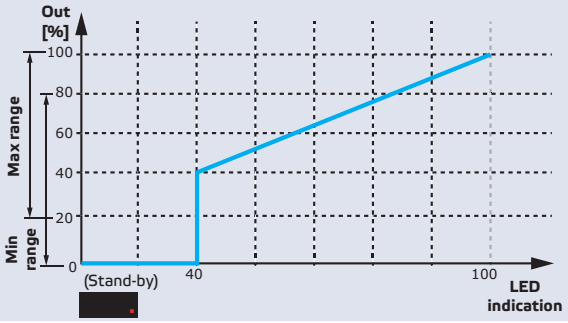


** PI control can require adjustment of parameters, depending on the local circumstances.*

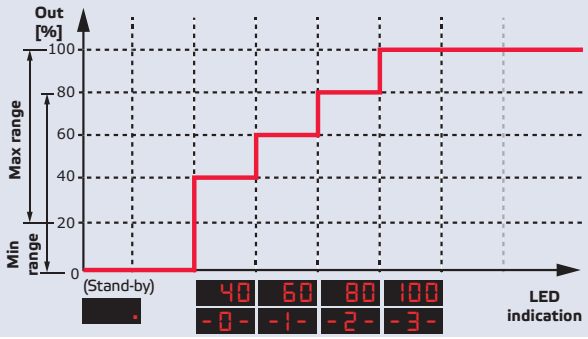


Manual mode

Stepless operational diagram



4 steps operational diagram



WIRING AND CONNECTIONS

L	Power supply, line (110—230 VAC ±10 % / 50—60 Hz)
N	Power supply, neutral (110—230 VAC ±10 % / 50—60 Hz)
Ao	Analogue / digital output (0—10 VDC / 0—20 mA / PWM)
GND	Ground
A	Modbus RTU (RS485), signal A
/B	Modbus RTU (RS485), signal /B
Connections	Cable cross section: max. 2,5 mm^2

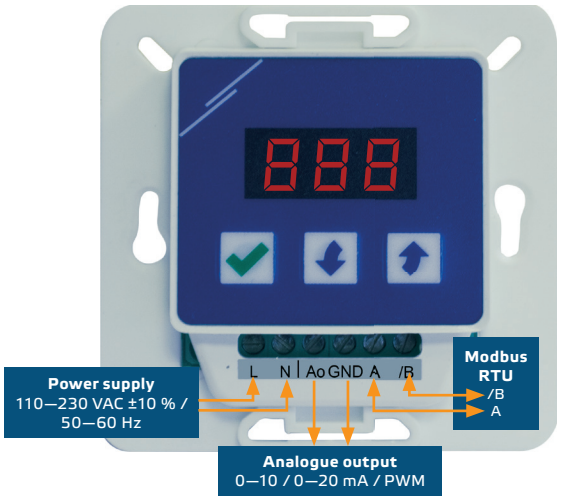
MOUNTING INSTRUCTIONS IN STEPS

Before you start mounting the RDCV controller, read carefully **"Safety and Precautions"**. Then proceed with the following steps:

For inset mounting

1. Disconnect the power supply.
2. Remove the frame cover of the enclosure and take the RDCV controller out, so that it can be easily connected.
3. Do the wiring according to the wiring diagram (see **Fig. 1**).

Fig. 1 Wiring and connections



⚠ ATTENTION

If an AC power supply is used with any of the units in a Modbus network, the GND terminal should NOT BE CONNECTED to other units on the network or via the CNVT-USB-RS485 converter. This may cause permanent damage to the communication semiconductors and / or the computer!

5. Mount the internal enclosure into the wall by inserting suitable connecting elements (not delivered) into the openings. Mind the correct position and mounting dimensions shown in **Fig. 2** and **Fig. 3**.

