ECP**300** EXPERT STEPPER

for EEV STEPPER

Operation and maintenance manual

READ AND KEEP

Software Rel.: 1

Thank you for choosing a PEGO electrical panel.

This manual provides detailed information on the installation, use and maintenance of the ECP300 EXPERT STEPPER series of electrical panels. Our products are designed and manufactured in compliance with current safety standards, in the specific field of use of refrigeration and air conditioning systems. Different use is allowed provided that the operating conditions for which the panel was designed and manufactured are respected. Before using the panel, it is advisable to read this manual in full, paying particular attention to the parts highlighted with the symbols described below:

This symbol is placed to indicate notes concerning installation, use and maintenance operations.

This symbol is placed to highlight notes of particular importance.

This symbol is placed to indicate the prohibition to perform the indicated operation.

Disposal information:

The electrical panel consists of metal parts and plastic parts. With reference to Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 and the relevant national legislation on the subject, we inform you that:

A. There is an obligation not to dispose of WEEE as municipal waste and to carry out separate collection of such waste.

B. Public or private collection systems provided for by local laws should be used for disposal. It is also possible to return the equipment to the distributor at the end of its life if a new one is purchased.

C. This equipment may contain hazardous substances: improper use or improper disposal could have adverse effects on human health and the environment.

D. The symbol ▬▬ (crossed-out wheeled bin) on the product and instructions indicates that the equipment was placed on the market after August 13, 2005 and must be collected separately.

E. In the event of improper disposal of electrical and electronic waste, penalties are established by current local regulations on disposal.

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CHAPTER 1: INTRODUCTION

1.1 GENERAL INFORMATION

DESCRIPTION:
Line of panels with power and electronic control dedicated to the management of a single three-phase evaporator unit where utilities are serviced by a refrigeration centre or a remote motorised condenser unit.

ECP300 EXPERT STEPPER
Electrical panel, with power and control of the stepper electronic expansion valve (stepper motor), dedicated to the management of the three-phase evaporator unit.

APPLICATIONS:
- Management of evaporator units with electrical defrosting up to 12 kW.
- Bipolar motorised expansion valve management.
- Remote control for compressor consent to be combined with power panel.

CHAPTER 2: TECHNICAL SPECIFICATIONS

PRODUCT IDENTIFICATION CODES 2.1

11030ESUVD02

Control and management of motorised electronic expansion valve, consent for motorised condensing unit, defrosting resistors (up to 12kW), evaporator fans, solenoid valve, cold room light, door resistance and presence of all the electrical protections required by regulations. Connectable to any type of bipolar stepper valve on the market.

TECHNICAL SPECIFICATIONS PER PRODUCT SERIES 2.2

TECHNICAL SPECIFICATIONS	11030ESUVD02
Case size	400x300x135 mm
Weight	10 Kg
Protection level	IP65
Power supply (3F + N + T)	400Vac ±10% 50-60Hz
Command type	Three-phase
Working temperature	- 5 ÷ + 40 °C
Storage temperature	-25 ÷ +55 °C
Relative ambient humidity	<90% RH non-condensing
Probe reading range	-45 ÷ +99 °C
General switch/general protection Interruption capacity	Four-pole magnetic-thermal switch **25A "C"** Icn=6kA / Ics=8kA / Icu=15kA
Dedicated protection for COLD ROOM LIGHT	Differential magnetic-thermal switch Id=30mA
Control	**PEGO**
Defrosting	Electrical
Component status indication	LED + display
Alarm signals	LED + Buzzer
Ambient probe	NTC 10K 1%
Evaporator probe	NTC 10K 1%
Suction probe	NTC 10K 1%
Evaporation pressure probe	4-20mA
Door switch	Present
Man in cold room alarm	Available
Evaporator fans	2 x 1500W (1ph / 3ph)
Defrosting	12000W (3x4000) (AC1) balanced resistive load
Cold room light	1200W (AC1) resistive load
Stepper Valve Outlet	Bipolar
Consent for motorised condensing unit	Present
Configurable auxiliary relays (alarm / Aux)	100W
Door resistor	Present
Supervision	TeleNET or Modbus
Connection diagram	See attached wiring diagram

OVERALL DIMENSIONS | 2.3

300mm

400mm   135mm

IDENTIFICATION DATA | 2.4

The apparatus described in this manual is provided on its side with a plate showing its identification data:

• Manufacturer's Name
• Electrical panel code
• Serial number (S.N.)
• Supply voltage
• Auxiliary circuit voltage
• IP protection level

MADE IN ITALY	Code:	11030ESUVD02
	S.N.:	20123450001
	Date:	06/04/20
RoHS compliant	Power supply:	400Vac 50-60Hz
	Aux:	230Vac
	Protection:	I.P.65

Directive: 2014/35/UE 2014/30/UE
Standards: EN 60204-1 EN 61439-1 EN 61000-6–1 EN 61000-6–3

2.5 | TRANSPORT AND STORAGE

Each electrical panel is supplied packed to be shipped without being damaged under normal conditions of transport. In the case of subsequent transport, it must be verified that:

❑ There are no objects or free parts inside the panel.

❑ The panel door is correctly closed and locked.

❑ If the original packaging is not used, adequately protect the product to allow it to be transported without damage.

The room intended for storage must have an adequate temperature and must be free from moisture; furthermore, the electrical panel must not come into contact with aggressive contaminants, which could impair its functionality and electrical safety.

WARRANTY CONDITIONS

2.6

The **ECP300 EXPERT STEPPER** series of electrical panels are covered by warranty against all manufacturing defects for 24 months from the date indicated on the product identification code.

In the event of a defect, the equipment must be shipped with appropriate packaging to our Authorized Facility or Service Centre, upon previous request of the return authorization number.

The Customer is entitled to the repair of the defective equipment including labour and spare parts. Transport costs and risks are borne entirely by the Customer.
Any intervention under warranty does not extend or renew the expiry of the same.

The warranty is voided in case of:
- Damage due to tampering, carelessness, inexperience or improper installation of the equipment.
- Installation, use or maintenance not in accordance with the requirements and instructions provided with the equipment.
- Repair operations carried out by unauthorised personnel.
- Damage due to natural phenomena such as lightning, natural disasters, etc.

In all these cases the costs for the repair will be borne by the customer.

Warranty service may be refused when the equipment is modified or transformed.

Under no circumstances will **Pego S.r.l.** be liable for any loss of data and information, costs of substitute goods or services, damage to property, persons or animals, loss of sales or income, interruptions of activities, any direct, indirect, incidental, property, coverage, punitive, special or consequential damages caused in any way, whether contractual, extra-contractual or due to negligence or other liability arising from the use of the product or its installation.

Malfunction caused by tampering, impact, improper installation automatically voids the warranty. It is mandatory to comply with all the instructions in the following manual and the operating conditions of the equipment.

Pego S.r.l. declines all responsibility for the possible inaccuracies contained in this manual, if due to printing or transcription errors.

Pego S.r.l. reserves the right to make any changes to its products that it deems necessary or useful, without affecting their essential characteristics.

Each new release of Pego product manuals replaces all previous releases.

For anything not expressly indicated, the legal provisions in force and in particular art. 1512 of the Italian Civil Code apply to the warranty.

For any dispute, the jurisdiction of the Court of Rovigo shall be deemed elected and recognised by the parties.

CHAPTER 3: INSTALLATION

| 3.1 | STANDARD EQUIPMENT FOR ASSEMBLY AND USE |

The **ECP300 EXPERT STEPPER** electrical panel, for assembly and use, is equipped with:

• 4 Seals, to be interposed between the fixing screw and the bottom of the case.
• 1 Operation and maintenance manual.
• 1 Wiring diagram.
• 1 Drilling template.
• 2 NTC 10K Probes 1% .

| 3.2 | MECHANICAL ASSEMBLY OF THE PANEL |

- ❑ Each panel is designed for wall mounting; choose an appropriate fastening system depending on the weight of the panel and the type of wall.

- ❑ Install the equipment in places that respect its protection level.

- ❑ Keep the IP protection level of the equipment intact by fitting cable glands and/or pipe glands with adequate characteristics.

- ❑ Install the equipment at a height that allows easy use and inside access by the operator. The operator must not be in a dangerous situation when operating on the panel. In any case, the height must be between 0.6 and 1.7 metres from the service floor.

- ❑ Install the equipment in an area away from heat sources and possibly protected from atmospheric agents.

Below are the steps to perform a correct mechanical installation of the panel.

Fig. 1: Lift the transparent protective door of the general thermal magnetic switch.

Fig. 2: Remove the cover of the screws on the right side.
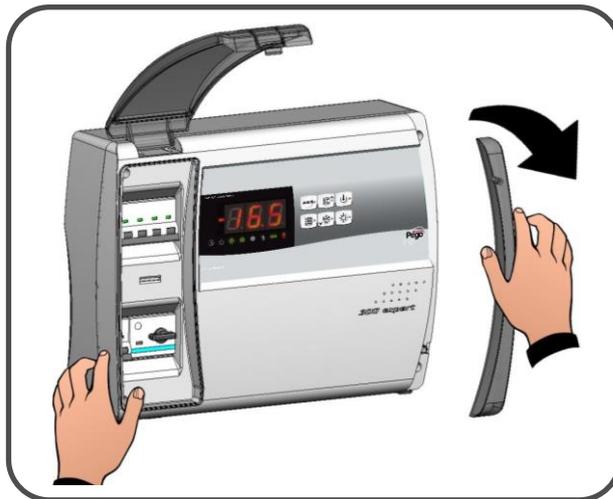
Fig. 3: Unscrew the 4 fixing screws of the front panel.

Fig. 4: Close the transparent protective door of the general thermal magnetic switch.

Fig. 5: Open the front of the panel by lifting it and sliding the two hinges to the end of their travel.

Fig. 6: Bend the hinges and rotate the front piece 180° downwards to access the inside of the panel and disconnect the connector of the electronic board.
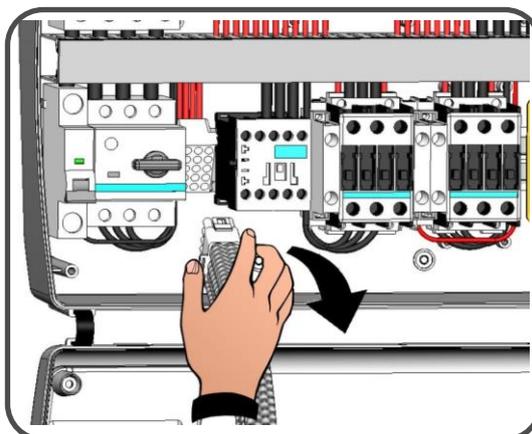
Fig. 7: Apply pressure to the sides of each individual hinge to remove it from its seat and completely remove the front piece.
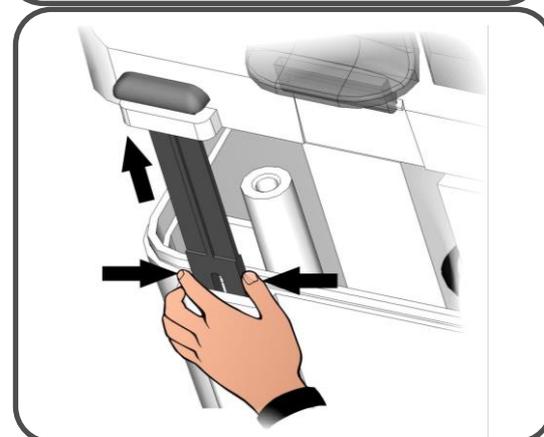
Fig. 8: Using a screwdriver, press on the four pre-marked holes in the bottom to make the holes for fixing the electrical panel.
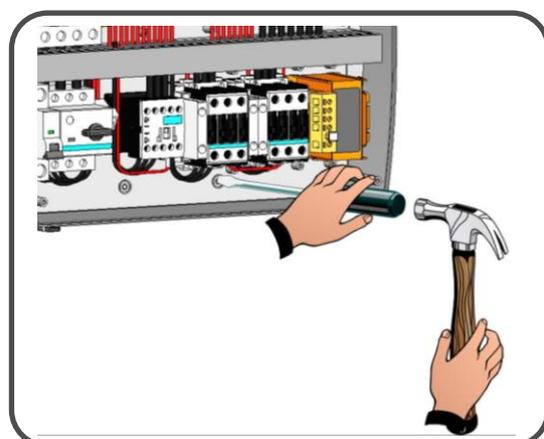
Fig. 9: Using the supplied drilling template sheet, make the four fixing holes on the wall.
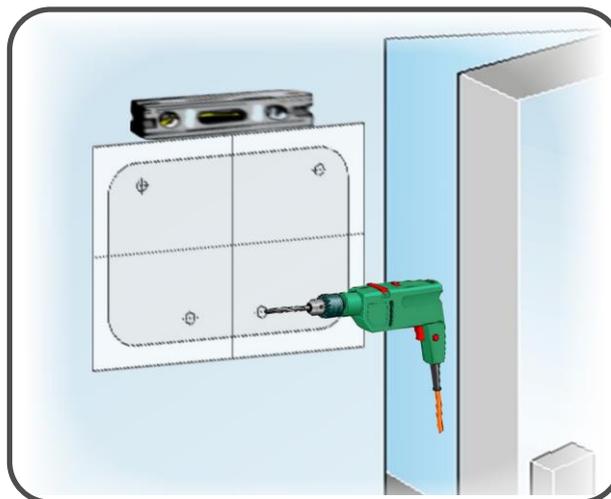
Fig.10: Using the holes made previously, fix the bottom of the case with four screws of adequate length in relation to the thickness of the wall on which to fix the panel. Place a rubber washer (supplied) between each fixing screw and the bottom of the case.
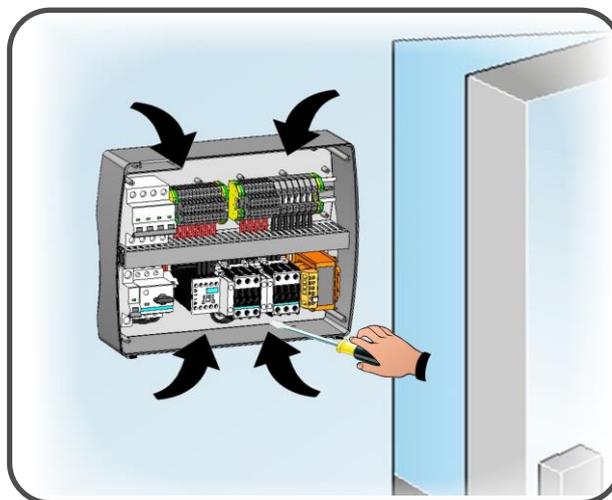
Fig.11: Now make the electrical connections as indicated in the following chapter.
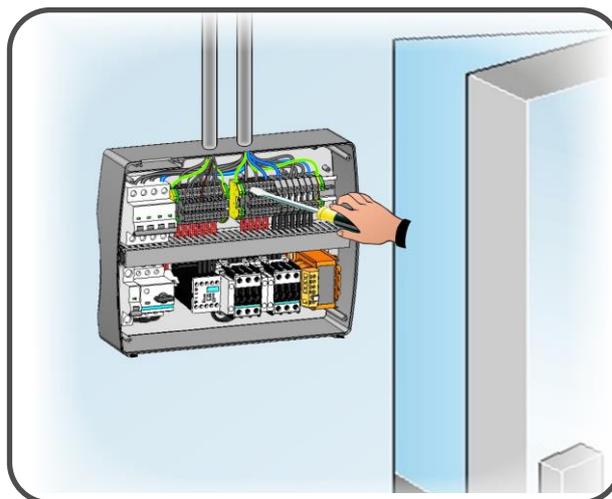
ELECTRICAL CONNECTIONS   3.3

