EV3 200 Web

Controllers - Gateway for a network of up to 10 devices

⚠ WARNING

Read and fully understand user manual before using this device.

Failure to follow these instructions can result in death or serious injury.

Installer Manual

1143W24E4.01 - 07/2023

CONTENTS

CONTENTS

CONTENTS

IMPORTANT INFORMATION

Liability and residual risks

EVCO assumes no liability for any damage caused by the following (by way of example; this is not an exhaustive list):

- Installation/use for purposes other than those specified and, in particular, not adhering to the safety provisions set out by current regulations in the country in which the product is installed and/or contained in this manual;
- Use in appliances that do not guarantee sufficient protection against electric shocks, water and dust within the installation conditions created;
- Use in appliances that allow access to hazardous parts without the use of a keyed or tooled locking mechanism when accessing the instrument;
- Tampering and/or modifying the product;
- Installation/use in appliances which do not comply with current regulations in the country in which the product is installed.

The customer/manufacturer is responsible for ensuring their machine complies with these regulations.
EVCO's responsibility is limited to the correct and professional use of the product in accordance with regulations and the instructions contained in this manual and other product support documents.

To comply with EMC standards, observe all the electrical connection instructions. As it depends on the wiring configuration as well as the load and the installation type, compliance must be verified for the final machine as specified by the relevant product standard.

Disclaimer

This document is the exclusive property of EVCO. It contains a general description and/or a description of the technical specifications for the features offered by the products listed herein. This document should not be used to determine the suitability or reliability of these products in relation to specific user applications. Each user or integration specialist should conduct their own complete and appropriate risk analysis, in addition to carrying out a product evaluation and test in relation to its specific application or use. Users can send us comments and suggestions on how to improve or correct this publication.

Neither EVCO nor any of its associates or subsidiaries shall be held responsible or liable for improper use of the information contained herein.

EVCO has a policy of continuous development, therefore reserves the right to make changes and improvements to any product described in this document without prior notice.

The images in this document and other documentation supplied with the product are provided for illustrative purposes only and may differ from the product itself.

The technical data in this manual is subject to change without prior notice.

Terms and Conditions of use

Permitted use

The device must be installed and used in accordance with the instructions provided and, in particular, hazardous live parts must not be accessible under normal conditions.

The device must be suitably protected from water and dust with regard to its application and must also only be accessible with the aid of a tool (with the exception of the front panel).
Only qualified personnel may install the product or perform technical support procedures on it.

The customer must only use the product as described in the documentation relating to that product.

Prohibited use

Any use other than those described in the "**Permitted use**" section and in the product support documentation is prohibited.

Disposal

The device must be disposed of according to local regulations governing the collection of electrical and electronic equipment.

Consider the environment

The company strives to respect the environment, taking account of customer requirements, technological innovations in terms of materials and the expectations of the community to which we belong. EVCO places great importance on respecting the environment, encouraging all associates to become involved with company values and guaranteeing safe, healthy and functional working conditions and workplaces.
Please consider the environment before printing this document.

IMPORTANT SAFETY INFORMATION

Read this document carefully before installation and take all precautions before using the device. Only use the device in accordance with the methods described in this document. The following safety messages may be repeated several times in the document, to provide information regarding potential hazards or to attract attention to information which may be useful in explaining or clarifying a procedure.

This symbol is used to indicate a risk of electric shock.
It is a safety indication and as such, should be observed to avoid potential accidents or fatalities.

This symbol is used to indicate a risk of serious personal injury.
It is a safety indication and as such, should be observed to avoid potential accidents or fatalities.

DANGER

DANGER indicates a situation of imminent danger which, if not avoided, **will result in death or serious injury**.

WARNING

WARNING indicates a situation of imminent danger which, if not avoided, **may result in death or serious injury**.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **could cause minor or moderate injury.**

NOTICE

NOTICE indicates a situation not related to physical injuries but which, if not avoided, could damage the equipment.

N.B. The maintenance, repair, installation and use of electrical equipment must only be entrusted to qualified personnel.

QUALIFIED PERSONNEL

Only suitably trained and experienced personnel capable of understanding the content of this manual and all documentation regarding the product are authorised to work on and with this equipment. Furthermore, the personnel must have completed courses in safety and must be able to recognise and prevent the implied dangers. The personnel must have suitable training, knowledge and experience at a technical level, and be capable of anticipating and detecting potential risks caused by using the product, as well as changing the settings and modifying the mechanical, electric and electronic equipment for the entire system in which the product is used. All personnel working on and with the product must be entirely familiar with the relevant standards and directives, as well as safety regulations.

SAFETY INFORMATION RELATING TO THE PRODUCT

Before carrying out any work on the equipment, read these instructions carefully, making sure you understand everything.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Only use electrically insulated measuring devices and equipment.
- Do not install the equipment while the power supply is connected.
- Switch off all equipment, including connected devices, before installing or uninstalling the device.
- Always use a correctly calibrated voltmeter to check the system is switched off.
- Do not touch the unshielded components or the terminals while they are live.
- Do not open, disassemble, repair or modify the product.
- Do not expose the equipment to liquids or chemicals.
- Before applying voltage to the equipment:
  - Make sure all protective elements, such as covers, hatches and grilles, are fitted and/or closed.
  - Check all wiring connections.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK AND FIRE

- Do not use the device with loads greater than those indicated in the technical specifications.
- Do not exceed the temperature and humidity ranges indicated in the technical specifications.
- Use the required safety interlocks (fuses and/or magnetothermal switches) of a suitable size.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK OR MALFUNCTIONING OF THE EQUIPMENT

Do not use damaged products or accessories.

This device was designed to operate in non-hazardous environments, excluding applications that generate, or could potentially generate, hazardous atmospheres. Only install this device in areas and for applications which are reliably free from hazardous atmospheres.

⚠ DANGER

RISK OF EXPLOSION

- Only install and use this device in sites that are not at risk.
- Do not install or use this device in applications which are capable of generating hazardous atmospheres, such as applications that use flammable refrigerants.

⚠ WARNING

MALFUNCTIONING OF THE EQUIPMENT

- Perform the wiring carefully, in compliance with electromagnetic compatibility requirements.
- Make sure the wiring is correct for the application.
- Use shielded cables for all I/O signal and communication cables.
- Minimise the length of the connections as much as possible and avoid winding the cables around electrically connected parts.
- The signal cables (analogue and digital inputs, communication and corresponding power supplies), power cables and power supply cables for the device must be routed separately.
- Before applying the power supply, check all the wiring connections.
- Use the required safety interlocks where personnel and/or equipment hazards exist.
- Install and operate this equipment in a cabinet appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions.
- Do not disassemble, repair or modify this equipment.
- Do not connect wires to unused terminals and/or to terminals labelled “No connection “(N.C.)”.

1. INTRODUCTION

1.1 DESCRIPTION

EVCO **EV3 200 Web** controllers remotely monitor up to 10 **EPoCA**-compatible controllers on the **EPoCA** cloud via the on-board Ethernet and RS-485 serial ports.

EV3 200 Web is compliant with HACCP regulations for food safety during food processing.

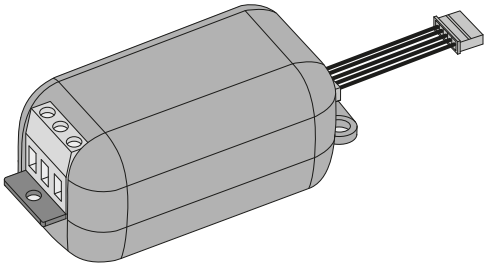
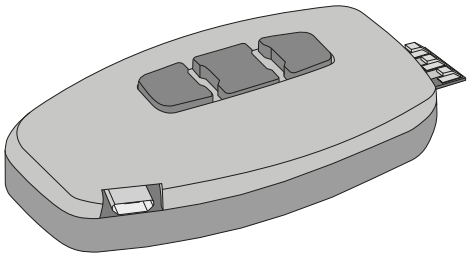
1.2 FEATURES

The main features of **EV3 200 Web** are:

- On-board regulation (defrost, compressor, energy saving etc...);
- 2 digital inputs;
- 2 analogue inputs for NTC probes;
- 4 relay outputs;
- 1 Ethernet RJ45 Modbus TCP/IP compatible serial port;
- 1 micro-B USB serial port;
- 1 RS-485 serial port;
- 1 32 MB internal memory;
- 1 year of HACCP data recording with 5-minute intervals, up to 3 probes;
- RTC shared with subnetwork;
- **EPoCA** compatible.

1.3 ACCESSORIES

The following accessories are available for **EV3 200 Web** controllers:

Type	P/n	Description
	**EVTPN615F200**	SND NTC TERM 1,5M 6x15 COSTFL
	**EVTPN630F200**	SND NTC TERM 3,0M 6x15 COSTFL
	**EVTPP815P200**	SND PTC PVC2 1,5M 6x30 STEEL67
	**EVTPP830P200**	SND PTC PVC2 3,0M 6x30 STEEL67
	**0810500023**	USB A-micro-B cable 1.5 m
	**EVIF22TSX**	Module for TTL/RS-485 serial interface
	**EV3KEY**	Programming key for EV3 regulation parameters

2. TECHNICAL SPECIFICATIONS

All the system components of the **EV3 200 Web** controllers meet the requirements of the European Community (EC) for electric equipment. They must be installed in a casing or other location designated for the specific ambient conditions and to keep the possibility of involuntary contact with dangerous electrical voltages to a minimum. Use metal casings to improve the immunity of the **EV3 200 Web** system to electromagnetic fields. This equipment meets EU requirements as shown in the tables below.

⚠ WARNING
MALFUNCTIONING OF THE EQUIPMENT Do not exceed the nominal values given in this section.

2.1 TECHNICAL SPECIFICATIONS

Type	Description
The product complies with the following harmonised standards:	EN60730-1 and EN60730-2-9
Device construction:	Built-in electronic device
Device purpose:	Operating control device
Type of action:	1
Pollution category:	2
Overvoltage category:	III
Rated impulse withstand voltage:	4000 V
Power supply:	115...230 Vac, ±10%, 50/60 Hz
Consumption:	10 VA maximum
Ambient operating conditions:	-10 ... 50 °C (14 ... 122 °F) 10 ... 90 % RH non-condensing
Transportation and storage conditions:	-20 ... 70 °C (-4 ... 158 °F) 10 ... 90 % RH non-condensing
Software class:	A
Environmental front protection:	IP65
Clock (RTC):	Built-in lithium battery
Clock drift:	≤ 60 s/month at 25 °C (77 °F)
Battery life:	30 days
Battery charging time:	24 h through device's power supply
Data memory:	32 MB
Data memory per device:	~2.7 MB

2.2 I/O FEATURES

Type	Description
Digital inputs:	2 voltage-free digital inputs
Analogue inputs for temperature:	2 analogue inputs for NTC probes
Digital output with non-hazardous voltage (SELV):	4 relay outputs
Serial:	1 Ethernet RJ45 10/100 MAC serial port 1 USB serial port

Analogue input features

	Default	NTC 10 kΩ at 25 °C BETA 3435	PTC KTY 81-121 990 Ω at 25 °C	RH	Digital input
Pb1	Probe Temperature	•	•	---	---
Pb2	Probe Evaporator	•	•	---	---
Range	---	-40...105 °C (-40...220 °F)	-50...150 °C (-58...302 °F)	---	---
Resolution	---	0.1 °C (1 °F)	---	---	---
Input impedance	---	10 kΩ	990 Ω	---	---

Digital output features

	Default	Description	Load (at 250 Vac)	Type of load
Out1	Fans	SPDT	16 A	Resistive
Out2	AUX	SPDT	5 A	Resistive
Out3	Compressor	SPDT	5 A	Resistive
Out4	Not configured	SPDT	8 A	Resistive

3. MECHANICAL ASSEMBLY

3.1 BEFORE STARTING

Read this manual carefully before installing the system.
In particular, the safety instructions, electrical requirements and current regulations for the machine or the process in which this device is involved must be observed. The use and application of the information contained herein require experience in the design and programming of automated control systems. Only the user, system integrator or machine builder can be aware of all the conditions and factors present during the installation, configuration, operation and maintenance of the machine or process, and can therefore determine the associated automation equipment and the related safeties and interlocks which can be effectively and properly used. When selecting automation and control equipment and any other related equipment or software for a particular application, always consider all the applicable local, regional or national standards and/or regulations.

⚠ WARNING

REGULATORY NON-COMPLIANCE

Make sure all the equipment used and the systems comply with all the applicable local, regional and national regulations.

3.2 INFORMATION ON INSTALLATION AND THE ENVIRONMENT

Before carrying out any work on the equipment, read these instructions carefully, making sure you understand everything.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Only use electrically insulated measuring devices and equipment.
- Do not install the equipment while the power supply is connected.
- Switch off all equipment, including connected devices, before installing or uninstalling the device.
- Always use a correctly calibrated voltmeter to check the system is switched off.
- Do not touch the unshielded components or the terminals while they are live.
- Do not open, disassemble, repair or modify the product.
- Do not expose the equipment to liquids or chemicals.
- Before applying voltage to the equipment:
  - Make sure all protective elements, such as covers, hatches and grilles, are fitted and/or closed.
  - Check all wiring connections.

This device was designed to operate in non-hazardous environments, excluding applications that generate, or could potentially generate, hazardous atmospheres. Only install this device in areas and for applications which are reliably free from hazardous atmospheres.

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⚠ WARNING

MALFUNCTIONING OF THE EQUIPMENT

- Perform the wiring carefully, in compliance with electromagnetic compatibility and safety requirements.
- Make sure the wiring is correct for the application.
- Use shielded cables for all I/O signal and communication cables.
- Minimise the length of the connections as much as possible and avoid winding the cables around electrically connected parts.
- The signal cables (analogue and digital inputs, communication and corresponding power supplies), power cables and power supply cables for the device must be routed separately.
- Before applying the power supply, check all the wiring connections.
- Use the required safety interlocks where personnel and/or equipment hazards exist.
- Install and operate this equipment in a cabinet appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions.
- Do not disassemble, repair or modify this equipment.
- Do not connect wires to unused terminals and/or to terminals labelled “No connection “(N.C.)”.

3.3 DIMENSIONS

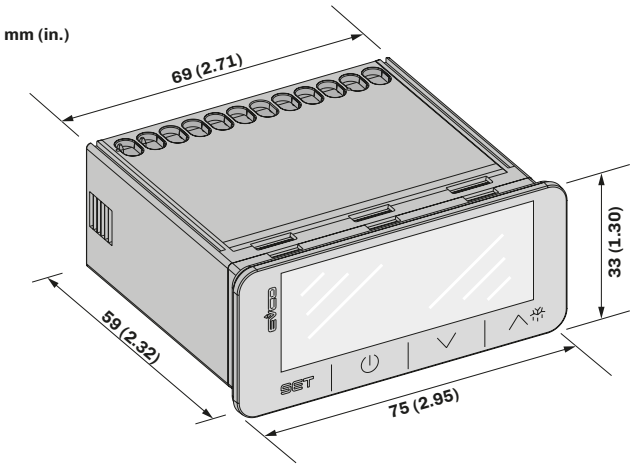

Fig. 1. *Dimensions* ***EV3 200 Web***

3.4 INSTALLATION

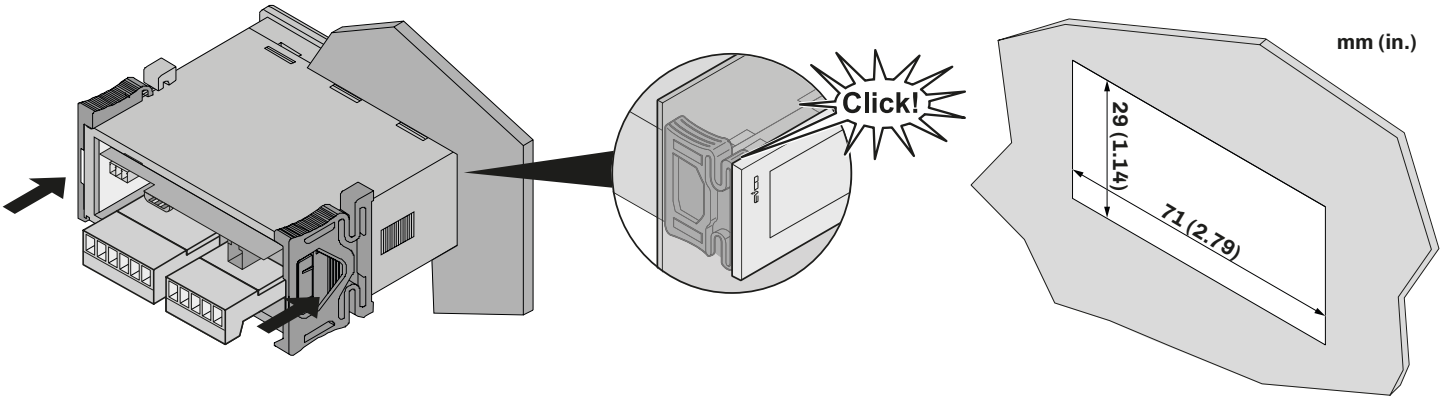

Fig. 2. *Installation* ***EV3 200 Web***

3.4.1 Minimum distances

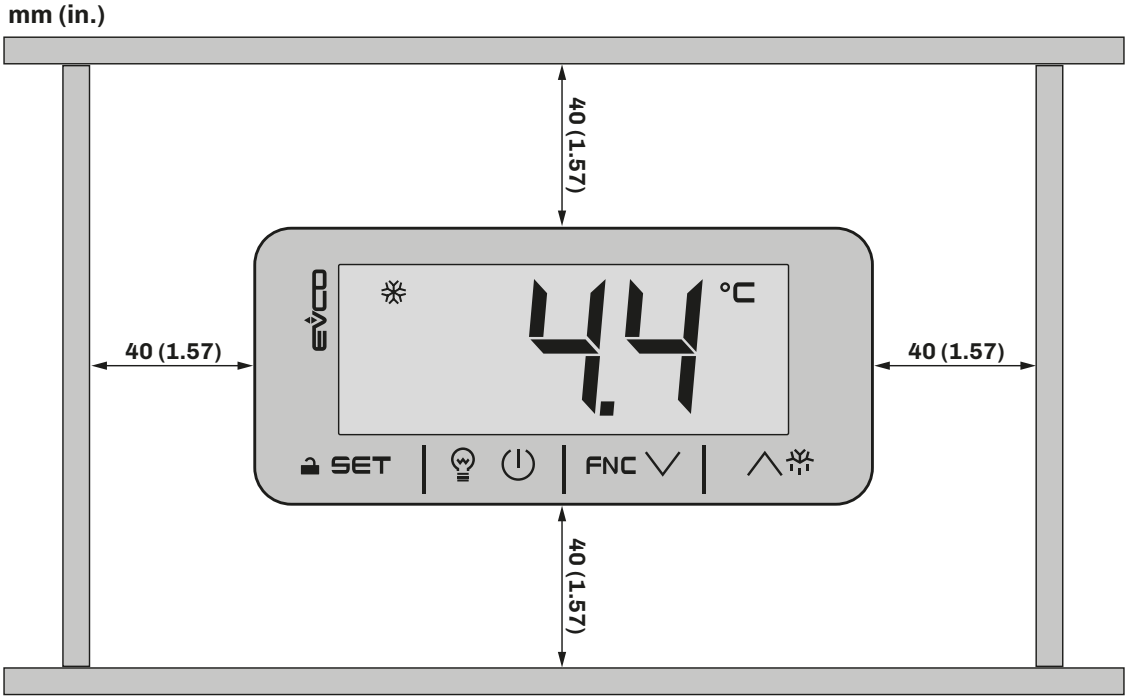

Fig. 3. *Minimum installation distances* ***EV3 200 Web***

4. ELECTRICAL CONNECTIONS

4.1 WIRING BEST PRACTICES

The following information describes the wiring guidelines and best practices which should be observed when using the equipment described in this manual.

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Only use electrically insulated measuring devices and equipment.
- Do not install the equipment while the power supply is connected.
- Switch off all equipment, including connected devices, before installing or uninstalling the device.
- Always use a correctly calibrated voltmeter to check the system is switched off.
- Do not touch the unshielded components or the terminals while they are live.
- Do not open, disassemble, repair or modify the product.
- Do not expose the equipment to liquids or chemicals.
- Before applying voltage to the equipment:
- Make sure all protective elements, such as covers, hatches and grilles, are fitted and/or closed.
- Check all wiring connections.

4.1.1 Wiring guidelines

When wiring the controllers, observe the following instructions:

- The I/O and communication wiring must be kept separate from the power supply wiring. These two types of wiring must be routed in separate ducts.
- Make sure the operating environment and conditions fall within the specified values.
- Use wires with the correct diameter, suited to the voltage and current requirements.
- Use copper conductors (compulsory).
- Use shielded twisted pair cables for analogue/digital I/O connections.

Use correctly earthed shielded cables for all analogue inputs or outputs and for communication connections. If shielded cables are not used for these connections, electromagnetic interference could cause the signal to deteriorate. Deteriorated signals can lead to unpredictable operation of the controller or modules and connected equipment.