Fig. 2 Mounting dimensions - inset mounting

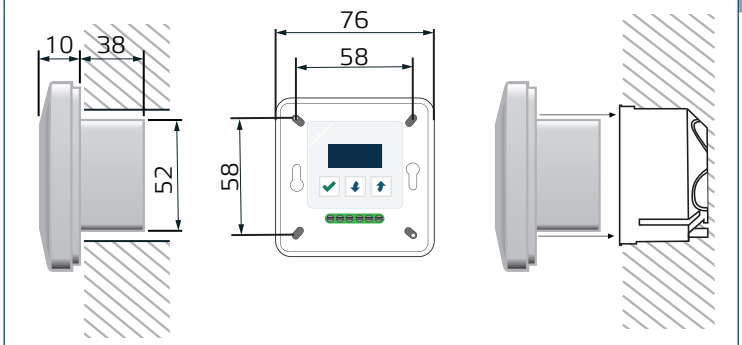
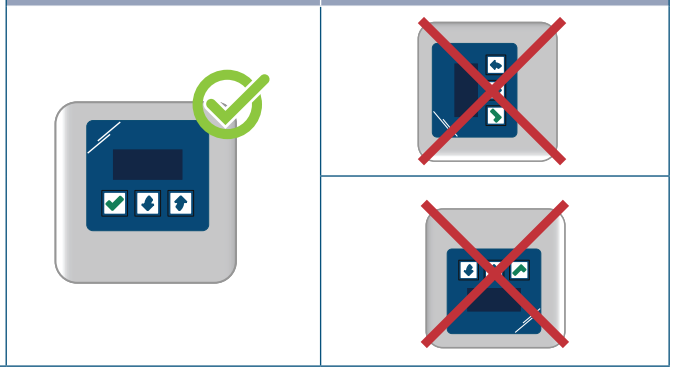


Fig. 3 Mounting position



6. Put back the frame cover of the enclosure.
7. Switch on the power supply.
8. Customise the factory settings to the desired ones via the 3-button interface, the 3SModbus software or via the Sensistant.

For surface mounting

1. Disconnect the power supply.
2. Remove the frame cover of the enclosure.
3. Take out the internal enclosure.
4. Mount the external enclosure to the wall using the delivered dowels and screws. Mind the correct position and mounting dimensions shown in **Fig. 4** and **Fig. 4**.
5. Insert the connecting cables through the grommets of the unit.

Fig. 4 Mounting dimensions - surface mounting

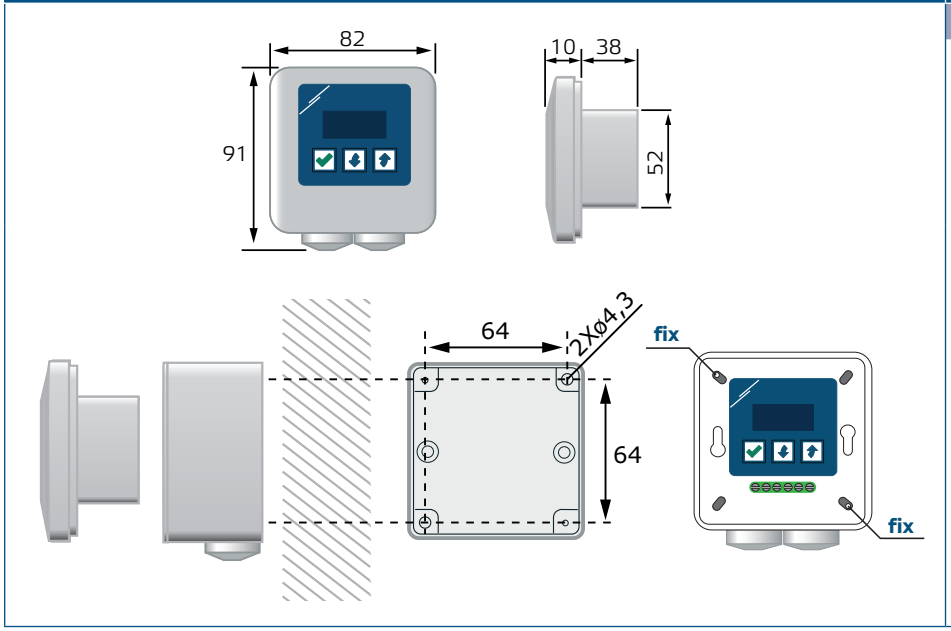
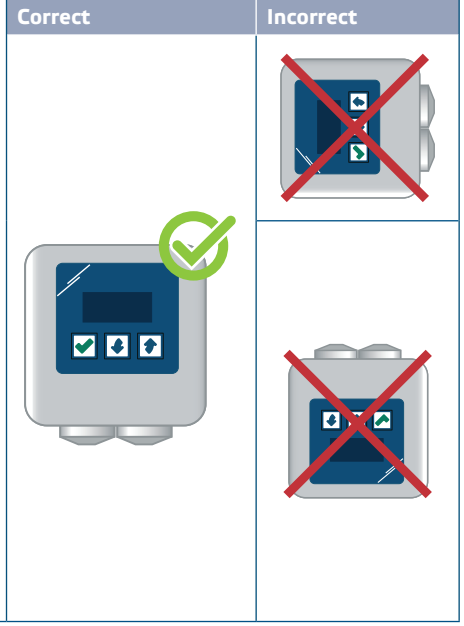


