

EV3 200 Web

Controllers - Gateway for a network of up to 10 devices





Installer Manual



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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 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.

A A 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.

A 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.

A 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:

Туре	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

Туре	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:	115230 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

Туре	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 k Ω at 25 °C BETA 3435	PTC KTY 81-121 990 Ω at 25 °C	RH	Digital input
Pb1	Probe Temperature	•	•		
Pb2	Probe Evaporator	•	•		
Range		-40105 °C (-40220 °F)	-50150 °C (-58302 °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.

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.

\Lambda 🗛 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.

A DANGER

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- 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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- 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.

A 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.
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- 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 7 in. 0.28									Ø 3.5 mm (0.14 in.)	() c	N•m <i>Ib-in</i>	0.50.6 4.425.31
mm ²	0.22.5	0.22.5	0.252.5	0.252.5	2 x 0.21	2 x 0.21.5	2 x 0.251	2 x 0.51.5				
AWG	2414	2414	2214	2214	2 x 2418	2 x 2416	2 x 2218	2 x 2016				

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)	13-1	13-14-15 RS-485 serial input				
2-6	Relay output Out3 (Compressor)		1	ON = Te	ermination resistor inserted		
3-6	Relay output Out4 (Defrost)	LT 2		Reserv	Reserved		
4-6	Power supply input	U	SB	USB 2.0 input for communication			
5-6	Relay output Out2 (AUX)	ETHE	RNET	RJ45 connector to connect to Ethernet serial po			
8-10	Digital input ID1		LD1	Red	Flashes with messages from subnetwork		
0.10	LO Digital input ID3 (if P4=0) Probe input Pb3 (if P4 ≠ 0)		LD2	Green	Stays on if connected to EPoCA		
9-10			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
∧巻	Scroll up through valuesMove within a menu	Activate manual defrost
	Scroll down through valuesMove within a menu	Access the FNC functions menu (functions activated by key)
@ (I)	Manually activate the light relay	Switch the device on/off (stand-by)
≟ SET	Confirm values on the displaySet 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 ONPre-dripping ON	Defrost delay ONDripping 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
•F	Temperature displayed in °F		Over-cooling ON
AUX	AUX function ONAUX digital output ON		AUX function OFF
٢	Energy saving ON		Energy saving OFF
عر	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 $(\bigcup$ key for at least 3 seconds to switch the controller on/off.



Fig. 7. Main screen



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 $\exists SET$ key to access the setpoint menu. Scroll the values with the FNC \lor or \land ^{\oplus} keys and touch \exists 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 个許 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 \vee key for at least 3 seconds to access the function menu; use the FNC \vee or \wedge th 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 P (1) 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 rightarrow SET key for at least 3 seconds to access and change the parameters. The code **PA** will appear. Touch the rightarrow SET key to enter the password, scrolling with the FNC \vee or $\wedge^{\#}$ keys and confirming with the rightarrow SET key; then use the FNC \vee or $\wedge^{\#}$ 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 $d\mathbf{0} = 0$, defrost is set to manual operation. For automatic mode, set $d\mathbf{0} > 0$.

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).		04
d9	Evaporation threshold for automatic defrost interval count.	°C/°F	-99.099.0
d18	Adaptive defrost interval. 0 = Manual only.	min	0999
d19	Adaptive defrost threshold (relative to optimal evaporation temperature).	°C/°F	0.040.0
d22	Evaporation threshold for adaptive defrost interval count (relative to optimal evaporation temperature).	°C/°F	-10.010.0

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;		04

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 ${\bf d0}$ 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
dO	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;		04

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		03
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 ;		04
d9	Evaporation threshold for automatic count of defrost intervals.	°C/°F	-99.099.0

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	r1r2
d8	Defrost interval count mode. 3 = Adaptive;		04
d18	Adaptive defrost interval.	min	0999
d19	Adaptive defrost threshold (relative to optimal evaporation temperature).	°C/°F	0.040.0
d22	Evaporation threshold for adaptive defrost interval count (relative to optimal evaporation temperature).	°C/°F	-10.010.0