❑ For electrical connections refer to the specific wiring diagram and the technical characteristics of the panel model to be installed.

❑ The power supply to the panel must be carried out exclusively with a dedicated line, upstream of which a device suitable for protection from indirect contacts (differential switch) must be installed.

❑ Avoid housing power cables together with signal cables (probes and digital inputs) in the same ducts (or tubes).

❑ Avoid using multi-pole cables in which conductors connected to inductive and power loads and signal conductors are present, such as probes and digital inputs.

❑ Reduce the lengths of the connection cables as much as possible, avoiding that the wiring takes on the shape of a spiral capable of possible inductive effects on the electronics.

❑ If it is necessary to move the probes farther, it is necessary to use conductors of appropriate cross-section and in any case not less than 1 mm^2.

❑ Cables with a section suitable for the current passing through them must be used for connections to the panel. Similarly, the degree of insulation must be compatible with the voltages applied. Cables with flame-retardant insulation and low toxic smoke emissions are preferable if affected by fire.

❑ It is **mandatory** to connect the terminal marked **PE** to the ground system of the power supply network. If necessary, check the efficiency of the earthing system.

❑ Other conductors must not be connected to the **PE** terminal except for the external protection conductor.

3.4	FRONT PANEL CONNECTION

Now reattach the front piece and reconnect the electronic board connector as shown below.

Fig.12: Reattach the front piece to the bottom of the case by reinserting the two hinges in the appropriate seats.
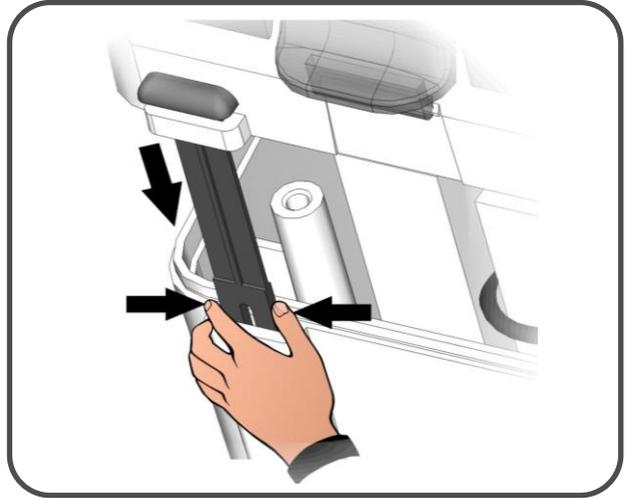
Fig.13: Bend the hinges and rotate the front 180° downwards to access the inside of the panel and reconnect the connector of the electronic board.
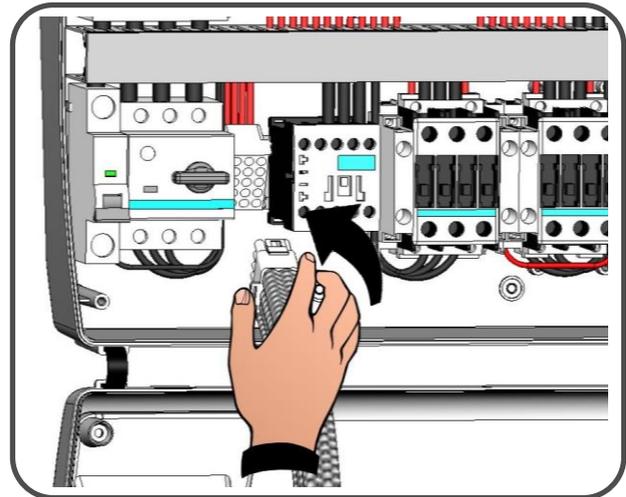
Fig.14: If the panel is connected to a **TeleNET/Modbus** network and/or the Aux/Alarm relay is used, make the necessary connections directly on the terminals of the electronic board.
As a cable path for these connections, it is recommended to place the existing connection cord between the electronic board and the bottom of the panel.
For further clarification on the connection terminals refer to chapter 6.1.
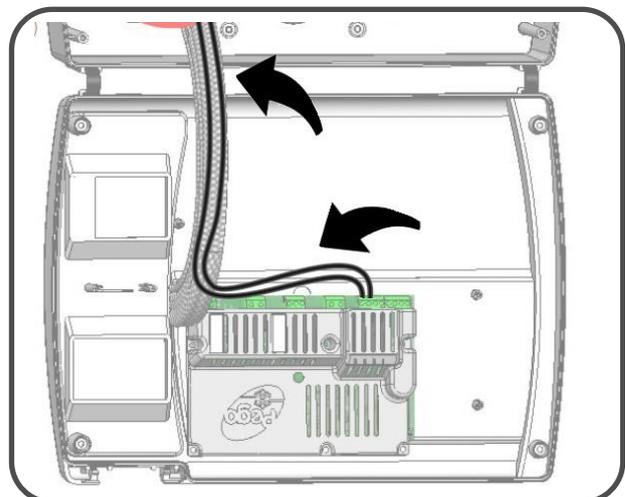
PRE-USE CHECKS	3.5

❑ Once the connections have been made, review the correct execution of the same using the wiring diagram.

❑ Ensure that the screws are tightened correctly on the terminal boards.

❑ Check, when possible, the correct operation of the external protection devices.

❑ Perform a correct calibration of the motor saver dedicated to the compressor motor as indicated in the next chapter (if present).

❑ After powering the electrical panel, check the correct current absorption of the various user loads and, after operating the system for a few hours, it is recommended to check the correct tightening of the terminal board screws (including the connection of the power supply line).

Caution: before performing this operation, it is necessary to disconnect the power supply line upstream and lock the disconnection switch with a padlock to ensure maximum safety. Check the absence of voltage with a Tester before any operation.

CLOSING THE ELECTRICAL PANEL	**3.6**

Once the electrical connections, checks and necessary calibrations have been completed, the electrical panel can be closed.

Fig.18: Close the front cover, making sure that all the cables are inside the case and that the case gasket is correctly housed in its seat.
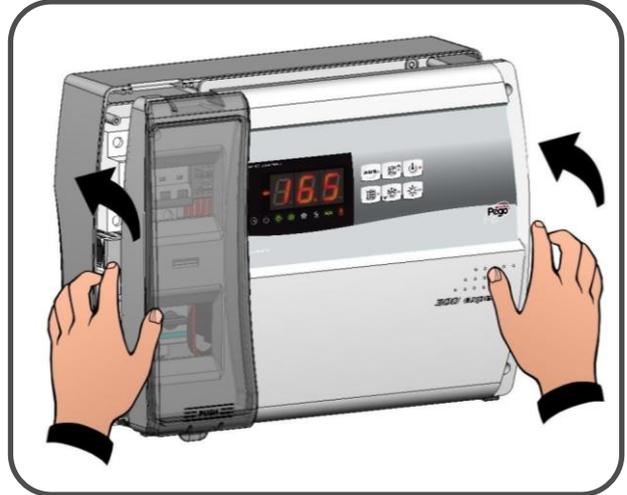
Fig.19: Tighten the front cover with the 4 screws. Replace the screw cover on the right side.

Fig.20: Connect the supply voltage to the panel and carefully read/program all the set parameters.

CHAPTER 4: FUNCTIONALITY

4.1	**FUNCTIONS MANAGED BY THE ECP300 EXPERT STEPPER ELECTRICAL PANEL**

- Compatible with 23 gas types: R404, R134, R22, R407A, R407F, R407H, R410A, R450A, R507, R513A, R744(CO2), R449A, R290, R32, R448A, R452A, R600, R600A, R1270, R1234ze, R23, R717(NH3), R454C.
- Easy valve parameter programming with 21 pre-sets for the most popular valves on the market. Ability to manually define valve parameters.
- Easy parameter programming with 4 pre-sets for the different applications of the electronic expansion valve.
- Safety solenoid valve management with the system stopped.
- Connectable to the backup battery module to allow the stepper valve to close in the absence of source voltage.
- Display and adjustment of the cell temperature with decimal point.
- Evaporator temperature display by parameter.
- Configurable digital inputs.
- Activation/deactivation of system control.
- System alarm signal (probe error, minimum and maximum temperature alarm, compressor protection, overheating anomalies).
- LED signals of the system status and large displays.
- Easy to use keyboard.
- Evaporator fan management.
- Air recirculation management in anti-stratification function.
- Emergency operation in case of ambient probe breakage.
- Automatic and manual defrosting management (static, resistor, thermostat resistor).
- Energy saving: day/night mode and intelligent defrosting.
- Consent for motorised condensing unit.
- Cold room light activation with button on the panel or via Door switch.
- Integrated differential magnetic-thermal switch for the protection and disconnection of the refrigeration unit.
- Self-extinguishing ABS case, with transparent access door to the magnetic-thermal differential protection, with IP65 protection level that allows it to be used as an external cell panel.
- Two alarm/auxiliary relays with activation configurable by parameter.
- RS485 for connection to the TeleNET supervision network or to a network with Modbus-RTU protocol.
- Import / export parameters via USB.
- Software upgradeable via USB.