Fig. 5 Mounting position



6. Do the wiring according to the wiring diagram (see **Fig. 1**) using the information from section "**Wiring and connections**".

⚠ ATTENTION

If an AC power supply is used with any of the units in a Modbus network, the GND terminal should NOT BE CONNECTED to other units on the network or via the CNVT-USB-RS485 converter. This may cause permanent damage to the communication semiconductors and / or the computer!

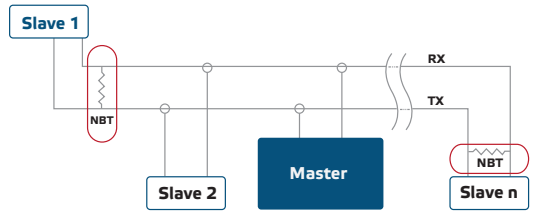
7. Put the internal enclosure into the external one and fix it using the delivered screws and washers. (**Fig. 4**).
8. Put back the frame cover of the enclosure.
9. Switch on the power supply.
10. Customise the factory settings to the desired ones via the 3-button interface, the 3SModbus software or Sensistant.

OPTIONAL MOUNTING INSTRUCTIONS

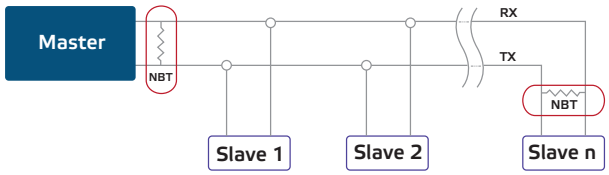
If your unit is the first or the last on the Modbus RTU network:

If your unit starts or terminates the network (see **Example 1** and **Example 2**), enable the NBT resistor via 3SModbus or the menu of the controller. If your device is not an end device, leave the NBT disabled (default Modbus setting).

Example 1



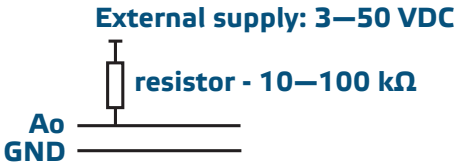
Example 2



If the output has to be PWM:

Customise the factory setting for the PWM output (if necessary). By default the PWM output connection schematic is open collector. To connect the output to an external voltage source via an external pull-up resistor, see **Fig. 6** *PWM connection example*.

Fig. 6 PWM connection example



OPERATING INSTRUCTIONS

When you first switch on the mains supply, the display will show “888” for 2 seconds. Then, “20” will appear and the connected EC motor will run at minimum speed.