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).		04
d9	Evaporation threshold for automatic defrost interval count.	°C/°F	-99.099.0
Hd1	Defrost 1 activation time. "" = Disabled.	h	, 023
Hd2	Defrost 2 activation time. "" = Disabled.	h	, 023
Hd3	Defrost 3 activation time. "" = Disabled.	h	, 023
Hd4	Defrost 4 activation time. "" = Disabled.	h	, 023
Hd5	Defrost 5 activation time. "" = Disabled.	h	, 023
Hd6	Defrost 6 activation time. "" = Disabled.	h	, 023
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.		02

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
CO	Compressor ON delay from power-on.	min	0240
C2	Minimum compressor OFF time.	min	0240
d0	Defrost interval.	h	099
d1	Type of defrost. 0 = Electrical heaters; 1 = Cycle reversed (hot gas); 2 = When compressor stops.		02
d2	Evaporator temperature above which defrost with evaporator probe terminates (Pr3 = 5).	°C/°F	-99.099.0
d3	Defrost duration.	min	099
d7	Evaporator dripping time after defrost.	min	015



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
CO	Compressor ON delay from power-on.	min	0240
C2	Minimum compressor OFF time.	min	0240
d0	Defrost interval.	h	099
d1	Type of defrost. 0 = Electrical heaters; 1 = Cycle reversed (hot gas); 2 = When compressor stops.		02
d2	Evaporator temperature above which defrost with evaporator probe terminates (Pr3 = 5).	°C/°F	-99.099.0
d3	Defrost duration.	min	099
d7	Evaporator dripping time after defrost.	min	015
d15	Compressor ON consecutive time before hot gas defrost.	min	099



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	099
d1	Type of defrost. 0 = Electrical heaters; 1 = Cycle reversed (hot gas); 2 = When compressor stops.		02
d3	Defrost duration.	min	099
d7	Evaporator dripping time after defrost.	min	015



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	0.115.0
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	-99.099.0

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	0.115.0
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	-99.099.0

7.2.1 Operation

Regulation in the neutral zone is activated if $r11 \neq 0$ (if r11 < 0, the neutral zone is activated with a heating request).





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 **CO** 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 **CO** 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 $\frac{4}{3}$ icon flashes until the compressor is activated, after which it stays on.

The compressor regulation configuration parameters are:

Par.	Description	MU	Range
CO	Compressor ON delay from power-on.	min	0240
C2	Minimum compressor OFF time.	min	0240
C3	Minimum compressor ON time.	s	0240
C4	Compressor OFF time in cabinet probe alarm.	min	0240
C5	Compressor ON time in cabinet probe alarm.	min	0240
C6	Condensation temperature above which the condenser overheat alarm sounds.	°C/°F	0199
C 7	Condenser temperature above which the compressor locked alarm sounds, once C8 time has elapsed.	°C/°F	0199
C8	Delay in activation of compressor locked alarm due to threshold C7 being exceeded.	min	015
C10	Compressor days for maintenance.	days	0990
C11	Second compressor switch-on delay from first compressor switch-on.	S	0240

7.3.1 Operating diagrams

Normal compressor operation



Fig. 29. Normal compressor operation





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 FO:

Par.	Description	MU	Range
FO	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).		04

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 .		02

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	015
F3	Maximum time evaporator fans off after dripping.	min	015

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 $P4 \neq 1$, 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	0.099.0
HE2	Manual energy saving duration.	min	0999
H01	Daily start time of energy saving temperature.	h	023
H02	Duration of daily energy saving.	h	024



Fig. 33. Operation in energy saving function

8. REMOTE COMMUNICATION CONFIGURATION

8.1 INTRODUCTION

EV3 200 Web can be configured to connect with EPoCA:

• From a **PC** (Windows only) through **EPoCA.exe** (online/offline) which can be downloaded from the website: <u>https://www.evco.it/assets/doc/EVCO-EV3200Web_configurator_for_EPoCA.zip</u>