CHAPTER 5: DATA PROGRAMMING

CONTROL PANEL　　5.1

FRONT KEYBOARD　　5.2

❶ **AUX**
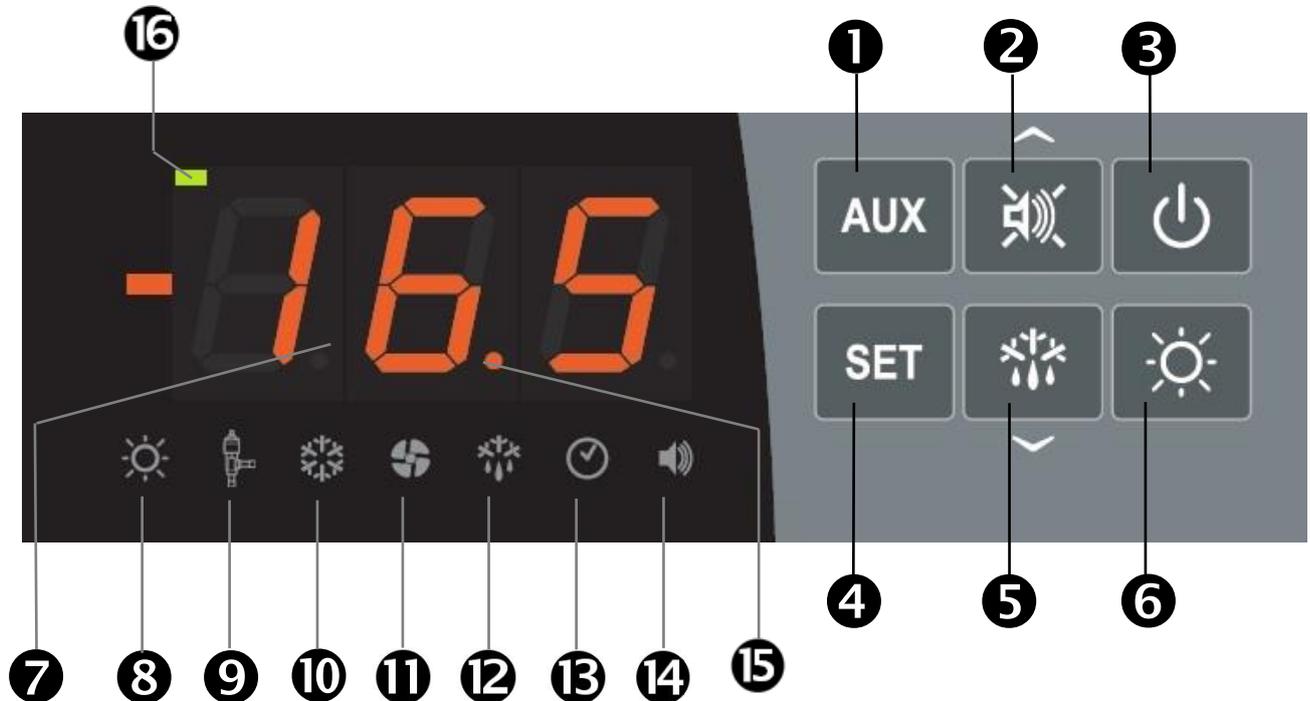
AUXILIARY RELAY COMMAND / PARAMETER SAVING to USB
Manually controls the relay if parameter AU1/AU2=2.
If pressed for 3 seconds, it accesses the parameter export/import menu via USB.

❷

UP KEY / MUTE BUZZER ALARM
Increases values / Scrolls up parameters.
Mutes the audible alarm if present / Acquires an alarm (if the alarm has returned and the bell is lighted, pressing this key turns off the bell as the alarm is acquired. If pressed for 3 seconds together with the standby button, it allows access to the valve adjustment menu (EEV parameters, level 3).

❸

STAND BY
Pressed for more than 1 second toggles the standby state to the normal operating state and vice-versa. Upon switching, a confirmation BEEP is generated.
In the standby state, the system stops and the display alternates the OFF word with the temperature (if programmed, the alternate OFF word is not displayed)

❹ **SET**

AMBIENT TEMPERATURE SETTING
Displays the set-point. Allows you to set the set-point if pressed in combination with the Down key or the UP key. Resets the audible alarm if present. If pressed for 3 seconds together with the standby button, allows access to the valve configuration menu (STEPPER parameters, level 4).

❺

DOWN / DEFROST
Pressed for more than 3 seconds activates manual defrosting (if the activation conditions are met).
Pressed for more than 3 seconds during defrosting, it ends the present defrosting.

❻

COLD ROOM LIGHT

5.3   **LED DISPLAY**

❼   `-16.5`   **AMBIENT TEMPERATURE/PARAMETER VALUES**

❽

DOOR SWITCH/COLD ROOM LIGHT ICON
Led OFF = Door switch not active or not used and cold room light off
Led ON = Cold room light ON
Flashing Led = Active Door switch and cold room light ON

❾

EEV STEPPER OUTPUT STATUS ICON output status of the EEV Stepper electronic valve (if enabled)
Led OFF = Motorised valve closed
Led ON = Motorised valve open

❿
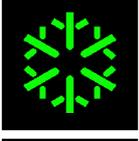
COLD CALL ICON
Led OFF = Cold call OFF
Led ON = Cold call ON
Flashing Led = Cold call ON but waiting for waiting time C1

⓫

FAN CALL ICON
Led OFF = Fan call OFF
Led ON = Fan call ON

⓬

DEFROST CALL ICON
Led OFF = Defrost call OFF
Led ON = Defrost call ON
Flashing LED = Dripping in progress after defrosting (see parameter d7)

⓭

REAL TIME CLOCK ICON
Led OFF = Real time clock defrosting disabled
Led ON = Real time clock defrosting enabled

⓮

ALARM PRESENCE ICON
Led OFF = No alarm present
Led ON = Alarm activated and then returned
Flashing LED = Alarm present

⓯
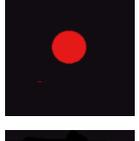
DECIMAL POINT (flashing in night mode)

⓰

AUXILIARY (AUX relay call signal if AU1=+/-2 or +/-3)

KEY COMBINATIONS

5.4
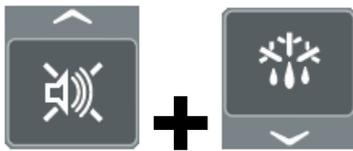
1ST-LEVEL PROGRAMMING
If pressed simultaneously for more than 3 seconds, they allow access to the first level programming menu.

LEAVING THE PROGRAMMING
If pressed simultaneously for more than 3 seconds within any programming menu.

2ND-LEVEL PROGRAMMING
If pressed simultaneously for more than 3 seconds, they allow access to the second level programming menu.
The entry in this menu activates the stand-by.
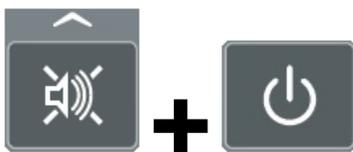
3RD-LEVEL PROGRAMMING
(EEV parameters)
If pressed simultaneously for more than 3 seconds, they allow access to the third level programming menu.
The entry in this menu activates the stand-by.

4TH LEVEL PROGRAMMING
(stepper valve parameters)
If pressed simultaneously for more than 3 seconds, they allow access to the fourth level programming menu. The entry in this menu activates the stand-by.

QUICK MENU FOR VARIABLE DISPLAY
(READ-ONLY)
If pressed simultaneously for more than 3 seconds, they allow access to the quick variable display menu.

Within this menu the up and down arrows allow the display of the variable label.
Pressing the Set key toggles the display of the label with its value.
When the label value is displayed, pressing the up or down arrow alternates the value display for the label display.
The leaving from this menu takes place automatically after 2 minutes of keyboard inactivity or by pressing up arrow + down arrow.

SWITCHING ON THE ECP300 EXPERT STEPPER PANEL

5.5

After completing all the electrical panel wiring connections, power the panel using the general switch; the electrical panel will emit immediately a sound for a few seconds and at the same time, all the LEDs will remain lighted on the display.

5.6   GENERAL INFORMATION

For safety reasons and greater convenience for the operator, the **ECP300 EXPERT STEPPER** system provides four programming levels; the first is used only for the configuration of frequently editable **SET-POINT** parameters, the second is used for programming and setting the general parameters relating to the various operating modes of the board, the third is used for managing the parameters relating to the electronic expansion valve and the fourth is used for managing the parameters relating to the stepper valve.

If you are at one programming level, you cannot directly access another level, but you must first leave the programming.

5.7   SYMBOLS

For convenience we will indicate with the symbols:

- **(⌃)** the UP key ⌦⌃ that performs the functions of value increase and tacit alarm.
- **(⌄)** the DOWN key ⌄❄ that performs the functions of decreasing the values and forcing defrosting.

5.8   SETTING AND SET-POINT DISPLAY

1. Press the **SET key** to display the current **SET-POINT** value (temperature).
2. Holding down the **SET key** and pressing one of the **(⌃)** or **(⌄)** keys changes the **SET-POINT** value.
3. Release the **SET key** to return to the cell temperature display; the changes made will be automatically saved.

5.9   FIRST-LEVEL PROGRAMMING (User level)

To access the first level configuration menu you must:
1. Press and hold the (⌃) and (⌄) keys simultaneously for more than 3 seconds until the first programming variable appears on the display.
2. Release the (⌃) and (⌄) keys.
3. Select with the (⌃) key or the (⌄) key the variable to be modified.
4. After selecting the desired variable you will be able to:
   - Display the setting by pressing the SET key.
   - Change the setting by holding down the SET key and pressing one of the (⌃) or (⌄) keys.

Once the configuration values have been set, to leave the menu, press and hold the (⌃) and (⌄) keys for a few seconds until the cell temperature value reappears.
Changes made to the variables will be automatically saved when leaving the configuration menu.

LIST OF 1ST-LEVEL VARIABLES (User Level)

5.10

VARIABLES	MEANING	VALUES	DEFAULT
r0	**Temperature differential** referred to the main SET-POINT. Defines the hysteresis of the temperature referred to the SET-POINT.	0.2 ÷ 10.0 °C	2.0 °C
d0	**Defrost interval** (hours) With d0=0 and dFr=0 defrosts are excluded.	0 ÷ 24 hours	4 hours
d2	**Defrost end set-point**. Defrosting is not performed if the temperature read by the defrosting probe is greater than the value d2. (In case of faulty probe defrosting is performed on time)	-35 ÷ 45 °C	15°C
d3	**Maximum defrost duration** (minutes)	1 ÷ 240 min	25 min
d7	**Dripping duration** (minutes) At the end of defrosting, the compressor and fans remain stationary for the set time d7, the defrosting LED on the front of the panel flashes.	0 ÷ 10 min	0 min
F5	**Fan pause** after defrosting (minutes) Allows the fans to remain stationary for a time F5 after dripping. This time is counted from the end of the dripping. If the dripping is not set, at the end of defrosting the fans pause immediately.	0 ÷ 10 min	0 min
A1	**Minimum temperature alarm** Absolute temperature referring to the ambient probe under which, once the delay time AId has elapsed, the low temperature alarm is activated, which consists of activating the Buzzer (if present), the **EL** word alternating with the temperature on the display and the flashing of the alarm presence icon. When the alarm returns, the "alarm presence" icon remains on steady to indicate the intervention until the UP key is pressed.	-45.0 ÷ (A2-1) °C	-45.0°C
A2	**Maximum temperature alarm** Absolute temperature referring to the ambient probe above which, once the delay time AId has elapsed, the high temperature alarm is activated, which consists of activating the Buzzer (if present), the **EH** word alternating with the temperature on the display and the flashing of the alarm presence icon. When the alarm returns, the "alarm presence" icon remains on steady to indicate the intervention until the UP key is pressed.	(A1+1) ÷ +99.0 °C	+99.0°C
dFr	**Enable real-time defrosting of evaporators** With d0=0 and dFr=1 it is possible to set up to 6 real-time defrosts over a day through the dF1…dF6 parameters.	0 = disabled 1 = enabled	0
dF1…dF6	**Programming the evaporator defrost times.** You can set up to 6 times for defrost. The time is in the form HH.M where HH represents the hour and M the tens of minutes (Ex. 0=0 min; 1=10 min, etc.). The flashing dot (.) indicates that a time is displayed and not a temperature.	00.0 ÷ 23.5	--
tdS	**Start of day phase**	00.0 ÷ 23.5	6.0
tdE	**End of day phase**	00.0 ÷ 23.5	22.0

5.11   2ND-LEVEL PROGRAMMING (Installer level)

To access the second programming level you must:
1. Press and hold the UP (▲), DOWN (▼), and cold room light keys for more than 3 seconds.
When the first programming variable appears, the <u>system automatically switches to standby</u>.
2. Select with the (▲) key or the (▼) key the variable to be modified. After selecting the desired variable you will be able to:
   - Display the setting by pressing the SET key.
   - Change the setting by holding down the SET key and pressing one of the (▲) or (▼) keys.
3. Once the configuration values have been set, to leave the menu, press and hold the (▲) and (▼) keys simultaneously for a few seconds until the cell temperature value reappears. When leaving the menu an audible signal will be emitted if the BUZZER is present.
Changes made to the variables will be automatically saved when leaving the configuration menu.
Press the STAND-BY key to enable the electronic control.