⚠ WARNING

MALFUNCTIONING OF THE EQUIPMENT

- Perform the wiring carefully, in compliance with electromagnetic compatibility and safety requirements.
- Make sure the wiring is correct for the application.
- Use shielded cables for all I/O signal and communication cables.
- Minimise the length of the connections as much as possible and avoid winding the cables around electrically connected parts.
- The signal cables (analogue and digital inputs, communication and corresponding power supplies), power cables and power supply cables for the device must be routed separately.
- Before applying the power supply, check all the wiring connections.
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- Install and operate this equipment in a cabinet appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions.
- Do not disassemble, repair or modify this equipment.
- Do not connect wires to unused terminals and/or to terminals labelled “No connection (N.C.)”.

4.1.2 Fixed screw terminal blocks guidelines

Suitable wiring for power supply and I/O SELV

Step 5.08 mm (0.199 in.)

mm / in.	7 / 0.28							
mm²	0.2…2.5	0.2…2.5	0.25…2.5	0.25…2.5	2 x 0.2…1	2 x 0.2…1.5	2 x 0.25…1	2 x 0.5...1.5
AWG	24…14	24…14	22...14	22...14	2 x 24…18	2 x 24…16	2 x 22…18	2 x 20...16

Ø 3.5 mm (0.14 in.)	C	N•m	0.5...0.6
		lb-in	4.42...5.31

Fig. 4. *Suitable wiring for power supply and I/O SELV*

4.1.3 Permitted lengths of wiring

NOTICE
INOPERABLE DEVICE • When connecting the probes, the digital inputs and the power supply, use cables with a maximum length of 10 m (32.80 ft). • When connecting the power supply of the controller and the relay outputs, use cables with a maximum length of 10 m (32.80 ft.).

4.2 WIRING DIAGRAM

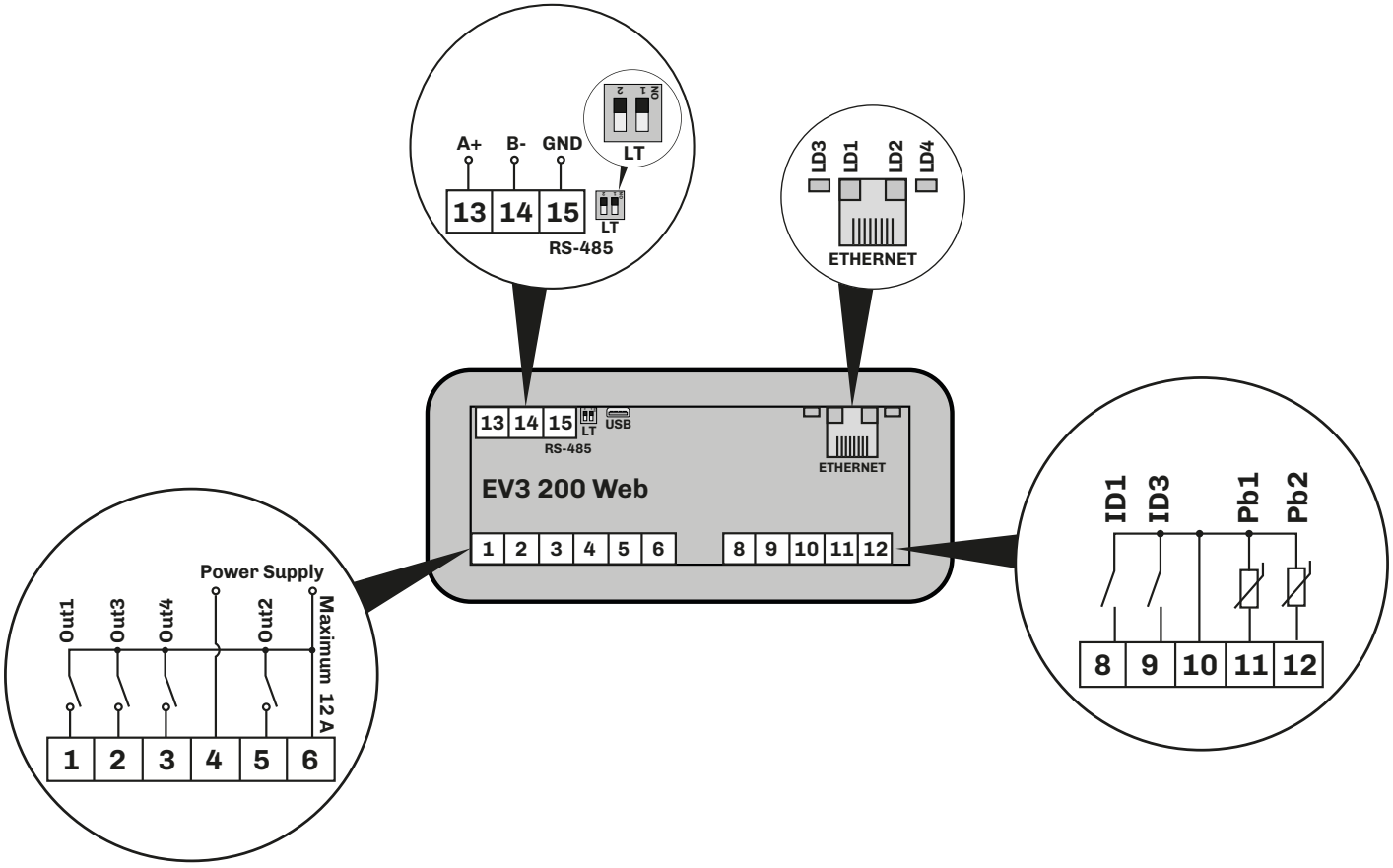

Fig. 5. *Wiring diagram* ***EV3 200 Web***

TERMINALS					
1-6	Relay output **Out1** (Fans)	**13-14-15**		RS-485 serial input	
2-6	Relay output **Out3** (Compressor)	**LT**	1	**ON** = Termination resistor inserted	
3-6	Relay output **Out4** (Defrost)		2	Reserved	
4-6	Power supply input	**USB**		USB 2.0 input for communication	
5-6	Relay output **Out2** (AUX)	**ETHERNET**		RJ45 connector to connect to Ethernet serial port	
8-10	Digital input **ID1**	**LED**	**LD1**	Red	Flashes with messages from subnetwork
9-10	Digital input **ID3** (if **P4**=0) Probe input **Pb3** (if **P4** ≠ 0)		**LD2**	Green	Stays on if connected to EPoCA
			LD3	Red	Stays on with Ethernet link-up
11-10	Analogue input **Pb1** (Temperature)		**LD4**	Green	Stays on with Ethernet activity
12-10	Analogue input **Pb2** (Evaporator)		**LEDs off:** No communication		

5. USER INTERFACE

5.1 INTERFACE

Fig. 6. ***EV3 200 Web*** *user interface*

5.2 TOUCH KEYS

A description of the touch keys is given below:

Key...	Press and release to...	Press for at least 3 seconds to...
∧	• Scroll up through values • Move within a menu	Activate manual defrost
FNC ∨	• Scroll down through values • Move within a menu	Access the FNC functions menu (functions activated by key)
	Manually activate the light relay	Switch the device on/off (stand-by)
SET	• Confirm values on the display • Set the setpoint	Enter the parameter menu

5.3 ICONS

Icon	ON	Flashing	OFF
	Compressor ON	• Protection delay compressor ON • Setpoint being changed	Compressor OFF
	• Defrost ON • Pre-dripping ON	• Defrost delay ON • Dripping ON	---
	Evaporator fans ON	Evaporator fan activation delay ON	Evaporator fans OFF
HACCP	HACCP alarm saved	New HACCP alarm recorded	---
°C	Temperature displayed in °C	---	• Over-heating ON • Over-cooling ON
°F	Temperature displayed in °F	---	
AUX	• AUX function ON • AUX digital output ON	---	AUX function OFF
	Energy saving ON	---	Energy saving OFF
	Compressor maintenance request	• Parameters being changed • Access to FNC menu (functions activated by key) • Active connection with EVconnect	---
	Device off	---	Device on

5.4 CONTROLLER OPERATION

5.4.1 Switching the controller ON/OFF

With the function enabled (**POF** = 1), press the ⏻ key for at least 3 seconds to switch the controller on/off.

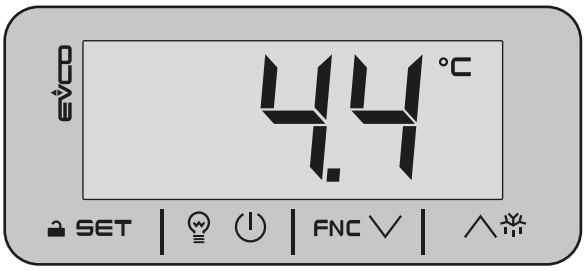

Fig. 7. *Main screen*

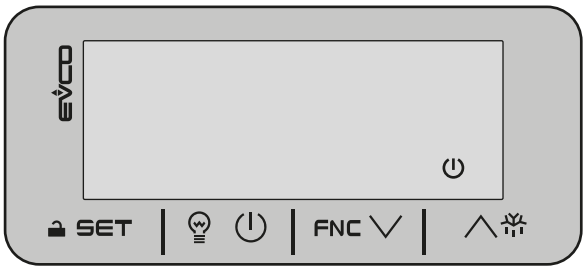

Fig. 8. *Controller off*

5.4.2 Unlocking the keypad

After about one minute of inactivity, the device automatically locks the keypad (the code **Loc** appears for a few seconds).

To unlock the keypad, hold down any key for about 3 seconds until the code **UnL** appears to confirm the keypad has been unlocked.

Fig. 9. *Keypad locked*

Fig. 10. *Confirmation keypad unlocked*

5.4.3 Setting/changing the setpoint

With the keypad unlocked, touch and release the SET key to access the setpoint menu. Scroll the values with the FNC ∨ or ∧ keys and touch SET to confirm the setpoint value.

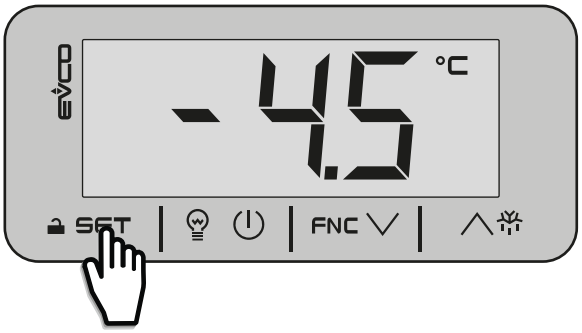

Fig. 11. *Accessing the setpoint menu*

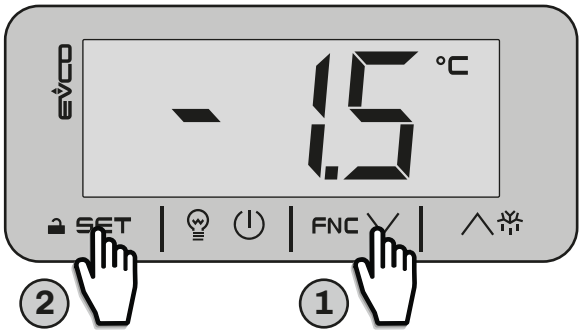

Fig. 12. *Changing the setpoint*

5.4.4 Activating manual defrost

With the keypad unlocked, touch the ∧ key for at least 3 seconds to activate manual defrost. The defrost icon will come on. To deactivate, switch the device off and then on again.

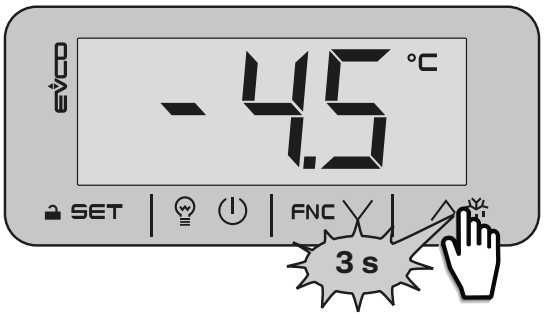

Fig. 13. *Activating manual defrost*

5.4.5 Functions that can be activated by key

To choose the function, touch the FNC ∨ key for at least 3 seconds to access the function menu; use the FNC ∨ or ∧ keys to scroll through and choose the following functions:

- **RTC**: sets/changes the clock;
- **Pb1**: displays the temperature read by probe Pb1;
- **Pb2**: displays the temperature read by probe Pb2;
- **CH**: displays the compressor operating hours;
- **rCH**: resets the compressor operating hours.

5.4.6 Activating the AUX digital output by key

With the keypad unlocked, touch and release the ⏻ key to manually activate the AUX digital output. The AUX icon will come on.

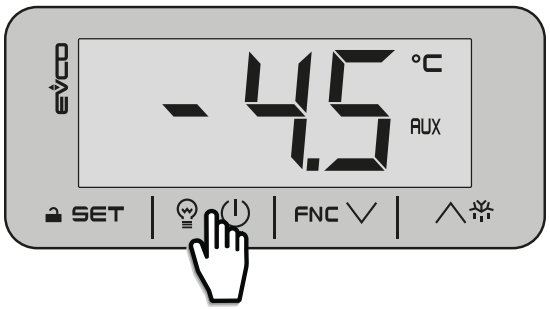

Fig. 14. Activating the AUX output by key

5.4.7 Accessing the parameters

With the keypad unlocked, touch the SET key for at least 3 seconds to access and change the parameters. The code **PA** will appear. Touch the SET key to enter the password, scrolling with the FNC ∨ or ∧ keys and confirming with the SET key; then use the FNC ∨ or ∧ keys to scroll the list of parameters.

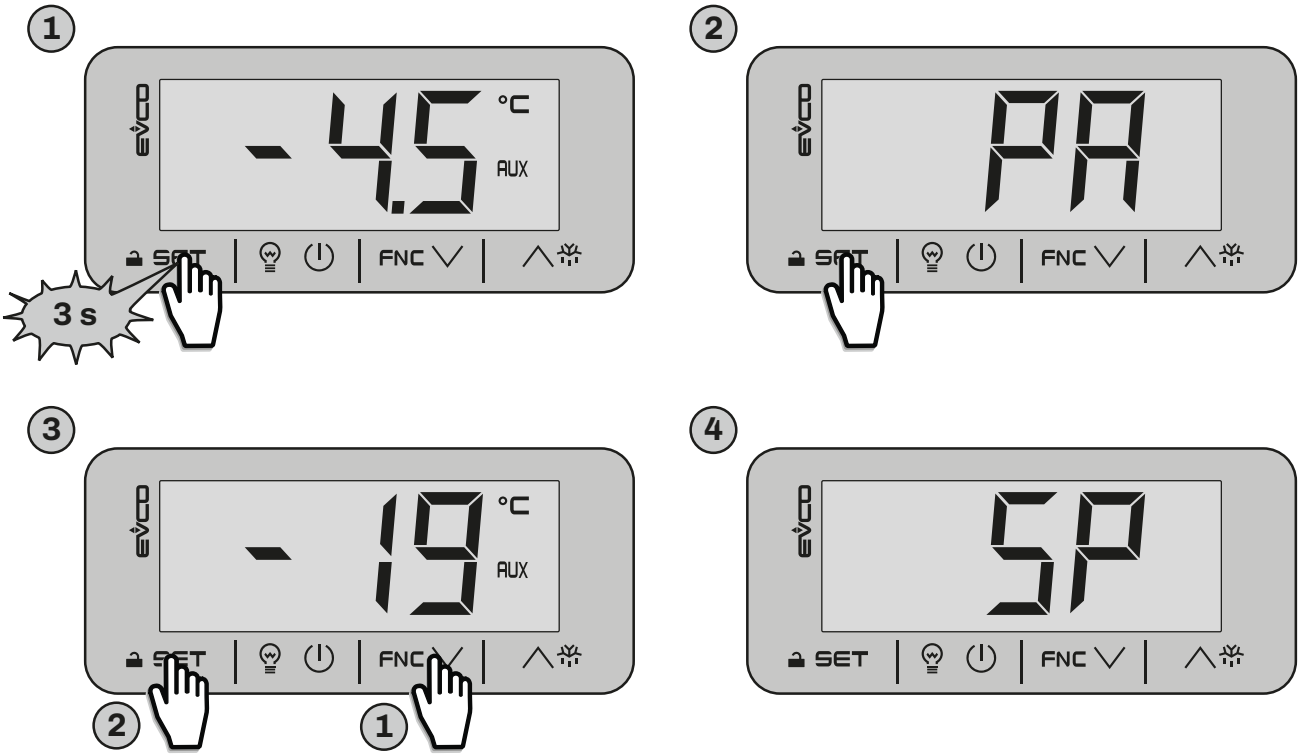

Fig. 15. Accessing the parameters

6. DEFROST

6.1 INTRODUCTION

Defrosting removes ice from the surface of the evaporator. The defrost cycle consists of 4 phases:

1. Defrost;
2. Pre-dripping;
3. Dripping;
4. Post-dripping.

At the end of each phase, the controller starts up the next one; when the entire defrost cycle is finished, the controller returns to normal operation.

With **d0** = 0, defrost is set to manual operation. For automatic mode, set **d0** > 0.

6.1.1 Types of defrost

The controller can operate with two different types of defrost:

- Modular;
- Standard.

6.2 ADAPTIVE DEFROST

Adaptive defrost is set by the following parameters:

Par.	Description	MU	Range
d0	Automatic defrost interval. **0** = Manual defrost only **N.B.**: if **d8** = 3, the maximum interval is considered.	h	0... 99
d8	Defrost interval count mode. **0** = Hours device ON; **1** = Hours compressor ON; **2** = Hours evaporator temperature < **d9**; **3** = Adaptive; **4** = In real time (RTC).	---	0...4
d9	Evaporation threshold for automatic defrost interval count.	°C/°F	-99.0...99.0
d18	Adaptive defrost interval. **0** = Manual only.	min	0...999
d19	Adaptive defrost threshold (relative to optimal evaporation temperature).	°C/°F	0.0...40.0
d22	Evaporation threshold for adaptive defrost interval count (relative to optimal evaporation temperature).	°C/°F	-10.0...10.0

6.2.1 Defrost with Hours device ON

Defrost with **Hours device ON** is set with the following parameters:

Par.	Description	MU	Range
d0	Automatic defrost interval. **0** = Manual defrost only **N.B.**: if **d8** = 3, the maximum interval is considered.	h	0... 99
d8	Defrost interval count mode. **0** = Hours device ON;	---	0...4

Operation

The controller begins counting the operating hours from when the device is switched on. If **d0** >0 and **d8** = 0, once time **d0** has elapsed, the device carries out defrost of the duration of **d3**.

The **d0** count is set to zero (and restarts) every time defrost starts up.

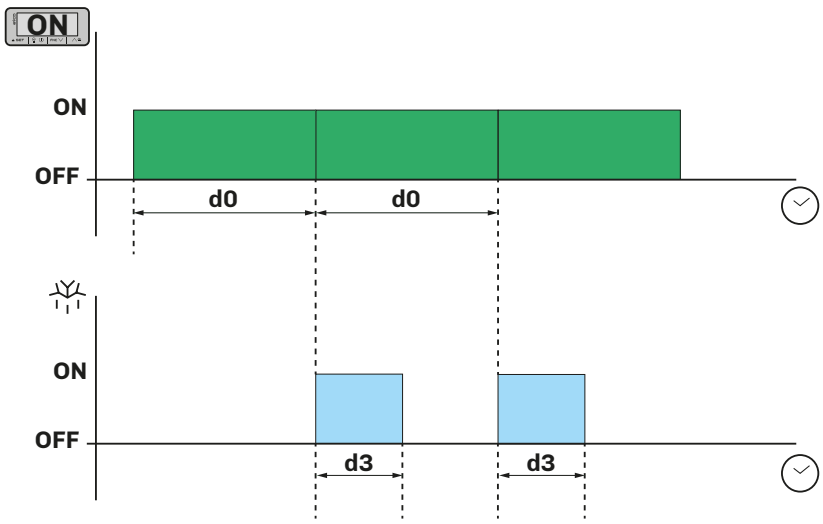

Fig. 16. *Modular defrost: Hours device ON*

6.2.2 Defrost with Hours compressor ON

Defrost with **Hours compressor ON** is set with the following parameters:

Par.	Description	MU	Range
d0	Automatic defrost interval. **0** = Manual defrost only **N.B.**: if **d8** = 3, the maximum interval is considered.	h	0... 99
d8	Defrost interval count mode. **1** = Hours compressor ON;	---	0...4

Operation

When the compressor operating time is the same as time **d0**, defrost is activated.

The controller accumulates all the compressor operating hours, even if they are not consecutive.

