CONTROLLERS FOR MULTIPLEXED CABINETS
EC3-XM678D
REL. 5.4

1. GENERAL WARNING

1.1 ⚠ PLEASE READ BEFORE USING THIS MANUAL

- This manual is part of the product and should be kept near the instrument for easy and quick reference.
- The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device.
- Check the application limits before proceeding.
- Emerson reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.

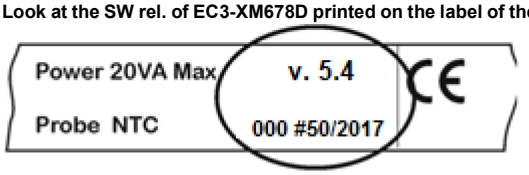
1.2 ⚠ SAFETY PRECAUTIONS

- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation
- Warning: disconnect all electrical connections before any kind of maintenance.
- Fit the probe where it is not accessible by the End User. The instrument must not be opened.
- In case of failure or faulty operation send the instrument back to the distributor or to Emerson (see address) with a detailed description of the fault.
- Consider the maximum current which can be applied to each relay (see Technical Data).
- Ensure that the wires for probes, loads and the power supply are separated and far enough from each other, without crossing or intertwining.
- In case of applications in industrial environments, the use of mains filters (our mod. FT1) in parallel with inductive loads could be useful.

2. BEFORE PROCEEDING

2.1 CHECK THE SW REL. OF THE EC3-XM678D

1. **Look at the SW rel. of EC3-XM678D printed on the label of the controller.**



2. **If the SW release is 5.4 proceed with this manual otherwise contact Emerson to get the right manual.**

3. GENERAL DESCRIPTION

The **EC3-XM678D** are high level microprocessor-based controllers for multiplexed cabinets suitable for applications on medium or low temperature. They can be inserted in a LAN of up to 8 different sections which can operate, depending on the programming, as standalone controllers or following the commands coming from the other sections. The **EC3-XM678D** are provided with 4 and 6 relay outputs respectively to control the solenoid valve, defrost - which can be either electrical or hot gas - the evaporator fans, the lights, an auxiliary output and an alarm output and with one output to drive **stepper electronic expansion valves**. The devices are also provided with four probe inputs, one for temperature control, one to control the defrost end temperature of the evaporator, the third for the display and the fourth can be used for application with virtual probe or for inlet/outlet air temperature measurement. In addition, they are provided by other two probes that have to be used for superheat measurement and regulation. Finally, they are equipped with the three digital inputs (free contact) fully configurable by parameters.
The instruments are equipped with the HOTKEY connector that permits to be programmed in a simple way. Direct serial output **RS485 ModBUS-RTU** compatible permits a simple XWEB interfacing. **RTC** are available as options. The HOTKEY connector can be used to connect **X-REP** display (Depending on the model).

4. INSTALLATION AND MOUNTING

This device can operate without any user interface, but normal application is with Emerson CH660 keyboard.

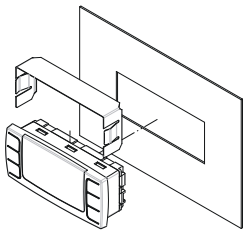


Figure 1a

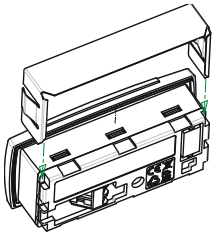


Figure 1b

The **CH660 keyboard** shall be mounted on vertical panel, in a 29 x 71 mm hole, and fixed using the special bracket supplied as shown in Fig. 1a/1b. The temperature range allowed for correct operation is 0 - 60°C. Avoid places subject to strong vibrations, corrosive gases, excessive dirt or humidity.

The same recommendations apply to probes. Let air circulate by the cooling holes.

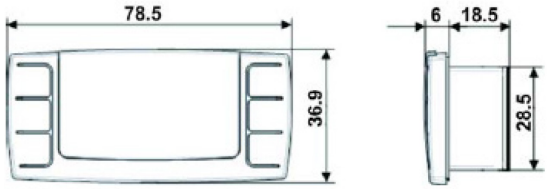


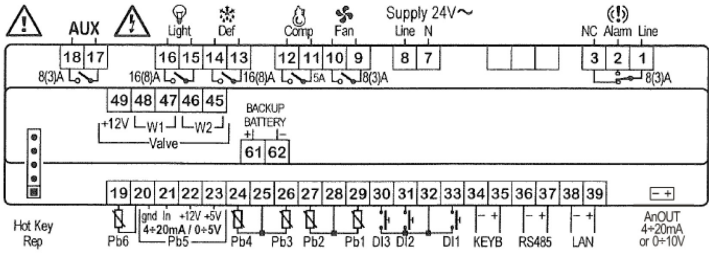
Figure 1c

5. WIRING DIAGRAM AND CONNECTIONS

5.1 IMPORTANT NOTE

XM device is provided with disconnectable terminal block to connect cables with a cross section up to 1.6 mm^2 for all the low voltage connection: the RS485, the LAN, the probes, the digital inputs and the keyboard. Other inputs, power supply and relay connections are provided with screw terminal block or fast-on connection (5.0 mm). Heat-resistant cables have to be used.
Before connecting cables make sure the power supply complies with the instrument's requirements. Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay, in case of heavier loads use a suitable external relay.
Note: Maximum current allowed for all the loads is 16 A.
The probes shall be mounted with the bulb upwards to prevent damages due to casual liquid infiltration. It is recommended to place the thermostat probe away from air streams to correctly measure the average room temperature. Place the defrost termination probe among the evaporator fins in the coldest place, where most ice is formed, far from heaters or from the warmest place during defrost, to prevent premature defrost termination.

5.2 EC3-XM678D



5.3 VALVE CONNECTIONS AND CONFIGURATION

5.3.1 Valve connections

!!! All the connections between EC3-XM678D and valve has to be done with the controller NOT supplied.!!!

5.3.2 Type of cables and max length

To connect the valve to the controller, use only shielded cables with section greater than or equal to 0.823 mm² (AWG18).
A twisted shielded cable with the above specification is suggested.
Don't connect the shield to any ground, live it floating.

The max distance between an XM controller and a valve **must not exceed 10 m**.

5.3.3 Valve selection

To avoid possible problems, before connecting the valve configure the driver by making the right changes on the parameters.
a. Select the kind of motor (**tEU parameter**)
b. Check if the valve is present in **tEP parameter table** reported here below.

→ **CHECK THE FOLLOWING TABLE FOR A RIGHT SETTING** ←

!!! In any case, the unique and valid reference has to be considered the datasheet made by valve manufacturer. Emerson cannot be considered responsible in case of valve damaging due to wrong settings!!!

tEP	Model	LSt (steps*10)	uSt (steps*10)	CPP (mA*10)	CHd (mA*10)	Sr (step/s)	tEu (bip/unip)	HSF (Half/full)
0	**Manual settings**	Par	Par	Par	Par	Par	Par	Par
1	Danfoss ETS-25/50	7	262	10	10	300	bP	FUL
2	Danfoss ETS-100	10	353	10	10	300	bP	FUL
3	Danfoss ETS-250/400	11	381	10	10	300	bP	FUL
11	Emerson EX4/EX5/EX6	5	75	50	10	500	bP	FUL

If you can see your valve on the table, please select the valve through **tEP parameter.** In this way, you can be sure of a right configuration. About the connection, please pay attention to the following table to have a quick reference on the connection mode for valves of different manufacturer

4 WIRES VALVES (BIPOLAR)

Connection numbering	ALCO EX4/5/6/7/8	DANFOSS ETS
45	**BLUE**	**BLACK**
46	**BROWN**	**WHITE**
47	**BLACK**	**RED**
48	**WHITE**	**GREEN**

5-6 WIRES VALVES (UNIPOLAR)

Connection numbering	SPORLAN	SAGINOMIYA
45	ORANGE	ORANGE
46	RED	RED
47	YELLOW	YELLOW
48	BLACK	BLACK
49 – Common	GRAY	GRAY

1. **After selecting the valve, please switch off and on the controller to load the new settings.**
2. **Switch off the controller, before connecting the valve. Do the connection with controller off.**
3. **Switch the controller on**

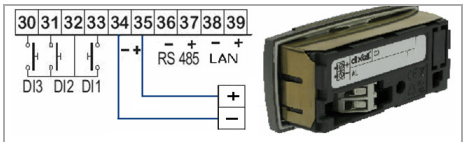
5.4 ABSOLUTE MAXIMUM POWER

EC3-XM678D is able to drive a wide range of stepper valves, on the following table are indicated the maximum values of current that the actuator can supply to the stepper wiring. The **TF20D** Emerson transformer has to be used.

NOTE: The electrical power absorption of the valve can be unrelated to refrigeration power that valve has. Before using the actuator, please read the technical manual of the valve supplied by the manufacturer and check the maximum current used to drive the valve in order to verify that they are lower than those indicated below.

VALVE		
	BIPOLAR VALVES (4 wires)	**Maximum Current 0.5 A**
	UNIPOLAR VALVES (5-6 wires)	**Maximum Current 0.33 A**

5.5 KEYBOARD DISPLAY CH660



The **EC3-XM678D** board can operate also without keyboard.