5.12   LIST OF 2ND-LEVEL VARIABLES (Installer level)

VARIABLES	MEANING	VALUES	DEFAULT
F3	**Evaporator fans operation**	0 = Fans running continuously 1 = Fans operating only during cold call 2 = Fans DISABLED	1
F4	**Pause fans during defrosting**	0 = Fans operating during defrosting 1 = Fans not working during defrosting	1
F6	**Evaporator fans activation for air recirculation.** The fans are activated for a time defined by F7 if they have not entered into operation for time F6. If the activation time coincides with the defrosting phase, the end of defrosting is still awaited.	0 ÷ 240 min 0 = function not activated	0 min
F7	**Duration of the evaporator fans activation for air circulation.** Fan operating time for F6	0 ÷ 240 sec	10 sec
dE	**Evaporator probe present.** If the evaporator probe is excluded, defrost occurs cyclically with period d0 and ends with the defrost end input active or due to expiration of time d3.	0 = evaporator probe present 1 = evaporator probe absent	0
d1	**Defrosting type**: resistance or thermostat resistance.	2 = resistance, thermostat 1 = (Do not use. See Chap. 5.27) 0 = resistance	0
dPo	**Defrost at start-up**	0 = disabled 1 = defrost at start-up (if possible)	0
dSE	**Intelligent defrosting**	0 = disabled 1 = enabled	0
dSt	**Intelligent defrost set-points (if dSE=1)** The time count between defrosts is increased only if the cold call is active and the evaporator temperature is less than dSt.	-30 ÷ 30 °C	1 °C

VARIABLES	MEANING	VALUES	DEFAULT
dFd	**Display view when defrosting**	0 = current ambient temperature 1 = ambient temperature at the beginning of defrosting 2 = "DEF"	1
Ad	**Network address** for connection to the TeleNET or Modbus supervisory system	0 ÷ 31 (with SEr=0) 1 ÷ 247 (with SEr=1)	0
SEr	**Communication protocol with RS-485**	0 = TeleNET Protocol 1 = Modbus-RTU protocol	0
Bdr	**Modbus baud rate**	2 = 1200 baud 4 = 4800 baud 6 = 14400 baud 3 = 2400 baud 5 = 9600 baud 7 = 19200 baud 8 = 38400 baud	5
Prt	**Parity bit Modbus**	0 = no parity 1 = even parity (even) 2 = odd parity (odd)	0
Ald	**Signalling delay time and display of minimum or maximum temperature alarm.**	0 ÷ 240 min	120 min
AtE	**Temperature alarm enabling**	0 = always enabled 1 = disabled in case of standby 2 = disabled if Door switch active 3 = disabled if standby or Door switch active	0
C1	Minimum time between shut down and subsequent **cold call activation**.	0 ÷ 15 min	0 min
CAL	**Ambient probe value correction**	-10.0 ÷ +10.0 °C	0.0 °C
CE1	**Operating time ON cold call, in case of faulty ambient probe** (emergency operation). With CE1=0 the emergency operation in the presence of error E0 remains disabled, the cold call remains off and defrosting is inhibited to preserve the residual cold.	0 ÷ 240 minutes 0 = disabled	0 min
CE2	**Operating time OFF cold call, in case of faulty ambient probe.**	5 ÷ 240 minutes	5 min
doC	**Cold call warning time for Door switch:** when opening the Door switch the evaporator fans turn off and the cold call will remain active for the **doC** time and then turn off.	0 ÷ 5 minutes	0 min
tdo	**Cold call reactivation time after opening the door:** when the door switch is opened and after the time tdo has elapsed, the normal operation of the control is restored by signalling an "open door" alarm (Ed). If the door switch is closed and the light remains on for a time longer than tdo, the cold room light alarm (E9) is signalled. With tdo=0 the parameter is disabled.	0 ÷ 240 minutes 0 = disabled	0 min
Fst	**FAN blocking TEMPERATURE** The fans will remain stationary if the temperature value read by the **evaporator** probe is higher than the value of this parameter. The blocking is deactivated with the evaporator probe disabled or in error.	-45 ÷ +99°C	+99°C
Fd	**Differential for Fst**	1 ÷ +10°C	2°C

VARIABLES	MEANING	VALUES	DEFAULT
LSE	Minimum value attributable to the set-point	-45 ÷ HSE-1°C	-45°C
HSE	Maximum value attributable to the set-point	LSE+1 ÷ +99°C	+99°C
dnE	Enable day/night (energy saving). During night operation the decimal point flashes.	0 = disabled 1 = enabled	0
nSC	SET correction factor during night operation. (energy saving, with In1 or In2 = 8 or -8) During night operation the adjustment Set is: Adjustment set = Set + nSc In night mode the decimal point flashes.	-20.0 ÷ +20.0 °C	0.0 °C
StA	Auxiliary relay temperature set	-45 ÷ +99°C	0
in1	INP-1 digital input setting	17 = tPF % fixed opening (N.O.) 16 = Compressor protection, display only (N.O., EcA) 15 = Condenser fan protection, display only (N.O., EFc) 14 = Evaporator fan protection, display only (N.O., EFE) 13 = Oil pressure switch protection (N.O., EcO) 12 = Minimum pressure switch protection (N.O., EcL) 11 = Maximum pressure switch protection (N.O., EcH) 10 = Pressure switch protection (N.O., EcP) 9 = Compressor thermal protection (N.O., Ect) 8 = Night input (energy saving) (N.O.) 7 = Remote defrost stop (N.O., active on the ascent front) 6 = Start defrosting remotely (N.O., active on the ascent front) 5 = Remote standby (N.O.) To indicate the remote standby OFF is displayed on the display 4 = Pump-down pressure switch (N.O.) 3 = Man in Cell alarm (N.O.) 2 = Compressor protection (N.O.) 1 = Door switch (N.O.) 0 = Disabled -1 = Door switch (N.C.) -2 = Compressor protection (N.C.) -3 = Man in Cell Alarm (N.C.) -4 = Pump-down pressure switch (N.C.) -5 = Remote Stand-by (N.C.) To indicate the remote standby OFF is displayed on the display -6 = Start defrost remotely (N.C., active on the descent front) -7 = Stop defrost remotely (N.C., active on the descent front) -8 = Night input (energy saving) (N.C.) -9 = Compressor thermal protection (N.C., Ect) -10 = Pressure switch protection (N.C., EcP) -11 = Maximum pressure switch protection (N.C., EcH) -12 = Minimum pressure switch protection (N.C., EcL) -13 = Oil pressure switch protection (N.C., EcO) -14 = Evaporator fan protection, display only (N.C., EFE) -15 = Condenser fan protection, display only (N.C., EFc) -16 = Compressor protection, display only (N.C., EcA) -17 = tPF % fixed opening (N.C.)	1
In2	INP-2 digital input setting	- Same value legend as In1 -	2
In3	INP-3 digital input setting	- Same value legend as In1 -	3
In4	INP-4 digital input setting	- Same value legend as In1 -	4

VARIABLES	MEANING	VALUES	DEFAULT
bEE	**Buzzer enabling**	0 = disabled 1 = enabled	1
P1	**Password: security type** (active when PA is other than 0)	0 = displays only the set-point and allows tacit alarms 1 = displays the set-point, allows tacit alarms, + defrost + light + aux key + access to variable only display menu 2 = blocks programming access of 1, 2, 3 and 4 level (all other functions are allowed) 3 = blocks programming access of 2, 3 and 4 levels (all other functions are allowed)	3
PA	**Password** (see P1 for type of protection)	0...999 0 = function disabled	0
AU1	**Setting of Auxiliary Relay 1 /Alarm** (output with voltage-free contacts)	-7 (NC) = Relay DO5 de-energised solenoid valve control -6 (NC) = Relay de-energised in standby -5 (NC) = Contact for sump resistance control (AUX relay closed with compressor output not active). This output remains active even when QE is in STANDBY MODE. -4 (NC) = Pump down function (see chap. 5.29) -3 (NC) = Automatic auxiliary relay managed by temperature set StA with differential 2°C -2 (NC) = Auxiliary manual relay controlled by AUX KEY -1 (NC) = Alarm relay 0 = Relay off 1 (NO) = Alarm relay 2 (NO) = Auxiliary manual relay controlled by AUX KEY 3 (NO) = Automatic auxiliary relay managed by temperature set StA with 2°C differential 4 (NO) = Pump down function (see chap. 5.29) 5 (NO) = Clean contact motorised condensing unit call (AUX relay parallel to compressor). 6 (NO) = Relay energised in standby 7 (NO) = Relay DO5 energised by solenoid valve control	-1
AU2	**Setting of Auxiliary Relay 2** (output with voltage-free contacts)	- Same value legend as AU1 -	7
Yr	**Year setting**	0...99	20
Mo	**Month setting**	1...12	1
dy	**Day setting**	1...31	1
Hr	**Time setting**	0...23	12
min	**Minute setting**	0...59	0
dEF	**Default reset** Press all keys simultaneously for 30 seconds to reset to factory settings.	---	---
reL	**Software release**	read-only	read-only

3RD-LEVEL PROGRAMMING (EEV PARAMETERS)   `5.13`

To access the third programming level you must:
1. Press and hold the UP (▲) and STANDBY keys for more than 3 seconds.
2. Select with the (▲) key or the (▼) key the variable to be modified. After selecting the desired variable you will be able to:
   - Display the setting by pressing the SET key.
   - Change the setting by holding down the SET key and pressing one of the (▲) or (▼) keys.
3. Once the configuration values have been set, to leave the menu, press simultaneously and hold the (▲) and (▼) keys for a few seconds until the cell temperature value reappears.

Changes made to the variables will be automatically saved when leaving the configuration menu.

LIST OF 3RD-LEVEL VARIABLES (EEV PARAMETERS)   `5.14`

VARIABLES	MEANING	VALUES	DEFAULT
ESH	**Overheating set-point.**	0.1÷ +25.0 °C	6.0°C
EEV	**EEV electronic valve management.** **Settings 1 through 5 load the default values into the ECt, EPb, Etl, Etd, ELS variables. When leaving the programming:** if the selected EEV value is different from the previously stored one, the defaults related to the selection are loaded. Pressing the Set key alone to see the current EEV value does not load the defaults.	1 = EEV control (default 1) 2 = EEV control (default 2) 3 = EEV control (default 3) 4 = EEV control (default 4) 5 = EEV control (default 5) 6 = EEV control via Modbus (register 1536) (see table in Chap. 5.15)	1
ErE	**Type of refrigeration GAS used.** Setting this parameter is of fundamental importance for the correct operation of the electrical panel.	0 = R404 1 = R134 2 = R22 3 = R407A 4 = R407F 5 = R407H 6 = R410A 7 = R450A 8 = R507 9 = R513A 10 = R744 (CO2) 11 = R449A 12 = R290 13 = R32 14 = R448A 15 = R452A 16 = R600 17 = R600A 18 = R1270 19 = R1234ze 20 = R23 21 = R717 (NH3) 22 = R454C	0
EPb	**Proportional band (gain) PID overheating adjustment.**	1 ÷ 100%	15%
Etl	**Integral time PID algorithm overheating adjustment**	0 ÷ 500 sec	100
Etd	**Derivative time PID algorithm overheating adjustment**	0.0 ÷ 10.0 sec	2.0
EOE	**Percentage of EEV valve opening in case of error in probes S4 or S5.** This function allows you to continue the adjustment although not optimally in case of failure of adjustment probes.	0 ÷ 100%	50%
ESO	During the Start phase the EEV valve opens at the ESO percentage for the ESt time	0 ÷ 100%	85%
ESt	Duration of the Start phase. **At this stage the MOP, LOP, LSH alarms are disabled.**	0 ÷ Edt tens of seconds	6 tens of sec
EdO	After Defrost the EEV valve opens at the EdO percentage for the Edt time	0 ÷ 100%	100%
Edt	Duration of EdO valve opening phase after Defrost. **At this stage the MOP, LOP, LSH alarms are disabled.**	Est ÷ 250 tens of seconds	24 tens of sec