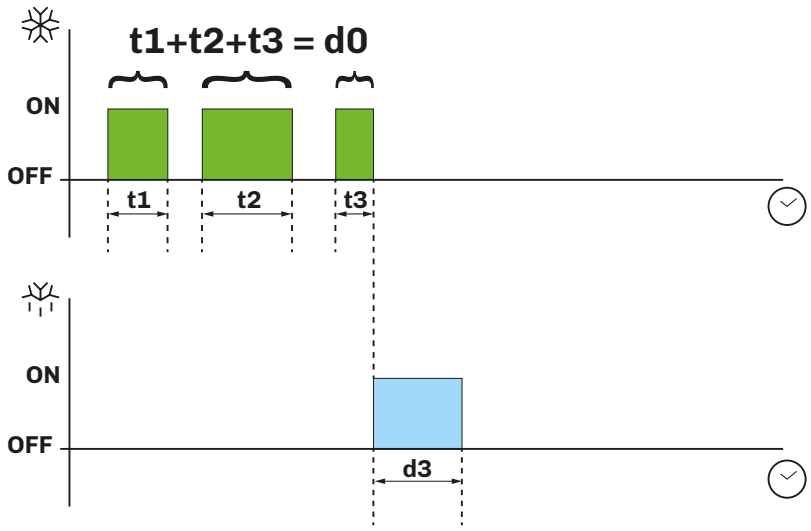

Fig. 17. *Modular defrost: Hours compressor ON*

6.2.3 Defrost with Evaporator temperature

Defrost with **Evaporator temperature** is set with the following parameters:

Par.	Description	MU	Range
P3	Evaporator probe operation. **1** = Defrost + fans	---	0...3
d0	Automatic defrost interval. **0** = Manual defrost only **N.B.**: if **d8** = 3, the maximum interval is considered.	h	0... 99
d8	Defrost interval count mode. **2** = Hours evaporator temperature < **d9**;	---	0...4
d9	Evaporation threshold for automatic count of defrost intervals.	°C/°F	-99.0...99.0

Operation

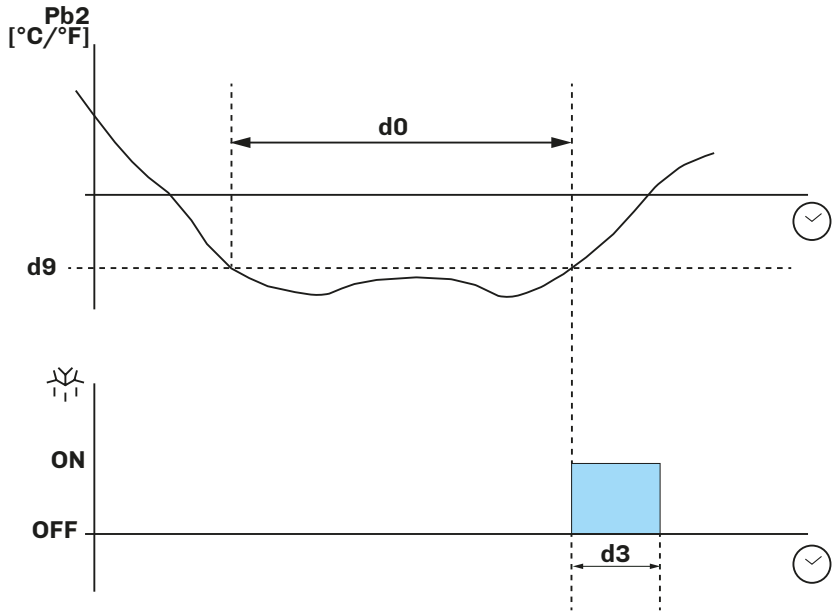

Fig. 18. *Modular defrost: Evaporator temperature*

6.2.4 Adaptive defrost

Adaptive defrost is set with the following parameters:

Par.	Description	MU	Range
SP	Temperature setpoint.	°C/°F	**r1...r2**
d8	Defrost interval count mode. **3** = Adaptive;	---	0...4
d18	Adaptive defrost interval.	min	0...999
d19	Adaptive defrost threshold (relative to optimal evaporation temperature).	°C/°F	0.0...40.0
d22	Evaporation threshold for adaptive defrost interval count (relative to optimal evaporation temperature).	°C/°F	-10.0...10.0

Operation

Adaptive defrost works by dividing temperature regulation into two phases:

- Calibration phase and;
- Normal working phase.

Calibration phase

When the refrigerating machine is switched on or after defrost, the device calculates the ideal evaporator working temperature to reach the setpoint **SP**.

Normal working phase

During the normal working phase, the device adds up the compressor ON times while the temperature read by Pb2 is lower than the ideal evaporator temperature.

Defrost is activated if:

- The count exceeds the time **d18**;
- The temperature read by Pb2 goes below the ideal temperature calculated of a threshold **d19**.

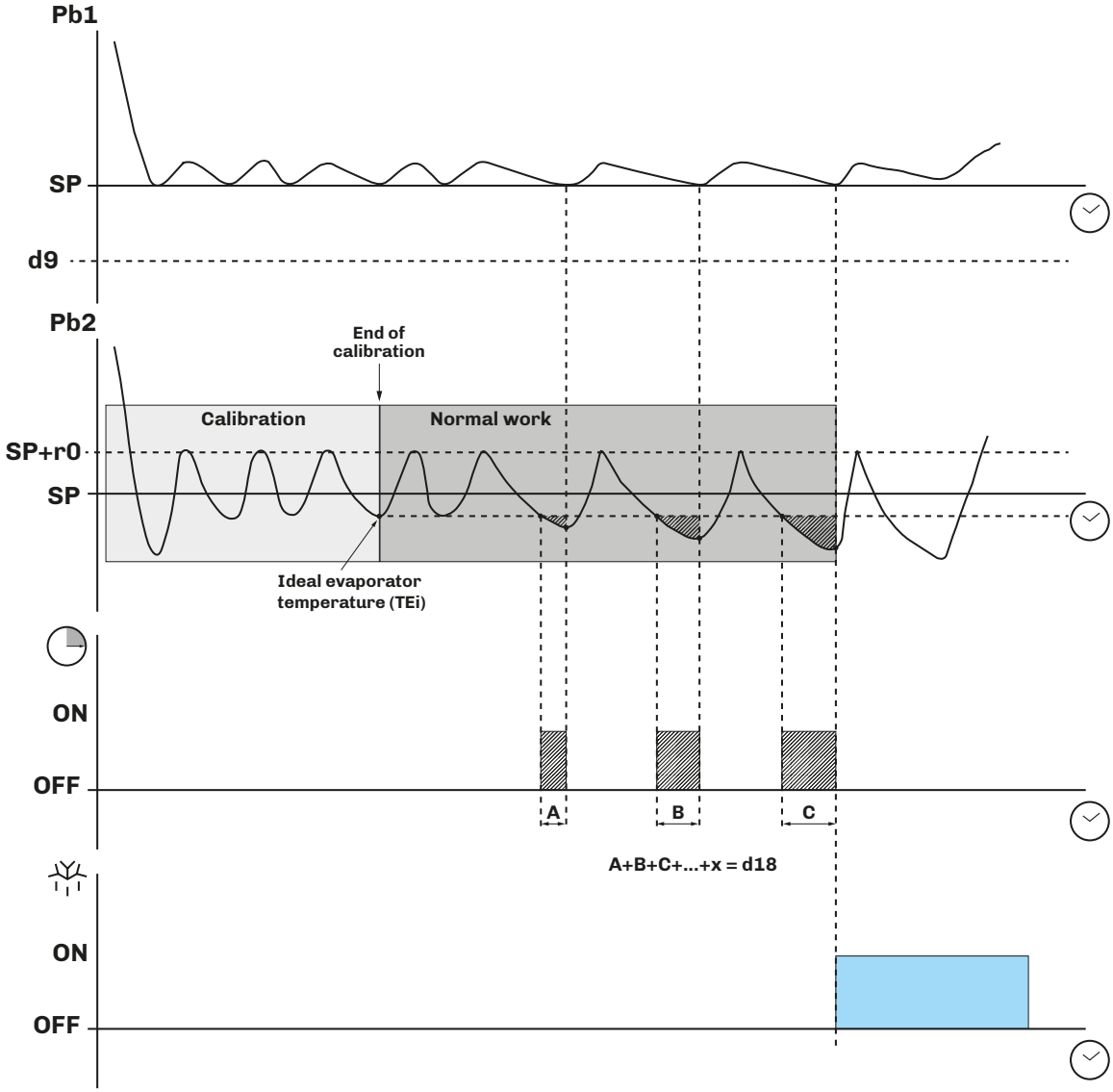

Fig. 19. *Modular defrost: Adaptive - start defrost due to time*

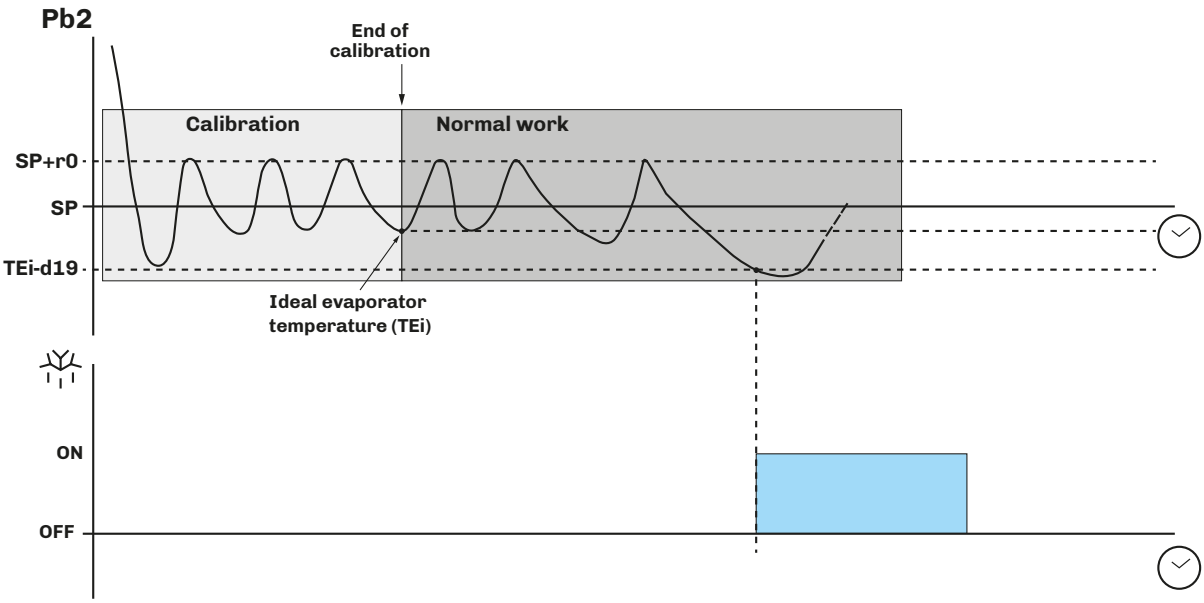

Fig. 20. *Modular defrost: Adaptive - start defrost due to temperature*

6.2.5 Modular defrost: In real time (RTC)

Defrost **In real time (RTC)** is set with the following parameters:

Par.	Description	MU	Range
d8	Defrost interval count mode. **4** = In real time (RTC).	---	0...4
d9	Evaporation threshold for automatic defrost interval count.	°C/°F	-99.0...99.0
Hd1	Defrost 1 activation time. "**----**" = Disabled.	h	----, 0...23
Hd2	Defrost 2 activation time. "**----**" = Disabled.	h	----, 0...23
Hd3	Defrost 3 activation time. "**----**" = Disabled.	h	----, 0...23
Hd4	Defrost 4 activation time. "**----**" = Disabled.	h	----, 0...23
Hd5	Defrost 5 activation time. "**----**" = Disabled.	h	----, 0...23
Hd6	Defrost 6 activation time. "**----**" = Disabled.	h	----, 0...23
Hr0	Activate the clock. **0** = No; **1** = Yes.	---	0/1

Operation

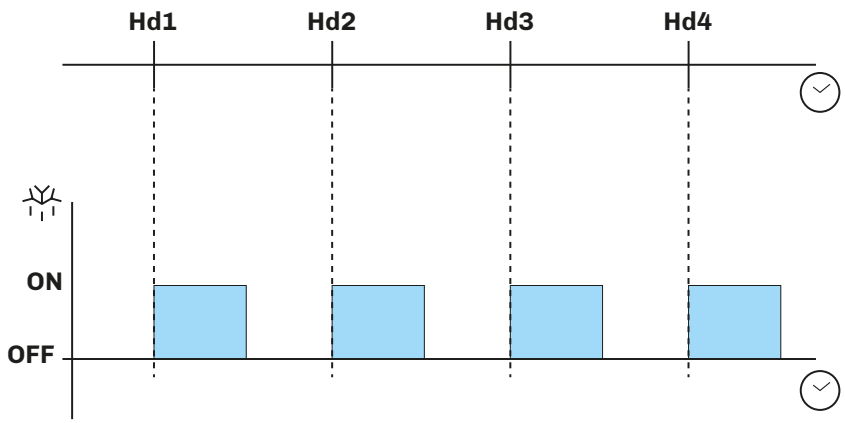

Fig. 21. *Modular defrost: In real time (RTC)*

6.3 STANDARD DEFROST

Parameter **d1** must be set to use this mode.
Defrost is carried out by heating the evaporator in one of the following ways:

Par.	Description	MU	Range
d1	Type of defrost. **0** = Electrical heaters; **1** = Cycle reversed (hot gas); **2** = When compressor stops.	---	0...2

6.3.1 Defrost with electrical heaters

Defrost with electrical heaters is obtained by setting **d1** = 0.

Activating defrost

When defrost is activated:

- The compressor stops;
- The relay output, where the electrical heaters are connected and which is configured as the defrost output, is activated.

Conditions for defrost end

The conditions for defrost end are:

- Defrost duration **d3** must be reached;
- Temperature to end defrost **d2** must be reached.

The defrost configuration parameters with electrical heaters are:

Par.	Description	MU	Range
C0	Compressor ON delay from power-on.	min	0...240
C2	Minimum compressor OFF time.	min	0...240
d0	Defrost interval.	h	0...99
d1	Type of defrost. **0** = Electrical heaters; **1** = Cycle reversed (hot gas); **2** = When compressor stops.	---	0...2
d2	Evaporator temperature above which defrost with evaporator probe terminates (**Pr3** = 5).	°C/°F	-99.0...99.0
d3	Defrost duration.	min	0...99
d7	Evaporator dripping time after defrost.	min	0...15

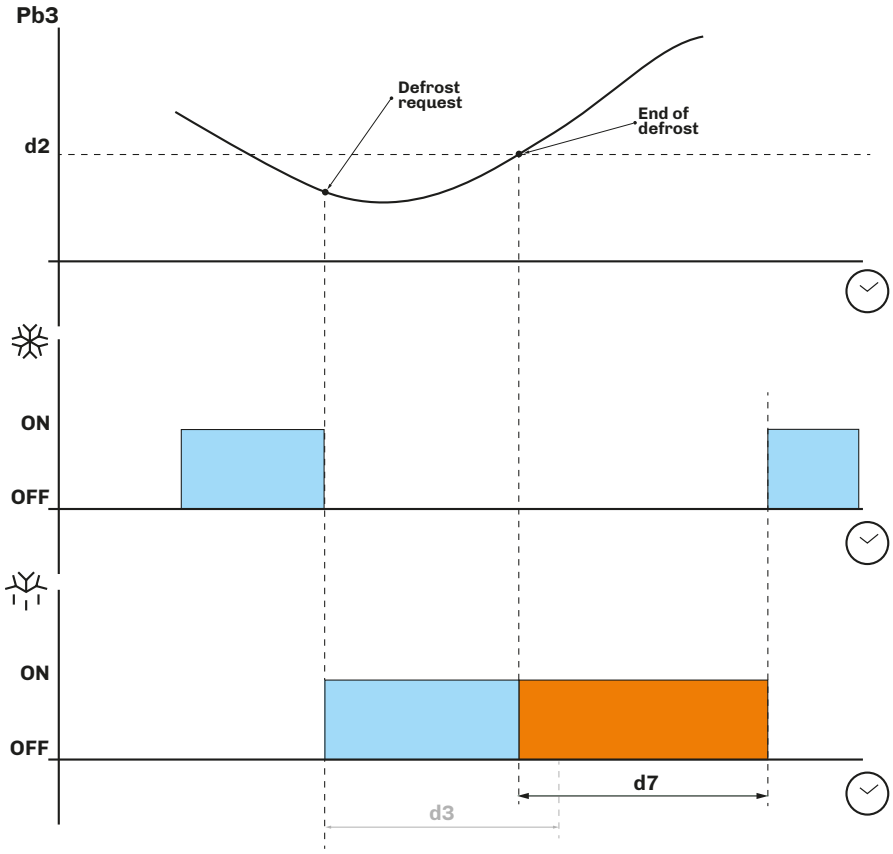

Fig. 22. *Defrost with electrical heaters - End of defrost due to temperature*

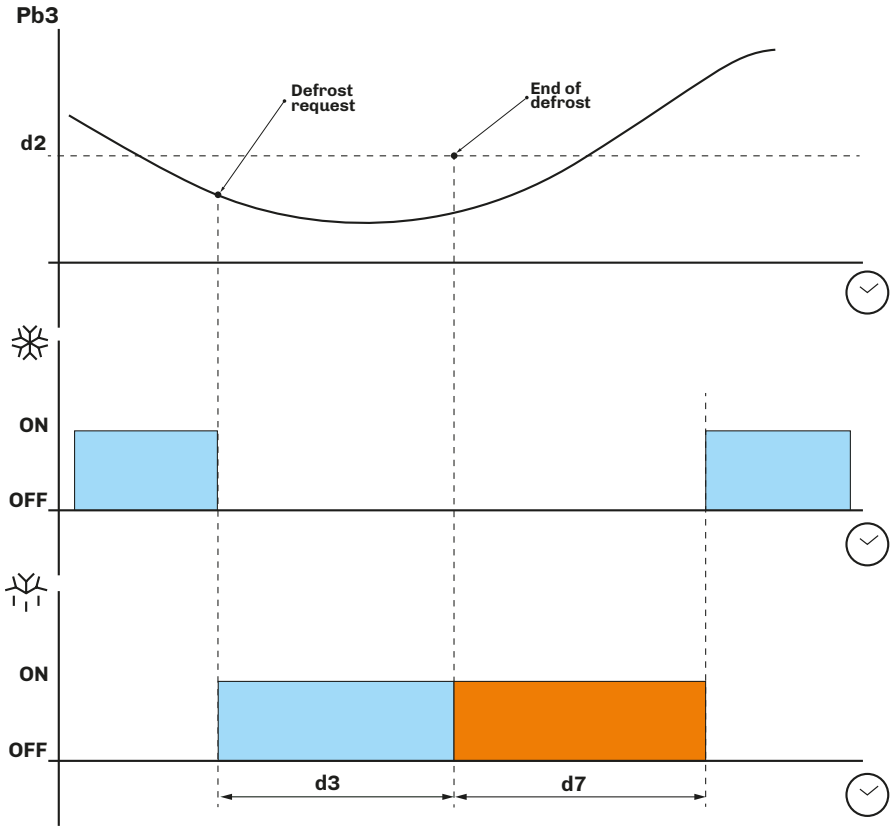

Fig. 23. *Defrost with electrical heaters - End of defrost due to maximum time*

6.3.2 Defrost with cycle reversed (hot gas)

Defrost with cycle reversed is obtained by setting **d1** = 1.

Activating defrost

When defrost is activated:

- The compressor is activated (or has already been active for time **d15**) and remains active for the entire duration of defrost;
- The relay output where the valve is connected (a solenoid valve if the system has a thermostatic valve) is activated.

Conditions for defrost end

The conditions for defrost end are:

- Maximum defrost duration, set by parameter **d3**, must be reached.
- Temperature to end defrost, set by parameter **d2**, must be reached.