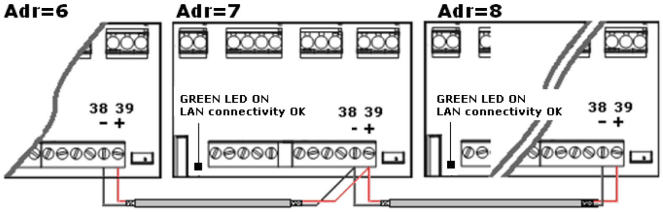
Polarity:
Terminal [**34**] [-]
Terminal [**35**] [+]

Use twisted shielded cable AWG 18 or less in case of long distance.
Max distance: 30 m

5.6 LAN CONNECTION

Follow next steps to create a LAN connection, which is a necessary condition to perform synchronized defrost (also called master-slave functioning):

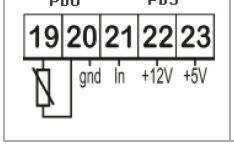
1) connect a shielded cable between terminals [**38**] [-] and [**39**] [+] for a **maximum of 8 sections**;
2) the **Adr** parameter is the number to identify each electronic board. **Address duplication is not permitted**, in this case the synchronized defrost and the communication with monitoring system is not guaranteed (the **Adr** is also the ModBUS address). For example, a correct configuration is the following:



If the LAN is well connected, the green LED will be ON. If the green LED blinks then the connection is wrongly configured.

The max distance allowed is 30 m

5.7 SENSORS FOR SUPERHEAT CONTROL



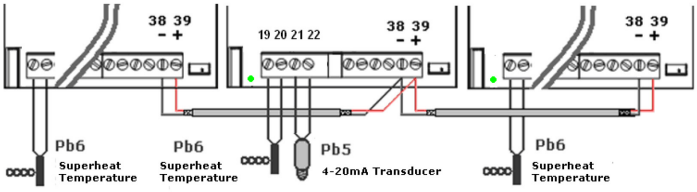
Temperature probe: Pb6 terminals [**19**] - [**20**] without any polarity.

Select the kind of sensor with **P6C** parameter.

Pressure transducer: Pb5 terminals:
[**21**] = input of the signal; [**22**] = Power Supply for 4 – 20 mA transducer; [**20**] = GND; [**23**] = +5 VDC power supply for ratiometric pressure transducer.

Select the configuration of the transducer with parameter **P5C**.

5.8 HOW TO USE ONLY ONE PRESSURE TRANSDUCER ON MULTIPLEXED APPLICATIONS



A working LAN connection is required (green LED lit on all EC3-XM678D boards of the same LAN). Connect and configure a pressure transducer only on **one** EC3-XM678D of the network. Afterwards, the value of pressure read by the unique transducer connected will be available to each device connected to the same LAN.

By pressing **UP ARROW** button, the user will be able to enter a fast selection menu and to read the value of the following parameters:

dPP = measured pressure (only on master device).
dP5 = value of temperature obtained from pressure → temperature conversion.
rPP = pressure value read from remote location (only for slave devices).

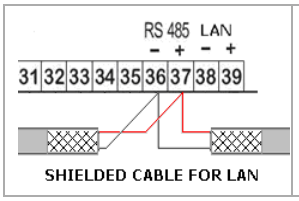
Examples of error messages:
dPP = **Err** → the local transducer read a wrong value, the pressure is out of the bounds of the pressure transducer or the **P5C** parameter is wrong. Check all these options and eventually change the transducer;

rPF → the remote pressure transducer is on error situation. Check the status of the onboard GREEN LED: if this LED is OFF the LAN is not working, otherwise check the remote transducer.

LAST CHECKS ABOUT SUPERHEAT

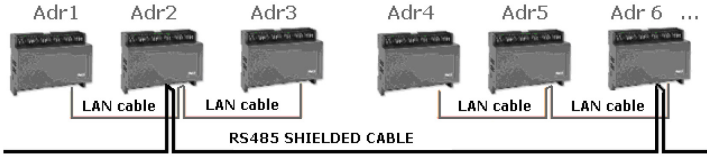
On the fast access menu:
dPP is the value read by the pressure gauge.
dP6 is the value read by the temperature probe, temperature of the gas on the outlet section of the evaporator.
SH is the value of the superheat. The **nA** or **Err** messages mean that the superheat has no sense in that moment and its value is not available.

5.9 HOW TO CONNECT MONITORING SYSTEM



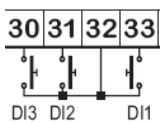
1) Terminals [**36**] [-] and [**37**] [+].
2) Use shielded twisted cable. For example Belden® 8762 o 8772 or cat 5 cables.
3) Maximum distance 1 Km.
4) Don't connect the shield to the earth or to GND terminals of the device, avoid accidental contacts by using insulating tape.

Only one device for each LAN has to be connected to the RS485 connection.



The **Adr** parameter is the number to identify each electronic board. **Address duplication is not permitted**, in this case the synchronized defrost and the communication with monitoring system is not guaranteed (the **Adr** is also the ModBUS address).

5.10 DIGITAL INPUTS

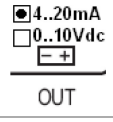


1) The terminals from [**30**] to [**33**] are all free of voltage;
2) Use shielded cable for distance higher than one meter;

For each input, has to be configured: the polarity of activation, the function of the input and the delay of signaling.

The parameters to perform this configuration are **i1P**, **i1F**, **i1d** respectively for polarity, functioning and delay.
The **i1P** can be:
cL = active when closed; **oP** = active when opened.
The **i1F** can be:
EAL = external alarm, **bAL** = serious lock alarm,
PAL = pressure switch alarm, **dor** = door switch,
dEF = external defrost, **AUS** = auxiliary activation command,
LiG = light activation, **OnF** = board On/OFF,
FHU = don't use this configuration, **ES** = day/night,
HdY = don't use this configuration.
Then there is **i1d** parameter for delay of activation.
For the others digital inputs there are a set of the same parameters: **i2P**, **i2F**, **i2d**, **i3P**, **i3F**, **i3d**.

5.11 ANALOG OUTPUT



- Selectable between 4 – 20 mA and 0 – 10 VDC.
- Use CABCJ15 to perform the connections

It's located near the terminal [**39**] on a 2-pin connector. It's possible to use the output to control anti-sweat heaters through a chopped phase controller XRPW500 (500 W) or family XV...D or XV...K.

6. QUICK REFERENCE GUIDE: HOW TO RUN THE SELF ADAPTIVE REGULATION IN 4 STEPS.

1. After wiring the EC3-XM678D, **set the proper gas** via **Fty** parameter
2. **Set the proper gas** via **Fty** parameter, among the following

CODE	REFRIGERANT	OPERATING RANGE
r22	R22	-50 - 60°C/-58 - 120°F
134	R134A	-50 -60°C/-58 - 120°F
290	R290 – Propane	-50 - 60°C/-58 - 120°F
404	R404A	-70 - 60°C/-94 - 120°F
47A	R407A	-50 - 60°C/-58 - 120°F
47C	R407C	-50 - 60°C/-58 - 120°F
47F	R407F	-50 - 60°C/-58 - 120°F
410	R410A	-50 - 60°C/-58 - 120°F
448	R448A	-45 - 60°C/-69 - 120°F

CODE	REFRIGERANT	OPERATING RANGE
449	R449A	-45 - 60°C/-69 - 120°F
450	R450A	-45 - 60°C/-69 - 120°F
507	R507	-70 - 60°C/-94 - 120°F
513	R513A	-45 - 60°C/-69 - 120°F
CO2	R744 - Co2	-50 - 60°C/-58 - 120°F

Pre-set refrigerant is **R448A.**

3. **Configure the probes**:
   - **Regulation and evaporator** probe are preset as NTC. If another kind of sensors is used, set it via P1c and P2c parameters.
   - **Superheat evaporator outlet probe** is pre-set as Pt1000, if another kind of sensor is used, set it via P6c parameter.
   - The **PP11** (-0.5 – 11 bar) is pre-set as **pressure probe.** It operates at relative pressure (**Pru** = rE).
     If you're using a ratiometric transducer, set **P5c = 0 - 5**, then use parameters **PA4** and **P20** to set the range
     NOTE: **C**heck the pressure gauge reading with the value of dPP, press the **UP** arrow once to enter the **Fast Access Menu**. If ok, proceed; otherwise solve the situation before proceeding acting on par. Pru, PA4 and P20.

4. **Set the parameters for self-adaptive regulation of superheat**
   NOTE: **T**he parameters **Pb** (regulation band) and **Int** (integral time) are automatically calculated by the controller
   - Set **CrE = no,** this disables the continuous regulation of the temperature. Default is CrE = no.
   - Set **SSH**, **superheating setpoint**: a value between 4 - 8 is acceptable. Default is SSH = 6
   - Set **ATU = y** to start the **self-adaptive regulation**. Default is ATU = y.
   - Set **AMS = y** to start the search of the **lowest stable superheat**. Default is AMS = n. This function reduces automatically the setpoint in order to optimize the use of the evaporator, keeping, at the same time, the superheating regulation stable. The minimum allowed SH set point is LSH+2°C.
   - Set **LSH**, **low superheating limit**: a value between 2 - 4 is acceptable. Default is LSH = 2
   - Set **AnP, pressure filter**: Default is AnP = 3. The value can be increased up to 10 in case of too fast response of the pressure variations.