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

8.2 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

EPOCA	– 🗆 X								
Prev	Next								
1. Plant Configuration									
Plant Name:									
Plant Password:									
Plant Category:									
Device Name:									
Serial Code:									
Plant ID:									
Build:									
Last Reset:									
Mac address:									
Internet Status:									
Erase Config.	Save Config.								
Upload plant file	Export plant file								
	EPOCA Prev I. Plant Co Plant Name: Plant Password: Plant Category: Device Name: Serial Code: Plant ID: Build: Last Reset: Mac address: Internet Status: Erase Config. Upload plant file								

Fig. 36. 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

5. Set the date, time and local time used and press

6. Set the name of the controllers connected via RS-485 to EV3 200 Web and press

Prev		March			
		Next		Prev	Next
2. Date a	und Tim	e		3. Cor	ntrollers
Day, NN MM Y	YYY hh:ı	nm:ss		Com1 💌	Autoaddres
aylight saving tin	ne	Off	•	Addr. 1	
				Name	Name
0.41.				Addr. 2	
Set loc	ai time			Name	Name
				Addr. 3	C
				Name	
				Addr. 4	0
				Name	
				Addr. 5	0
				Name	
				Addr. 6	0
				Name	
				Addr.7	0
				Name	
				Addr. 8	0
				Name	
				Addr. 9	0
				Name	
				Addr. 10	0
				Name	
	2: Day, NN MM Y Daylight saving tin Set loc	2. Date and Tim Day, NN MM YYYY hh: Daylight saving time Set local time	2. Date and fine Day, NN MM YYYY hh:mm:ss Daylight saving time Off Set local time	Day, NN MM YYYY hh:mm:ss Daylight saving time Off Set local time	Local time Job available Day, NN MM YYYY hh:mm:ss Com1 ▼ Addr. 1 Name Addr. 2 Name Addr. 3 Name Addr. 4 Name Addr. 5 Name Addr. 6 Name Addr. 7 Name Addr. 8 Name Addr. 9 Name

Fig. 37. 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. 38. 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. 39. 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. 40. 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



Fig. 41. 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



Fig. 42. 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.

7 EPOCA – 🗆 🗙	(8)	EPOCA	– 🗆 X	9	EPOCA	-	×
Prev Next		Prev	Next		Prev		
4. IP Address		5. Mo	dbus				
Dynamic 💌		Enable modbus-tcp	Yes 💌				
IP address:		Operation mode	Cloud			Configuno	
		Delay after boot	0			Connigure	
		Modbu	ıs RTU				
		Port	com1 🔻				
		Baud rate	19200 🔻				
		Parity	Evene 🔻				
		Stop bits	2				
		Timeout	200				
		Idle time	D				
		Modbu	IS TCP				
		Listening port	502				
		Connection Timeout	0				
		Exception on timeout	False 🔻				

Fig. 43. 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.

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	r1r2	0,0
	ANALOGUE INPUTS Group			
CA1	Probe Pb1 offset.	°C/°F	-25.025.0	0,0
CA2	Probe Pb2 offset.	°C/°F	-25.025.0	0,0
CA3	Probe Pb3 Offset.	°C/°F	-25.025.0	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). $0 = ^{\circ}C$; $1 = ^{\circ}F$.		0/1	0
P3	Probe Pb2 function. 0 = Disabled; 1 = Defrost + fans; 2 = Fans.		03	1
P4	Configuration of input Pb3/ID3. 0 = Digital input ID3; 1 = Condenser probe; 2 = Critical temperature probe; 3 = External air probe (display only).		03	0
Р5	Value displayed. 0 = Regulation temperature. 1 = Setpoint. 2 = Probe Pb2 temperature. 3 = Probe Pb3 temperature. 4 = Incoming air temperature.		04	1
P7	Incoming air coefficient to calculate product temperature (CPT). CPT = {[(P7 x (incoming air)] + [(100 - P7) x (outgoing air)] : 100}		010	5
P8	Refresh time display 1.	S	0250/10	5
	TEMPERATURE REGULATION Group			
r0	Cooling mode setpoint differential.	°C/°F	0.115.0	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	0.099.0	0,0
r5	Heating/Cooling regulation. 0 = Cooling; 1 = Heating.		0/1	0
r6	Setpoint offset in over-cooling/over-heating.	°C/°F	0.099.0	0,0
r7	Duration of over-cooling/over-heating.	min	0240	30
r8	Down key additional function FNC V. 0 = Disabled; 1 = Over-cooling/over-heating; 2 = Energy saving.		02	0