If this is not the case, check the connections.

Press and hold the up button until you reach the maximum output value ‘100’. The EC motor will run at maximum speed. Press the button for 4 seconds until the display shows a decimal point ‘.’. The RDCV is now in Stand-by mode, the output is 0, and the motor will stop.

If this is not the case, check the connections.

Choosing the operating mode

To choose the desired operating mode, press the up and down buttons simultaneously in order to access the Setup mode. The decimal point after the values indicates that the unit is in Setup Mode.

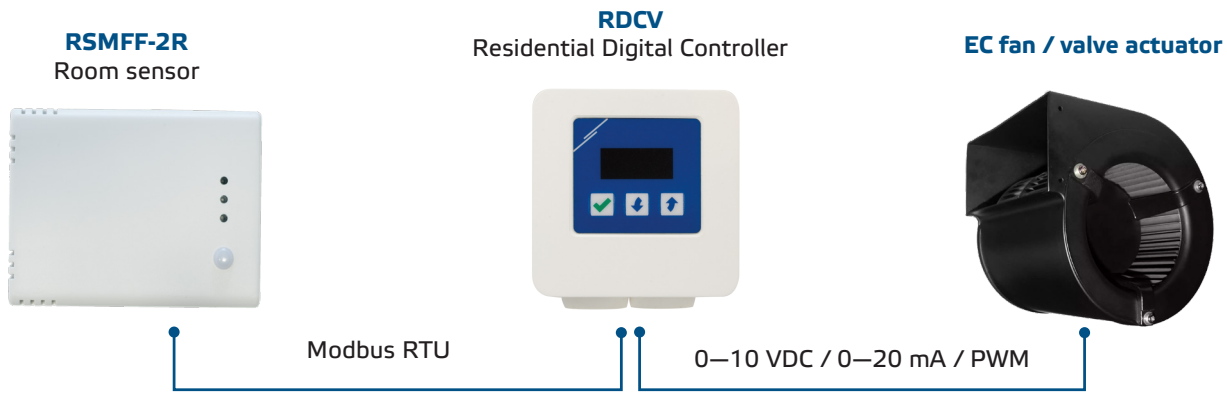
The display shows “RUN”. To change the run mode, press the button. Use the up and down buttons to select “1” for automatic mode or “0” - for manual mode.

To save the selected mode press for 4 seconds. The display will show "888" for a few second to indicate that the value is stored in the memory. Press the up and down buttons simultaneously again in order to exit the Setup mode.

- **AUTOMATIC MODE:**

  In **Automatic mode** the RDCV is a “master” device, i.e. it needs to be connected to a sensor via Modbus RTU in order to operate and control the environment based on the information received by the sensor. If no sensor is connected, the display will show “...” and the RDCV will not work. The sensor needs a few seconds in order to take samples from the environment.

Automatic mode



- **Adjustment of parameters:**

  If necessary, some parameters, such as setpoints, can be adjusted. To do so, you can either use the 3-button interface to enter the menu mode (see *MENU STRUCTURE* below), use the free downloadable 3SModbus software to enter the Modbus registers from a computer (see Modbus registers maps), or use the Sensistant configurator.

- **Operating the RDCV in automatic mode:**

  The RDCV can be switched on and off by pressing and holding the button for 4 seconds. The decimal point on the display indicates that the unit is in Stand-by mode.

  When the RDCV is operational , you can toggle the display between the value measured by the sensor and the output value (percentage) by pressing the button.