5. **Set the parameters for the temperature regulation**
   - Set the temperature **setpoint**. Default is 2°C
   - Set **the differential HY**: Default is 2°C.
   - If the **capacity of the valve** is higher than requested, it can be reduced by the par. **MnF** (Default is 100). A proper setting of MnF will reduce the time that the algorithm takes to reach the stability.
     MnF value doesn't affect the band width.

7. BATTERY BACK UP CONNECTION

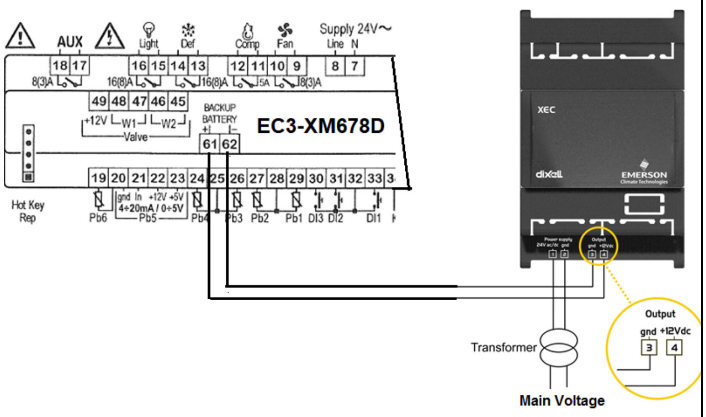
7.1 CONNECTION OF EXD-PM SUPERCAP

EXD-PM Supercap is designed to be used with Emerson products (EC3-XM678D, EXD-SH1/2);

!!!!! IMPORTANT !!!!!
EXD-PM Supercap and EC3-XM678D **must be powered by two different transformers**; the failure of the observance of this rule may result in damage to the EXD-PM Supercap and / or the connected EC3-XM678D.

Wiring connection

EC3-XM678D	EXD-PM
Terminal 61 (+)	Terminal 4 (12 VDC)
Terminal 62 (-)	Terminal 3 (gnd)



7.2 EMERSON ECP-024 CONNECTION

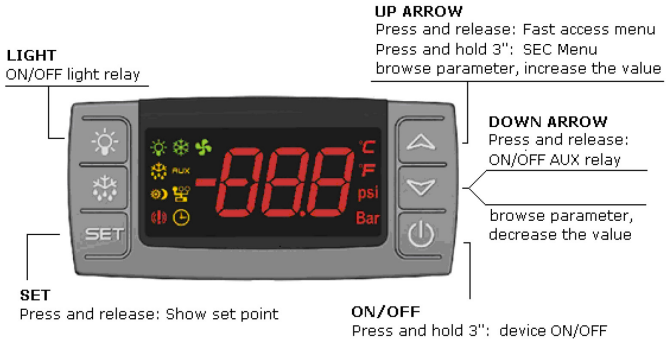
The Emerson ECP-024 rechargeable accumulator can be connected to the EC3-XM678D to close the stepper valve in case of power interruption.

Wiring connection

EC3-XM678D	ECP-024
Terminal 61 (+)	Terminal +
Terminal 62 (-)	Terminal -

About conditions of use and limitation please refer to the ECP-024 manuals.

8. USER INTERFACE



8.1 ICONS

Cooling output ↓

Light →				← Fan
Defrost →		AUX	← Auxiliary relay	
Energy saving →			← Multimaster Enabled	
Generic alarm →			← Clock / time	

With icon ON the output is active, while with blinking icon there is a delay.

MEASUREMENT UNIT

°C, bar and (time) are ON depending on the selection.

DURING PROGRAMMING: blink the measurement units of temperature and pressure

8.2 KEYBOARD COMMANDS

Single commands:

LIGHT relay	Press light button.
AUX relay	Press down arrow.
Manual defrost	Press and hold for 3 s the defrost button
ON/OFF	Press for 3 s the **ON/OFF** button (if the function is enabled).
Energy Saving	Press for 3 s the **ON/OFF** button (if the function is enabled).

Double commands:

+	Press and hold for about 3 s to lock (**Pon**) or unlock (**PoF**) the keyboard.
SET +	Pressed together to exit from programming mode or from menu; on submenus **rtC** and **EEV** this combination allow to come back to previous level.
SET +	Pressed together for 3 s allow to access to first level of programming mode.

8.3 HOW TO MODIFY THE SET POINT FOR AIR TEMPERATURE REGULATION

The thermostat set point is the value that will be used to regulate the air temperature. The regulation output is controlled by the electronic valve or by the relay.

Action	Button or display	Notes
BEGIN	SET	Press SET button for 3 s, the measurement units will blink together.
Value modification	or	With the arrows it's possible to change the value within the LS and US parameters value.
EXIT	SET	By pressing SET it is possible to confirm the value that will blink for about 2 s.

In any case, it is possible to wait for about 10 seconds to exit. In order to show the air temperature set is sufficient to press and release the SET button, the value is displayed for about 60 sec.**KEY COMBINATIONS.**

9. HOW TO PROGRAM THE PARAMETERS (PR1 AND PR2)

The device provide 2 programming levels: **Pr1** with direct access and **Pr2** protected with a password (intended for experts).

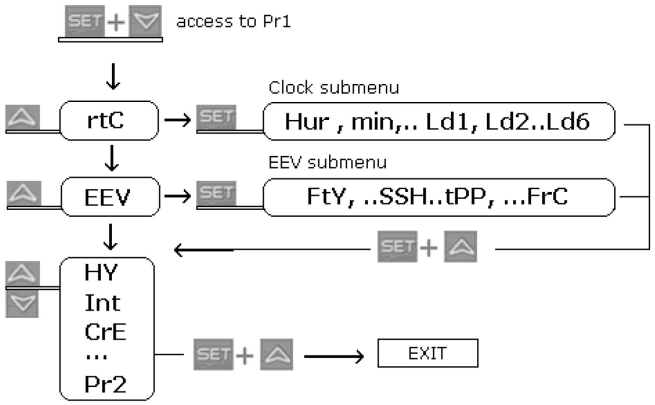
Action	Button or display	Notes
ACCESS to Pr1	SET +	Press and hold for about 3 seconds to have access to the first programming level (**Pr1**).
Select item	or	Select the parameter or submenu using the arrows.
Show value	SET	Press **SET** button.
Modify	or	Use the arrows to modify the value.
Confirm and store	SET	Press **SET** key: the value will blink for 3 seconds, and then the display will show the next parameter.
EXIT	SET +	Instantaneous exit from the programming mode, otherwise wait for about 10 seconds (without press any button).

9.1 HOW TO HAVE ACCESS TO "PR2"

To enter **Pr2** programming menu:

1. Access to a **Pr1** menu by pressing both **SET+DOWN** keys for 3 seconds, the first parameter label will be showed;
2. Press **DOWN** key till the **Pr2** label will be showed, then press **SET**;
3. The blinking **PAS** label will be showed, wait some seconds;
4. Will be showed "**0 - -**" with blinking 0: insert the password [**321**] using the keys **UP** and **DOWN** and confirming with **SET** key.

GENERAL STRUCTURE: The first two item **rtC** and **EEV** are related to submenus with other parameters.



- **SET+UP** keys on **rtC** or **EEV** submenus allow coming back to parameter list,
- **SET+UP** keys on parameter list allow immediate exit.

9.2 HOW TO MOVE PARAMETER FROM PR1 TO PR2 AND VICE VERSA

Enter on **Pr2**; select the parameter; press together [**SET** + **DOWN**]; a left side LED ON gives to the parameter the presence on **Pr1** level, a left side LED OFF means that the parameter is not present on **Pr1** (only **Pr2**).

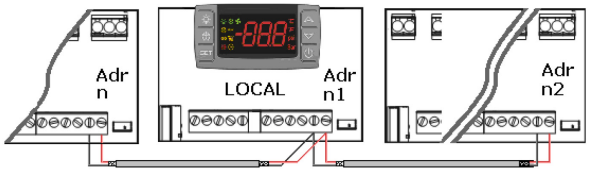
10. FAST ACCESS MENU

This menu contains the list of probes and some values that are automatically evacuate by the board such as the superheat and the percentage of valve opening. The values: **nP** or **noP** stands for probe not present or value not evacuate, **Err** value out of range, probe damaged not connected or incorrectly configured.

Action	Button or display	Notes
Entering fast access menu		By press and release the **UP arrow**. The duration of the menu in case of inactivity is about 3 min. The values that will be showed depend on the configuration of the board.
Use or arrows to select an entry, then press SET to see the value or to go on with other value.		**MAP** Current map (0÷3): it shows which map is used. **HM** Access to clock menu or reset of the RTC alarm; **An** Value of analog output; **SH** Value of superheat. **nA** = not Available; **oPP** Percentage of valve opening. **dP1** (Pb1) Value read by probe 1. **dP2** (Pb2) Value read by probe 2. **dP3** (Pb3) Value read by probe 3. **dp4** (Pb4) Value read by probe 4. **dP5** (Pb5) Temperature read by probe 5 or value obtained from pressure transducer. **dP6** (Pb6) Value read by probe 6. **dPP** Pressure value read by (Pb5) transducer. **rPP** Virtual pressure probe, only on slave. **rCP** Value of P4 remote probe for heaters. It is displayed only with P4C = LAn. If the value is not available "noP" label is displayed. **dPr** Regulation probe value **rSE** Real thermoregulation set point: the value includes the sum of SET, HES and/or the dynamic set point if the functions are enabled. **L°t** Minimum room temperature; **H°t** Maximum room temperature; **tMd** Time to next defrost (mins) **LSn** Number of devices in the LAN **LAn** Address list of devices in the LAN **GAL** To see all the active alarms in each device connected to the LAN
Exit	SET +	Pressed together or wait the timeout of about 60 sec

11. MENU FOR MULTIMASTER FUNCTION: SEC

The function "section" **SEC** is enabled when icon is lit. It allows share the commands, from a keyboard not physically connected to the board, through the LAN functionality.