Par.	Description	MU	Range	Default
	Differential position r0 .			
r12	0 = Asymmetrical;		0/1	0
	1 = Symmetrical.			
	COMPRESSOR Group		0.0/0	
CO	Compressor ON delay from power-on.	min	0240	0
C2	Minimum compressor OFF time.	min	0240	3
C3	Minimum compressor UN time.	S .	0240	0
04	Compressor OFF time in cabinet probe alarm.	min	0240	10
05	Compressor UN time in cabinet probe alarm.	min	0240	10
C6	Condensation temperature above which the condenser overheat alarm sounds.	°C/°F	0.0199	80,0
C7	has elapsed.	°C/°F	0.0199	90,0
C8	Delay in activation of compressor locked alarm due to threshold C7 being exceeded.	min	015	1
C10	Compressor hours for maintenance. 0 = Disabled.	h	0999*100	0
C11	Second compressor switch-on delay from first compressor switch-on.	s	0240	0
C13	Number of start-ups per compressor rotation. 0 = Disabled.	num	010	0
	DEFROST Group	,		
d0	Defrost interval. 0 = Manual defrost only. If d8 = 3, maximum interval.	h	099	8
	Type of defrost.			
d1	1 = Cycle reversed (hot gas);		02	0
	2 = When compressor stops.			
d2	Evaporation temperature above which defrost with evaporator probe terminates ($\mathbf{Pr3} = 5$).	°C/°F	-99.099.0	8,0
d3	Defrost duration. If P3 = 1, maximum duration.	min	099	30
d4	Enable defrost when device is switched on. 0 = Disabled:		0/1	0
	1 = Enabled.		-/ -	-
d5	Defrost activation delay from power-on.	min	099	0
	Value displayed during defrost.			
d6	0 = Regulation; 1 = Locked display:		02	2
	2 = Code "DEF".			
d7	Evaporator dripping time after defrost.	min	015	2
	Defrost interval count mode.			
	0 = Hours device ON; 1 = Hours compressor ON;			
d8	2 = Hours evaporator temperature < d9;		04	0
	3 = Adaptive;			
0	4 = In real time (RTC).	00 /0F	00.0.00.0	0.0
09	Enable defrost terminated warning due to maximum duration (code dFd).	¹ C/ ¹ F	-99.099.0	0,0
d11	0 = No; 1 = Yes.		0/1	0
d15	Compressor ON time before hot gas defrost.	min	099	0
d16	Pre-dripping time for hot gas defrost.	min	099	0
d18	Adaptive defrost interval. 0 = Manual defrost only.	min	0999	40
d19	Adaptive defrost threshold (relative to optimal evaporation temperature).	°C/°F	0.040.0	3,0
d20	Compressor-on consecutive time for defrost.	min	0999	180
d21	Compressor-on consecutive time for defrost from power-on and from over-cooling.	min	U500	200
d22	temperature).	°C/°F	-10.010.0	-2,0
	ALARM Group	1		
	Select value for high/low temperature alarms			
AA	$\mathbf{I} = \text{Evaporator temperature;}$		02	0
	2 = Probe Pb3 temperature.			
A1	Low temperature alarm threshold.	°C/°F	-99.099.0	-10,0