VARIABLES	MEANING	VALUES	DEFAULT
EHO	**Maximum opening percentage of the EEV valve:** in the case of an oversized valve, this variable allows limiting its maximum opening to the set percentage.	0 ÷ 100%	100%
EPt	**Temperature transducer type (S4):** Sets the type of transducer used to detect the temperature (S4)	0 = NTC 1 = PT1000 2 = PTC (-45/80 °C)	0
EP4	**Pressure (bar) corresponding to 4mA or 0V referred to the Evaporation pressure probe (S5).**	-1.0 ÷ EP2 bar	0.0
EP2	**Pressure (bar) corresponding to 20mA or 5V referred to the Evaporation pressure probe (S5).**	EP4 ÷ 90.0 bar	12.0
CA4	**Calibration of Suction temperature transducer (S4)**	-10.0 ÷ +10.0 °C	0.0
CA5	**Calibration of Evaporation pressure transducer (S5)**	-10.0 ÷ +10.0 Bar	0.0
LSH	**LSH threshold (Low overheating temperature)** Too low overheating values can cause liquid to return to the compressor or strong oscillations. Below the LSH value, the ELS protection intervenes, which increases the speed of the PID when closing the valve to move to the set overheating setting.	0.0 ÷ Set SH °C	2.0 °C
ELS	**LSH protection** If enabled, when **tSH < LSH** the PID integration time is set based on ELS selection from 1 to 7. Setting 1 generates the fastest shut down. Upon insertion of this protection, the SHd count for activating the LSH alarm begins. LSH PROTECTION TAKES PRECEDENCE OVER LOP PROTECTION. LSH PROTECTION IS NOT ACTIVATED DURING THE START PHASE (ESt TIME), AND DURING THE DEFROST OR POST-DEFROST PHASE (Edt TIME).	0 = LSH protection and related LSH alarm disabled 1 = 5% Etl 2 = 10% Etl 3 = 15% Etl 4 = 20% Etl 5 = 25% Etl 6 = 30% Etl 7 = 35% Etl 8 = 50% Etl 9 = 100% Etl (no correction and only activates the LSH alarm)	2
SHd	**LSH alarm activation delay** The LSH overheating alarm is signalled only after it has remained active for the SHd time. In case of LSH alarm, valve closure is still instantaneous. The alarm is self-resetting and returns when **tSH ≥ LSH.** With an active alarm you have: - The flashing LSH word on display - Buzzer	0 ÷ 240 tens of seconds	30
MOP	MOP threshold (Maximum Saturated Evaporation Temperature referring to sensor **S5**) **Represents the maximum evaporation pressure, expressed in saturated degrees, above which MOP protection is activated (EMO Parameter). In case of MOP the control closes the valve gradually to limit the evaporation temperature and prevent the compressor from stopping for thermal protection.**	(LOP+1) ÷ +99°C	+45°C
EMO	**MOP protection (active with tS5>MOP)** When the evaporation temperature (tS5) is above the MOP threshold, the control interrupts the overheating adjustment and the valve closes trying to limit the evaporation temperature (and therefore the pressure). The closing speed of the valve depends, in addition to the difference between the evaporation temperature and the MOP threshold, also on the EMO integral time parameter: the lower it is the lower will be the valve closing time. When this protection is inserted, the MOd count for activating THE MOP alarm begins. THE MOP PROTECTION IS NOT ACTIVATED DURING THE START PHASE (ESt TIME), AND DURING THE DEFROST OR POST-DEFROST PHASE (Edt TIME).	0 = MOP protection disabled and also the related MOP alarm signal 0 ÷ 500 seconds 2 second steps	0

VARIABLES	MEANING	VALUES	DEFAULT
MOd	**MOP alarm activation delay:** the MOP alarm is signalled only after the MOP protection has remained active for the MOd time**.** The alarm is self-resetting when **"S5 Temp"≤ MOP.** With an active alarm you have: - The flashing MOP word on display - Buzzer	0 ÷ 240 tens of seconds	60
LOP	**LOP threshold (minimum Saturated evaporation temperature referring to sensor S5).** Represents the minimum evaporation pressure, expressed in saturated degrees, below which the LOP protection is activated. In case of LPO the control opens the valve to prevent the compressor from stopping due to low pressure (mechanical pressure switch).	-45°C ÷ (MOP-1)	-45°C
ELO	**LOP protection (active with tS5 < LOP).** When the evaporation temperature (tS5) is below the LOP threshold, the control interrupts the overheating adjustment and the valve opens. The opening speed of the valve depends, in addition to the difference between the evaporation temperature and the LOP threshold, also on the integral time parameter ELO: the lower it is the higher the valve opening speed will be. When this protection is activated, the LOd count starts to activate the LOP alarm. LSH PROTECTION TAKES PRECEDENCE OVER LOP PROTECTION. THE LOP PROTECTION IS NOT ACTIVATED DURING THE START PHASE (ESt TIME), AND DURING THE DEFROST OR POST-DEFROST PHASE (Edt TIME).	0 = LOP protection disabled and also the related LOP alarm signal 0 ÷ 500 seconds 2 second steps	0
LOd	**LOP alarm activation delay:** the LOP alarm is signalled only after it has remained active for the LOd time. In case of LOP alarm. The alarm is self-resetting when **"S5 Temp" ≥ LOP** With an active alarm you have: - The flashing LOP word on display - Buzzer	0 ÷ 240 tens of seconds	30
tPF	**Forced valve positioning:** via digital input (if the control is not in standby) it is always possible to force the valve to open at a predetermined value.	0 ÷ 100 %	50%

NOTE: All LSH, MOP, LOP alarm calculation times are reset when the adjustment is stopped OR DURING THE START PHASE (ESt TIME), AND DURING THE DEFROST OR POST-DEFROST PHASE (Edt TIME).

LOADING DEFAULT SETTINGS BASED ON THE EEV VARIABLE   **5.15**

	EEV = 1 PEGO DEFAULT	EEV = 2 (CELL control or TN REFRIGERATION BENCH with compressor on board)	EEV = 3 (CELL control or BT REFRIGERATION BENCH with compressor on board)	EEV = 4 (CELL control or TN CHANNELED REFRIGERATION BENCH)	EEV = 5 (CELL control or BT CHANNELED REFRIGERATION BENCH)
ESH	6 °C	6 °C	6 °C	11 °C	11 °C
EPb	15 %	15 %	15 %	15 %	15 %
EtI	100 sec	100 sec	100 sec	150 sec	150 sec
Etd	2 sec	2 sec	2 sec	5 sec	5 sec
LSH	2 °C	2 °C	2 °C	5 °C	5 °C
ELS	2	2	2	2	2
MOP	+45 °C	5 °C	-15 °C	+5 °C	-15 °C
EMO	0	5	5	5	5
LOP	-45 °C	-25 °C	-45 °C	0	0
ELO	0	15	15	0	0

5.16	4TH-LEVEL PROGRAMMING (STEPPER VALVE PARAMETERS)

To access the fourth programming level press and hold the SET and STAND-BY keys for more than 3 seconds. When the first programming variable appears, the <u>system automatically switches to stand-by</u>.

1. Select with the (▲) key or the (▼) key the variable to be modified. After selecting the desired variable, you can view its setting by pressing the SET key.

2. Change the setting by holding down the SET key and pressing one of the (▲) or (▼) keys.

3. Once the configuration values have been set, to leave the menu, press and hold the (▲) and (▼) keys for a few seconds until the value of the main display reappears.

Press the STAND-BY key to enable the electronic control.

Changes made to the variables will be automatically saved when leaving the configuration menu. By entering this menu the adjustment is interrupted and the valve is closed.

<u>POSSIBLE ELECTRICAL DAMAGE! => make changes in this programming level with the valve disconnected. When leaving the valve is completely closed. At the first start it is necessary to set the type of valve (parameter "tEU"). Parameters for coded valves cannot be changed (tEU >=1).</u>

5.17	LIST OF 4TH-LEVEL VARIABLES (STEPPER VALVE PARAMETERS)

VARIABLES	MEANING	VALUES	DEFAULT
tEU	**Type of motorised valve connected.** **With tEU = -2 all related controls and signals are disabled. The related errors of probes S4 (Intake temperature) and S5 (Evaporation pressure) are also disabled and excluded.** Settings 1 to 21 load default values into the ISP, HSP, CSP, SPD, ICF, ICM, SYN, TYP variables. However, it is possible to change the default values set automatically by selecting tEU other than zero. Pressing the Set key only allows you to see the current EEV value: it does not load the defaults.	-2 = Disables valve control (keeps cold room control only -1 = Valve not configured 0 = Custom (set EEV parameters) 1 = Carel ExV 2 = Danfoss ETS 25-50 3 = Danfoss ETS 100 4 = Danfoss ETS 250/400 5 = ETS 6 Danfoss 6 = Alco EX4 7 = Alco EX5 8 = Alco EX6 9 = Alco EX7 10 = Alco EX8 500 11 = Sporlan SEI 0.5-11 12 = Sporlan SER 1.5-20 13 = Sporlan SER(I) G, J, K 14 = Sporlan SEI 30 15 = Sporlan SEI 50 16 = Sporlan SEH 100 17 = Sporlan SEH 175 18 = Castel 261 / Eliwell SXVB261 19 = Castel 262-263 / Eliwell SXVB262-263 20 = Castel 272-273 21 = Castel 264-274 / Eliwell SXVB264-274	-1
LSP	**Minimum number of steps:** Allows you to select the minimum number of valve steps at which the valve is to be considered completely closed. You must read the valve manufacturer's manual to set this parameter correctly. It is the minimum number of steps to remain within the operating range recommended by the manufacturer.	0 ÷ HSP-1 (10*steps)	---
HSP	**Maximum number of steps:** Allows you to select the Maximum number of steps that can be performed by the valve. At this number of steps the valve should be fully open. You must read the valve manufacturer's manual to set this parameter correctly. It is the maximum number of steps to remain within the operating range recommended by the manufacturer.	LSP+1 ÷ CSP (10*steps)	---

VARIABLES	MEANING	VALUES	DEFAULT
CSP	**Closing steps:** number of additional steps to achieve the complete closing of the valve, it is used to realign the valve to the physical position of fully closed. Driver and valve are then ready for adjustment and both aligned to 0 (zero). Then the forced closing is performed when the controller is switched on and also periodically, to realign the valve position to the position calculated by the driver.	HSP ÷ 999 (10*steps)	---
Spd	**Rated speed:** maximum motor movement speed without loss of steps and therefore without loss of precision. You must stay below the maximum speed available for the valve.	0 ÷ 999 steps/sec	---
ICF	**Rated current per phase (bipolar valves):** is the current per phase used by the valve during adjustment. Consult the manufacturer's manual.	BWI+1 ÷ 800 mA	---
BWI	**Parking current (bipolar valves):** is the current per phase when the valve has been stopped for at least 5 minutes.	0 ÷ ICF-1 mA	---
dut	**Valve duty cycle:** fraction of time during which the valve is checked.	10 ÷ 100 %	100
SYN	**Active synchronization:** every time the valve has to be fully opened or closed a number of extra steps are performed to arrive at the complete opening/closing of the valve	0 = off 1 = activated in opening 2 = activated in closing 3 = activated in opening and closing	0
CTr	**Adjustment type:** sets the current adjustment type of the stepper motor. A microstep or half-step control ensures smoother movement (there is current modulation) but this causes torque reduction. With the full-step control the windings are always adjusted to the maximum current but the movement is quicker.	0 = Microstep 1 = Full – step 2 = Half - step	0

Loading default settings based on the tEU variable:

tEU	LSP (x10) step	HSP (x10) step	CSP (x10) step	Spd (step/s)	ICF (mA)	BWI (mA)	SYN
-1= Valve not configured	---	---	---	---	---	---	---
0 = Custom	5	48	50	50	450	100	1
1 = Carel ExV	5	48	50	50	450	100	1
2 = Danfoss ETS 25-50	7	262	262	300	100	100	1
3 = Danfoss ETS 100	10	353	353	300	100	100	1
4 = Danfoss ETS 250/400	11	381	381	300	100	100	1
5 = NOT USED	0	48	52	30	260	260	1
6 = Alco EX4	10	75	75	500	500	100	1
7 = Alco EX5	10	75	75	500	500	100	1
8 = Alco EX6	10	75	75	500	500	100	1
9 = Alco EX7	10	160	160	500	750	250	1
10 = Alco EX8 500	10	260	260	500	800	500	1
11 = Sporlan SEI 0.5-11	10	160	360	200	200	50	1
12 = Sporlan SER 1.5-20	10	160	360	200	200	50	1
13 = Sporlan SER(I) G, J, K	10	250	350	200	200	50	1
14 = Sporlan SEI 30	20	319	360	200	200	50	1
15 = Sporlan SEI 50	40	639	750	200	200	50	1
16 = Sporlan SEH 100	40	639	750	200	200	50	1
17 = Sporlan SEH 175	40	639	750	200	200	50	1
18 = Castel 261 / 271 Eliwell SXVB261	0	42	51	35	200	50	2
19 = Castel 262 / 263 Eliwell SXVB262 / SXVB263	0	20	25	20	200	50	2
20 = Castel 272 / 273	0	42	51	35	300	50	2
21 = Castel 264 / 274 Eliwell SXVB264	0	99	113	70	560	50	2

5.18 — REFRIGERATION FLUID TEMPERATURE TABLE

The following table shows the evaporation temperature limits (tS5, see chap. 5.20) according to the type of refrigeration fluid set (ErE parameter).

Parameter ErE	Encoding	Temperature Range	ErE parameter	Encoding	Temperature Range
0	R404	-50 ÷ 70 °C	11	R449A	-50 ÷ 70 °C
1	R134A	-50 ÷ 70 °C	12	R290	-50 ÷ 70 °C
2	R22	-50 ÷ 70 °C	13	R32	-50 ÷ 70 °C
3	R407A	-50 ÷ 70 °C	14	R448A	-50 ÷ 70 °C
4	R407F	-50 ÷ 70 °C	15	R452A	-50 ÷ 70 °C
5	R407H	-50 ÷ 70 °C	16	R600	-20 ÷ 70 °C
6	R410A	-50 ÷ 70 °C	17	R600A	-30 ÷ 70 °C
7	R450A	-40 ÷ 70 °C	18	R1270	-50 ÷ 70 °C
8	R507	-50 ÷ 70 °C	19	R1234ZE	-30 ÷ 70 °C
9	R513A	-45 ÷ 70 °C	20	R23	-50 ÷ 25 °C
10	R744 (CO2)	-50 ÷ 40 °C	21	R717 (NH3)	-50 ÷ 70 °C
			22	R454C	-50 ÷ 70 °C

5.19 — QUICK MENU FOR VARIABLE DISPLAY (READ-ONLY)

During the start-up of the system, it may be useful to easily check the reading of the various probes or some values in order to follow-up or optimise the process. To access the quick variable display menu, press and hold the DOWN (▼) and STANDBY keys for more than 3 seconds.
Within this menu the up or down arrows allow the display of the variable label. Pressing the Set key toggles the display of the label with its value (to make reading easier, pressing the set key alternates between label and value: it is not necessary to hold down the set key). When the label value is displayed, pressing the up or down arrow will still display the label after or before the current one (leaves the value display to display the label). The leaving from this menu takes place automatically after 2 minutes of keyboard inactivity or by pressing up arrow + down arrow.