Action	Button or display	Notes
Enter menu		Press UP arrow for about 3 s, the icon will be ON.
Waiting for action	**SEC**	The menu to change the section will be entered. **SEC** label will be displayed.
Enter section list	SET	Press **SET** to confirm. The following list will be available to select the proper network function.
Select proper function	Or **LOC** **GLb**	To gain access only to the local device. To share global commands to all the devices connected to the LAN.
Confirm	SET	Select and confirm an entry by pressing **SET** button.
Exit menu	SET +	Press **SET** and **UP** together or wait about 10 seconds.

(*) The devices on the LAN are indexed by using the **Adr** parameter (in ascending order).

EXAMPLE:
To send a command to in all the devices connected to the LAN: enter multimaster menu. Select and confirm **GLb**. Exit from multimaster menu. Enter the programming menu and set the parameter of global commands (from LMd to ACE).
The new setting will be shared among the controllers connected to the LAN.

⚠ **AT THE END OF THE PROGRAMMING PROCEDURE, SELECT THE SECTION "LOC". IN THIS WAY THE ICON WILL BE SWITCHED OFF!!!**

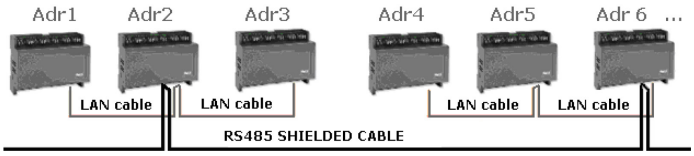
11.1 SYNCHRONIZED DEFROST

The synchronized defrost allow to manage multiple defrost from different boards connected through the LAN connection. In this way, the boards can perform simultaneous defrosts with the possibility to end them in a synchronized way.

⚠ **The Adr parameter cannot be duplicated because in this case the defrost cannot be correctly managed.**

Action	Button or display	Notes
BEGIN	SET +	Press for 3 seconds, the **rtC** or other will be showed. The measurement unit blinks.
Find Adr		Press more than once the DOWN arrow to find the **Adr** parameter, the press **SET**.
Modify Adr	or	Set the value of **Adr** parameter, then press **SET** to confirm the parameter.
EXIT	SET +	Press the two keys together to exit from menu or wait for about 10 seconds.

The **LSn** and **LAn** parameter are only to show the actual settings (read only). The following example of configuration:



DAILY DEFROST FROM RTC: [cPb = y] & [EdF = rtC]

IdF Parameter:
for safety reason force the value of **Idf** at +1 respect to the interval between two **Ld** parameters. The **IdF** timer is reinitialized after defrost and at every power-on.
DEFROST START:
at the time selected by the parameters **Ld1** to **Ld6** or **Sd1** to **Sd6**.
DEFROST END:
if the probes reach the **dtE** temperature or for maximum **MdF** time.
SAFETY and RtC or RtF ALARM:
with clock alarm the device will use the parameter **IdF, dtE** and **MdF**.

!!! WARNING: Don't set [EdF = rtC] and [CPb = n].!!!

MULTIMASTER DEFROST: all the probes with clock
Table for example

Par.	Unit A (RTC)	Unit B (RTC)	Unit C (RTC)
Adr	n	N + 1	N + 2
EdF	rtC (clock)	rtC (clock)	rtC (clock)
IdF	9 hours safety	9 hours safety	9 hours safety
MdF	45 min safety	45 min safety	45 min safety
dtE	12°C safety	12°C safety	12°C safety
Ld1	06:00 1°	06:00 1°	06:00 1°
Ld2	14:00 2°	14:00 2°	14:00 2°
Ld3	22:00 3°	22:00 3°	22:00 3°

12. COMMISSIONING

12.1 CLOCK SETTING AND RTC ALARM RESET

If the clock is present: [**EdF = rtC**] enable the defrost from rtc [**Ld1** - **Ld6**].

Action	Button or display	Notes
BEGIN		UP arrow (press once) to access the fast access menu
Display	**HM** identify the clock RTC submenu; press SET	

Display	**HUr** = hour → press SET to confirm/modify **Min** = minutes → press SET to confirm/modify …… **don't use** others parameters if present.
EXIT	SET + ⌃ Press for about 10 seconds. The operation resets the RTC alarm.

Note: The **rtC** clock menu is present also on the second level of parameters.
Warning: **If the board shows the rtF alarm, the device has to be changed.!!!**

12.2 ⚠ ELECTRONIC VALVE SETTINGS

Some parameters have to be checked:
[1] Superheat temperature probe: Ntc, Ptc, Pt1000 with parameter **P6C**. The sensor has to be fixed at the end of the evaporator.
[2] Pressure transducer: [4 – 20 mA] or ratiometric **P5C = 420** or **5Vr** with parameter **P5C.**
[3] Range of measurement: check the parameter of conversion **PA4** and **P20** that are related to the transducer.
TRANSDUCER: [-0.5/7 bar] or [0.5/8 bar abs] the correct setup is relative pressure with PA4 = -0.5 and P20 = 7.0. The [0.5/12 bar abs] the correct setup is relative pressure with PA4 = -0.5 and P20 = 11.00.

Example of virtual pressure with unique [4 – 20 mA] or [0 – 5 V] transducer:

Param.	EC3-XM678D_1 without transducer	EC3-XM678D_2 + with transducer	EC3-XM678D_3+ without transducer
Adr	n	n + 1	n + 2
LPP	LPP = n	LPP = Y	LPP = n
P5C	LAN or not connect the probe	P5C= 4-20 mA or 0-5 V	LAN or not connect the probe
PA4	Not used	-0.5 bar	Not used
P20	Not used	11.0 bar	Not used

[4] From EEV submenu: select the correct kind of gas with **FTY parameter.**
[5] Use the following parameters to setup the right valve driving, according to the valve datasheet from the manufacturer.

13. ⚠ KIND OF REGULATION FOR SUPERHEAT: SELF ADAPTIVE OR MANUAL OPERATING MODE

13.1 GENERAL CONSIDERATIONS: SELF ADAPTIVE OR MANUAL SH CONTROL

The controller is able to regulate the superheat in manual or self-adaptive mode, according to the value of the parameter **ATU, autotuing enabling.**
- With **ATU = n: the manual SH regulation is performed**
- With **ATU = y: the self-adaptive SH regulation is performed**

13.2 MANUAL OPERATING MODE - ATU = NO

The temperature and SH regulation can be performed in 2 ways according to the value of the parameter CrE: on/off or continuous. See below in details Standard temperature regulation

13.2.1 ON/OFF TEMPERATURE REGULATION [CrE = n]

1. Temperature regulation is ON/OFF and it depends on the SET point and HY parameter (differential) Valve is closed when the temperature reaches the set point and open when the temperature is higher than set point + differential.
2. The superheat is regulated to be closer to its set point.
3. With more pauses normally also the humidity is bigger.
4. Regulation pauses can be realized using **Sti** and **Std** parameters (during these pauses the valve is closed).

13.2.2 COUNTINUOUS REGULATION OF THE TEMPERATURE [CrE = Y] (with superheat regulation):

1. The **HY** parameter becomes temperature band for PI control. A default good value is **10°K.**
2. The regulation of injection is continuous and the cooling output is always on.
   The icon ❄ is always ON excluding the defrost phase.
3. The superheat is regulated following the **SSH** parameter.
4. Regulation pauses can be realized using **Sti** and **Std** parameters (during these pauses the valve is closed).
5. Increasing the **Int** integral time it is possible to decrease the speed of reaction of the regulator on the **HY** band.

13.3 SELF ADAPTIVE OPERATING MODE – ATU = YES

Auto-adaptive means to find and maintain the condition of the lowest super heating according to the load and environmental conditions present in a given time on the evaporator.
The parameter **ATU** enables the self-adaptive mode for the superheat regulation.
In this functioning the values of Pb and inC parameter are automatically set by the controller according to the kind of applications and the response of the system.

With the **ATU = YES, CrE** must be set at **NO**.

The self-adaptive algorithm does not affect, the functions related to the forced opening of the valve in special situation such as:
- **Forced opening of the valve at start of regulation,** parameter **SFP** (percentage) and **SFd** (time).
- **Forced opening of the valve after defrost,** parameter **oPd** (percentage) and **Pdd** (time).

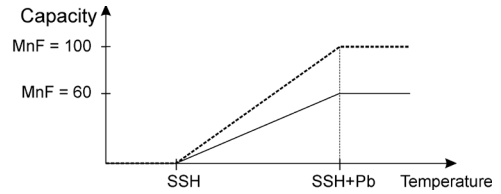
13.4 MINIMUM STABLE SUPERHEAT SEARCH - AMS = YES, AMS = YES

With the parameter **AMS,** the minimum stable superheat search function is enabled**.**

With AMS = yES controllers start searching the minimum stable value for the SH, the minimum admitted value in any case is LSH + 2°C (4°F).Please take it in consideration, before setting LSH value.