The defrost configuration parameters with cycle reversed are:

Par.	Description	MU	Range
C0	Compressor ON delay from power-on.	min	0...240
C2	Minimum compressor OFF time.	min	0...240
d0	Defrost interval.	h	0...99
d1	Type of defrost. **0** = Electrical heaters; **1** = Cycle reversed (hot gas); **2** = When compressor stops.	---	0...2
d2	Evaporator temperature above which defrost with evaporator probe terminates (**Pr3** = 5).	°C/°F	-99.0...99.0
d3	Defrost duration.	min	0...99
d7	Evaporator dripping time after defrost.	min	0...15
d15	Compressor ON consecutive time before hot gas defrost.	min	0...99

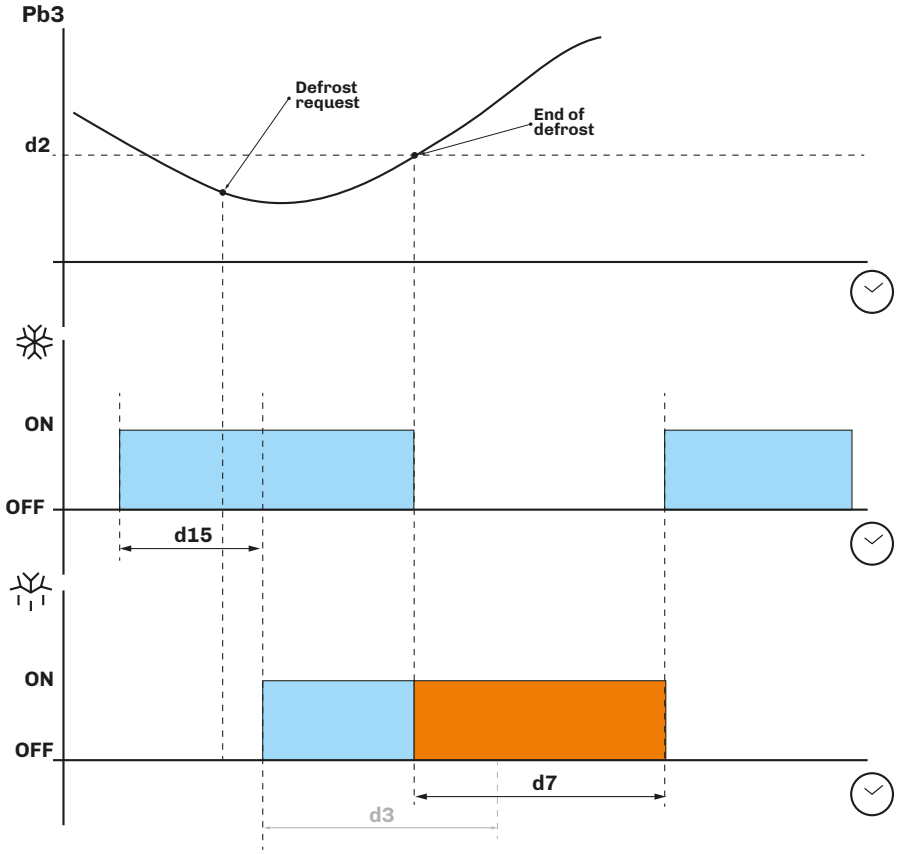

Fig. 24. *Defrost with cycle reversed - End of defrost due to temperature*

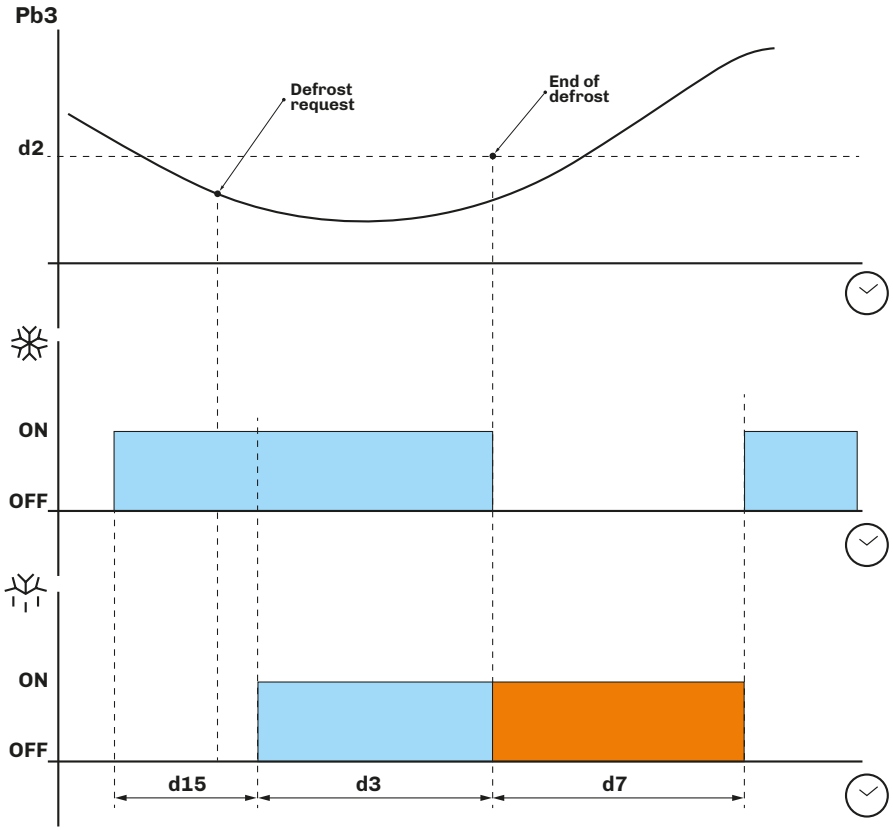

Fig. 25. *Defrost with cycle reversed - End of defrost due to maximum time*

6.3.3 Defrost when compressor stops

Defrost when the compressor stops is obtained by setting **d1** = 2.

The defrost configuration parameters with cycle reversed are:

Par.	Description	MU	Range
d0	Defrost interval.	h	0...99
d1	Type of defrost. **0** = Electrical heaters; **1** = Cycle reversed (hot gas); **2** = When compressor stops.	---	0...2
d3	Defrost duration.	min	0...99
d7	Evaporator dripping time after defrost.	min	0...15

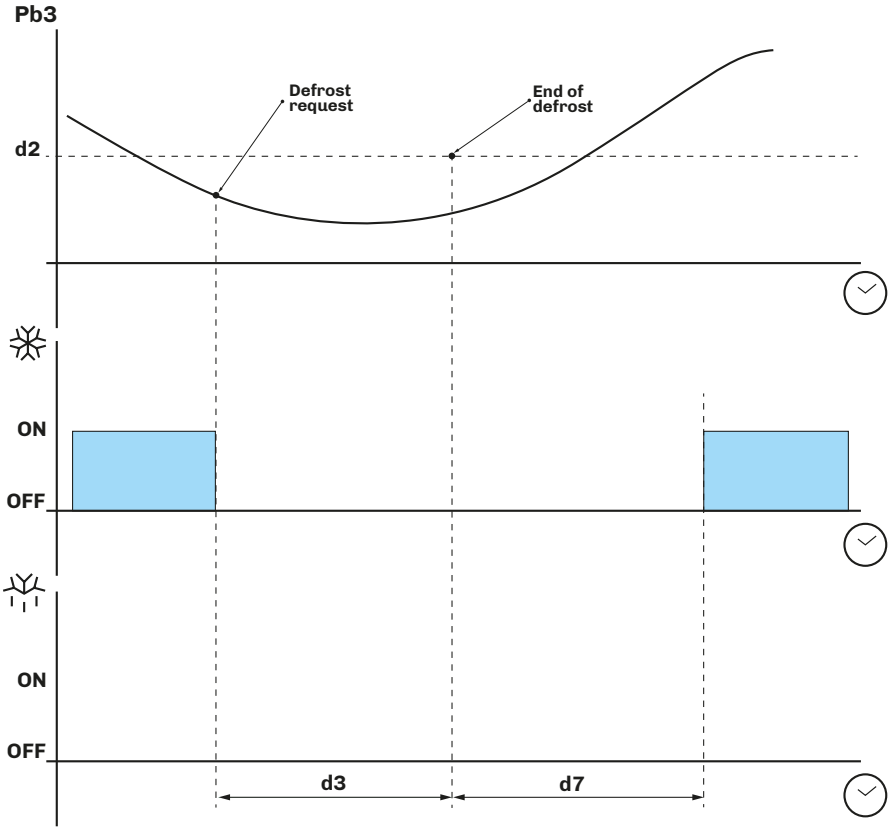

Fig. 26. *Defrost when compressor stops*

7. REGULATORS

7.1 HEATING/COOLING TEMPERATURE

The temperature regulation configuration parameters are:

Par.	Description	MU	Range
r0	Cooling regulation differential; temperature to be added to the setpoint (**Setpoint** + **r0**)	°C/°F	0.1...15.0
r1	Minimum value attributable to setpoint.	°C/°F	-30.0...**r2**
r2	Maximum value attributable to setpoint.	°C/°F	**r1**...99.0
r12	Differential position **r0**. **0** = Asymmetrical; **1** = Symmetrical.	---	0/1
u7	Neutral zone threshold for heating.	°C/°F	-99.0...99.0

7.1.1 Operation

The controller manages the temperature according to the type of request (heating/cooling).

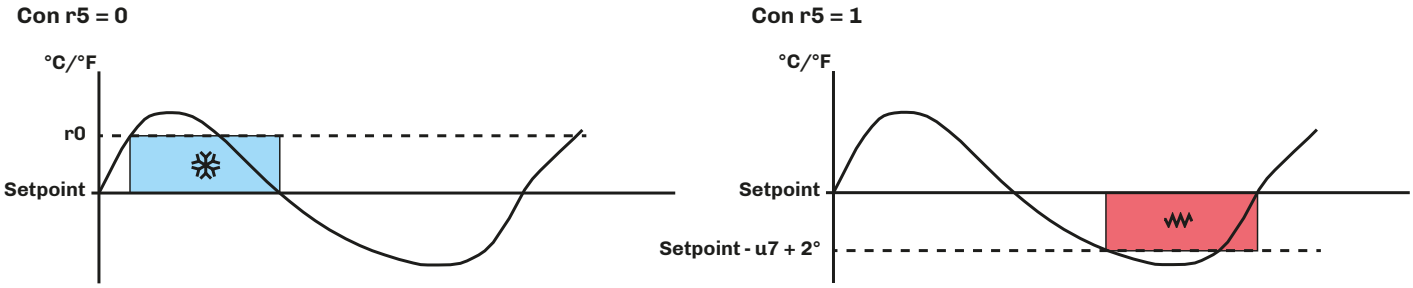

Fig. 27. *Operation of temperature regulator*

Cooling

If the controller receives a cooling request:

- Cooling output (Compressor) between **Setpoint + r0** and **Setpoint** .

When the temperature read by Pb1 reaches the value of **Setpoint + r0**, the controller activates the compressor output to cool until the temperature goes below the threshold set by **Setpoint**.

Heating

If the controller receives a heating request:

- Heating output (Heaters) between **Setpoint** and **Setpoint - u7+ 2°**.

When the temperature read by Pb1 reaches the value of **Setpoint - u7**, the controller activates the heater output to produce heat until the temperature goes above the threshold set by **Setpoint - u7 + 2°**.

7.2 HEATING/COOLING TEMPERATURE IN THE NEUTRAL ZONE

The temperature regulation configuration parameters in the neutral zone are:

Par.	Description	MU	Range
r0	Cooling regulation differential; temperature to be added to the setpoint (**Setpoint** + **r0**)	°C/°F	0.1...15.0
r1	Minimum value attributable to setpoint.	°C/°F	-30.0...**r2**
r2	Maximum value attributable to setpoint.	°C/°F	**r1**...99.0
u7	Neutral zone threshold for heating.	°C/°F	-99.0...99.0

7.2.1 Operation

Regulation in the neutral zone is activated if **r11** ≠ 0 (if **r11** < 0, the neutral zone is activated with a heating request).

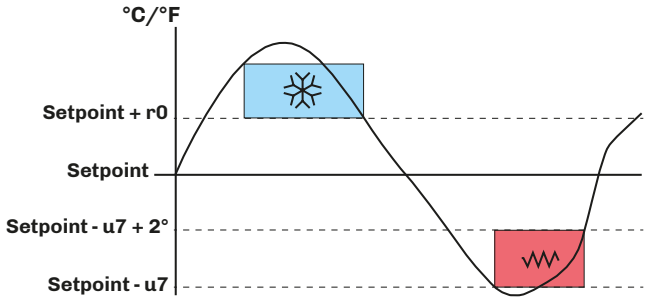

Fig. 28. *Operation of temperature regulator in the neutral zone*

Cooling
If the controller receives a cooling request:

- Cooling output (Compressor) between **Setpoint + r0** and **Setpoint** .

When the temperature read by Pb1 reaches the value of **Setpoint + r0**, the controller activates the compressor output until the temperature goes below the threshold set by **Setpoint**.

Heating
If the controller receives a heating request:

- Heating output (Heaters) between **Setpoint - u7** and **Setpoint - u7 + 2°**.

When the temperature read by Pb1 reaches the value of **Setpoint - u7**, the controller activates the heater output to produce heat until the temperature goes above the threshold set by **Setpoint - u7 + 2°**.

7.3 COMPRESSOR

The compressor regulator is active in relay output **out1** (not configurable).

The switching on/off of the compressor is controlled by:

- Temperature read by probe Pb1;
- Configuration of heat regulation;
- Defrost and dripping.

Conditions for activation
The compressor is activated if the following conditions are met:

- The controller is on (regulation is blocked when the controller is in stand-by);
- Probe Pb1 is working;
- Compressor activation delay **C0** from switch-on is terminated;
- Compressor switch-on delay **C2** between 2 consecutive activations;
- If **d1** = 0.2, defrost and dripping must be terminated.

If a delay **C0** or **C2** is set and there is a request for compressor activation, the controller waits for the delay to end before activating the compressor. During the wait, the ❄ icon flashes until the compressor is activated, after which it stays on.

The compressor regulation configuration parameters are:

Par.	Description	MU	Range
C0	Compressor ON delay from power-on.	min	0...240
C2	Minimum compressor OFF time.	min	0...240
C3	Minimum compressor ON time.	s	0...240
C4	Compressor OFF time in cabinet probe alarm.	min	0...240
C5	Compressor ON time in cabinet probe alarm.	min	0...240
C6	Condensation temperature above which the condenser overheat alarm sounds.	°C/°F	0...199
C7	Condenser temperature above which the compressor locked alarm sounds, once **C8** time has elapsed.	°C/°F	0...199
C8	Delay in activation of compressor locked alarm due to threshold **C7** being exceeded.	min	0...15
C10	Compressor days for maintenance.	days	0...990
C11	Second compressor switch-on delay from first compressor switch-on.	s	0...240

7.3.1 Operating diagrams

Normal compressor operation

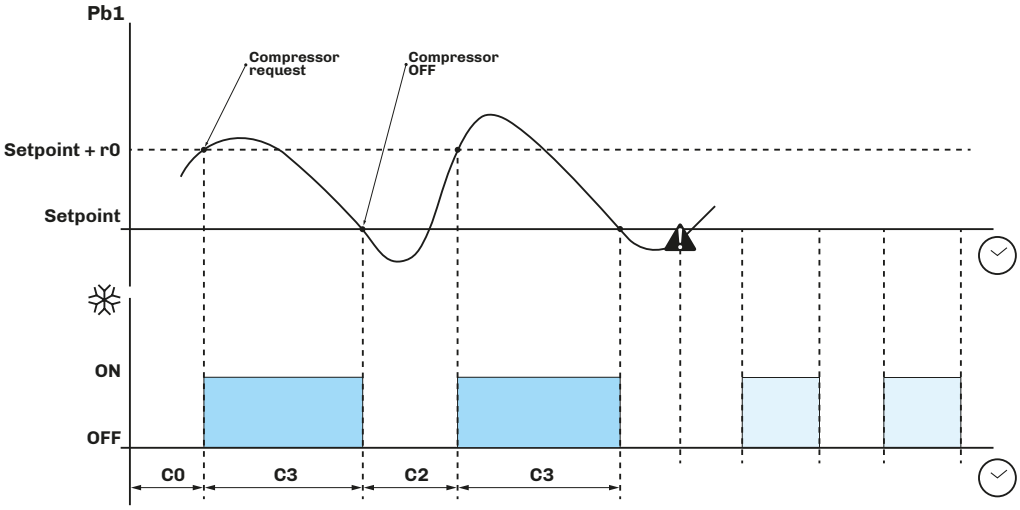

Fig. 29. *Normal compressor operation*

Compressor operation with alarm probe

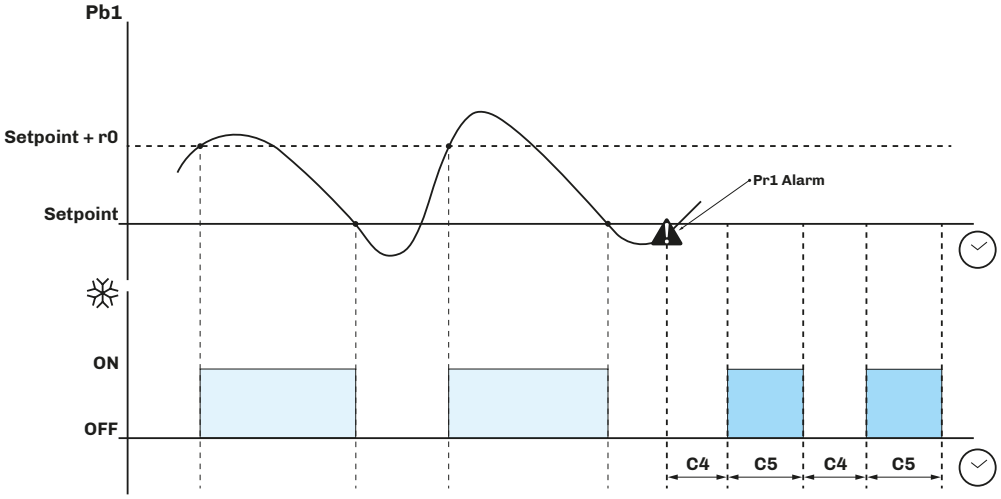

Fig. 30. *Operation with compressor alarm probe*

7.4 DOUBLE COMPRESSOR

If output **out4** is configured **u1** = 8, the controller manages 2 compressors.

Activating compressor 2
Compressor 2 is activated after a delay **C11** from compressor 1 switch-on.
If active, compressor 2 uses the:

- Setpoints;
- Differentials;
- Delays and
- Protections

set for compressor 1.

7.4.1 Operating Diagram

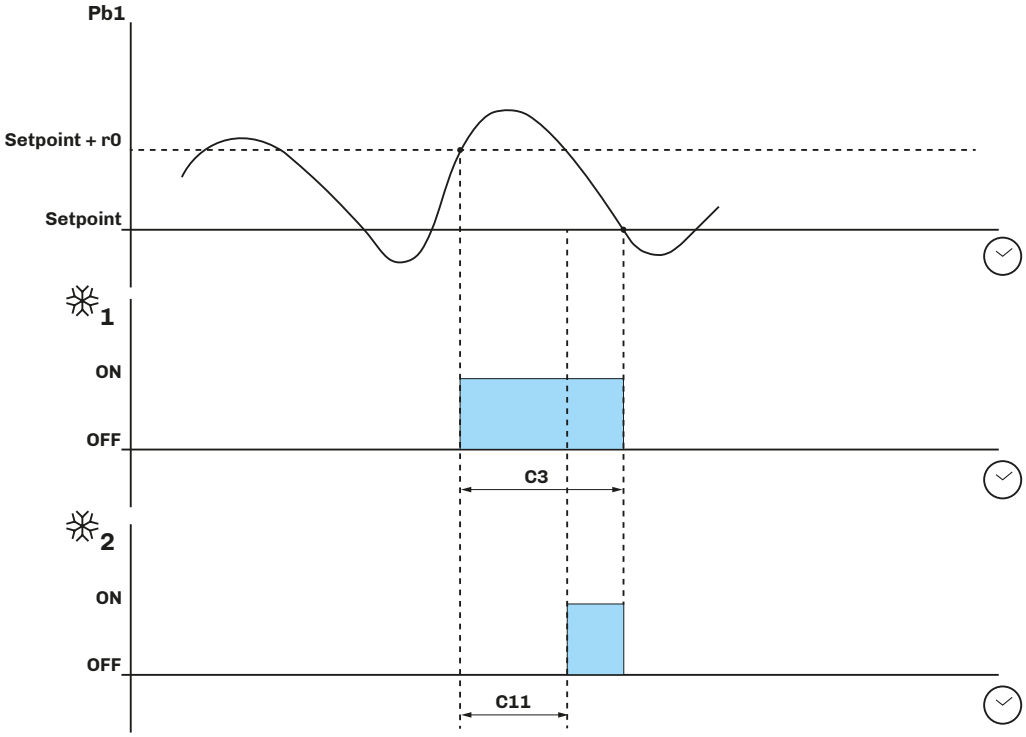

Fig. 31. *Normal compressor 2 operation*

7.5 EVAPORATOR FANS

The evaporator fan regulator is activated in the following conditions:

- The delay **F3** has elapsed at the end of dripping;
- The temperature of the evaporator probe Pb3 is higher than the threshold **F1** (if **F0** = 3, 4);
- The fans are not deactivated during defrost **F2** = 0;
- There is no dripping active **d7**.

7.5.1 Regulator operation

The evaporator fan regulator may be activated following a request from another regulator as follows:

- Compressor request, to encourage production and diffusion of cool air (heat regulation function);
- Defrost request, to control/limit the diffusion of hot air;
- Humidification/dehumidification request, to spread or limit the diffusion of humidity.

7.5.2 Operating mode

The evaporator fans operate according to parameter **F0**:

Par.	Description	MU	Range
F0	Evaporator fan mode in normal operating mode. With **F0** = 0 it is possible to manage cycles by setting **F11**, **F12**. **0** = In cycles; **1** = Always ON; **2** = On with compressor ON; **3** = Thermostat controlled (**F1** relative to temperature control); **4** = Thermostat controlled with compressor ON (**F1** relative to temperature control).	---	0...4

Evaporator fan cycles with F11 > 0

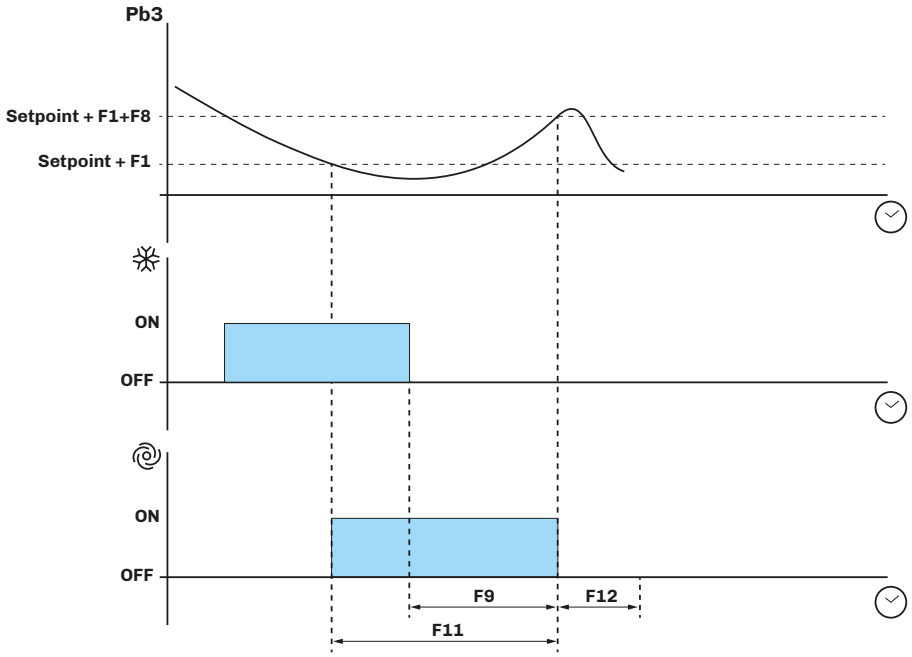

Fig. 32. *Operation of evaporator fans with **F11** > 0*

7.5.3 Operation during defrost

Operation of the evaporator fans during defrost depends on **F2**.