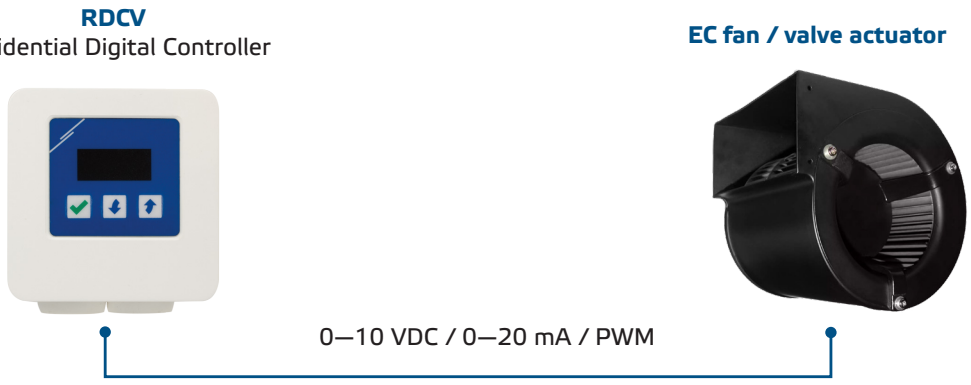
  The automatic output for RDCV (to obtain the installed setpoint), can be temporarily overruled by pressing and holding the up button for 4 seconds (See **Fig. 7** *Overrule mode* below). You can now manually adjust the output to the desired level. After a predefined period of time (from 10 to 120 minutes), the RDCV returns to automatic mode. The setting of this duration is only accessible via Modbus RTU. The I-O adjustable parameter should be set to “Output”.

Fig. 7 Overrule mode

- **MANUAL MODE:**

  In **Manual mode**, the RDCV operates as a full-featured manual controller for EC fans, actuators, lighting or other applications with an analogue signal (0—10 VDC / 0—20 mA / PWM). The output value increases / decreases in the range between the min. and max. settings (or 0). See the operational diagram. The output can be stepless or divided into 2—10 equal steps.

Manual mode



- **Adjustment of parameters:**

  If necessary, some paramaters, such as the number of steps, can be adjusted. To do so, you can either use the 3-button interface to enter the menu mode (see *MENU STRUCTURE* below), use the free downloadable 3SModbus software to enter the Modbus registers from a computer (see Modbus registers maps) or use the Sensistant configurator.

- **Operating the RDCV in manual mode:**

  The RDCV can be switched on and off by pressing and holding the ✔ button for 4 seconds. The decimal point on the display indicates that the unit is in Stand-by mode.