13.5 VALVE CAPACITY REDUCING – MNF PARAMETER

Thanks to the parameter MnF it's possible to reduce the capacity of the valve, to fine tune the valve to the evaporator.
The regulation band is not affected from the modification of the MnF parameter.
See below the behaviour of the capacity of the valve, when the MnF parameter is adjusted.



NOTE: During the soft start phase (oPE, SFd), MnF parameter is not taken in consideration and the capacity of the valve is set by the parameters SFP and oPd, respectively.

13.6 PRESSURE FILTERING – AnP PARAMETER

For a good SH regulation, it's important to use a filtered value of the pressure.
This can be done by the parameter AnP.
Suggested values: From 1-5 evaporators for each racks: AnP = 5-6
From 6-30 evaporators for each racks: AnP = 3-4
More than 30 evaporators for each racks: AnP = 2-3

14. DISPLAY MESSAGES

	Display	Causes	Notes
		KEYBOARD	
1	**nod**	No display: the keyboard is trying to work with another board that is not working or not present	Press for 3 seconds UP arrow, enter the **SEC** menu and select **LOC** entry.
2	**Pon**	Keyboard is unlocked	
3	**PoF**	Keyboard is locked	
4	**rSt**	Alarm reset	Alarm output deactivated
5	**noP, nP nA**	Not present (configuration) Not available (evaluation)	
6	**noL**	The keyboard is not able to communicate with the EC3-XM678D	Verify the connection. Call the Service
		ALARM FROM PROBE INPUT	
6	**P1 P2 P3 P4 P5 P6 PPF CPF**	Sensor brake down, value out of range or sensor incorrectly configured **P1C**, **P2C** to **P6C**. **PPF** can be showed by slaves of pressure that don't receive the value of pressure. **CPF** is showed when the remote probe 4 is not working.	**P1**: the cooling output works with **Con** and **COF**, With defrost probe on error the defrost is performed only at interval. For **P5**, **P6** and **PPF**: the percentage of the valve opening is fixed at **PEO** value.
		TEMPERATURE ALARM	
7	**HA**	Temperature alarm from parameter ALU on probe **rAL**.	Outputs unchanged.
8	**LA**	Temperature alarm from parameter ALL on probe **rAL**.	Outputs unchanged.
9	**HA2**	Second high temperature alarm	Outputs depends on setting.
10	**LA2**	Second low temperature alarm	Outputs depends on setting.
		DIGITAL INPUT ALARM	
13	**dA**	Door open alarm from input **i1F**, **i2F** or **i3F** = after delay **d1d**, **d2d** or **d3d**.	Cooling relay and fan follow the **odc** parameter. Cooling restart as specified on **rrd** parameter.
14	**EA**	Generic alarm from digital input **i1F**, **i2F**, **i3F** = **EAL**.	
15	**CA**	Severe alarm of regulation lock from digital input **i1F**, **i2F**, **i3F** = **bAL**.	Regulation output OFF.
16	**PAL**	Pressure switch lock **i1F**, **i2F** o **i3F** = **PAL**.	All the outputs are OFF.
		ELECTRONIC VALVE ALARM	
17	**LOP**	Minimum operating pressure threshold from **LOP** parameter.	The valve output increases its opening of **dML** quantity every second.
18	**MOP**	Maximum operating pressure threshold from MOP parameter.	The valve output decreases its opening of **dML** quantity every second.
19	**LSH**	Low superheating from **LSH** parameter and **SHd** delay.	The valve will be closed; the alarm will be showed after **SHd** delay.
20	**HSH**	High superheating from **HSH** parameter and **SHd** delay.	Only display.
		CLOCK ALARM	
21	**rtC**	Clock settings lost.	Defrost will be performed with **IdF** till restoring the settings of RTC.
22	**rtF**	Clock damaged.	Defrost will be performed with **IdF**.
		OTHERS	
23	**EE**	EEPROM serious problem.	Output OFF.
24	**Err**	Error with upload/download parameters.	Repeat the operation.
25	**End**	Parameters have been correctly transferred.	
26	**dEF**	Defrost is progress	
27	**cLn**	Cleaning function active	

14.1 ALLARM RECOVERY

Probe alarms **P1**, **P2, P3** and **P4** start some seconds after the fault in the related probe; they automatically stop some seconds after the probe restarts normal operation. Check connections before replacing the probe.
Temperature alarms **HA**, **LA, HA2** and **LA2** automatically stop as soon as the temperature returns to normal values.
Alarms **EA** and **CA** (with **i1F** = **bAL**) recover as soon as the digital input is disabled.
Alarm **CA** (with **i1F** = **PAL**) recovers only by **switching off and on** the instrument.

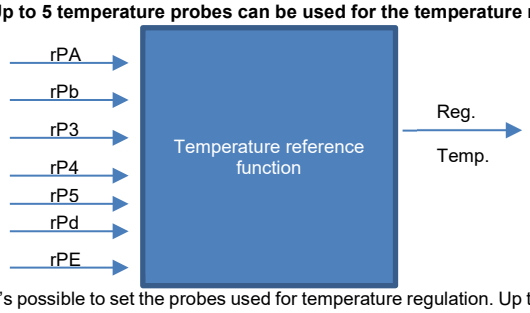
15. ELECTRONIC EXPANSION VALVE MENU

1. Enter the Programming mode by pressing the SET and DOWN key for few seconds (measurement unit starts blinking).
2. Press arrows until the instrument shows EEU label;
3. Press SET. You are now in EEV function menu;

16. CONTROLLING LOADS

16.1 TEMPERATURE PROBE REFERENCE FOR REGULATION

Up to 5 temperature probes can be used for the temperature regulation.



It's possible to set the probes used for temperature regulation. Up to 5 Temperature inputs Pb1, Pb2, Pb3, Pb4, Pb6, can be used.
To support above function, the parameters rPA, rPb, rP3, rP4, rP5 are used.
Which temperature probe methods of combine is set by par. rPd among the following: Average, Minimum, Maximum, First, or Mix.

rPd = Avr Average– average of all valid probes defined as Regulation Probe by par. (rPA, rPb, rP3, rP4, rP5)
rPd = Min Minimum – minimum of all valid probes defined as Regulation Probe by par. (rPA, rPb, rP3, rP4, rP5)
rPd = MAS Maximum – maximum of all valid probes defined as Regulation Probe by par. (rPA, rPb, rP3, rP4, rP5)
rPd = FrS First – first valid probe defined as Regulation Probe by par. (rPA, rPb, rP3, rP4, rP5)
rPd = rPE Mix – this is currently done with "rPE" parameter.

16.1.1 Sensor's failure

In case of multiple temperature sensor regulation: (rPd = Aur, Min, Max or rPE), and with sensor failure, the remaining sensors are used for the regulation.
In case of all sensors failure, the valve opens at PEO percentage

16.2 DUAL TEMP MODE OPERATION

Controller can have up to 4 pre-set regulation.
The preset regulation is set in the parameter MAP.
By digital input or supervising system is possible to enable the second regulation mode, set in the parameter M2P.
In this way a dual temp case can be easily set and controlled.

16.2.1 Second map function by digital input configuration

By setting on digital input among i1F, i2F, i3F as the "nt" the map set in the parameter M2P is loaded when the digital input is enabled.

16.3 THE SOLENOID VALVE

The regulation is performed according to the temperature measured by the thermostat probe that can be physical probe or virtual probe obtained by a weighted average between two probes (see parameters table description) with a positive differential from the set point. If the temperature increases and reaches set point plus differential the solenoid valve is opened and then it is closed when the temperature reaches the set point value again.
In case of fault in the thermostat probe the opening and closing time of solenoid valve is configured by "**Con**" and "**CoF**" parameters.

16.4 STANDARD REGULATION AND CONTINUOUS REGULATION

The regulation can be performed in two ways: the goal of the first way (**standard regulation**) is reaching the best superheat via a classic temperature regulation obtained using hysteresis.
The second way, permits to use the valve to realise an high performance temperature regulation with a good factor of superheat precision. **This second possibility, it can be used only in centralized plants and it is available only with electronic expansion valve** by selecting **CrE = Y** parameter.

First kind of regulation:
In this case, the **Hy** parameter is the differential for standard ON/OFF regulation. During this phase the valve will maintain the SH set point

Second kind of regulation – Continuous regulation
In this case, the **Hy** parameter is the proportional band of PI in charge of room temperature regulation and we advise to use at least **Hy = 5.0°C/ 10°F**. The **int** parameter is the integral time of the same PI regulator. Increasing **int** parameter the PI regulator become slow in reaction and of course is true vice versa. To disable the integral part of regulation you should set **int = 0**.