Par.	Description	MU	Range
F2	Evaporator fan mode during defrost. **0** = OFF; **1** = ON; **2** = According to **F0**.	---	0...2

7.5.4 Fan operation during dripping

During dripping, the evaporator fans stay off for the time set by **d7**. A further delay of **F3** may be set when the evaporator fans are activated after dripping. In this case, the fans are activated after **F3** has elapsed.

Par.	Description	MU	Range
d7	Evaporator dripping time after defrost.	min	0...15
F3	Maximum time evaporator fans off after dripping.	min	0...15

7.6 CONDENSER FANS

7.6.1 Operation

The condenser fans are activated in the following conditions:

- The digital output **u1** = 6 (configured as condenser fans);
- If P4 ≠ 1, the condenser fans are activated in parallel with the compressor;
- With **F11**, the fans are activated at threshold **F11 + 2°** and switch off at threshold **F11**;
- During hot gas defrost, they are activated if the temperature Pb3 goes above the alarm threshold **C6**.

7.7 ENERGY SAVING

7.7.1 Operation

Energy saving can be activated:

- By digital input, if **i5** = 2;
- By key, if **r8** = 2;
- If the door stays open > **i10**: energy saving is then activated for the time **HE2**;
- By the RTC clock, activating the energy saving function every day at the time **H01** for a time of **H02**.

With energy saving active:

- **Setpoint** is replaced by **Setpoint + r4**.

The energy saving configuration parameters are:

Par.	Description	MU	Range
r4	Setpoint offset in energy saving added to setpoint value.	°C/°F	0.0...99.0
HE2	Manual energy saving duration.	min	0...999
H01	Daily start time of energy saving temperature.	h	0...23
H02	Duration of daily energy saving.	h	0...24

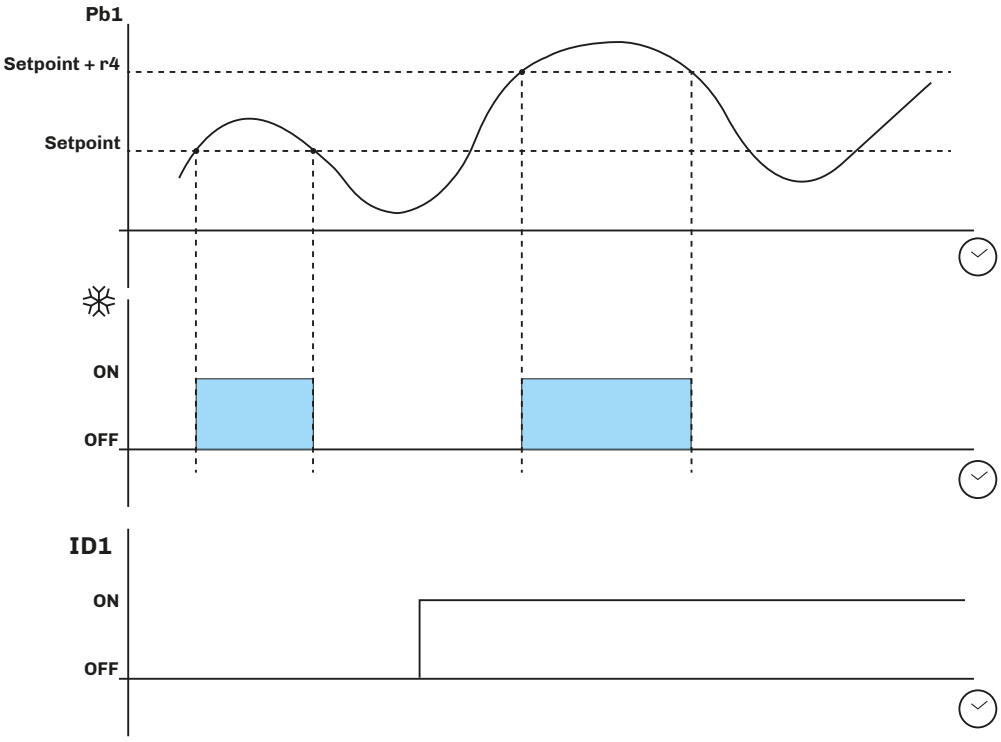

Fig. 33. *Operation in energy saving function*

8. REMOTE COMMUNICATION CONFIGURATION

8.1 INTRODUCTION

EV3 200 Web can be configured to connect with **EPoCA** in two different ways:

- From a **PC** (Windows only) through ***EPoCA.exe*** *(online/offline)* which can be downloaded from the website: https://www.evco.it/assets/doc/EVCO-EV3200Web_configurator_for_EPoCA.zip
- From a **smartphone/tablet** using the ***EPoCA START*** app.

In both cases, the devices must be visible on the local network. If the local network requires a static IP address, configure using the micro-B USB cable.

If used in a subnetwork, configure the **BLE** parameter for every device from 1 to 10 before searching on the network.

8.1.1 Configuration diagram when using a PC with direct connection via USB

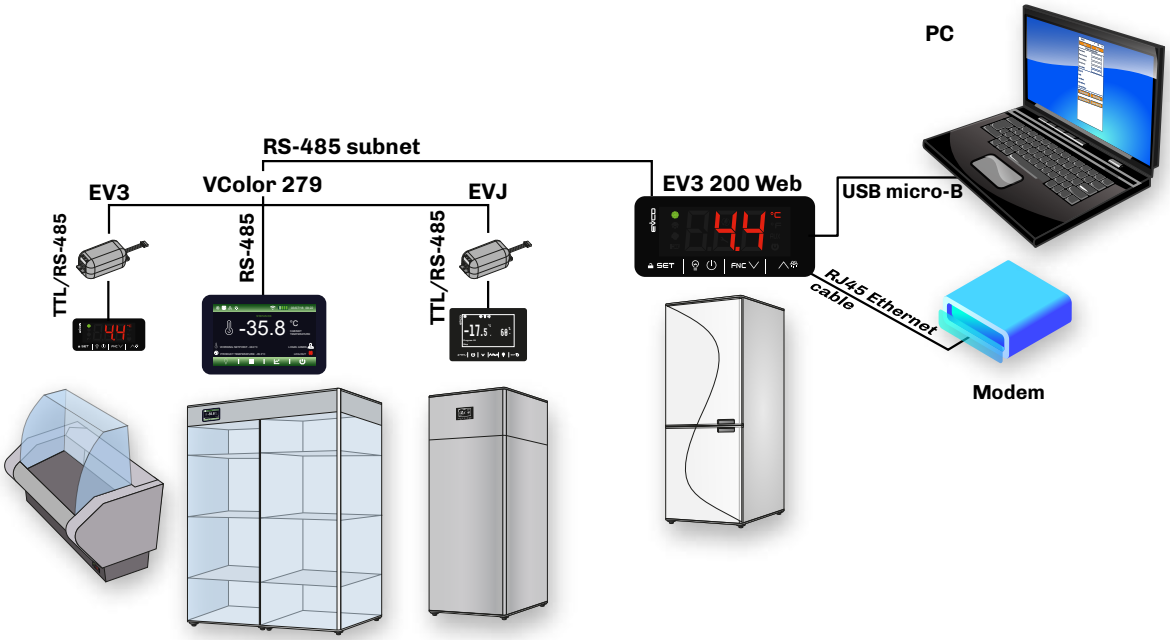

Fig. 34. *Configuration diagram when using a PC - USB*

8.1.2 Configuration diagram when using a PC with connection via Ethernet

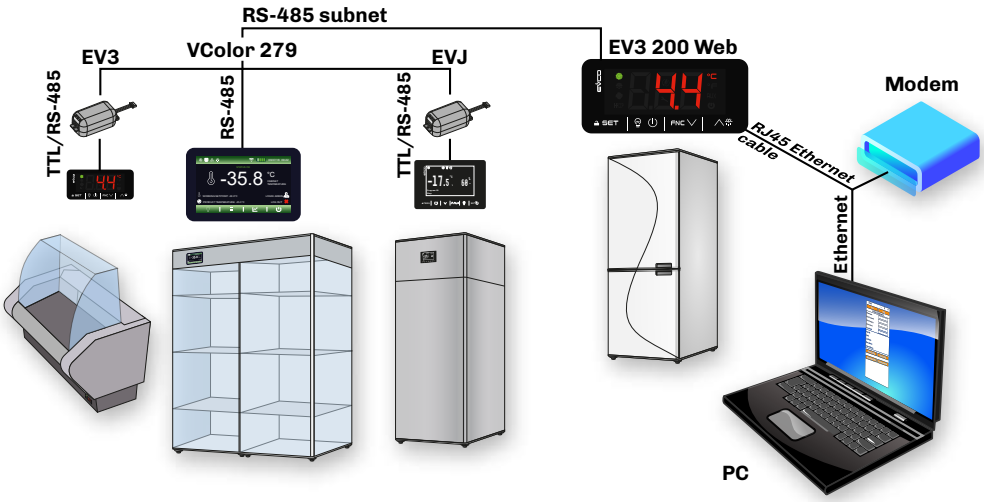

Fig. 35. *Configuration diagram when using a PC - Ethernet*

8.1.3 Configuration diagram when using a smartphone and the EPoCA START app.

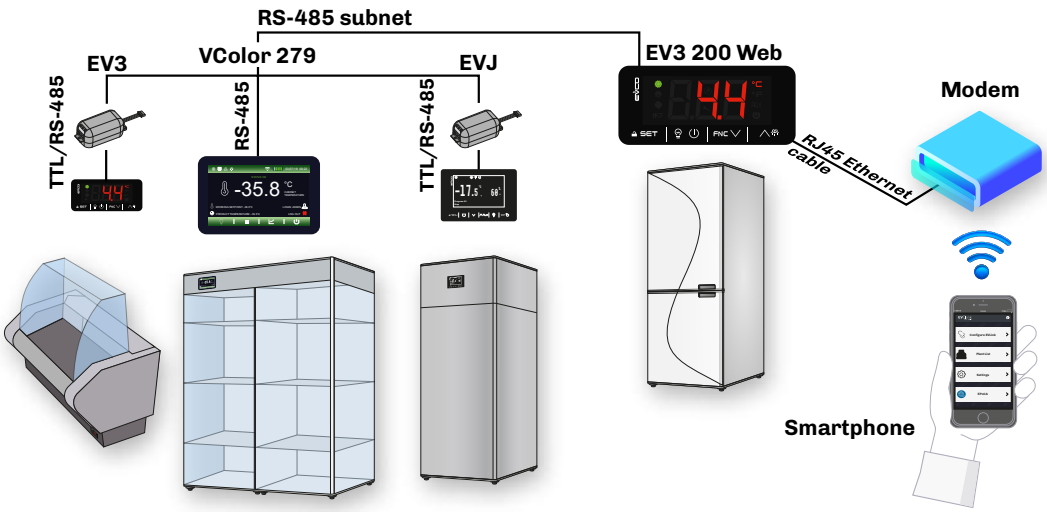

Fig. 36. Configuration diagram when using a smartphone

8.2 FIRST CONFIGURATION

8.2.1 Configuration using a PC

Connecting using a micro-B USB cable

1. Connect the micro-B USB cable from the PC to the device;
2. Make sure ***EPoCA.exe*** has been installed in the PC;
3. Boot up ***EPoCA.exe***;
4. Set the Plant and Device data, save the configuration by pressing Save Config. and continue by pressing Next;

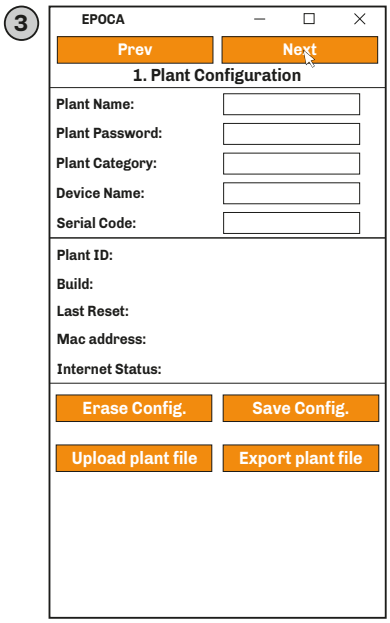

Fig. 37. Selecting the device and configuring the Plant and Device

N.B.: Save to continue with configuration by pressing Save Config..

NOTICE
WRONG OR FORGOTTEN ACCESS CREDENTIALS
Keep your access credentials in a safe place.

In case of incorrect or lost login credentials, log in using a USB cable to skip the login procedure.

Other commands:

Command	Description
Erase Config.	Cancels current configuration
Save Config.	Saves current configuration
Upload Plantfile	Uploads a previously saved plant file
Export Plantfile	Saves the plant file in a folder chosen by the user

5. Set the date, time and local time used and press **Next**;
6. Set the name of the controllers connected via RS-485 to **EV3 200 Web** and press **Next**;

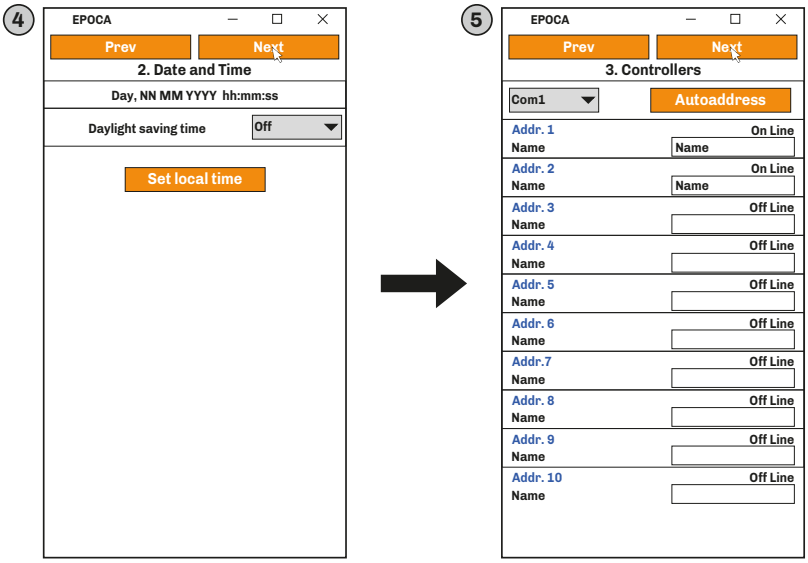

Fig. 38. *Selecting the device and configuring the Plant and Device*

Autoaddress: if the devices are switched on one at a time, this key automatically configures the **BLE** parameter of the device being switched on.

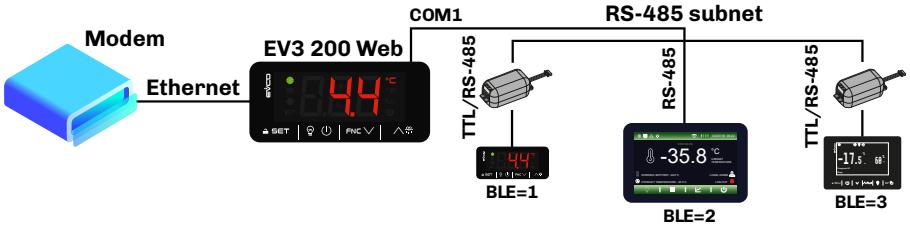

Fig. 39. *Diagram of subnetwork and BLE configuration*

To erase a device and its failed configuration, press **Addr. X**. A pop-up appears where you can choose to erase the recordings or the configuration of the device.

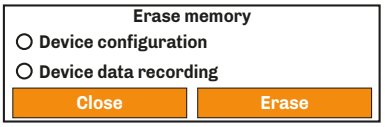

Fig. 40. *Pop-up to erase memory*

7. Set the type of IP address and press **Next**;
8. Press **Configure** to complete configuration of the device.

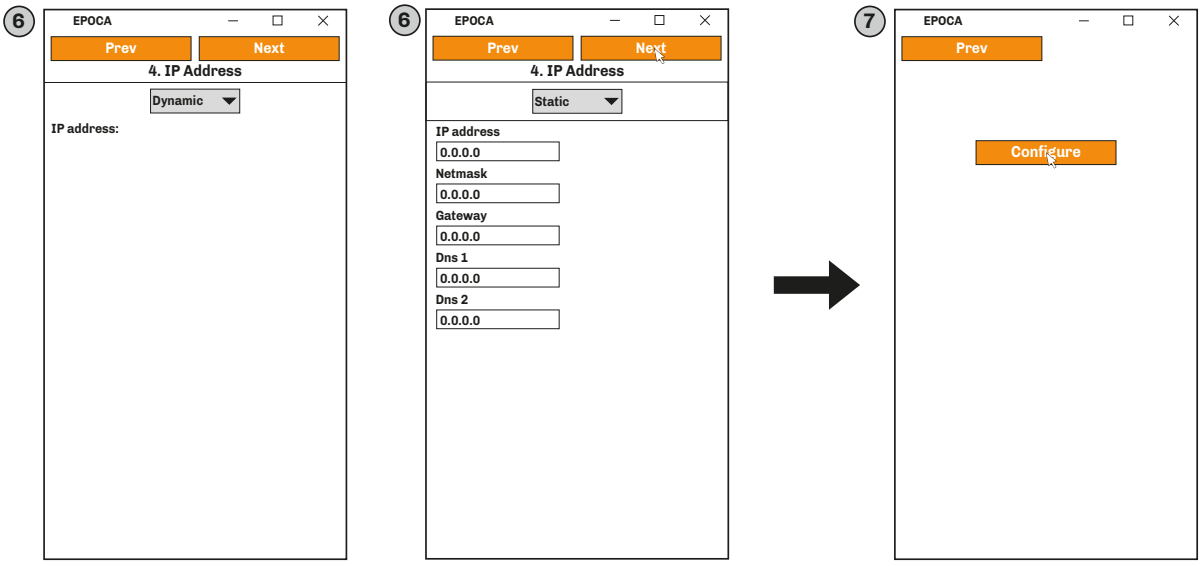

Fig. 41. *Selecting the type of IP address and end of configuration*

Connecting using an Ethernet cable (with connection to modem)

1. Make sure **EPoCA.exe** has been installed in the PC;
2. Boot up ***EPoCA.exe***, the programme scans the local network (LAN) which the PC is connected to to detect the devices;
3. Select the device to configure and press Next;
4. Set the Plant and Device data, save the configuration by pressing ***Save Config.*** and continue by pressing Next;

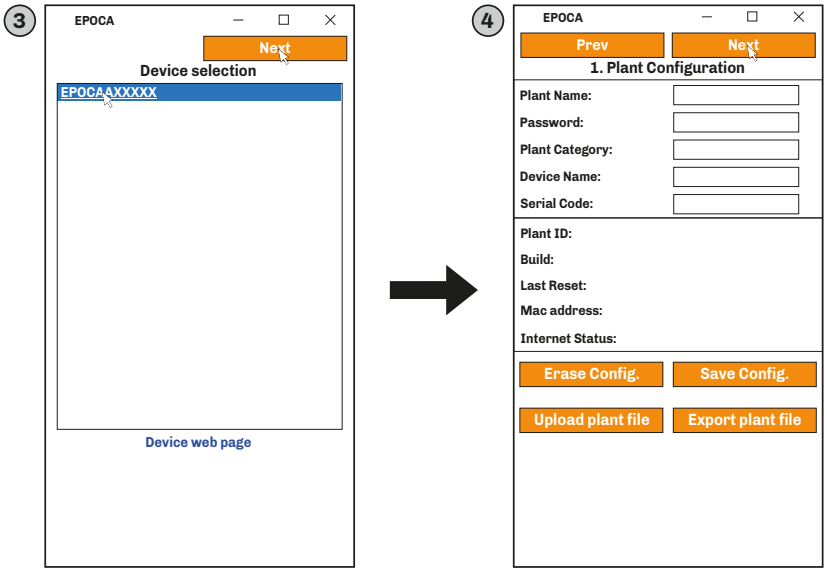

Fig. 42. *Selecting the device and configuring the Plant and Device*

N.B.: Save to continue with configuration.

NOTICE
WRONG OR FORGOTTEN ACCESS CREDENTIALS
Keep your access credentials in a safe place.

In case of incorrect or lost login credentials, log in using a USB cable to skip the login procedure.