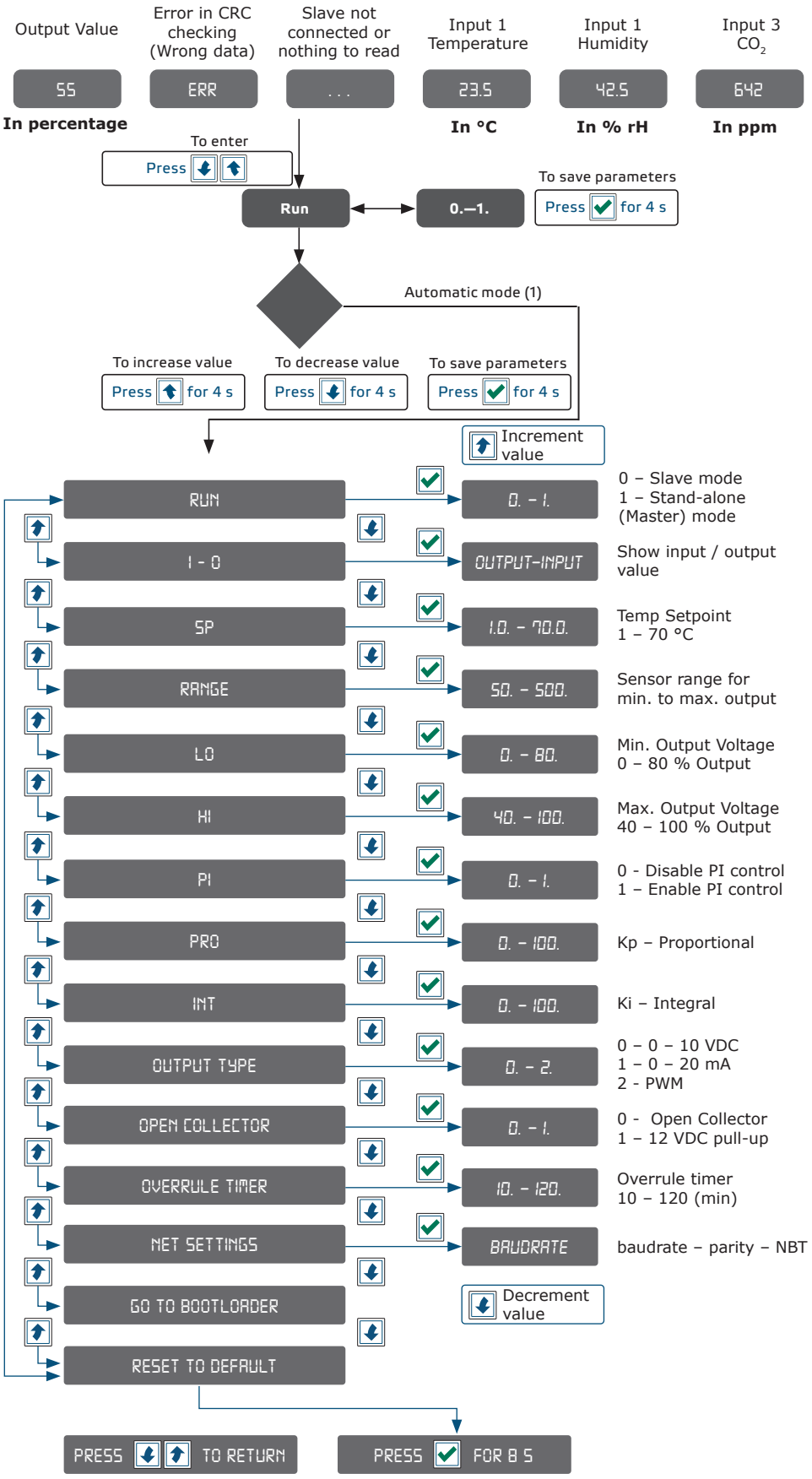
  To increase the output value or step, use the up ↑ button. To decrease the output value or step, press the down ↓ button.

  When the number of steps is > 0, you can toggle the display between the number of steps and the output value (percentage) by pressing the ✔ button.