16.5 PUMP DOWN BEFORE DEFROST

The following parameters has been added:
Pdt pump down type (nu; FAn; F-C)
With **Pdt = nu,** the pump down is not enabled.
With **Pdt = Fan**, when a defrost trigger is given:
a. Compressor relay will be open.
b. EEV valve (if present):
- will be closed with CrE = n, y
- will be open with CrE = EUP or EU5

c. Fan will be forced on for Pdn time
With **Pdt = F - C,** when a defrost trigger is given:
a. EEV valve (if present):
- will be closed with CrE = n, y
- will be open with CrE = EUP or EU5

b. Compressor relay and Fan will be forced on for Pdn time.
Pdn pump down duration (0 - 255 min)

16.6 DEFROST

DEFROST STARTING
In any case, the device check the temperature read by configured defrost probe before starting defrost procedure, after that:
- (If RTC is present)Two defrost modes are available through the "**tdF**" parameter: defrost with electrical heater and hot gas defrost. The defrost interval is controlled by parameter "**EdF**": (EdF = rtc) defrost is made in real time depending on the hours set in the parameters **Ld1 - Ld6** in workdays and in **Sd1 - Sd6** on holidays; (EdF = in) the defrost is made every "**IdF**" time;
- defrost cycle starting can be operated locally (manual activation by means of the keyboard or digital input or end of interval time) or the command can come from the Master defrost unit of the LAN. In this case the controller will operate the defrost cycle following the parameters it has programmed but, at the end of the drip time, will wait that all the other controllers of the LAN finish their defrost cycle before to re-start the normal regulation of the temperature according to **dEM** parameter;
- Every time any of the controller of the LAN begin a defrost cycle it issue the command into the network making all the other controllers start their own cycle. This allows a perfect synchronisation of the defrost in the whole multiplexed cabinet according to **LMd** parameter;
- Selecting **dPA** and **dPb** probes and by changing the **dtP** and **ddP** parameters the defrost can be started when the difference between dPA and dPb probes is lower than dtP for all ddP time. This is useful to start defrost when a low thermal exchange is detected. If **ddP = 0** this function is disabled;

MINIMUM DEFROST TIME
The "**ndt**" (0 - MnF) Minimum Defrost Time, set the minimum defrost duration, when the defrost is ended by evaporator temperature probe.
The **ndt** time is taken in account everytime the defrost is trigged, independently form the value of end defrost temperature probe and end defrost digital input status.

DEFROST ENDING
- When defrost is started via rtc, the maximum duration of defrost is obtained from **Md** parameter and the defrost end temperature is obtained from **dtE** parameter (and **dtS** if two defrost probes are selected).
- If **dPA** and **dPb** are present and **d2P = y** the instrument stops the defrost procedure when **dPA** is higher than **dtE** temperature and **dPb** is higher than **dtS** temperature;

At the end of defrost the drip time is controlled through the "**Fdt**" parameter.

16.6.1 Kind of defrost

The kind of defrost is set by parameter tdF among the following possibilities
tdF = Air **natural defrost**.
Defrost is made by opening the compressor/solenoid relay. The fan during defrost depends on the parameter Fnc. Defrost relay is off. The valve is closed
tdF = EL **defrost with electrical heater**:
Defrost is made by opening the compressor/solenoid relay. The fan during defrost depends on the parameter Fnc. Defrost relay is on. The valve is closed
tdF = in **hot gas defrost**.
Defrost is made by closing the compressor/solenoid relay. The fan during defrost depends on the parameter Fnc. Defrost relay is on. The valve opening percentage during the defrost is set by the par. oPd.

16.7 ON DEMAND DEFROST

CONCEPT
Controller can perform on demand defrost. It is based on the behavior of evaporator temperature.
Controller monitors the evaporator temperature and triggers a defrost if some conditions are satisfied. For defrost efficiency its' important to place the "end defrost probe", usually P2, in the coldest place of the evaporator, usually immediately after the expansion valve.

NOTE: Because of different type of evaporators and consequentially behaviors, it's warmed suggested to test and validate this algorithm in a climatic chamber before applying it in the field.

PARAMETES & SETTINGS
The «On Demand Defrost» can be activated with the following settings:
CrE = "n" , EdF ="Aut"
cdt: **evaporator temperature differential to trigger a defrost** (default cdt = 4°K)
nbd: **minimum compressor run before automatic defrost** (or minimum time of activation of solenoid valve) it has to be set properly. It prevents defrost from starting (default nbd = 4.0h)
Mbd: **max compressor run before automatic defrost** (or max time of activation of solenoid valve): it has to be set properly. If reached a defrost is triggered (default Mbd = 16.0h)
nct: **minimum evap. temperature**, it has to be set properly. a defrost is triggered when this temperature reached (default nct = -30°C)

NOTE: With CrE = "y" or CrE = "EUP" or CrE = EU5 only «RTC defrost» and «interval defrost» are allowed.
With EdF = "Aut" & CrE = "y" or CrE = "EUP" or CrE = EU5 the «interval defrost» will be performed, as with EdF = in

EXCEPTIONS:
1. A defrost cannot be triggered if the compressor has not ran more than minimum time (***nbd** parameter*) since the last defrost or initial power up. (Resolution hh.m)
2. If the compressor has ran for more than maximum time since the last defrost or initial power up (***Mbd** parameter*), a defrost is triggered regardless of coil temperature.
3. If the coil temperature reaches very low temperature, (***nct** parameter*), a defrost is triggered regardless of ***cdt*** value.

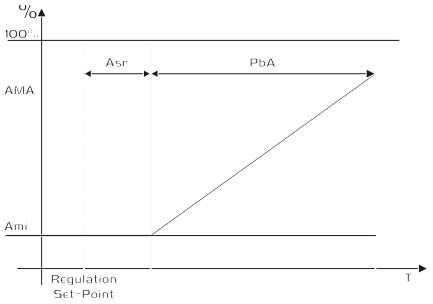
16.8 FANS

CONTROL WITH RELAY

The fan control mode is selected by means of the "**FnC**" parameter:
- **C - n** = running with the solenoid valve, OFF during the defrost;
- **C - y** = running with th1e solenoid valve, ON during the defrost;
- **O - n** = continuous mode, OFF during the defrost;
- **O - y** = continuous mode, ON during the defrost;

An additional parameter "**FSt**" provides the setting of temperature, detected by the evaporator probe, above which the fans are always OFF. This can be used to make sure circulation of air only if his temperature is lower than set in "**FSt**".

CONTROL WITH ANALOG OUTPUT (if present)



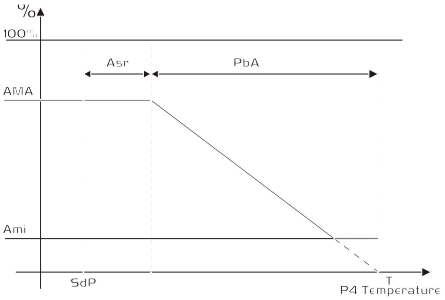
The modulating output (**trA=rEG**) works in proportional way (excluding the first **AMt** seconds where the fans speed is the maximum). The regulation set point is relative to regulation set point and is indicated by **ASr,** the proportional band is always located above **SET+ASr** value and its value is **PbA**. The fan are at minimum speed (**AMi)** when the temperature read by fan probe is **SET+ASr** and the fan is at maximum speed (**AMA**) when the temperature is **SET+ASr+PbA**.

16.9 ANTI SWEAT HEATERS

The anti-sweat heater regulation can be performed with on board relay (if **OA6 = AC**) or with the analog output (if present by setting **trA = AC**). However the regulation can be performed in two ways:

- Without real dew-point information: in this case the default value for dew-point is used (**SdP** parameter).
- Receiving dew-point from **XWEB5000** system: the **SdP** parameter is overwritten when valid value for dew-point is received from XWEB. In case of XWEB link is lost, **SdP** is the value that will be used for safety.

The best performance can be obtained using probe 4. In this case, the regulation follows the chart:



Probe 4 should be placed on the showcase glass. For each cabinet can be used only one probe 4 (P4) sending its value to the others section that are connected to the LAN.

HOW TO WORK WITH PROBE 4 THROUGH THE LAN:

Param.	EC3-XM6x8D_1 Without probe 4	EC3-XM6x8D_2 + with probe 4	EC3-XM6x8D_3+ Without probe 4
Adr	n	n + 1	n + 2
LCP	LCP = n	LCP = Y	LCP = n
P4C	LAN or not connect the probe	P4C = NTC, PtC or PtM	LAN or not connect the probe
trA	trA = AC if the device has the analog output		
OA6	OA6 = AC if the device will use the AUX relay for regulation		

In case of P4 error or if P4 is absent the output is at **AMA** value for the **AMt** time then the output is at 0 value for the time [**255 – AMt**] time performing a simple PWM modulation.

16.10 CLEANING MODE FUNCTION BY DIGITAL INPUT CONFIGURATION

The "**cLn**" value is added to the functions of the digital input.
The function has the same basic features of the stand by function, but with the following differences:

a. By the parameter **LcL** (no, yES) it's possible to set if the light is on or off during cleaning mode.
   This parameter **LcL** can be override by light button or by Light on/off Modbus command.
b. By the parameter **FcL** (no, yES)) it's possible to set if the fan is on or off during cleaning mode.
   In case of fan on, the FSt parameter (fan stop temperature) is override.

16.10.1 Display

During the Cleaning Status, the display shows the "cLn" message.

16.11 AUXILIARY OUTPUT

The auxiliary output is switch ON and OFF by means of the corresponding digital input or by pressing and releasing the down arrow key.