Par.	Description	MU	Range	Default
A2	Type of low temperature alarm. 0 = Disabled; 1 = Relative to SET; 2 = Absolute.		02	2
A4	High temperature alarm threshold.	°C/°F	-99.099.0	10,0
A5	Type of high temperature alarm. 0 = Disabled; 1 = Relative to SET; 2 = Absolute.		02	2
A6	Delay in activation of temperature and humidity alarms due to threshold exceeded when device is switched on.	min	099*10	12
A7	Minimum and maximum temperature alarm delay.	min	0240	15
A 8	Delay in activation of alarm due to threshold exceeded after defrost.	min	0240	15
A9	Delay in activation of alarm due to threshold exceeded after door closed.	min	0240	15
A10	Duration of power failure to record alarm.	min	0240	10
A11	Hysteresis referring to A1 and A4 to determine alarm reset threshold.	°C/°F	1.015.0	2,0
	EVAPORATOR/CONDENSER FANS Group			
FO	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).		04	1
F1	Evaporator fan regulation threshold with $FO = 3, 4$.	°C/°F	-99.099.0	-4,0
F2	Evaporator fan mode during defrost. 0 = OFF; 1 = ON; 2 = According to F0 .		02	0
F3	Maximum time evaporator fans off after dripping.	min	015	2
F4	Time evaporator fans OFF in energy saving.	s	0240*10	0
F5	Time evaporator fans ON in energy saving.	s	0240*10	10
F7	Evaporator fans ON threshold from dripping.	°C/°F	-99.099.0	5,0
F9	Evaporator fan switch-off delay from compressor switch-off	s	0240	0
F11	Condenser fans ON threshold.	°C/°F	-99.099.0	15,0
F12	Condenser fans OFF delay from compressor OFF.	S	0240	30
F15	Time evaporator fans OFF with compressor OFF.	S	0240	0
F16	Time evaporator fans ON with compressor OFF.	S	0240	1
iO	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.		05	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	-1120	30
i3	Maximum time for inhibiting regulation with door open. -1 = Disabled.	min	-1120	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.		06	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	-1120	0
i10	Door closed consecutive time for energy saving.	min	0999	0
i13	Number of door openings for defrost. 0 = Disabled.	num	0240	180
i14	Door open consecutive time for defrost. 0 = Disabled.	min	0240	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.		08	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	-99.099.0	-1,0
u6	Duration demisting ON.	min	1120	5
u7	Neutral zone threshold for heating.	°C/°F	-99.099.0	5,0
	ENERGY SAVING Group			
HE2	Maximum duration energy saving.	min	0999	0
	ENERGY SAVING IN REAL TIME (RTC) Group			
H01	Energy saving time Monday.	h	023	0
H02	Maximum duration energy saving Monday.	h	024	0
H03	Energy saving time Tuesday.	h	023	0
H04	Maximum duration energy saving Tuesday.	h	024	0
H05	Energy saving time Wednesday.	h	023	0
H06	Maximum duration energy saving Wednesday.	h	024	0
H07	Energy saving time Thursday.	h	023	0
H08	Maximum duration energy saving Thursday.	h	024	0
H09	Energy saving time Friday.	h	023	0
H10	Maximum duration energy saving Friday.	h	024	0
H11	Energy saving time Saturday.	h	023	0
H12	Maximum duration energy saving Saturday.	h	024	0
H13	Energy saving time Sunday.	h	023	0
H14	Maximum duration energy saving Sunday.	h	024	0
	RTC DEFROST CONFIGURATION Group	1		
Hd1	Defrost 1 activation time. "" = Disabled.	h	, 023	
Hd2	Defrost 2 activation time. "" = Disabled.	h	, 023	
Hd3	Defrost 3 activation time. "" = Disabled.	h	, 023	
Hd4	Defrost 4 activation time. "" = Disabled.	h	, 023	
Hd5	Defrost 5 activation time. "" = Disabled.	h	, 023	
Hd6	Defrost 6 activation time. "" = Disabled.	h	, 023	
	PASSWORD Group	1		
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	1		
Hr0	Enable clock. 0 = Disabled; 1 = Enabled.		0/1	0
	REMOTE COMMUNICATION Group			
BLE	Reserved. Do not change.			1
rE0	Recording interval.	min	0240	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.		05	1
	MODBUS CONFIGURATION Group			
LA	MODBUS protocol controller address.		0247	247
Lb	MODBUS transmission speed (baud rate). 0 = 2400; 1 = 4800; 2 = 9600; 3 = 19200.	baud	03	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. 44. 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. 45. 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. 46. 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).