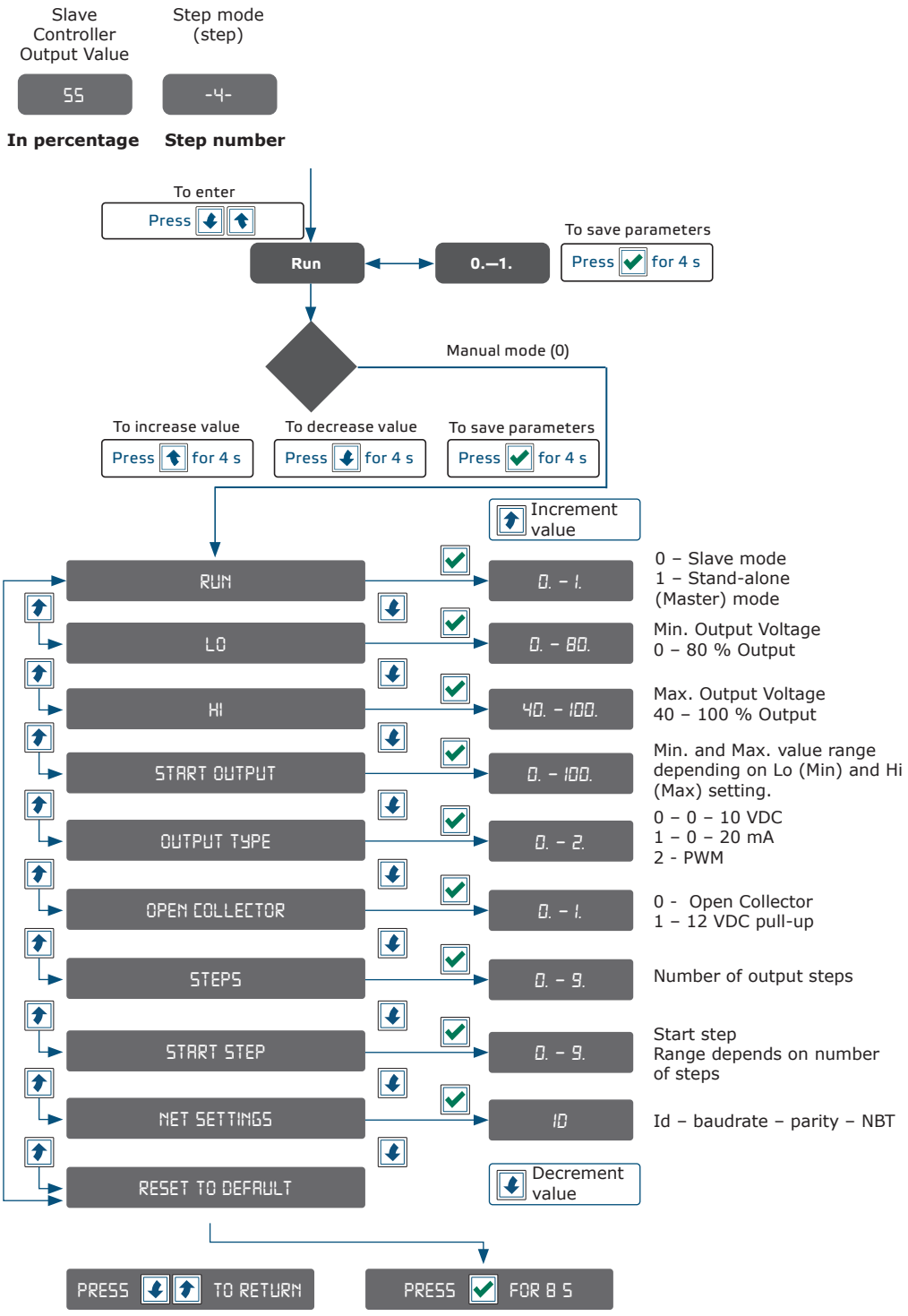
NOTE

In manual mode, the RDCV is a "slave" device. This means that eventually, the output value can be overwritten by a Building Management System.

MENU STRUCTURE - AUTOMATIC MODE



MENU STRUCTURE - MANUAL MODE



7-SEGMENT DISPLAY INDICATION

Indication		Description
	Digits	Output value, menu items and settings
	A decimal point	Stand-by mode
	Blinking digits	Parameter saving or unit reset
	1—100	Output value in working mode
	Digits with a point	Parameter value in setting mode
	Indication of output steps	Toggled with output value by pressing

VERIFICATION OF THE INSTALLATION INSTRUCTIONS

- After switching on the supply, “888” must be displayed for 2 seconds.
- Then it shows the output value and the connected EC motor must run at minimum or corresponding speed.

Fig. 8 Start-up indication

TRANSPORT AND STORAGE

Avoid shocks and extreme conditions; stock in original packing.

WARRANTY AND RESTRICTIONS

Two years from the delivery date against defects in manufacturing. Any modifications or alterations to the product after the date of publication relieve the manufacturer of any responsibilities. The manufacturer bears no responsibility for any misprints or mistakes in this data.

MAINTENANCE

In normal conditions this product is maintenance-free. If soiled, clean with a dry or damp cloth. In case of heavy pollution, clean with a non-aggressive product. In these circumstances the unit should be disconnected from the supply. Pay attention that no fluids enter the unit. Only reconnect it to the supply when it is completely dry.