5.20 — LIST OF VARIABLES IN THE QUICK DISPLAY MENU (READ-ONLY)

VARIABLES	MEANING	VALUES
tS0	**Probe display (S0) Ambient temperature**	(read-only) °C
tE	**Probe display (S1) Defrost temperature**	(read-only) °C
tS4	**Probe display (S4) Suction temperature**	(read-only) °C
tS5	**Probe display (S5) Evaporation temperature**	(read-only) °C
PS5	**Probe display (S5) Evaporation pressure**	(read-only) Bar
tSH	**Overheating temperature display** $tSH = tS4 - tS5$	(read-only) °C
oEV	**EEV Valve opening percentage**	(read-only) %
STEP	**EEV valve open position**	(read-only) steps/10

THERMOSTAT OPERATING MODE	**5.21**

COLD CALL MODE

The COMPR. output is activated when the temperature measured by the Ambient probe reaches or exceeds the SET-POINT value +r0 and remains active until the temperature drops below the SET-POINT. The COMPR. output is combined with the lighting of the cold call icon.
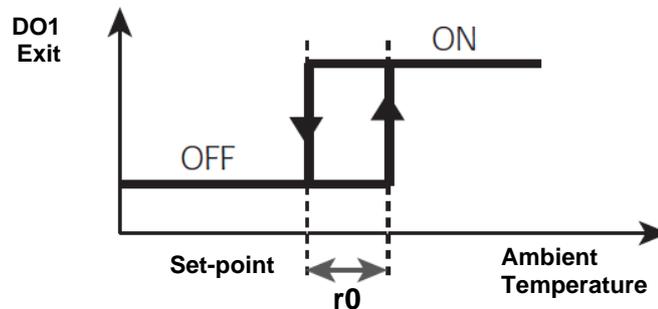
PASSWORD FUNCTION	**5.22**

The password function is activated by setting a value other than 0 for the PA parameter. See parameter P1 for different security levels.

Protection is automatically enabled after about 2 minutes of inactivity on the keyboard.

The figure 000 appears on the display. Use the up/down keys to change the number and the SET key to confirm it.

The password entry mask 000 disappears if you do not act on the keyboard within 2 minutes.

If you forget your password, use the universal number 100.

EMERGENCY OPERATION IN CASE OF ERROR E0 **(AMBIENT PROBE FAULT)**	**5.23**

This safety mode ensures the operation of the compressor even in the event of a faulty environment probe (error E0).

With probe error E0 and CE1 other than 0, the compressor operates in work pause mode, with compressor ON for time CE1 and OFF for time CE2.

With CE1>0, in case of error E0, defrosts are managed as in normal operating mode.

With CE1=0 the emergency operation in the presence of error E0 remains disabled: the compressor remains off and defrosting is inhibited to preserve the residual cold,

Eliminate the cause of error E0 as soon as possible and reactivate the normal function of the control for a correct temperature adjustment.

MANUAL DEFROST ACTIVATION	**5.24**

To activate defrosting, simply press the DOWN button for more than 3 seconds; in this way the resistance relay is activated. Defrosting is not activated if the activation conditions are not met (defrost end temperature (d2) set lower than the temperature detected by the evaporator probe).

Defrosting will end when the defrost end temperature (d2) is reached or due to maximum defrost duration (d3) or due to manually forced defrost stop (defrost stop key or digital input).

5.25 — MANUALLY FORCED DEFROST STOP IN PROGRESS

During a defrost in progress, pressing the DOWN button for 3 seconds forces the end of defrosting. **The manual defrost stop also cancels the dripping.**

5.26 — DEFROST WITH THERMOSTAT RESISTORS

Set parameter d1=2 to manage the defrost with resistors within a time limit. During defrosting the defrost relay is activated if the temperature read by the defrost probe is less than d2. The defrosting phase lasts d3 minutes, regardless of the relay status. This allows a better defrosting of the evaporator with consequent energy savings.

5.27 — HOT GAS DEFROSTING

WARNING: this function **is not available** in this type of electrical panel.
Do not set parameter d1=1.

5.28 — AMBIENT TEMPERATURE DISPLAY AFTER DEFROSTING

After defrosting, the display continues to display for 1 minute the last ambient temperature value detected before defrosting begins.

5.29 — PUMP DOWN FUNCTION

Setting the parameter AU1 = 4 or -4 activates the compressor stop operation in pump down. The digital input configured as a pump-down input (In1 or In2 = 4 or -4) constitutes the working pressure switch input and directly manages the compressor output. The AUX relay becomes the evaporator solenoid call and is managed by the cold call of the thermostat which also turns on the EEV solenoid output.

5.30 — INITIAL START-UP PROCEDURE

The fourth level valve parameters must be configured at the first start-up. The first start-up procedure is as follows:
1) **With the valve disconnected** (terminals 1A-1B-2A-2B free) turn on the ECP300 EXPERT STEPPER control. The "CFG" alarm appears to indicate that the valve must be configured.
2) Press the SET and STANDBY keys for more than 3 seconds to enter the fourth programming level. Set the "tEU" parameter according to the type of valve connected, or configure the necessary parameters (see par. 5.17).
3) When the configuration values have been set, leave the menu by pressing the (▲) and (▼) keys simultaneously for a few seconds until the value of the main display reappears.
4) Turn off the ECP300 EXPERT STEPPER control by turning off the power.
5) **Appropriately connect the electronic valve (see Appendix A2 and A4) with the control off**.
6) Turn on the ECP300 EXPERT STEPPER control. When switched on, after an initialization phase ("ini" is displayed and the valve is completely closed) the control starts adjusting the cell and the overheating temperature. Then set all the necessary parameters according to the type of application (ambient set-point, overheating set-point, etc.).

CHAPTER 6: OPTIONS

6.1	TELENET MONITORING/SUPERVISION SYSTEM

To insert the panel into a **TeleNET** network, follow the diagram below. Refer to the **TeleNET** manual for instrument configuration.

IMPORTANT: During configuration under "Module" select the item "ECP200EEV instrument".
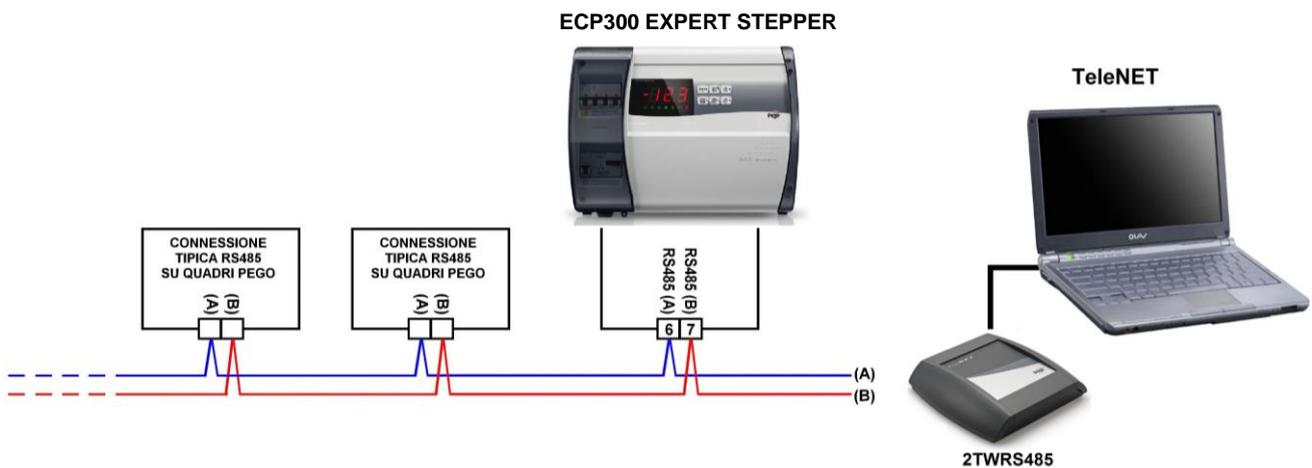
6.2	NETWORK CONFIGURATION WITH MODBUS-RTU PROTOCOL

To insert the panel into an RS485 network with **Modbus-RTU** protocol, follow the diagram below.
Refer to the MODBUS-RTU_ECP200EEV manual (available on our website) for MODBUS-RTU communication protocol specifications.
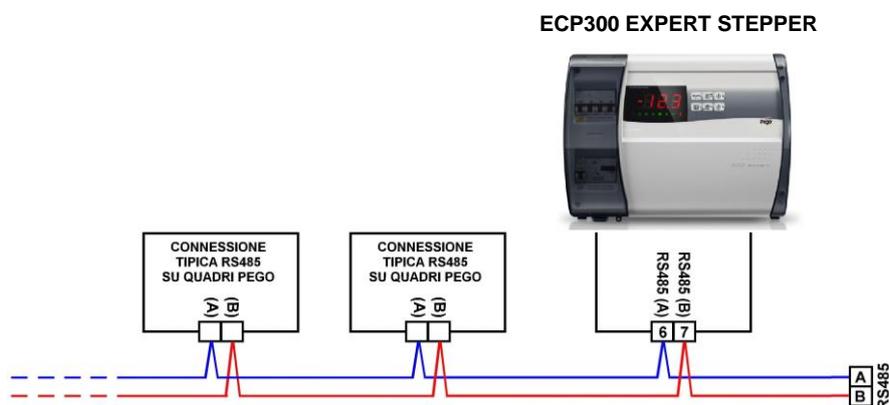
CHAPTER 7: DIAGNOSTICS

| 7.1 | DIAGNOSTICS BY MEANS OF ALARM CODES |

The **ECP300 EXPERT STEPPER** controller warns the operator in case of any anomalies through the alarm codes displayed on the display and an audible signal emitted by a buzzer. The audible alarm is silenced by pressing the UP key (the error code remains) and is reactivated by pressing the SET key.

If an alarm condition occurs, one of the following messages will appear on the display:

ALARM CODE	POSSIBLE CAUSE	OPERATION TO BE PERFORMED
E0i E0E	**Eeprom alarm** An error was detected in the EEPROM memory. (outputs are all disabled except alarm outputs)	• Turn the equipment off and on again. • Reset to default values.
E0	**Functional fault of the ambient probe (S0)**	• Check the status of the ambient probe. • If the problem persists, replace the probe.
E1	**Functional fault of the defrost probe (S1).** In this case, any defrost will have a duration equal to time d3.	• Check the status of the defrost probe. • If the problem persists, replace the probe.
E4	**Functional fault of the suction temperature probe (S4)**	• Check the condition of the suction probe.
E5	**Evaporation Pressure probe functional fault (S5)**	• Check the evaporation pressure probe status.
E6	**Low battery alarm:** the control will work for at least another 20 days, after which the clock setting will be lost if the power supply to the panel fails.	• Replace the clock battery (**CR2032**), located on the board on the front of the panel.
E8	**Man in cold room alarm:** the "man in cell alarm" button has been pressed to signal a dangerous situation.	• Reset the man in cell alarm input.
E9	**Cold room light alarm**: when the light comes on with the key, alarm E9 is activated after the time tdo. If it is silenced and the light is not switched off, when the time tdo expires again, the alarm will reappear.	• Turn off the light.
Ect	**Compressor thermal protection insertion:** the outputs are all deactivated except the alarm one, if present.	• Check the compressor status. • Check compressor absorption. • If the problem persists, contact technical support.
EcP	**Compressor pressure switch protection insertion:** the outputs are all deactivated except for the alarm one, if present.	• Check the compressor status. • Check the compressor protection pressure switch. • If the problem persists, contact technical support.
EcL	**Compressor low pressure protection insertion:** the outputs are all deactivated except the alarm one, if present.	• Check the compressor status. • Check the compressor protection pressure switch. • If the problem persists, contact technical support.
EcH	**Compressor high pressure protection insertion:** the outputs are all deactivated except the alarm one, if present.	• Check the compressor status. • Check the compressor protection pressure switch. • If the problem persists, contact technical support.
EcO	**Compressor oil pressure switch protection insertion:** the outputs are all deactivated except for the alarm one, if present.	• Check the compressor status. • If the problem persists, contact technical support.