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	r1r2	°C/°F
	ANALOGUE INPUT group			1				
CA1	Probe Pb1 offset.	1539		RW	BYTES	Y	-25.025.0	°C/°F
CA2	Probe Pb2 offset.	1540		RW	BYTES	Y	-25.025.0	°C/°F
CA3	Probe Pb3 offset.	1541		RW	BYTES	Y	-25.025.0	°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		03	
P4	Pb3/ID3 input configuration.	1546		RW	BYTES		03	
P5	Value shown on the display.	1547		RW	BYTES		04	
P7	Inlet air coefficient for product temperature calculation (CPT).	1548		RW	BYTES		010	
P 8	Display 1 refresh time.	1549		RW	BYTES		0250/10	S
	TEMPERATURE MANAGEMENT group							
r0	Setpoint differential.	1550		RW	BYTES		0.115.0	°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		0.099.0	°C/°F
r5	Hot/Cold regulation.	1554		RW	BYTES		0/1	
r6	Setpoint offset in overcooling/overheating.	1555		RW	BYTES		0.099.0	°C/°F
r7	Overcooling/overheating duration.	1556		RW	BYTES		0240	min
r8	Down key additional function FNC V.	1557		RW	BYTES		02	
r12	Differential position r0 .	1558		RW	BYTES		0/1	
	COMPRESSOR group	[]					-	
C 0	Compressor ON delay from power-on.	1559		RW	BYTES		0240	min
C2	Minimum compressor OFF time.	1560		RW	BYTES		0240	min
C3	Minimum compressor ON time.	1561		RW	BYTES		0240	S
C4	Compressor OFF time in cold room probe alarm mode.	1562		RW	BYTES		0240	min
C5	Compressor ON time in cold room probe alarm mode.	1563		RW	BYTES		0240	min
C6	Condensation temperature over which the condenser overheat alarm is triggered.	1564		RW	WORD		0.0199	°C/°F
C7	Condenser temperature over which the compressor lock alarm is triggered, once time period C8 has elapsed.	1565		RW	WORD		0.0199	°C/°F
C8	Compressor lock alarm activation delay from when threshold C7 was exceeded.	1566		RW	BYTES		015	min
C10	Compressor maintenance hours.	1567		RW	WORD		0999*100	h
C11	Second compressor power-on delay from first compressor power-on.	1568		RW	BYTES		0240	s
C13	Number of boosts for compressor rotation.	1569		RW	BYTES		010	num
	DEFROST group							
d0	Defrost interval.	1570		RW	BYTES		099	h
d1	Defrost type.	1571		RW	BYTES		02	
d2	Evaporation temperature over which defrost ends with evaporator probe (Pr3 = 5).	1572		RW	WORD	Y	-99.099.0	°C/°F
d3	Defrost duration. If P3 = 1, maximum duration.	1573		RW	BYTES		099	min
d4	Enable defrost at device switch-on.	1574		RW	BYTES		0/1	
d5	Defrost activation delay from power-on.	1575		RW	BYTES		099	min
d6	Value shown on the display during a defrost.	1576		RW	BYTES		02	