5. Set the date, time and local time used and press Next;
6. Set the name of the controllers connected via RS-485 to **EV3 200 Web** and press Next;

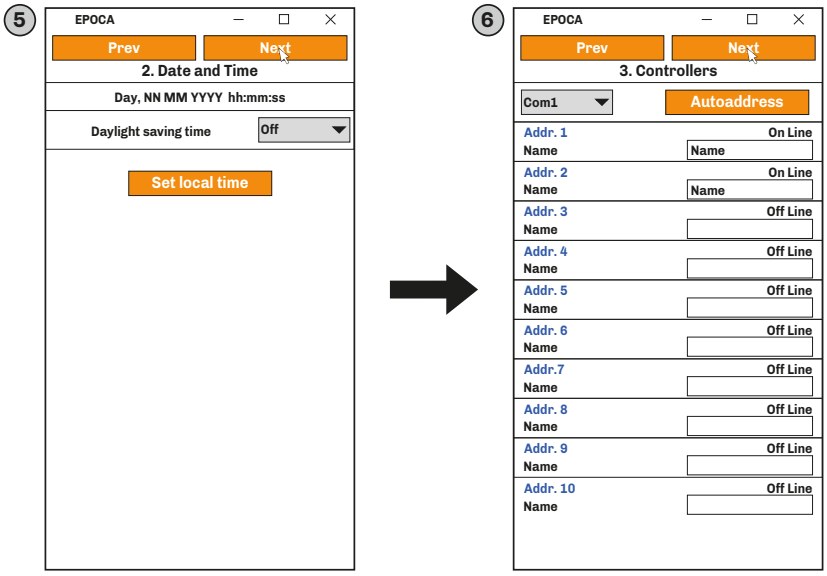

Fig. 43. *Selecting the device and configuring the Plant and Device*

7. Set the type of IP address and press Next;
8. Set the Modbus RTU and Modbus TCP communication parameters and press Next;
9. Press Configure to end the instrument configuration phase.

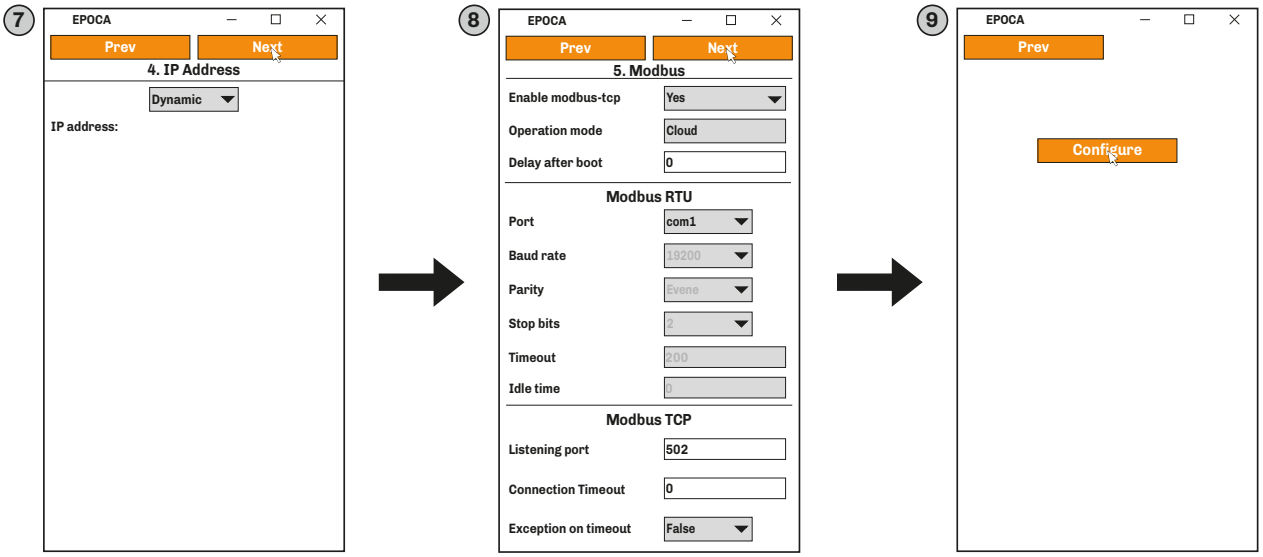

Fig. 44. *Selecting the type of IP address and end of configuration*

- **Enable modbus-tcp**: Enables/disables Modbus TCP communication.
- **Operation Mode**: Establishes the operating mode of the Modbus TCP network:
  - **Raw Bridge**: operation for EVCO controllers without functions with RTC and not **EPoCA** compatible or for third-party controllers;
  - **Cloud**: operation for **EPoCA** compatible controllers.
- **Delay after booting**: establishes the minimum time between the controller powering on and the start of communication.
- **Modbus RTU:** Sets the Modbus RTU serial communication parameters:
  - **Port:** sets the Modbus RTU communication port number on which the device waits for connection requests
  - **Baud rate**: sets the Modbus RTU communication speed (in baud) with the controller;
  - **Parity**: sets the parity bit for data-bit error checking;
  - **Stop bits**: sets the number of stop bits of Modbus RTU communication with the controller;
  - **Timeout**: sets the maximum time allowed for the controller to respond to a request;
  - **Idle time**: sets the minimum time between receiving a response and the subsequent request.
- **Modbus TCP:** Sets the Modbus TCP serial communication parameters:
  - **Listening port**: sets the Modbus TCP communication port number on which the device waits for connection requests;
  - **Connection timeout**: sets the idle time of Modbus TCP communication to terminate the connection;
  - **Exception on timeout**: sets whether to send an error code after the expiry of the **Timeout**.

NOTE: Do not change value 502 **TCP Port**.

NOTE: In case of use with EPoCA do not modify the displayed defaults.

8.2.2 Configuration using a smartphone or tablet

To configure **EV3 200 Web** using a ***smartphone or tablet*** follow these steps:

1. Make sure the ***EPoCA START*** app has been downloaded to the smartphone or tablet (otherwise download it from:
   - *Google Play Store* for smartphone/tablet **Android 5.0** or later);

To download the ***EPoCA START*** app from the *Google Play Store*, scan the **QR code** in the image below; this takes you directly to the download page.

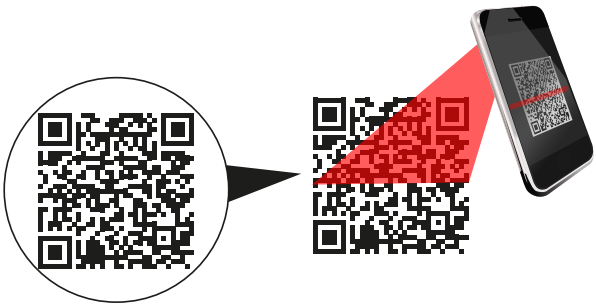

Fig. 45. *Scanning the QR code to download the EVLink app*

2. Boot up ***EPoCA START***;

3. Touch ***Configure Devices***;
4. Select the device to configure;

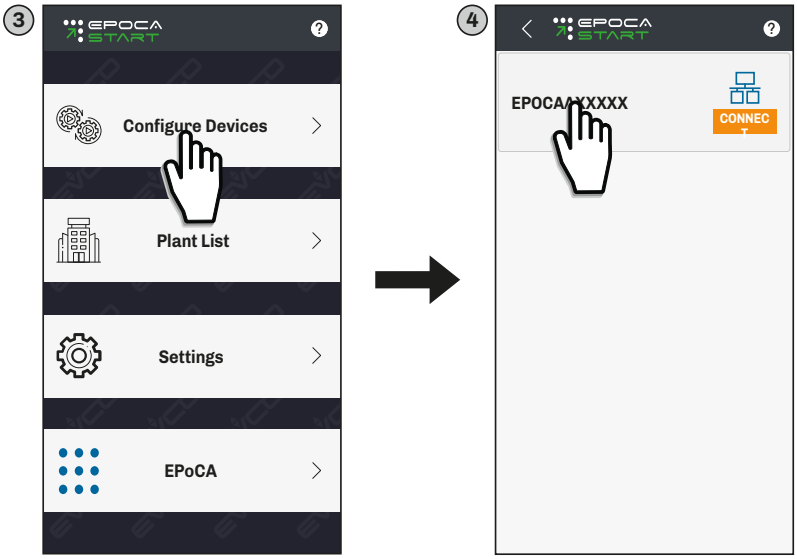

Fig. 46. *HOME screen and selecting the device*

5. Touch ***Configure***, set the Plant data and touch NEXT;

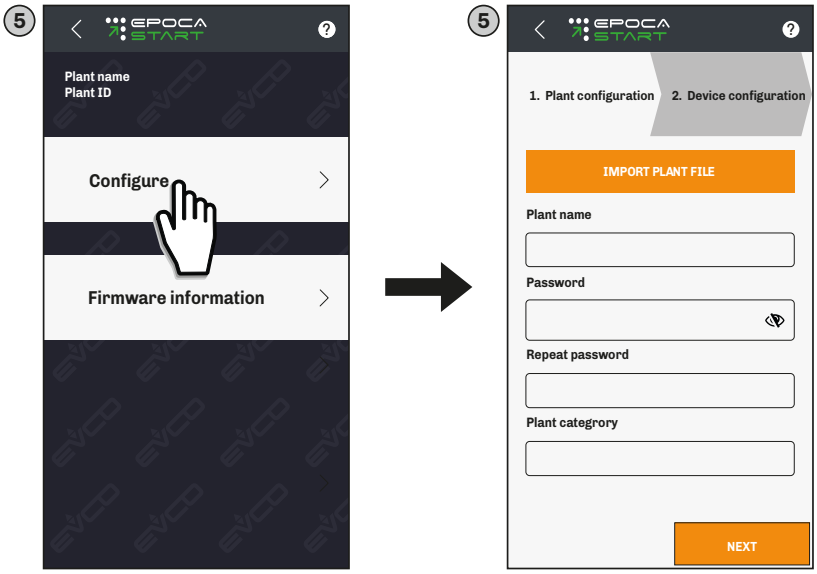

Fig. 47. *Configuring the plant*

6. Insert the device data and touch NEXT;
7. Set the date, time and local time used and touch NEXT;

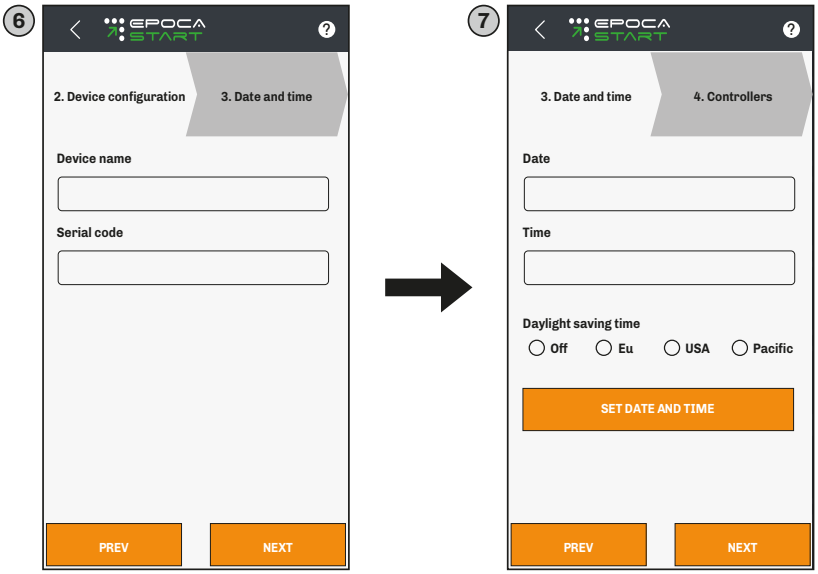

Fig. 48. *Configuring the device, date and time*

8. Set the name of the controllers connected via RS-485 to **EV3 200 Web** and touch NEXT;
9. Set the type of IP address of the network and touch NEXT;

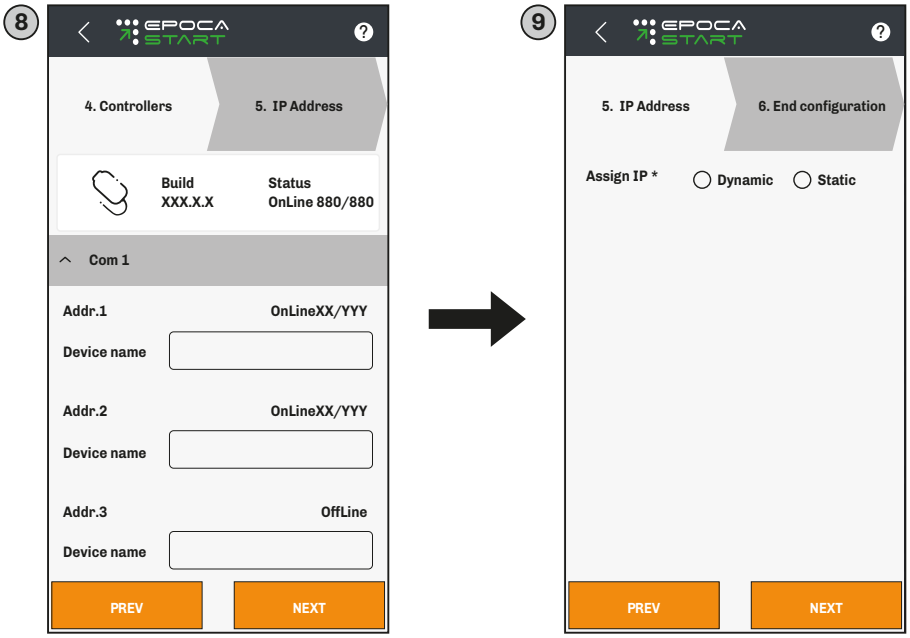

Fig. 49. *Configuring the addresses of the controllers and type of IP address*

When selecting a **Static** type of **IP** it is necessary to set other information:

- The IP address that you want to assign;
- Subnet mask (Netmask);
- The Gateway;
- Preferred DNS (DNS 1):
- Alternative DNS (DNS 2).

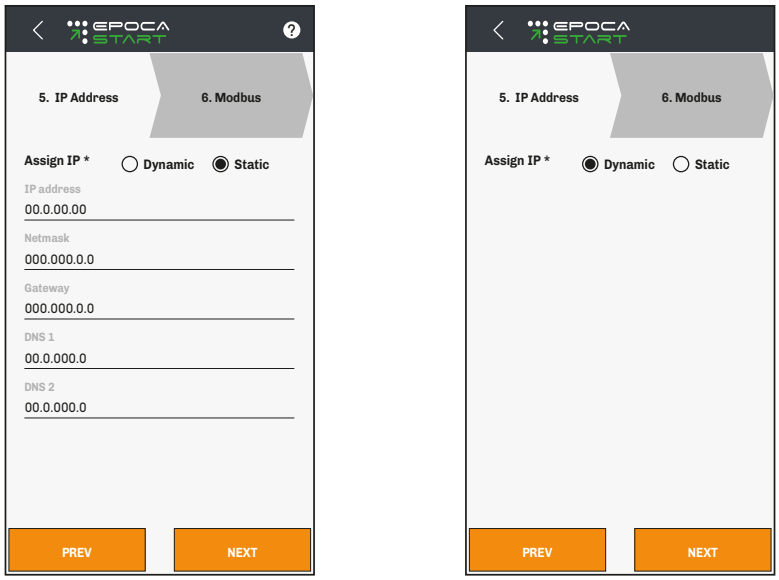

Fig. 50. *Static / dynamic IP configuration*

If necessary, configure the settings of the **Modbus TCP** network

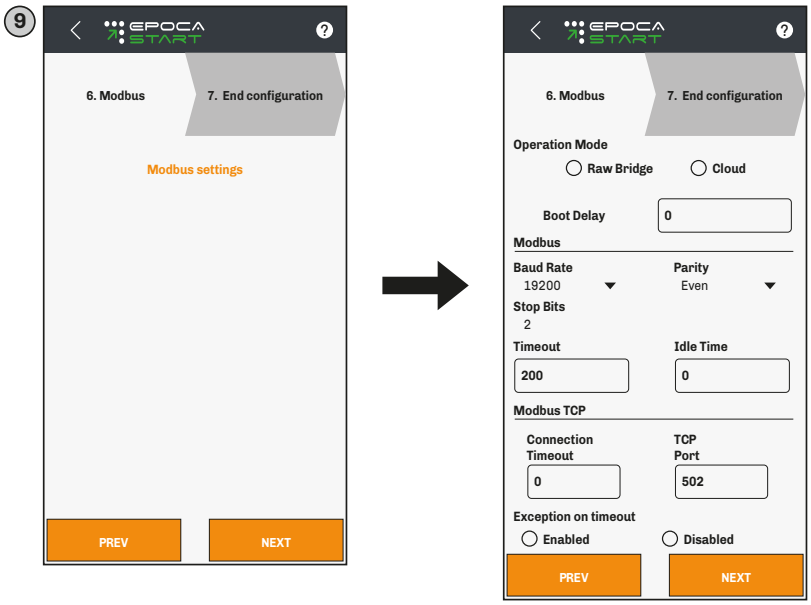

Fig. 51. *Modbus TCP configuration*

- **Operation Mode**: Establishes the operating mode of the Modbus TCP network:
  - **Raw Bridge**: operation for EVCO controllers without functions with RTC and not **EPoCA** compatible or for third-party controllers;
  - **Cloud**: operation for **EPoCA** compatible controllers.
- **Boot Delay**: establishes the minimum time between the controller powering on and the start of communication.
- **Modbus**: Sets the Modbus RTU serial communication parameters:
  - **Baud rate**: sets the Modbus RTU communication speed (in baud) with the controller;
  - **Parity**: sets the parity bit for data-bit error checking;
  - **Stop bits**: sets the number of stop bits of Modbus RTU communication with the controller;
  - **Timeout**: sets the maximum time allowed for the controller to respond to a request;
  - **Idle time**: sets the minimum time between receiving a response and the subsequent request.
- **Modbus TCP:** Sets the Modbus TCP serial communication parameters:
  - **Connection timeout**: sets the idle time of Modbus TCP communication to terminate the connection;
  - **TCP port**: sets the Modbus TCP communication port number on which the device waits for connection requests;
  - **Exception on timeout**: sets whether to send an error code after the expiry of the **Timeout**.

NOTE: Do not change the value 502 **TCP Port**.

10. Touch CONFIGURE to complete configuration of the device;
The next time the device is accessed, it will ask for the access credentials (Plant name, Password).

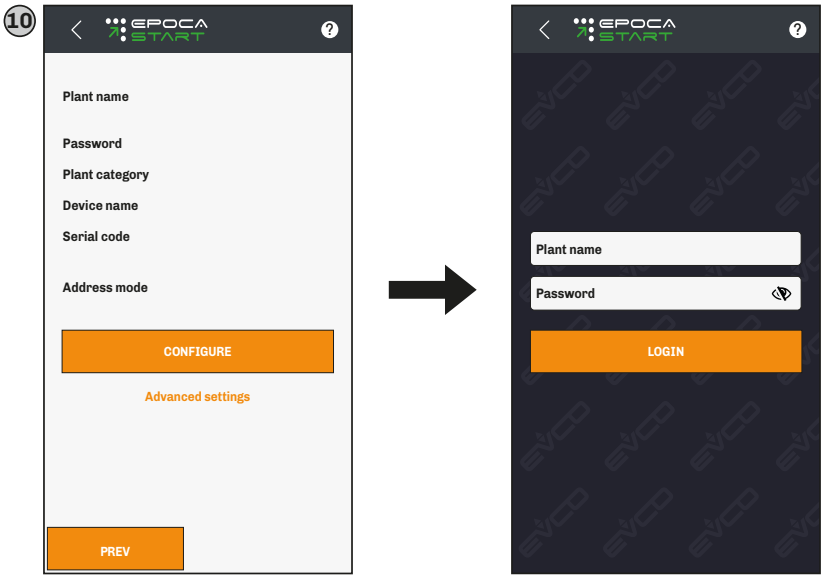

Fig. 52. *End of configuration*

9. REGULATION PARAMETERS

Description of columns in the Table of Parameters

- **Par.**: List of configurable device parameters;
- **Description**: Indicates parameter operation and any possible selections;
- **MU**: Measurement unit relating to the parameter;
- **Range**: Describes the interval of values that the parameter can assume. This can be correlated with other instrument parameters (indicated with the parameter code).
  NOTE: *if the actual value is outside the permitted limits for that parameter (for example, because other parameters defining the aforementioned limits have been altered), the value of the violated limit is displayed instead of the actual value;*
- **Default**: Indicates the pre-set factory configuration;
- **PW**: Indicates the access level for the parameter.
- **MODBUS address**: Indicates the address of the MODBUS register containing the resource you want to access.