Ec	**Cold call alarm:** remote alarm from the motorised condensing unit.	• Check the compressor status. • Check compressor absorption. • If the problem persists, contact technical support.
Ed	**Open door alarm:** when the door switch is opened and the time **tdo** has elapsed, the normal operation of the control is restored by signalling "door open alarm" (**Ed**).	• Check that the door is closed. • Check the electrical connections of the Door switch. • If the problem persists, contact technical support.
EH	**Maximum ambient temperature alarm:** a temperature higher than that set for the maximum temperature alarm has been reached by the ambient (see variable A2).	• Check the compressor status. • The probe does not detect the temperature correctly or the compressor stop/run command does not work. • If the problem persists, contact technical support.
EL	**Minimum ambient temperature alarm:** the ambient probe has reached a temperature lower than that set for the minimum temperature alarm (see variable A1).	• Check the compressor status. • The probe does not detect the temperature correctly or the compressor stop/run command does not work. • If the problem persists, contact technical support.
EcA	**Compressor alarm** (display only)	• Check the compressor status.
EFc	**Condenser fan alarm** (display only)	• Check the status of the condenser fans.
EFE	**Evaporator fan alarm** (display only)	• Check the status of the evaporator fans.
LSH	**Low overheating temperature alarm**	• Check the status of the refrigeration system. • Change PID parameters. • If the problem persists, contact technical support.
MOP	**Maximum saturated evaporation temperature alarm referring to sensor S4**	• Check the status of the refrigeration system. • Change PID parameters. • If the problem persists, contact technical support.
LOP	**Minimum saturated evaporation temperature alarm referring to sensor S4**	• Check the status of the refrigeration system. • Change PID parameters. • If the problem persists, contact technical support.
VAL	**Valve Alarm:** A valve overcurrent or overheating alarm has been detected. Valve management is disabled. When the alarm returns, the valve is re-initialized to the total closing position.	• Check valve configuration and connections. • Switch the equipment off and on again. • If the problem persists, contact technical support.
CFG	**Valve not configured:** at first start-up, you are prompted to configure the type of valve connected.	• Configure the type of connected valve by setting the fourth level parameter "tEU".
Ini	**Initializing in progress** (complete closing)	• Wait for the initialization procedure to complete.

	TROUBLESHOOTING	**7.2**

If there is no alarm code, we list below some of the most common causes that can cause anomalies. These causes may be due to problems inside or outside the electrical panel.

EVENTS	POSSIBLE CAUSE	OPERATION TO BE PERFORMED
Display is off	No source power	• Check that the display on the panel and the green system indicator lights are on. ⏻ • Check the ambient probe connections. • If the problem persists, replace the probe.
	Intervention of the general protective magnetic-thermal switch.	• Before reinserting the magnetic-thermal switch, check that there are no short circuits. Then reinsert the magnetic-thermal switch, checking all the absorptions to detect eventual anomalies.
	Intervention of the secondary circuit protection fuse on the transformer.	• Reset the fuse (glass fuse 10x20 F**250mA** 250V). • Check that the absorption on the secondary of the transformer does not exceed 0.25A. • Check that no other users have been connected to the Kriwan power terminals. • Check that there are no short circuits on the secondary circuit.
The cold doesn't start	The panel is in stand-by mode	• Check that panel is not in stand-by (⏻ flashing green light). If necessary, press the correct key to reactivate the panel (⏻ steady green light).
Defrosting cycle is not performed	Incorrect setting of defrost cycle parameters	• Check that the set parameters are entered correctly.

CHAPTER 8: MAINTENANCE

8.1	GENERAL SAFETY RULES

Whatever the nature of the maintenance, it must only be carried out by specialised technical personnel.

In the event of failure or maintenance of the electrical system, before proceeding with any check, the power supply to the panel must be disconnected by placing the main power switch in the open position (O). Check the absence of voltage with a Tester before any operation.
Every element of the electrical panel, in the event that it is faulty, must be replaced exclusively with original parts.

If the intervention involves parts outside the panel, perform the following steps:
❑ Permanently and safely disconnect the power supply to the panel in one of the following ways:
  1) Turn the main switch of the 300 EXPERT STEPPER to OFF and padlock the front cover.
  2) Disconnect the power supply upstream of our panel permanently by padlocking it to OFF.
❑ Place signs to indicate the machine being serviced.

Before proceeding with maintenance operations, perform the following safety requirements:
❑ The electrical panel must be powerless.
❑ Prevent the presence of unauthorised personnel in the intervention area.
❑ Place appropriate signs to indicate "Machine in Maintenance".
❑ Wear suitable work clothing (overalls, gloves, shoes, headgear) and free of loose appendages.
❑ Remove any objects that may become entangled in protruding parts of the panel.
❑ Have available accident prevention means and tools suitable for the operation.
❑ The tools must be well cleaned and degreased.
❑ Have the necessary technical documentation available to perform the maintenance work (wiring diagrams, tables, drawings, etc.).
❑ At the end of the maintenance operations, remove all residual materials and thoroughly clean the panel.

It is absolutely forbidden to accommodate additional parts inside the electrical panel.

**The manufacturer declines all responsibility
in the event that the points of this chapter are not observed.**

MAINTENANCE 8.2

Programmed maintenance is necessary to ensure the functionality of the electrical panel over time and avoid that the deterioration of some elements becomes a source of danger to people. It must be carried out exclusively by specialised technical personnel and in compliance with general safety standards.

COMPONENT	TYPE OF INTERVENTION	FREQUENCY
Terminal blocks	Wire clamping	After the first 20 days of operation
Terminal blocks	Wire clamping	Yearly

SPARE PARTS/ACCESSORIES 8.3

Spare parts/accessories **ECP300 SERIES EXPERT STEPPER**

PEGO identification codes	DESCRIPTION
200SCH200STP	REPLACEMENT ELECTRONIC BOARD
SONOT1012	PRESSURE PROBE 4-20mA 0-12BAR FOR THE MEASUREMENT OF OVERHEATING
SONNTC3MIP68	TEMPERATURE PROBE FOR THE MEASUREMENT OF OVERHEATING

Spare parts and accessories must be requested from your dealer.

ATTACHMENTS / APPENDICES

A.1	EU DECLARATION OF CONFORMITY

LA PRESENTE DICHIARAZIONE DI CONFORMITA' E' RILASCIATA SOTTO LA RESPONSABILITA' ESCLUSIVA DEL FABBRICANTE:
THIS DECLARATION OF CONFORMITY IS ISSUED UNDER THE EXCLUSIVE RESPONSIBILITY OF THE MANUFACTURER:

PEGO S.r.l.   Via Piacentina 6/b, 45030 Occhiobello (RO) – Italy –
Società soggetta all'attività di direzione e coordinamento di Castel S.r.l.

DENOMINAZIONE DEL PRODOTTO IN OGGETTO / *DENOMINATION OF THE PRODUCT IN OBJECT*

❑ ECP300 EXPERT STEPPER

IL PRODOTTO DI CUI SOPRA E' CONFORME ALLA PERTINENTE NORMATIVA DI ARMONIZZAZIONE DELL'UNIONE EUROPEA:
THE PRODUCT IS IN CONFORMITY WITH THE RELEVANT EUROPEAN HARMONISATION LEGISLATION:

Direttiva Bassa Tensione (LVD):   **2014/35/EU**
Low voltage directive (LVD):   ***2014/35/EU***

Direttiva EMC: **2014/30/EU**
Electromagnetic compatibility (EMC):   ***2014/30/EU***

LA CONFORMITA' PRESCRITTA DALLA DIRETTIVA E' GARANTITA DALL'ADEMPIMENTO A TUTTI GLI EFFETTI DELLE SEGUENTI NORME:
THE CONFORMITY WITH THE REQUIREMENTS OF THIS DIRECTIVE IS TESTIFIED BY COMPLETE ADHERENCE TO THE FOLLOWING STANDARDS (including all amendments):

Norme armonizzate: **EN 60204-1:2006, EN 61439-1:2011, EN 61000-6–1:2007, EN 61000-6-3:2007**
European standards: ***EN 60204-1:2006, EN 61439-1:2011, EN 61000-6–1:2007, EN 61000-6–3:2007***

Firmato per nome e per conto di: Luogo e Data del rilascio:
Signed for and on behalf of: *Place and Date of Release:*

Pego S.r.l.   Occhiobello (RO), 01/01/2022
Martino Villa
Presidente

BOARD CONNECTION DIAGRAM　　**A.2**

Digital and analogical input diagram:

DIGITAL INPUTS	
2) Digital input 1 (Door switch)	4) Digital input 3 (Man in cell alarm)
3) Digital input 2 (Compressor protection)	12) Digital input 4
11) GND (common digital inputs 1 and 2)	13) GND (common digital inputs 3 and 4)
ANALOGICAL INPUTS	
7) Analogical Input 1 (Overheating Probe)	5) Analogical Input 3 (Defrost Probe)
6) Analogical Input 2 (Ambient Probe)	14) GND (common analogical input 3)
15) GND (common analogical inputs 1 and 2)	
PRESSURE PROBE INPUT	
8) Input 4-20mA (Pressure probe)	16) Power supply for 4-20mA probe
RS-485	
9) RS-485 channel A	1) GND input RS-485
10) RS-485 channel B	
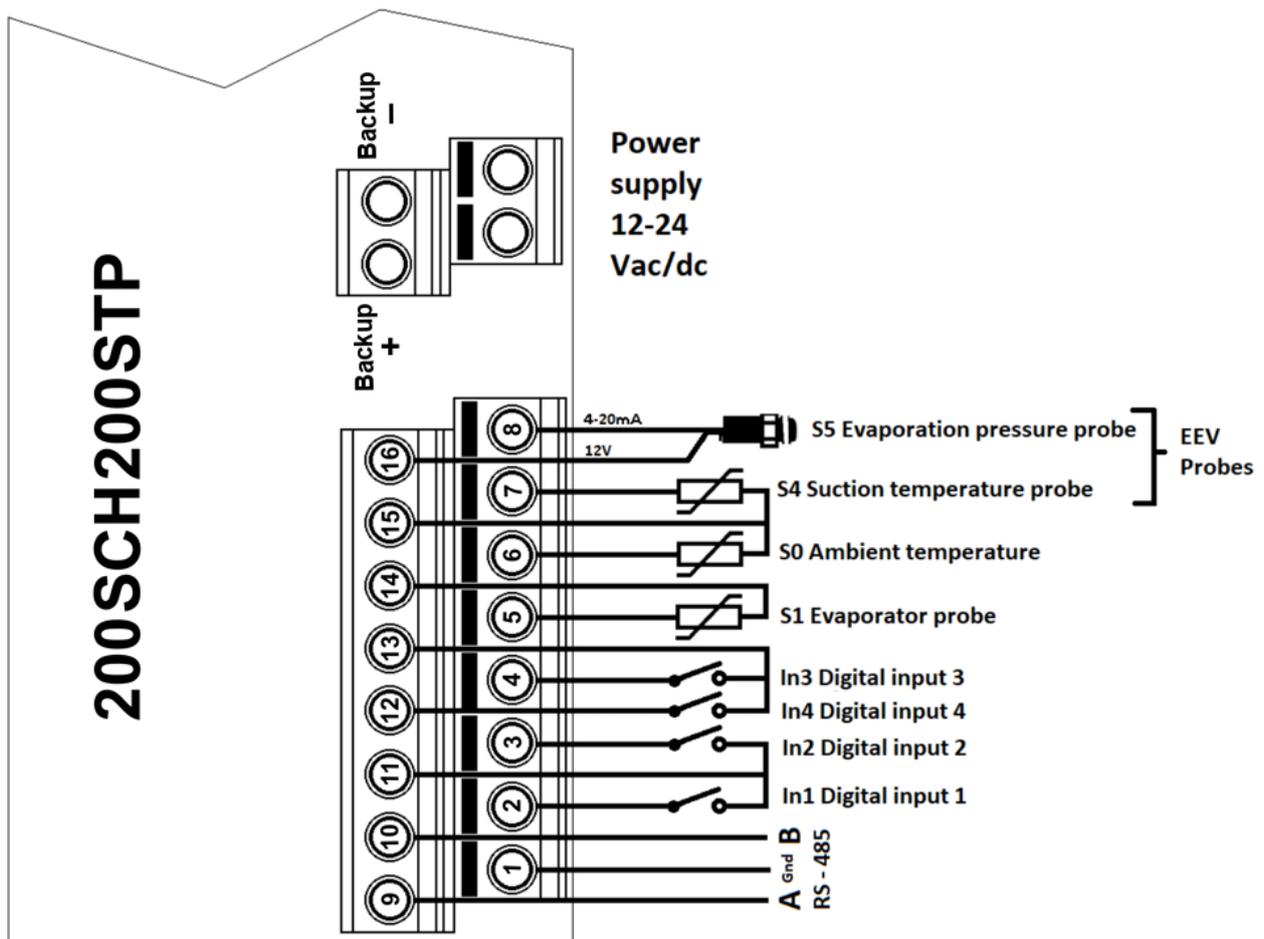
Output diagram:
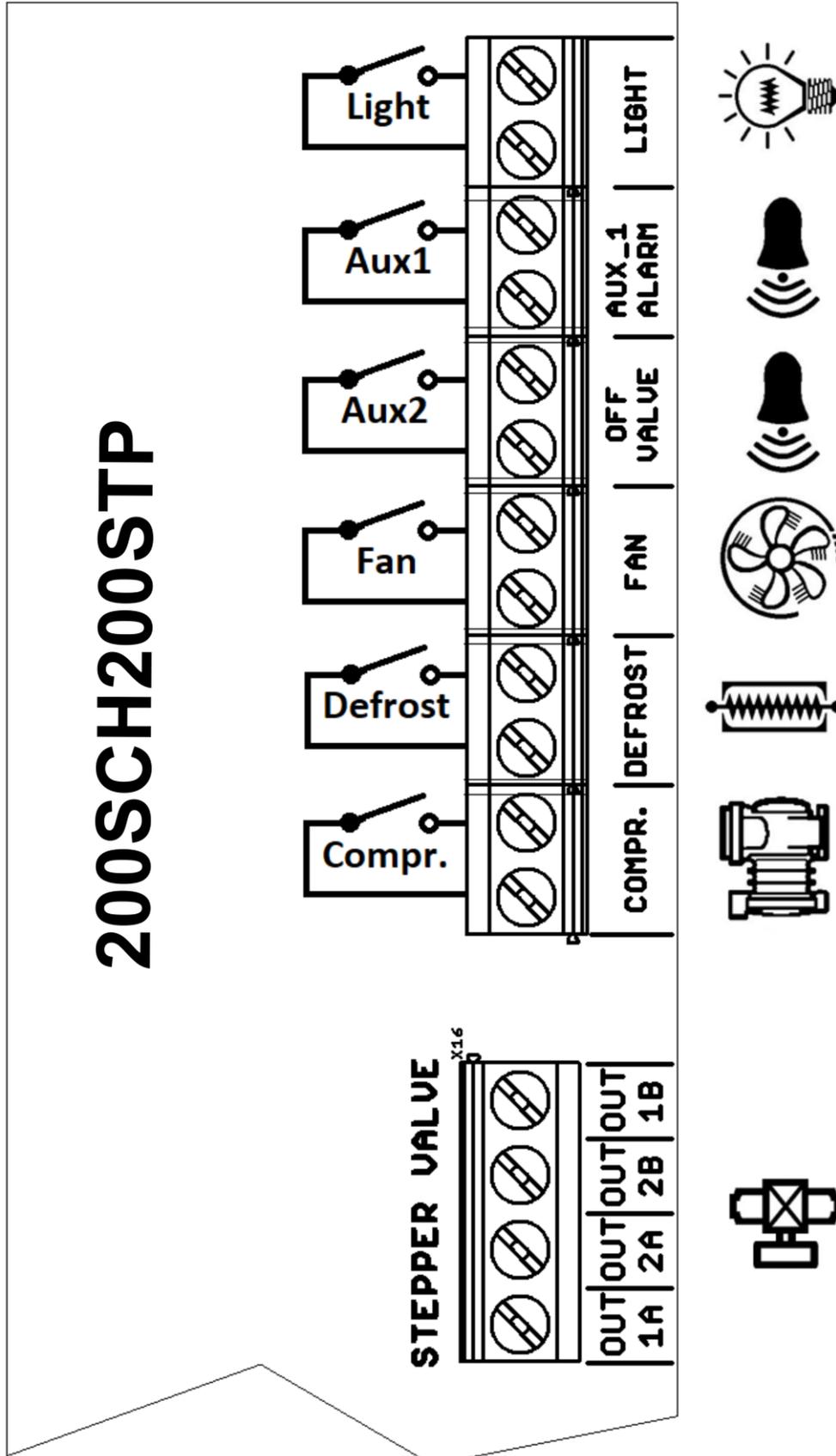
A.3　　　　**CONNECTION DIAGRAM TO THE TELENET NETWORK**