Par.	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	Range	MU
d7	Evaporator drip time after a defrost.	1577		RW	BYTES		015	min
d8	Defrost interval count mode.	1578		RW	BYTES		04	
d9	Evaporation threshold for counting automatic defrost interval.	1579		RW	WORD	Y	-99.099.0	°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		099	min
d16	Pre-drip time for hot gas defrost.	1582		RW	BYTES		099	min
d18	Adaptive defrost interval.	1583		RW	BYTES		0999	min
d19	Threshold for adaptive defrost (relative to evaporation optimal temperature).	1584		RW	WORD		0.040.0	°C/°F
d20	Consecutive time compressor ON for defrost.	1585		RW	WORD		0999	min
d21	Consecutive compressor ON time for defrost from power-on and from overcooling.	1586		RW	WORD		0500	min
d22	Evaporation threshold for adaptive defrost interval count (relative to evaporation optimal temperature).	1587		RW	WORD	Y	-10.010.0	°C/°F
	ALARMS group							
AA	Size selection for high/low temperature alarms.	1588		RW	BYTES		02	
A1	Low temperature alarm threshold.	1589		RW	WORD	Y	-99.099.0	°C/°F
A2	Low temperature alarm type.	1590		RW	BYTES		02	
A4	High temperature alarm threshold.	1591		RW	WORD	Y	-99.099.0	°C/°F
A5	High temperature alarm type.	1592		RW	BYTES		02	
A6	Temperature and humidity alarm activation delay from when threshold was exceeded at device startup.	1593		RW	WORD		099*10	min
A7	Minimum and maximum temperature alarms delay.	1594		RW	BYTES		0240	min
A 8	Delay in alarm activation to indicate threshold exceeded after a defrost.	1595		RW	BYTES		0240	min
A9	Delay in alarm activation to indicate threshold exceeded after door closure.	1596		RW	BYTES		0240	min
A10	Power failure duration for alarm recording.	1597		RW	BYTES		0240	min
A11	Hysteresis referring to A1 and A4 for determining alarm reset threshold.	1598		RW	WORD		1.015.0	°C/°F
	EVAPORATOR/CONDENSER FAN group		-					
FO	Evaporator fans in normal operating mode.	1599		RW	BYTES		04	
F1	Evaporator fan regulation threshold with F0 = 3, 4.	1600		RW	WORD	Y	-99.099.0	°C/°F
F2	Evaporator fan mode during defrosting.	1601		RW	BYTES		02	
F3	Maximum evaporator fan post-dripping stoppage time.	1602		RW	BYTES		015	min
F4	Evaporator fans OFF time in energy saving.	1603		RW	WORD		0240*10	s
F5	Evaporator fans ON time in energy saving.	1604		RW	WORD		0240*10	s
F7	Evaporator fans ON threshold from dripping.	1605		RW	WORD	Y	-99.099.0	°C/°F
F9	Evaporator fan switch-off delay from compressor switch-off.	1606		RW	BYTES		0240	S
F11	Condenser fans ON threshold.	1607		RW	WORD	Y	-99.099.0	°C/°F
F12	Condenser fans OFF delay from compressor OFF.	1608		RW	BYTES		0240	s
F15	Evaporator fans OFF time with compressor OFF.	1609		RW	BYTES		0240	S
F16	Evaporator fans ON time with compressor OFF.	1610		RW	BYTES		0240	S
	DIGITAL INPUT PROPERTIES group	[1		r	
i0	Digital input function ID1 .	1611		RW	BYTES		05	
i1	Digital input activation ID1 (Polarity).	1612		RW	BYTES		0/1	
i2	Alarm indication delay from door opening.	1613		RW	WORD	Y	-1120	min
i3	Maximum regulation inhibition time with door open.	1614		RW	WORD	Y	-1120	min
i5	Digital input function ID3 .	1615		RW	BYTES		06	
i6	Digital input activation ID3 (Polarity).	1616		RW	BYTES		0/1	
i7	Alarm indication delay from door opening.	1617		RW	WORD	Y	-1120	min
i10	Consecutive time door closed for energy saving.	1618		RW	WORD		0999	min
i13	Number of door openings for defrost.	1619		RW	BYTES		0240	num