9.1 TABLE OF REGULATION PARAMETERS

Par.	Description	MU	Range	Default
	SETPOINT Group			
SP	Temperature setpoint.	°C/°F	**r1**...**r2**	0,0
	ANALOGUE INPUTS Group			
CA1	Probe Pb1 offset.	°C/°F	-25.0...25.0	0,0
CA2	Probe Pb2 offset.	°C/°F	-25.0...25.0	0,0
CA3	Probe Pb3 Offset.	°C/°F	-25.0...25.0	0,0
P0	Type of probe. **0** = PTC; **1** = NTC.	---	0/1	1
P1	Enable decimal point in °C. **0** = No; **1** = Yes.	---	0/1	1
P2	Temperature measurement unit (if the value is changed, the temperature parameter limits must be reset manually). **0** = °C; **1** = °F.	---	0/1	0
P3	Probe Pb2 function. **0** = Disabled; **1** = Defrost + fans; **2** = Fans.	---	0...3	1
P4	Configuration of input Pb3/ID3. **0** = Digital input ID3; **1** = Condenser probe; **2** = Critical temperature probe; **3** = External air probe (display only).	---	0...3	0
P5	Value displayed. **0** = Regulation temperature. **1** = Setpoint. **2** = Probe Pb2 temperature. **3** = Probe Pb3 temperature. **4** = Incoming air temperature.	---	0...4	1
P7	Incoming air coefficient to calculate product temperature (**CPT**). **CPT** = {[(**P7** x (incoming air)] + [(100 - **P7**) x (outgoing air)] : 100}	---	0...10	5
P8	Refresh time display 1.	s	0...250/10	5
	TEMPERATURE REGULATION Group			
r0	Cooling mode setpoint differential.	°C/°F	0.1...15.0	2,0
r1	Minimum setpoint.	°C/°F	-99.0...**r2**	-50,0
r2	Maximum setpoint.	°C/°F	**r1**...199	50,0
r4	Setpoint offset in energy saving added to SET value.	°C/°F	0.0...99.0	0,0
r5	Heating/Cooling regulation. **0** = Cooling; **1** = Heating.	---	0/1	0
r6	Setpoint offset in over-cooling/over-heating.	°C/°F	0.0...99.0	0,0
r7	Duration of over-cooling/over-heating.	min	0...240	30
r8	Down key additional function **FNC** ∨. **0** = Disabled; **1** = Over-cooling/over-heating; **2** = Energy saving.	---	0...2	0

Par.	Description	MU	Range	Default
r12	Differential position **r0**. **0** = Asymmetrical; **1** = Symmetrical.	---	0/1	0
	COMPRESSOR Group			
C0	Compressor ON delay from power-on.	min	0...240	0
C2	Minimum compressor OFF time.	min	0...240	3
C3	Minimum compressor ON time.	s	0...240	0
C4	Compressor OFF time in cabinet probe alarm.	min	0...240	10
C5	Compressor ON time in cabinet probe alarm.	min	0...240	10
C6	Condensation temperature above which the condenser overheat alarm sounds.	°C/°F	0.0...199	80,0
C7	Condenser temperature above which the compressor locked alarm sounds, once **C8** time has elapsed.	°C/°F	0.0...199	90,0
C8	Delay in activation of compressor locked alarm due to threshold **C7** being exceeded.	min	0...15	1
C10	Compressor hours for maintenance. **0** = Disabled.	h	0...999*100	0
C11	Second compressor switch-on delay from first compressor switch-on.	s	0...240	0
C13	Number of start-ups per compressor rotation. **0** = Disabled.	num	0...10	0
	DEFROST Group			
d0	Defrost interval. **0** = Manual defrost only. If **d8** = 3, maximum interval.	h	0...99	8
d1	Type of defrost. **0** = Electrical heaters; **1** = Cycle reversed (hot gas); **2** = When compressor stops.	---	0...2	0
d2	Evaporation temperature above which defrost with evaporator probe terminates (**Pr3** = 5).	°C/°F	-99.0...99.0	8,0
d3	Defrost duration. If **P3** = 1, maximum duration.	min	0...99	30
d4	Enable defrost when device is switched on. **0** = Disabled; **1** = Enabled.	---	0/1	0
d5	Defrost activation delay from power-on.	min	0...99	0
d6	Value displayed during defrost. **0** = Regulation; **1** = Locked display; **2** = Code "**DEF**".	---	0...2	2
d7	Evaporator dripping time after defrost.	min	0...15	2
d8	Defrost interval count mode. **0** = Hours device ON; **1** = Hours compressor ON; **2** = Hours evaporator temperature < **d9**; **3** = Adaptive; **4** = In real time (RTC).	---	0...4	0
d9	Evaporation threshold for automatic defrost interval count.	°C/°F	-99.0...99.0	0,0
d11	Enable defrost terminated warning due to maximum duration (code **dFd**). **0** = No; **1** = Yes.	---	0/1	0
d15	Compressor ON time before hot gas defrost.	min	0...99	0
d16	Pre-dripping time for hot gas defrost.	min	0...99	0
d18	Adaptive defrost interval. **0** = Manual defrost only.	min	0...999	40
d19	Adaptive defrost threshold (relative to optimal evaporation temperature).	°C/°F	0.0...40.0	3,0
d20	Compressor-on consecutive time for defrost.	min	0...999	180
d21	Compressor-on consecutive time for defrost from power-on and from over-cooling.	min	0...500	200
d22	Evaporation threshold for adaptive defrost interval count (relative to optimal evaporation temperature).	°C/°F	-10.0...10.0	-2,0
	ALARM Group			
AA	Select value for high/low temperature alarms **0** = Regulation temperature; **1** = Evaporator temperature; **2** = Probe Pb3 temperature.	---	0...2	0
A1	Low temperature alarm threshold.	°C/°F	-99.0...99.0	-10,0

Par.	Description	MU	Range	Default
A2	Type of low temperature alarm. **0** = Disabled; **1** = Relative to SET; **2** = Absolute.	---	0...2	2
A4	High temperature alarm threshold.	°C/°F	-99.0...99.0	10,0
A5	Type of high temperature alarm. **0** = Disabled; **1** = Relative to SET; **2** = Absolute.	---	0...2	2
A6	Delay in activation of temperature and humidity alarms due to threshold exceeded when device is switched on.	min	0...99*10	12
A7	Minimum and maximum temperature alarm delay.	min	0...240	15
A8	Delay in activation of alarm due to threshold exceeded after defrost.	min	0...240	15
A9	Delay in activation of alarm due to threshold exceeded after door closed.	min	0...240	15
A10	Duration of power failure to record alarm.	min	0...240	10
A11	Hysteresis referring to **A1** and **A4** to determine alarm reset threshold.	°C/°F	1.0...15.0	2,0
	EVAPORATOR/CONDENSER FANS Group			
F0	Evaporator fan mode in normal operating mode. With **F0** = 0 it is possible to manage cycles by setting **F11**, **F12**. **0** = In cycles; **1** = Always ON; **2** = On with compressor ON; **3** = Thermostat controlled (**F1** relative to temperature control); **4** = Thermostat controlled with compressor ON (**F1** relative to temperature control).	---	0...4	1
F1	Evaporator fan regulation threshold with **F0** = 3, 4.	°C/°F	-99.0...99.0	-4,0
F2	Evaporator fan mode during defrost. **0** = OFF; **1** = ON; **2** = According to **F0**.	---	0...2	0
F3	Maximum time evaporator fans off after dripping.	min	0...15	2
F4	Time evaporator fans OFF in energy saving.	s	0...240*10	0
F5	Time evaporator fans ON in energy saving.	s	0...240*10	10
F7	Evaporator fans ON threshold from dripping.	°C/°F	-99.0...99.0	5,0
F9	Evaporator fan switch-off delay from compressor switch-off	s	0...240	0
F11	Condenser fans ON threshold.	°C/°F	-99.0...99.0	15,0
F12	Condenser fans OFF delay from compressor OFF.	s	0...240	30
F15	Time evaporator fans OFF with compressor OFF.	s	0...240	0
F16	Time evaporator fans ON with compressor OFF.	s	0...240	1
	DIGITAL INPUT PROPERTIES Group			
i0	Digital input **ID1** function. **0** = Disabled; **1** = Compressor + evaporator fans OFF; **2** = Evaporator fans OFF; **3** = Light ON; **4** = Compressor + evaporator fans OFF, light ON; **5** = Evaporator fans OFF, light ON.	---	0...5	5
i1	Digital input **ID1** activation (polarity). **0** = Contact closed (NC); **1** = Contact open (NO).	---	0/1	0
i2	Delay in alarm signal from door open. **-1** = Disabled.	min	-1...120	30
i3	Maximum time for inhibiting regulation with door open. **-1** = Disabled.	min	-1...120	15
i5	Digital input **ID3** function. **0** = Disabled; **1** = Energy saving; **2** = iA alarm; **3** = AUX ON; **4** = Stand-by; **5** = Cth alarm; **6** = th alarm.	---	0...6	0
i6	Digital input **ID3** activation (polarity). **0** = Contact closed (NC); **1** = Contact open (NO).	---	0/1	0
i7	Delay in alarm signal from door open. **-1** = Disabled.	min	-1...120	0
i10	Door closed consecutive time for energy saving.	min	0...999	0
i13	Number of door openings for defrost. **0** = Disabled.	num	0...240	180
i14	Door open consecutive time for defrost. **0** = Disabled.	min	0...240	32

Par.	Description	MU	Range	Default
	DIGITAL OUTPUT Group			
u1	Configuration output **out4**. Use the AUX key for manual control. **0** = Cabinet light; **1** = Demisting heaters; **2** = AUX output; **3** = Alarm; **4** = Door heaters; **5** = Neutral zone; **6** = Condenser fans; **7** = ON/Stand-by; **8** = Compressor 2.	---	0...8	0
u2	Enable cabinet light and load in stand-by using the key. **0** = Disabled; **1** = Enabled.	---	0/1	0
u4	Enable silencing alarm output. **0** = Disabled; **1** = Enabled.	---	0/1	0
u5	Door heaters activation threshold.	°C/°F	-99.0...99.0	-1,0
u6	Duration demisting ON.	min	1...120	5
u7	Neutral zone threshold for heating.	°C/°F	-99.0...99.0	5,0
	ENERGY SAVING Group			
HE2	Maximum duration energy saving.	min	0...999	0
	ENERGY SAVING IN REAL TIME (RTC) Group			
H01	Energy saving time Monday.	h	0...23	0
H02	Maximum duration energy saving Monday.	h	0...24	0
H03	Energy saving time Tuesday.	h	0...23	0
H04	Maximum duration energy saving Tuesday.	h	0...24	0
H05	Energy saving time Wednesday.	h	0...23	0
H06	Maximum duration energy saving Wednesday.	h	0...24	0
H07	Energy saving time Thursday.	h	0...23	0
H08	Maximum duration energy saving Thursday.	h	0...24	0
H09	Energy saving time Friday.	h	0...23	0
H10	Maximum duration energy saving Friday.	h	0...24	0
H11	Energy saving time Saturday.	h	0...23	0
H12	Maximum duration energy saving Saturday.	h	0...24	0
H13	Energy saving time Sunday.	h	0...23	0
H14	Maximum duration energy saving Sunday.	h	0...24	0
	RTC DEFROST CONFIGURATION Group			
Hd1	Defrost 1 activation time. "**----**" = Disabled.	h	----, 0...23	----
Hd2	Defrost 2 activation time. "**----**" = Disabled.	h	----, 0...23	----
Hd3	Defrost 3 activation time. "**----**" = Disabled.	h	----, 0...23	----
Hd4	Defrost 4 activation time. "**----**" = Disabled.	h	----, 0...23	----
Hd5	Defrost 5 activation time. "**----**" = Disabled.	h	----, 0...23	----
Hd6	Defrost 6 activation time. "**----**" = Disabled.	h	----, 0...23	----
	PASSWORD Group			
POF	Enable stand-by key (ON/OFF). **0** = Disabled; **1**= Enabled.	---	0/1	1
PAS	Level 2 password to access parameters (installer).	---	-99... 999	-19
PA1	EVlink/EVconnect user password (not entered on device).	---	-99... 999	426
PA2	EVlink/EVconnect service password (not entered on device).	---	-99... 999	824
	CLOCK Group			
Hr0	Enable clock. **0** = Disabled; **1**= Enabled.	---	0/1	0
	REMOTE COMMUNICATION Group			
BLE	Reserved. **Do not change**.	---	---	1
rE0	Recording interval.	min	0...240	15

Par.	Description	MU	Range	Default
rE1	Value to record. **0** = No value to record; **1** = Only probe Pb1 value; **2** = Only probe Pb2 value; **3** = Only probe Pb3 value; **4** = Probe Pb1 and Pb2 value; **5** = Value of all the probes.	---	0...5	1
	MODBUS CONFIGURATION Group			
LA	MODBUS protocol controller address.	---	0...247	247
Lb	MODBUS transmission speed (baud rate). **0** = 2400; **1** = 4800; **2** = 9600; **3** = 19200.	baud	0...3	2

10. MODBUS TCP FUNCTIONS AND RESOURCES

10.1 INTRODUCTION

The Modbus TCP is a variant of Modbus and is based on the TCP that allows sending messages over an Intranet and the Internet. The Modbus TCP uses binary data encoding and the TCP detection mechanism for transmission errors. It also uses the Master - Slave paradigm, in the Client - Server variant between devices connected to a TCP Ethernet network.
Four types of messages are used in this type of communication.

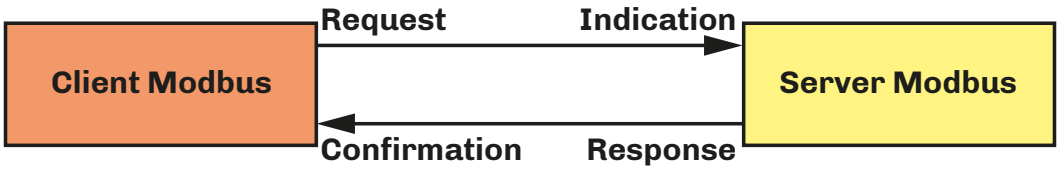

Fig. 53. *Diagram showing message exchange in a Modbus TCP communication*

The Modbus TCP message exchange service is used to exchange data in real time between two application devices, between application devices and other devices, between **HMI** (Human Machine Interface) or **SCADA** applications and devices, and between PCs and application devices that provide online services.

Only the client device identified as the master can initiate a transaction, building the message ADU, whose function code tells the server what action to take.

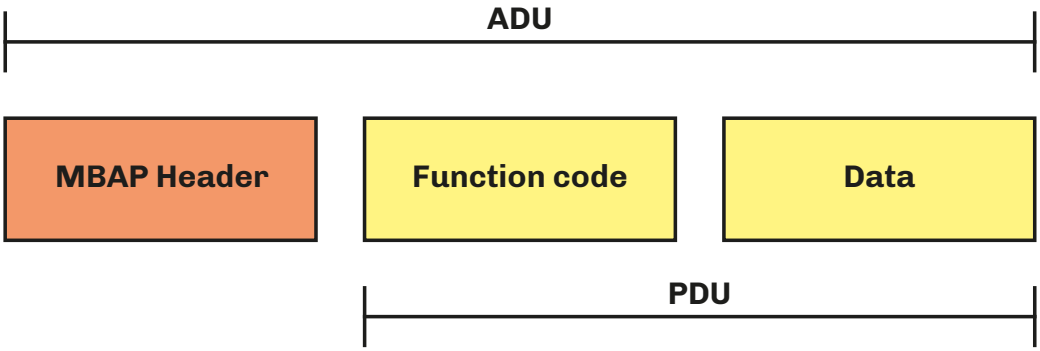

Fig. 54. *Framing of a message using the Modbus TCP*

For further information relating to the Modbus protocol, visit the official Modbus website: www.modbus.org.

10.2 MANAGING MODBUS CONNECTIONS OVER A TCP NETWORK

EV3 200 Web supports up to 5 concurrent Modbus client connections. If a new connection request is received and the number of connections is already at the limit, the connection is rejected.

10.3 MODBUS MESSAGE STRUCTURE

The Modbus protocol uses a 16-bit word. The Modbus message starts with a header. A Modbus message uses a Modbus function code as the first byte.

A description of the structure of a modbus message header is given below.

Unique identifier	Type of protocol	Command length	Unit ID	Modbus message
2 bytes	2 bytes	2 bytes	1 byte	N-bytes
Field associating a request with a response	The Modbus field value is always 0	The field value is the size of the rest of the message	This field is used to identify a remote server located on a non-TCP network (for serial connection)	The first byte is the Modbus function code

10.4 MODBUS FUNCTIONS AND REGISTERS

The Modbus registers for the device are organised around the four types of basic data reference indicated above, and this type of data is further identified by the first number of the address.

10.4.1 Available Modbus commands and data areas

The commands implemented are as follows:

Command	Description
03 (hex 0x03)	Resource reading command
06 (hex 0x06)	Resource writing command
16 (hex 0x10)	Writing command for one or more registers

10.5 ADDRESS CONFIGURATION

Node address 0 is used exclusively for broadcast messages, recognized by all servers. To a broadcast message, the Server devices do not respond.
To work with Modbus TCP the **BLE** parameter must be 1. In this case the **LA**, **Lb** and **BLE** parameters must not be modified.

The address of a device within a Modbus message is set by the **LA** parameter.

Address **0** is only used for broadcast messages, recognised by all slaves. Slave devices do not respond to a broadcast message.

Unit address: this is the address of the node that allows communicating with the connected instrument or with other slaves.

Holding register number: modbus addresses of each instrument.

Modbus TCP default port: **502**.

10.6 OPERATION

10.6.1 Stand-alone operation

To communicate solely with **EV3 200 Web**, set the Destination ID of the modbus message to 247 (value set by the **BLE = 1** parameter).

NOTICE
NO COMMUNICATION Do not change the default value of the **BLE** parameter.

10.6.2 Cloud + Modbus TCP

In this operating mode it is possible to use up to 10 devices (1 EV3 200 Web + 9 compatible EPocA devices)

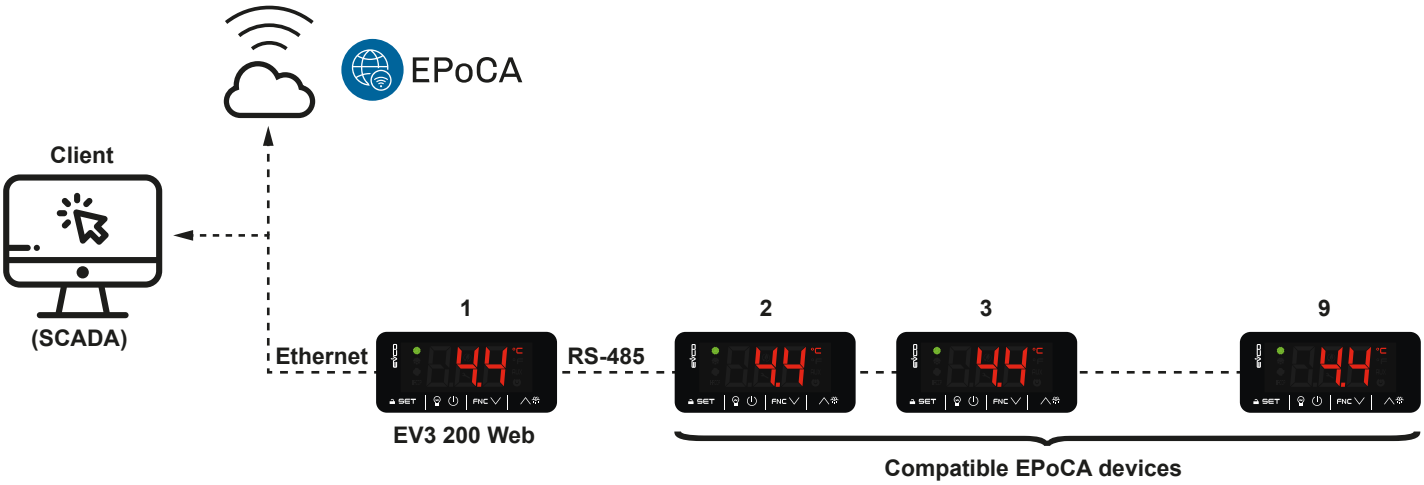

Fig. 55. *Cloud + Modbus TCP*

Setup

- **Modbus TCP** = 1;
- **Operation Mode** = Cloud.

10.6.3 Modbus TCP only

In this operating mode it is possible to use up to 20 devices (1 **EV3 200 Web** + 19 compatible EPocA devices).

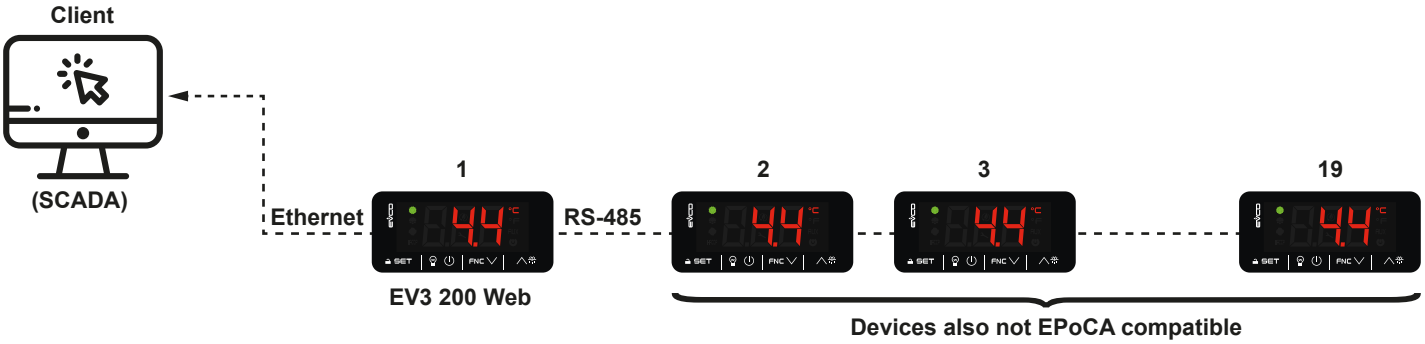

Fig. 56. *Modbus TCP only*

Setup

- **Modbus TCP** = 1;
- **Operation Mode** = Raw Bridge.