Remember to assign a network address consistent with the current TeleNET network, if present (2nd level parameter Ad).

A.4   **POSITIONING AND DESCRIPTION OF PROBES**

EEV

Evaporatore   Condensatore

S4 (Temp. Aspirazione)
S5 (Press. Evaporazione)

Compressore
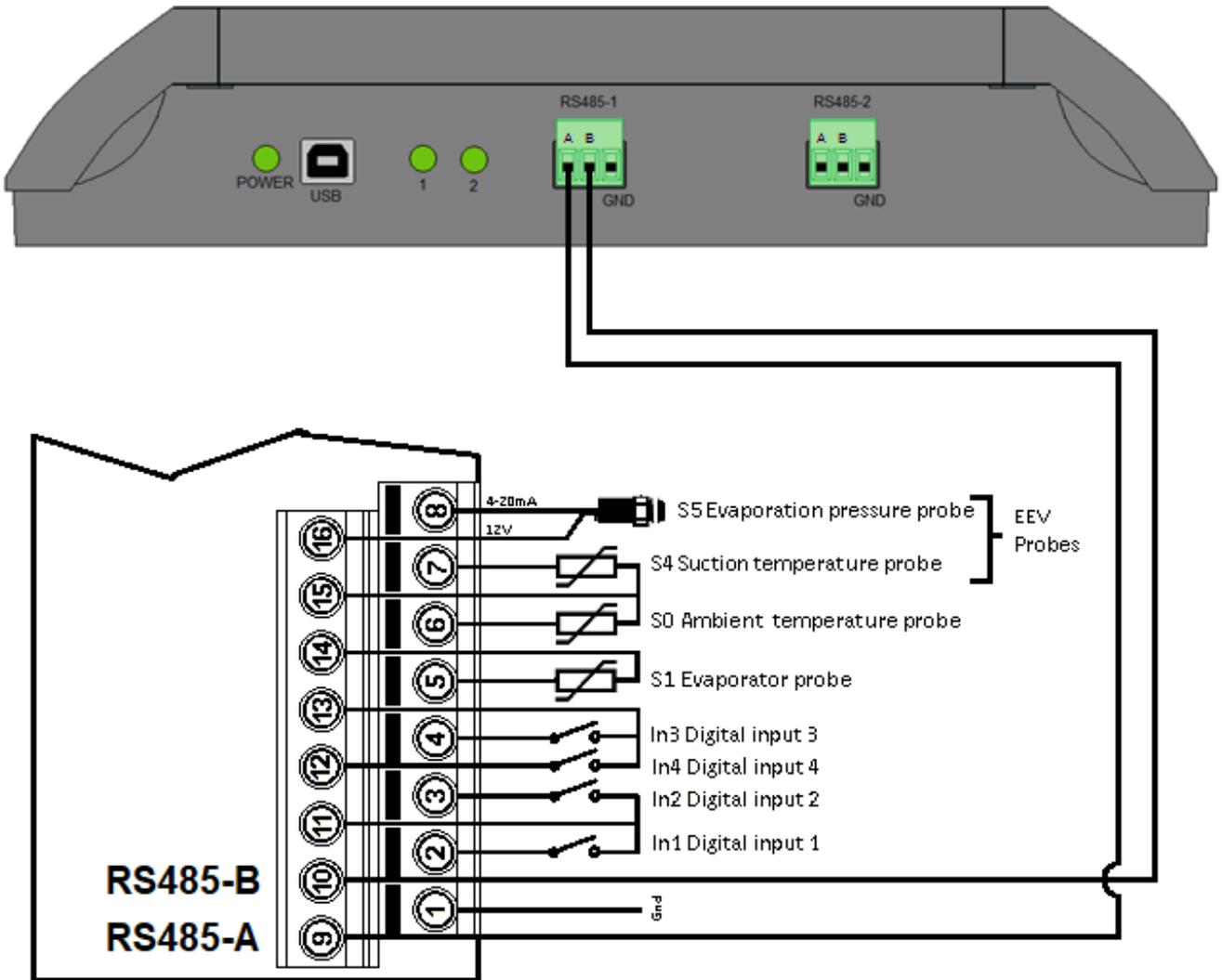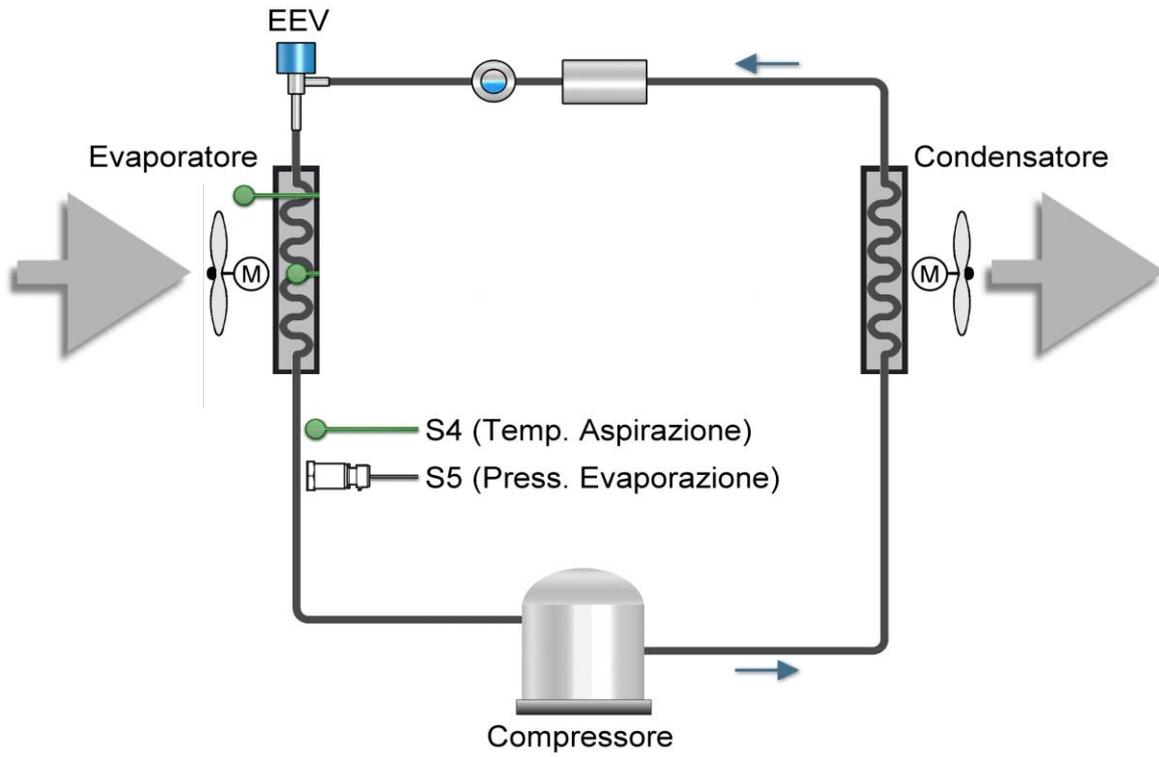
A.5   VALVE CONNECTIONS

Valve (par. tEU)	PIN 1A	PIN 2A	PIN 2B	PIN 1B
1 = Carel ExV	GREEN	BROWN	YELLOW	WHITE
2 = Danfoss ETS 25-50	GREEN	RED	WHITE	BLACK
3 = Danfoss ETS 100	GREEN	RED	WHITE	BLACK
4 = Danfoss ETS 250/400	GREEN	RED	WHITE	BLACK
5 = NOT USED	YELLOW	ORANGE	BLACK	RED
6 = Alco EX4	BLUE	BROWN	WHITE	BLACK
7 = Alco EX5	BLUE	BROWN	WHITE	BLACK
8 = Alco EX6	BLUE	BROWN	WHITE	BLACK
9 = Alco EX7	BLUE	BROWN	WHITE	BLACK
10 = Alco EX8 500	BLUE	BROWN	WHITE	BLACK
11 = Sporlan SEI 0.5-11	GREEN	RED	BLACK	WHITE
12 = Sporlan SER 1.5-20	GREEN	RED	BLACK	WHITE
13 = Sporlan SER(I) G,J,K	GREEN	RED	BLACK	WHITE
14 = Sporlan SEI 30	GREEN	RED	BLACK	WHITE
15 = Sporlan SEI 50	GREEN	RED	BLACK	WHITE
16 = Sporlan SEH 100	GREEN	RED	BLACK	WHITE
17 = Sporlan SEH 175	GREEN	RED	BLACK	WHITE
18 = Castel 261-271 / Eliwell SXVB261	WHITE(2)	BROWN(1)	BLUE(3)	BLACK(4)
19 = Castel 262-263/Eli. SXVB262-263	WHITE(2)	BROWN(1)	BLUE(3)	BLACK(4)
20 = Castel 272-273	WHITE(2)	BROWN(1)	BLUE(3)	BLACK(4)
21 = Castel 264 -274 / Eliwell SXVB264	WHITE(2)	BROWN(1)	BLUE(3)	BLACK(4)

NOTES

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