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Par.	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	Range	MU
i14	Consecutive time door open for defrost.	1620		RW	BYTES		0240	min
	DIGITAL OUTPUT group							
u1	Configuration of output out4 . Manual control is via the AUX key.	1621		RW	BYTES		08	
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	-99.099.0	°C/°F
u6	Duration of demisting ON.	1625		RW	BYTES		1120	min
u7	Neutral zone threshold for heating.	1626		RW	WORD	Y	-99.099.0	°C/°F
	ENERGY SAVING group	1		1	[r	1	1
HE2	Maximum energy saving duration.	1627		RW	WORD		0999	min
	ENERGY SAVING IN REAL TIME (RTC) group	1		1				1
H01	Monday energy saving schedule.	1628		RW	BYTES		023	h
H02	Monday maximum energy saving duration.	1629		RW	BYTES		024	h
H03	Tuesday energy saving schedule.	1630		RW	BYTES		023	h
H04	Tuesday maximum energy saving duration.	1631		RW	BYTES		024	h
H05	Wednesday energy saving schedule.	1632		RW	BYTES		023	h
H06	Wednesday maximum energy saving duration.	1633		RW	BYTES		024	h
H07	Thursday energy saving schedule.	1634		RW	BYTES		023	h
H08	Thursday maximum energy saving duration.	1635		RW	BYTES		024	h
H09	Friday energy saving schedule.	1636		RW	BYTES		023	h
H10	Friday maximum energy saving duration.	1637		RW	BYTES		024	h
H11	Saturday energy saving schedule.	1638		RW	BYTES		023	h
H12	Saturday maximum energy saving duration.	1639		RW	BYTES		024	h
H13	Sunday energy saving schedule.	1640		RW	BYTES		023	h
H14	Sunday maximum energy saving duration.	1641		RW	BYTES		024	h
	DEFROST RTC CONFIGURATION group	1		1	1	[
Hd1	Defrost 1 activation schedule.	1642		RW	BYTES		, 023	h
Hd2	Defrost 2 activation schedule.	1643		RW	BYTES		, 023	h
Hd3	Defrost 3 activation schedule.	1644		RW	BYTES		, 023	h
Hd4	Defrost 4 activation schedule.	1645		RW	BYTES		, 023	h
Hd5	Defrost 5 activation schedule.	1646		RW	BYTES		, 023	h
Hd6	Defrost 6 activation schedule.	1647		RW	BYTES		, 023	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	EVIInk/EVconnect user password (not via instrument).	1650		RW	WORD	Y	-99 999	
PA2	EVInk/EVconnect password service (not via instrument).	1651		RW	WORD	Y	-99 999	
	CLOCK group	I						
Hr0	Enable clock.	1652		RW	BYTES		0/1	
	REMOTE COMMUNICATION group				D) (-			
BLE	Reserved. Do not change.	1653		RW	BYTES			
rE0	Recording interval.	1654		RW	BYTES		0240	mın
rE1		1655		RW	BYTES		05	
	MODBUS CONFIGURATION group							
LA	Modbus protocol controller address.	1656		RW	BYTES		0247	
Lb	Modbus transmission speed (baud rate).	1657		RW	BYTES		03	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	811	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	07	R	8 BIT	
	Firmware variations (MSB).	65290	815	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	
СОН	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 **A** and the buzzer sounds. Every alarm is recorded in the Alarm menu.

11.1 TABLE OF ALARMS

Code	Description	Cause	Effects	Resolution
Pr1		 Probe not working Probe incorrectly 	 Code Pr1 displayed Alarm output ON Compressor regulated according to C4 and C5 Defrost suspended 	• Check the type of probe (PO)
Pr2	Probe error	• Incorrect type of probe	 Code Pr2 displayed Alarm output ON If P4 = 1, defrost active for time d3 	 Check probe wiring Change type of probe
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)
АН	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
СОН	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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The customer (manufacturer, installer or end user) assumes all responsibility for the configuration of the device.

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MADE IN ITALY

EVCO S.p.A.

 Via Feltre 81, 32036 Sedico (BL) ITALY

 Telephone:
 +39 0437 8422

 Fax:
 +39 0437 83648

 Email:
 info@evco.it

 Web:
 www.evco.it