10.7 MODBUS TABLES CONTENT

Table content description

The tables below contain the information required to access the resources properly and directly.
There are 2 tables:

- Modbus parameter table, which contains all the configuration parameters for the device and the corresponding addresses
- Modbus resource table, which contains all the status (I/O) and alarm resources in the device memory.

Description of columns in the Table of addresses

- **Par.**: List of configurable device parameters;
- **Description**: Indicates parameter operation and any possible selections;
- **UM**: Measurement unit relating to the parameter;
- **Range**: Describes the interval of values that the parameter can assume. This can be correlated with other instrument parameters (indicated with the parameter code).
  NOTE: *If the actual value is outside the permitted limits for that parameter (for example, because other parameters defining the aforementioned limits have been altered), the value of the violated limit is displayed instead of the actual value;*
- **Default**: Indicates the pre-set factory configuration;
- **PW**: Indicates the access level for the parameter.
- **Val. Adr.**: Indicates the address of the Modbus register containing the resource you want to access;
- **Filter value**: bit position of the data to be considered in the holding register. This information is always provided when the register contains more than one piece of information and it is necessary to distinguish which bits actually represent the data (the useful size of the data indicated in the DATA SIZE column should also be taken into account);

NOTE: Some holding registers contain two separate fields: one contained in the **MSB** (most significant byte) and the other in the **LESS**.

- **R/W:** Indicates the option of reading or writing the resource:
  - **R**: The resource is read-only;
  - **W**: The resource is write-only;
  - **R/W**: The resource can be both read and written.
- **CPL**: When the fields indicates Y, the value read by the register needs to be converted because the value represents a number with a sign. In the other cases the value is always positive or zero.
- **DATA SIZE**: Indicates the size in data bits:
  - **WORD** = 16 bits
  - **Byte** = 8 bits
  - The "**n**" bit = 0...15 bit depending on the value of "n".

10.8 MODBUS ADDRESSES

10.8.1 Table of Modbus Parameters

Par.	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	Range	MU
	SETPOINT group							
SP	Temperature setpoint.	1538	---	RW	WORD	Y	**r1**...**r2**	°C/°F
	ANALOGUE INPUT group							
CA1	Probe Pb1 offset.	1539	---	RW	BYTES	Y	-25.0...25.0	°C/°F
CA2	Probe Pb2 offset.	1540	---	RW	BYTES	Y	-25.0...25.0	°C/°F
CA3	Probe Pb3 offset.	1541	---	RW	BYTES	Y	-25.0...25.0	°C/°F
P0	Probe type.	1542	---	RW	BYTES	---	0/1	---
P1	Enables decimal point in °C.	1543	---	RW	BYTES	---	0/1	---
P2	Temperature unit of measure (changing value means that the temperature parameter limits will need to be reset manually).	1544	---	RW	BYTES	---	0/1	---
P3	Pb2 probe function.	1545	---	RW	BYTES	---	0...3	---
P4	Pb3/ID3 input configuration.	1546	---	RW	BYTES	---	0...3	---
P5	Value shown on the display.	1547	---	RW	BYTES	---	0...4	---
P7	Inlet air coefficient for product temperature calculation (**CPT**).	1548	---	RW	BYTES	---	0...10	---
P8	Display 1 refresh time.	1549	---	RW	BYTES	---	0...250/10	s
	TEMPERATURE MANAGEMENT group							
r0	Setpoint differential.	1550	---	RW	BYTES	---	0.1...15.0	°C/°F
r1	Minimum setpoint.	1551	---	RW	BYTES	Y	-99.0...**r2**	°C/°F
r2	Maximum setpoint.	1552	---	RW	BYTES	---	**r1**...199	°C/°F
r4	Offset setpoint in energy saving added to the SET value.	1553	---	RW	BYTES	---	0.0...99.0	°C/°F
r5	Hot/Cold regulation.	1554	---	RW	BYTES	---	0/1	---
r6	Setpoint offset in overcooling/overheating.	1555	---	RW	BYTES	---	0.0...99.0	°C/°F
r7	Overcooling/overheating duration.	1556	---	RW	BYTES	---	0...240	min
r8	Down key additional function **FNC** ∨.	1557	---	RW	BYTES	---	0...2	---
r12	Differential position **r0**.	1558	---	RW	BYTES	---	0/1	---
	COMPRESSOR group							
C0	Compressor ON delay from power-on.	1559	---	RW	BYTES	---	0...240	min
C2	Minimum compressor OFF time.	1560	---	RW	BYTES	---	0...240	min
C3	Minimum compressor ON time.	1561	---	RW	BYTES	---	0...240	s
C4	Compressor OFF time in cold room probe alarm mode.	1562	---	RW	BYTES	---	0...240	min
C5	Compressor ON time in cold room probe alarm mode.	1563	---	RW	BYTES	---	0...240	min
C6	Condensation temperature over which the condenser overheat alarm is triggered.	1564	---	RW	WORD	---	0.0...199	°C/°F
C7	Condenser temperature over which the compressor lock alarm is triggered, once time period **C8** has elapsed.	1565	---	RW	WORD	---	0.0...199	°C/°F
C8	Compressor lock alarm activation delay from when threshold **C7** was exceeded.	1566	---	RW	BYTES	---	0...15	min
C10	Compressor maintenance hours.	1567	---	RW	WORD	---	0...999*100	h
C11	Second compressor power-on delay from first compressor power-on.	1568	---	RW	BYTES	---	0...240	s
C13	Number of boosts for compressor rotation.	1569	---	RW	BYTES	---	0...10	num
	DEFROST group							
d0	Defrost interval.	1570	---	RW	BYTES	---	0...99	h
d1	Defrost type.	1571	---	RW	BYTES	---	0...2	---
d2	Evaporation temperature over which defrost ends with evaporator probe (**Pr3** = 5).	1572	---	RW	WORD	Y	-99.0...99.0	°C/°F
d3	Defrost duration. If **P3** = 1, maximum duration.	1573	---	RW	BYTES	---	0...99	min
d4	Enable defrost at device switch-on.	1574	---	RW	BYTES	---	0/1	---
d5	Defrost activation delay from power-on.	1575	---	RW	BYTES	---	0...99	min
d6	Value shown on the display during a defrost.	1576	---	RW	BYTES	---	0...2	---

Par.	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	Range	MU
d7	Evaporator drip time after a defrost.	1577	---	RW	BYTES	---	0...15	min
d8	Defrost interval count mode.	1578	---	RW	BYTES	---	0...4	---
d9	Evaporation threshold for counting automatic defrost interval.	1579	---	RW	WORD	Y	-99.0...99.0	°C/°F
d11	Enable notice for defrost end due to maximum duration (code **dFd**).	1580	---	RW	BYTES	---	0/1	---
d15	Compressor ON time before hot gas defrost.	1581	---	RW	BYTES	---	0...99	min
d16	Pre-drip time for hot gas defrost.	1582	---	RW	BYTES	---	0...99	min
d18	Adaptive defrost interval.	1583	---	RW	BYTES	---	0...999	min
d19	Threshold for adaptive defrost (relative to evaporation optimal temperature).	1584	---	RW	WORD	---	0.0...40.0	°C/°F
d20	Consecutive time compressor ON for defrost.	1585	---	RW	WORD	---	0...999	min
d21	Consecutive compressor ON time for defrost from power-on and from overcooling.	1586	---	RW	WORD	---	0...500	min
d22	Evaporation threshold for adaptive defrost interval count (relative to evaporation optimal temperature).	1587	---	RW	WORD	Y	-10.0...10.0	°C/°F
	ALARMS group							
AA	Size selection for high/low temperature alarms.	1588	---	RW	BYTES	---	0...2	---
A1	Low temperature alarm threshold.	1589	---	RW	WORD	Y	-99.0...99.0	°C/°F
A2	Low temperature alarm type.	1590	---	RW	BYTES	---	0...2	---
A4	High temperature alarm threshold.	1591	---	RW	WORD	Y	-99.0...99.0	°C/°F
A5	High temperature alarm type.	1592	---	RW	BYTES	---	0...2	---
A6	Temperature and humidity alarm activation delay from when threshold was exceeded at device startup.	1593	---	RW	WORD	---	0...99*10	min
A7	Minimum and maximum temperature alarms delay.	1594	---	RW	BYTES	---	0...240	min
A8	Delay in alarm activation to indicate threshold exceeded after a defrost.	1595	---	RW	BYTES	---	0...240	min
A9	Delay in alarm activation to indicate threshold exceeded after door closure.	1596	---	RW	BYTES	---	0...240	min
A10	Power failure duration for alarm recording.	1597	---	RW	BYTES	---	0...240	min
A11	Hysteresis referring to **A1** and **A4** for determining alarm reset threshold.	1598	---	RW	WORD	---	1.0...15.0	°C/°F
	EVAPORATOR/CONDENSER FAN group							
F0	Evaporator fans in normal operating mode.	1599	---	RW	BYTES	---	0...4	---
F1	Evaporator fan regulation threshold with **F0** = 3, 4.	1600	---	RW	WORD	Y	-99.0...99.0	°C/°F
F2	Evaporator fan mode during defrosting.	1601	---	RW	BYTES	---	0...2	---
F3	Maximum evaporator fan post-dripping stoppage time.	1602	---	RW	BYTES	---	0...15	min
F4	Evaporator fans OFF time in energy saving.	1603	---	RW	WORD	---	0...240*10	s
F5	Evaporator fans ON time in energy saving.	1604	---	RW	WORD	---	0...240*10	s
F7	Evaporator fans ON threshold from dripping.	1605	---	RW	WORD	Y	-99.0...99.0	°C/°F
F9	Evaporator fan switch-off delay from compressor switch-off.	1606	---	RW	BYTES	---	0...240	s
F11	Condenser fans ON threshold.	1607	---	RW	WORD	Y	-99.0...99.0	°C/°F
F12	Condenser fans OFF delay from compressor OFF.	1608	---	RW	BYTES	---	0...240	s
F15	Evaporator fans OFF time with compressor OFF.	1609	---	RW	BYTES	---	0...240	s
F16	Evaporator fans ON time with compressor OFF.	1610	---	RW	BYTES	---	0...240	s
	DIGITAL INPUT PROPERTIES group							
i0	Digital input function **ID1**.	1611	---	RW	BYTES	---	0...5	---
i1	Digital input activation **ID1** (Polarity).	1612	---	RW	BYTES	---	0/1	---
i2	Alarm indication delay from door opening.	1613	---	RW	WORD	Y	-1...120	min
i3	Maximum regulation inhibition time with door open.	1614	---	RW	WORD	Y	-1...120	min
i5	Digital input function **ID3**.	1615	---	RW	BYTES	---	0...6	---
i6	Digital input activation **ID3** (Polarity).	1616	---	RW	BYTES	---	0/1	---
i7	Alarm indication delay from door opening.	1617	---	RW	WORD	Y	-1...120	min
i10	Consecutive time door closed for energy saving.	1618	---	RW	WORD	---	0...999	min
i13	Number of door openings for defrost.	1619	---	RW	BYTES	---	0...240	num

Par.	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	Range	MU
i14	Consecutive time door open for defrost.	1620	---	RW	BYTES	---	0...240	min
	DIGITAL OUTPUT group							
u1	Configuration of output **out4**. Manual control is via the AUX key.	1621	---	RW	BYTES	---	0...8	---
u2	Enables cold room light and loading via button on stand-by.	1622	---	RW	BYTES	---	0/1	---
u4	Enables alarm output silencing.	1623	---	RW	BYTES	---	0/1	---
u5	Door heater activation threshold.	1624	---	RW	WORD	Y	-99.0...99.0	°C/°F
u6	Duration of demisting ON.	1625	---	RW	BYTES	---	1...120	min
u7	Neutral zone threshold for heating.	1626	---	RW	WORD	Y	-99.0...99.0	°C/°F
	ENERGY SAVING group							
HE2	Maximum energy saving duration.	1627	---	RW	WORD	---	0...999	min
	ENERGY SAVING IN REAL TIME (RTC) group							
H01	Monday energy saving schedule.	1628	---	RW	BYTES	---	0...23	h
H02	Monday maximum energy saving duration.	1629	---	RW	BYTES	---	0...24	h
H03	Tuesday energy saving schedule.	1630	---	RW	BYTES	---	0...23	h
H04	Tuesday maximum energy saving duration.	1631	---	RW	BYTES	---	0...24	h
H05	Wednesday energy saving schedule.	1632	---	RW	BYTES	---	0...23	h
H06	Wednesday maximum energy saving duration.	1633	---	RW	BYTES	---	0...24	h
H07	Thursday energy saving schedule.	1634	---	RW	BYTES	---	0...23	h
H08	Thursday maximum energy saving duration.	1635	---	RW	BYTES	---	0...24	h
H09	Friday energy saving schedule.	1636	---	RW	BYTES	---	0...23	h
H10	Friday maximum energy saving duration.	1637	---	RW	BYTES	---	0...24	h
H11	Saturday energy saving schedule.	1638	---	RW	BYTES	---	0...23	h
H12	Saturday maximum energy saving duration.	1639	---	RW	BYTES	---	0...24	h
H13	Sunday energy saving schedule.	1640	---	RW	BYTES	---	0...23	h
H14	Sunday maximum energy saving duration.	1641	---	RW	BYTES	---	0...24	h
	DEFROST RTC CONFIGURATION group							
Hd1	Defrost 1 activation schedule.	1642	---	RW	BYTES	---	----, 0...23	h
Hd2	Defrost 2 activation schedule.	1643	---	RW	BYTES	---	----, 0...23	h
Hd3	Defrost 3 activation schedule.	1644	---	RW	BYTES	---	----, 0...23	h
Hd4	Defrost 4 activation schedule.	1645	---	RW	BYTES	---	----, 0...23	h
Hd5	Defrost 5 activation schedule.	1646	---	RW	BYTES	---	----, 0...23	h
Hd6	Defrost 6 activation schedule.	1647	---	RW	BYTES	---	----, 0...23	h
	PASSWORD group							
POF	Enable standby key (ON/OFF).	1648	---	RW	BYTES	---	0/1	---
PAS	Level 2 (Installer) parameters password.	1649	---	RW	WORD	Y	-99... 999	---
PA1	EVlink/EVconnect user password (not via instrument).	1650	---	RW	WORD	Y	-99... 999	---
PA2	EVlink/EVconnect password service (not via instrument).	1651	---	RW	WORD	Y	-99... 999	---
	CLOCK group							
Hr0	Enable clock.	1652	---	RW	BYTES	---	0/1	---
	REMOTE COMMUNICATION group							
BLE	Reserved. **Do not change**.	1653	---	RW	BYTES	---	---	---
rE0	Recording interval.	1654	---	RW	BYTES	---	0...240	min
rE1	Value to record.	1655	---	RW	BYTES	---	0...5	---
	MODBUS CONFIGURATION group							
LA	Modbus protocol controller address.	1656	---	RW	BYTES	---	0...247	---
Lb	Modbus transmission speed (baud rate).	1657	---	RW	BYTES	---	0...3	baud

10.8.2 Table of Modbus Resources

Code	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL
—	Probe 1.	514	---	R	WORD	Y

Code	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL
—	Probe 2.	515	---	R	WORD	Y
—	Probe 3.	516	---	R	WORD	Y
—	Compressor output.	386	0	R	1 BIT	---
—	Defrost output.	386	1	R	1 BIT	---
—	Fan output.	386	2	R	1 BIT	---
—	AUX output.	386	3	R	1 BIT	---
—	Digital input **ID1**.	258	2	R	1 BIT	---
—	Digital input **ID3**.	258	3	R	1 BIT	---
—	Next defrost counter.	10375	---	RW	WORD	---
—	Device ON/OFF status.	1282	---	RW	BYTES	---
—	Defrost phase.	1368	8...11	R	4 BIT	---
—	Defrost control.	10417	---	W	BYTES	---
—	Time to next defrost.	1370	---	R	WORD	---
—	Time to the end of defrost.	1371	---	R	WORD	---
—	Light status.	1283	---	RW	1 BIT	---
—	AUX status.	1284	---	RW	1 BIT	---
—	Resistor status.	1285	---	RW	1 BIT	---
—	Setpoint.	1369	---	R	WORD	Y
—	Energy saving due to idle port.	10437	9	RW	1 BIT	---
—	Energy saving.	10439	1	RW	1 BIT	---
—	Overcooling.	10439	12	RW	1 BIT	---
—	Service request.	10439	10	RW	1 BIT	---
—	Setpoint reached.	10437	11	RW	1 BIT	---
—	End of adaptive defrost calibration.	10437	14	R	1 BIT	---
—	End of cooling.	10437	10	R	1 BIT	---
—	Real time clock. MonthYear.	10321	---	RW	WORD	---
—	Day of the week	10322	---	RW	WORD	---
—	Tenth of a second.	10324	---	RW	WORD	---
—	Minutes Hours.	10323	---	RW	WORD	---
—	Firmware identifier.	65289	---	R	WORD	---
—	Firmware revision.	65290	0...7	R	8 BIT	---
—	Firmware variations (MSB).	65290	8...15	R	8 BIT	---
—	Prog. Firmware.	65291	---	R	WORD	---
—	Serial number.	65521 ... 65524	---	R	WORD	---
AL	Minimum temperature alarm.	770	4	R	1 BIT	---
AH	Maximum temperature alarm	770	3	R	1 BIT	---
ID	Door alarm.	770	7	R	1 BIT	---
iA	Digital input alarm **ID1**.	770	6	R	1 BIT	---
Pr1	Temperature probe error.	770	0	R	1 BIT	---
Pr2	Evaporator probe error.	770	1	R	1 BIT	---
Pr3	Condenser probe error.	770	2	R	1 BIT	---
COH	Condenser overheat alert.	770	9	R	1 BIT	---
CSD	High condensation alarm.	770	10	R	1 BIT	---
RTC	Clock alarm.	770	13	R	1 BIT	---
Cth	Compressor thermal switch alarm.	770	12	R	1 BIT	---
th	Global thermal switch alarm.	770	5	R	1 BIT	---
dFd	Defrost timeout alarm.	770	11	R	1 BIT	---

11. DIAGNOSTICS

The table below lists alarms with their corresponding solutions. To signal an alarm, the LED alarm lights up ⚠ and the buzzer sounds. Every alarm is recorded in the Alarm menu.

11.1 TABLE OF ALARMS

Code	Description	Cause	Effects	Resolution
Pr1	Probe error	• Probe not working • Probe incorrectly connected • Incorrect type of probe	• Code **Pr1** displayed • Alarm output ON • Compressor regulated according to **C4** and **C5** • Defrost suspended	• Check the type of probe (**PO**) • Check probe wiring • Change type of probe
Pr2			• Code **Pr2** displayed • Alarm output ON • If **P4** = 1, defrost active for time **d3**	
Pr3			• Code **Pr3** displayed • No effect on regulation	
rtc	Clock alarm	Clock (RTC) alarm not working	Clock-connected functions not present or not synchronised with the actual time	Set the right time. If the error persists, replace the device (RTC battery dead)
AL	Low temperature alarm Pb1	Temperature Pb1 > **A1** for a time equal to **A7**	• Code **AL** displayed • No effect on regulation	Wait until the temperature read by Pb1 goes below the alarm threshold (**A1-A11**)
AH	High temperature alarm Pb1	Temperature Pb1 > **A4** for a time equal to **A7**	• Code **AH** displayed • No effect on regulation	Wait until the temperature read by Pb1 goes above the alarm threshold (**A4+A11**)
id	Door open alarm	Digital input activated for a time > **i2**	• Code **id** displayed • Regulators blocked depending on the current function in **iC1** = 7, 8 or 9	• If **i2** = -1 the alarm is disabled; • Check **i2** and **iP1**
PF	Power outage alarm	Power failure for > **A10**	Code **PF** is recorded	Check the power supply wiring
COH	Condenser overheat signal	Condenser temp. > **C6**	• Code **COH** displayed • No effect on regulation	Check **C6**
CSd	High condensation alarm	Condenser temperature > **C7** for a time = **C8**	• Code **CSd** displayed • Compressor locked	• Switch the device off then on again; • Check **C7** and **C8**
iA	Multi-purpose input alarm	Digital input activated (**iC1** = 2) for a time = **i5**	• Code **iA** displayed • No effect on regulation	Check **i5** and **i6**
CtH	Compressor thermal switch alarm	Digital input activated (**iC1** = 5)	The regulator counts the number of events **i13** in the time **i7** from the first one	• If **i7** = 0 alarm is always automatically reset • Check **i5** and **i6**
th	Thermal switch global alarm	Digital input activated (**iC1** = 5)	The regulator counts the number of events **i13** in the time **i7** from the first one	• Switch the device off then on again; • Check **i5** and **i6**
dFd	Defrost timeout alarm	Defrost terminated due to timeout and not to reaching temperature **d2**	• Code **dFd** displayed • No effect on regulation	• Touch any key • Check **d2**, **d3** and **d11**

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