17. PARAMETER LIST

REGULATION

Set **Temperature set point** (LS - US)
rtC **Access to CLOCK submenu (if present);**
EEU **Access to EEV submenu**
Hy **Differential:** (0.1 - 25,5°C; 1 - 45°F): Intervention differential for set point, always positive. Solenoid valve Cut IN is Set Point Plus Differential (Hy). Solenoid valve Cut OUT is when the temperature reaches the set point.
Int **Integral time for room temperature regulation:** (0 - 255 s) integral time for room temperature PI regulator. 0= no integral action;
CrE **Continuous regulation activation:** (n - Y) n = standard regulation; Y = continuous regulation. Use it only in centralized plants;
LS **Minimum set point limit:** (-55.0°C - SET; -67°F - SET) Sets the minimum acceptable value for the set point.
US **Maximum set point limit:** (SET - +150°C; SET - 302°F) Set the maximum acceptable value for set point.
OdS **Outputs activation delay at start up:** (0 - 255 min) This function is enabled at the initial start-up of the instrument and inhibits any output activation for the period of time set in the parameter. (AUX and Light can work)
AC **Anti-short cycle delay:** (0 - 60 min) interval between the solenoid valve stop and the following restart.
CCt **Compressor ON time during continuous cycle:** (0.0 - 24.0 h; resolution 10min) Allows to set the length of the continuous cycle: compressor stays on without interruption for the CCt time. Can be used, for instance, when the room is filled with new products.
CCS **Set point for continuous cycle:** (-55 - 150°C / -67 - 302°F) it sets the set point used during the continuous cycle.
Con **solenoid valve ON time with faulty probe:** (0÷255 min) time during which the solenoid valve is active in case of faulty thermostat probe. With Con =0 solenoid valve is always OFF.
CoF **solenoid valve OFF time with faulty probe:** (0 - 255 min) time during which the solenoid valve is off in case of faulty thermostat probe. With COF = 0 solenoid valve is always active.

DISPLAY

CF **Temperature measurement unit: °C =** Celsius; **°F** = Fahrenheit.
!!! **WARNING !!!** When the measurement unit is changed **the parameters** with temperature values **have to be checked**.
PrU **Pressure mode:** (rEL or AbS) it defines the mode to use the pressure.
!!! WARNING !!! the setting of PrU is used for all the pressure parameters. If PrU = rEL all pressure parameters are in relative pressure unit, if PrU = AbS all pressure parameters are in absolute pressure unit.
PMU **Pressure measurement unit:** (bAr - PSI - MPA) it selects the pressure measurement units. MPA = the value of pressure measured by kPA*10.
PMd **Way of displaying pressure:** (tEM - PrE) it permits showing the value measured by pressure probe with **tEM=** temperature or by **PrE =** pressure
rES **Resolution (for °C)**: (in = 1°C; dE = 0.1°C) allows decimal point display
rEP **Resolution for % value**: (in = integer; dE = with decimal point) allows decimal point display for percentage values
Lod **Instrument display**: (nP; P1; P2, P3, P4, P5, P6, tEr, dEF) it selects which probe is displayed by the instrument. **P1, P2, P3, P4**, **P5**, **P6**, **tEr =** virtual probe for thermostat, **dEF =** virtual probe for defrost.
rEd **Remote display**: (nP; P1; P2, P3, P4, P5, P6, tEr, dEF) it selects which probe is displayed by the X-REP. **P1, P2, P3, P4**, **P5**, **P6**, **tEr =** virtual probe for thermostat, **dEF =** virtual probe for defrost.
dLy **Display delay:** (0 - 24.0 m; resolution 10s) when the temperature increases, the display is updated of 1 °C/1°F after this time.
rPA **Regulation probe A:** (nP; P1; P2, P3, P4, P6) first probe used to regulate room temperature. If rPA = nP the regulation is performed with real value of rPb.
rPb **Regulation probe B:** (nP; P1; P2, P3, P4, P5) second probe used to regulate room temperature. If rPb = nP the regulation is performed with real value of rPA
rP3 **Regulation probe 3:** (nP; P1; P2, P3, P4, P6) third probe used to regulate room temperature, with rPd = Aur or Min or MA or FrS
rP4 **Regulation probe 4:** (nP; P1; P2, P3, P4, P6) fourth probe used to regulate room temperature, with rPd = Aur or Min or MA or FrS
rP5 **Regulation probe 5:** (nP; P1; P2, P3, P4, P6) fifth probe used to regulate room temperature, with rPd = Aur or Min or MA or FrS
rPd **Temperature Regulation Strategy:** (Aur, Min, MAS, FrS, rPE)
Aur: average of all valid probes defined as Regulation Probe
Min: minimum value of all valid probes defined as Regulation Probe
MaS: maximum of all valid probes defined as Regulation Probe
FrS: first valid probe defined as Regulation probe
rPE: mix between rPA and rPb deifned by rPE parameter
rPE **Regulation virtual probe percentage:** (0 - 100%) it defines the percentage of the rPA respect to rPb. The value used to regulate room temperature is obtained by:
value_for_room = (rPA*rPE + rPb*(100-rPE))/100

ELECTRONIC EXPANSION VALVE SUBMENU

FtY **Kind of gas:**

CODE	REFR.	OPERATING RANGE	CODE	REFR.	OPERATING RANGE
r22	R22	-50 - 60°C/-58 - 120°F	**410**	R410A	-50 - 60°C/-58 - 120°F
134	R134A	-50 -60°C/-58 - 120°F	**448**	R448A	-45 - 60°C/-69 - 120°F
290	R290	-50 - 60°C/-58 - 120°F	**449**	R449A	-45 - 60°C/-69 - 120°F
404	R404A	-70 - 60°C/-94 - 120°F	**450**	R450A	-45 - 60°C/-69 - 120°F
47A	R407A	-50 - 60°C/-58 - 120°F	**507**	R507	-70 - 60°C/-94 - 120°F
47C	R407C	-50 - 60°C/-58 - 120°F	**513**	R513A	-45 - 60°C/-69 - 120°F
47F	R407F	-50 - 60°C/-58 - 120°F	**CO2**	R744	-50 - 60°C/-58 - 120°F

ATU **Self-adaptive SH regulation enabling** (No; yES) This parameter enables the self-adaptive regulation of the superheat. **CrE = no must to be set, when this function is enabled**.
AMS **Minimum STABLE superheat search (**No; yES). This parameter enables the search of the minimum stable superheat. The lowest admitted value is LSH+2°C
SSH **Superheat set point:** (0.1 - 25.5°C; 1 - 45°F) used to regulate superheat
SHy **Differential for low superheat function:** this value is used by X-WEB with XeCO2 function. When the monitoring system enable the low superheat Shy is subtracted to the SSH set point (-12.0 - 12.0°C)
Pb **Proportional band:** (0.1 - 60.0 / 1 - 108°F) PI proportional band
PbH **Dead band for superheat regulation:** it's a band across the SH set point, inside this band the valve opening percentage is not updated.
rS **Band Offset:** (-12.0 - 12.0°C; -21 - 21°F) PI band offset
inC **Integration time:** (0 – 255 s) PI integration time
dFC **Derivative time:** (0 – 255 s) PID derivative time
Ped **Probe error delay before stopping regulation:** 0 - 239 seconds – On (240)
PEO **Probe Error opening percentage:** (0÷100%) if a probe error occurs, valve opening percentage is **PEo**;
SFd **Start Function duration:** (0.0 - 42.0 min: resolution 10 s) It sets start function duration and post-defrost duration. **During this phase the SH alarms are overridden**;
SFP **Start opening Percentage:** (0 - 100 %) Opening valve percentage when start function is active. This phase duration is **SFd time**;
OHg **Opening Percentage during hot gas defrost:** (0 – 100 %) Opening valve percentage when hot gas defrost is active.
Pdd **Post Defrost Function duration:** (0.0 - 42.0 min: resolution 10 s) It sets start function duration and post-defrost duration. **During this phase the alarms are overridden**;
OPd **Opening Percentage after defrost phase:** (0 - 100%) Opening valve percentage when after defrost function is active. Phase duration is **Pdd time**;
LnF **Minimum opening percentage at normal Functioning:** (0 – 100 %) during regulation it sets the minimum valve opening percentage; (0 – MnF %)
MnF **Maximum opening percentage at normal Functioning:** (LnF - 100 %) during regulation it sets the maximum valve opening percentage
dCL **Regulation off delay, when the set point is reached** (0 – 255 s)
Fot **Forced opening percentage:** (0 – 100 % - **nu**) it permits to force the valve opening to the specified value. This value overwrites the value calculated by PID algorithm. **!!! WARNING !!!** to obtain the correct superheat regulation you have to set **Fot = nu**
LPL **Lower Pressure Limit for superheat regulation:** (PA4 - P20 bar / psi / **kPA*10**) when suction pressure comes down to LPL the regulation is performed with a LPL fixed value for pressure, when pressure comes back to LPL the normal pressure value is used. (related to PrM parameter)
MOP **Maximum Operating Pressure threshold:** (PA4 - P20 bar / psi / **kPA*10**) if suction pressure exceeds maximum operating pressure value, instrument signals situation with MOP alarm. (related to PrM parameter)
dMP **Delay for Maximum Operating Pressure threshold alarm signalling:** (0 ÷ 255s) when a MOP alarm occurs it's signalled after dMP time
LOP **Minimum Operating Pressure threshold:** (PA4 - P20 bar / psi / **kPA*10**) if the suction pressure comes down to this value a low-pressure alarm is signalled with LOP alarm. (related to PrM parameter)
dLP **Delay for Minimum Operating Pressure threshold alarm signalling:** (0 – 255 s) when a LOP alarm occurs it's signalled after dMP time
dML **Opening steps variation during MOP and LOP:** (0 - 100%) when a MOP alarm occurs valve will close of the dML percentage every cycle period until MOP alarm is active. When LOP occurs valve will open of the dML percentage every cycle period until LOP alarm is active.
AAS **Low superheat alarm with "XeCO2 function active: n =** no superheat alarm, **Y =** Low superheat alarm is still signalled
HSH **High Superheat alarm:** (LSH - 80.0°C / LSH - 144°F) when superheat exceeds this value an high superheat alarm is signalled after interval **SHd**
LSH **Low Superheat alarm:** (0 - HSH °C / 0 - HSH °F) when superheat goes down to this value a low superheat alarm is signalled after interval **SHd**
dHS **High superheat alarm activation delay:** (0 - 42 min: resolution 10 s) when high superheat alarm occurs, the time dHS must pass before alarm signalling.
dLS **Low superheat alarm activation delay:** (0 - 42 min: resolution 10 s) when low superheat alarm occurs, the time SHd must pass before alarm signalling.
LSA **Opening percentage decrease with low Superheat alarm:** (0 – 100 %)
FrC **Fast-recovery Constant:** (0 - 100 s) permits to increase integral time when SH is below the set-point. If **FrC = 0** fast recovery function is disabled.
AnP **Pressure filter** (0 - 100) It uses the last average values of the pressure to calculate the superheat. **E.I.** with **AnP = 5** controller uses the average pressure in the last 5 seconds to calculate the SH. **NOTE:** avoid values higher than 10
Ant **Temperature filter** (0 - 100) It uses the last average values of the temperature to calculate the superheat. **E.I.** with **Ant = 5** controller uses the average temperature in the last 5 seconds to calculate the SH. **NOTE:** avoid values higher than 10
SLb **Reaction time** (0 - 255 s): time to update the valve open percentage. EI. With SLb = 24: the valve open percentage is updated every 24 seconds.
tEP **Predefined valve selection:** (0 – 10) if (**tEP = 0**) the user has to modify all the parameters of configuration in order to use the valve. If **tEP is different from 0** the device performs a fast configuration of the following parameters: **LSt, uSt, Sr, CPP, CHd**. To select the right number please use the following table:

tEP	Model	LSt (steps*10)	uSt (steps*10)	CPP (mA*10)	CHd (mA*10)	Sr (step/s)	tEu (bip/ unip)	HSF (Half/ full)
0	**Manual settings**	Par	Par	Par	Par	Par	Par	Par
1	Danfoss ETS-25/50	7	262	10	10	300	bP	FUL
2	Danfoss ETS-100	10	353	10	10	300	bP	FUL
3	Danfoss ETS-250/400	11	381	10	10	300	bP	FUL
11	Emerson EX4 - 6	5	75	50	10	500	bP	FUL

If **tEP is different from 0** previous configuration of **LSt, uSt, Sr, CPP and CHd are overwritten.**

tEU **Type of Stepper motor:** [**uP-bP**] it permits to select the kind of valve. **uP =** 5 - 6 wires unipolar valves; **bP =** 4 wires bipolar valves; **!!!WARNING!!! by changing this parameter the valve must be reinitialized.**
bdM **bipolar valve piloting: ["UAM"(0 = Wave Mode) - "noM"(1 = Normal Mode)]** Bipolar valve pilot mode: Wave Mode - Normal Mode
HFS **Kind of motor movement:** (HAF; FUL)
HAF = half step. Use this setting for the unipolar valve.
FUL = half step. Use this setting for the bipolar valve.
LSt **Minimum number of steps:** [**0** - **USt**] it permits to select the minimum number of steps. At this number of steps the valve should be closed. So it's necessary the reading of manufacturer datasheet to set correctly this parameter. It's the minimum number of steps to stay in advised range of functioning. **!!! WARNING !!! By changing this parameter the valve has to be reinitialized. The device performs this procedure automatically and restarts its normal functioning when the programming mode ends.**
USt **Maximum number of steps:** [LSt - 800*10] it permits to select the maximum number of steps. At this number of steps the valve should be completely opened. Read the datasheet provided by manufacturer of the valve to set correctly this parameter. It's the maximum number of steps to stay in advised range of functioning.
!!! WARNING !!! By changing this parameter the valve has to be reinitialized. The device performs this procedure automatically and restarts its normal functioning when the programming mode ends.
ESt **Extra step during closing phase:** (0 - 255 (*10)) it sets the number of extra steps the controller performs, when the valve is closed at start up, and during the pauses of regulation, to force the closure of the valve.
NOTE: To set ESt the following steps has to be done:
1. **Set the kind of valve by the parameter tEP. This pre-set the parameters related to the valve**
2. **Set the right value of ESt**

Sr **Step rate** [10 - 600 step/sec] it's the maximum speed to change step without losing precision (means without losing steps). It's advised to stay under the maximum speed.
CPP **Current per phase (only bipolar valves):** [0 - 100*10 mA] it's the maximum current per phase used to drive valve. It's used **only with bipolar valves**.
CHd **Holding current per phase (only bipolar valves):** [0 t- 100*10 mA] it's the current per phase when the valve is stopped for more than 4 min. It's used **only with bipolar valves**.
GtC **Minimum Interval to enable calibration cycles with extra steps ESt:** [0 – GtH (h)] Indicates the number of hours after which the valve calibration is enabled (with extra steps ESt) when the regulation closes the valve at 0 %.
GtH **Interval between automatic valve calibration cycles:** [GtC - 255 (ore)]
Dty **Pilot duty:** (20 - 100%) with dtY = 100, the valve is moved without interruption, with dtY = 60 the valve is moved with a pilot duty of 60 %: for 0.6 s on and then for 0.4 s off till the final position is reached.

DEFROST

dPA **defrost Probe A:** (nP; P1; P2, P3, P4, P6) first probe used for defrost. If rPA=nP the regulation is performed with real value of dPb.
dPb **defrost Probe B:** (nP; P1; P2, P3, P4, P6) second probe used for defrost. If rPB=nP the regulation is performed with real value of dPA.
value_for_defrost= (dPA*dPE + dPb*(100-dPE))/100
tdF **Defrost type**: (Air, EL, in)
Air = Air defrost (defrost relay is not switched on during defrost)
EL = defrost with electrical heater; **in** = hot gas defrost;
EdF **Defrost mode**: (rtc – in- Aut) **(only if RTC is present) rtc=** defrost activation via RTC; **in=** defrost activation with **idf**; **AUt =** on demand defrost.
Srt **Heater set point during defrost:** (-55 - 150°C; -67 - 302°F) if **tdF = EL** during the defrost the defrost relay perform an ON/OFF regulation with **Srt** as set point.
Hyr **Differential for heater**: (0.1- 25.5°C, 1 - 45°F) the differential for heater
tod **Time out for heater: (**0 - 255 min.) if the defrost probe temperature is bigger than **Srt** for all **tod** time the defrost ends altough the defrost probe temperature is lower than dtE or dtS. It permits to reduce defrost duration;
d2P **Defrost with two probes:** (n - Y) **n=** only the dPA probe is used to defrost management; **Y=** defrost is managed with **dPA** probe and **dPb** probe. Defrost can performed only if both probe value are lower than dtE for dPA probe and dtS for dPb probe;
dtE **Defrost termination temperature (Probe A):** (-55 - 50°C; -67 - 122°F) (Enabled only when the evaporator probe is present) sets the temperature measured by the evaporator probe **dPA** which causes the end of defrost
dtS **Defrost termination temperature (Probe B):** (-55 - 50°C; -67 - 122°F) (Enabled only when the evaporator probe is present) sets the temperature measured by the evaporator probe **dPb** which causes the end of defrost
IdF **Interval between defrosts:** (0 - 120h) Determines the time interval between the beginning of two defrost cycles
idE **Time to next defrost log into not volatile memory**
no: time to next defrost is not logged into no volatile memory, this means controller will use the idF interval after a power off. **E.I.** idF = 8: controller performs a defrost every 8h. If controller is switched off, independently from when last defrost happened, at power on it will do the first defrost after 8 h.
yES: time to next defrost is logged into no volatile memory, this means controller will use it after a power off. **E.I.** idF = 8: controller performs a defrost every 8h. If controller is switched off 6 hours after last defrost, at power on it will do the first defrost after 2 hours (6+2 = 8). It is useful in places subjected to frequent power outages.
ndt **Minimum duration of defrost:** (0 - MdF min) it sets the minimum defrost duration, independently form the temperature reached by the end defrost probes;
MdF **Maximum duration of defrost:** (ndt - 255 min) When **dPA** and **dPb** aren't present, it sets the defrost duration, otherwise it sets the maximum duration for defrost;
dSd **Start defrost delay**: (0 - 255 min) This is useful when different defrost start times are necessary to avoid overloading the plant.
dFd **Display during defrost: rt** = real temperature; **it** = temperature reading at the defrost start; **Set** = set point; **dEF** = "dEF" label;
dAd **Defrost display time out:** (0 - 255 min) Sets the maximum time between the end of defrost and the restarting of the real room temperature display.
Fdt **Drain down time:** (0 - 255 min.) time interval between reaching defrost termination temperature and the restoring of the control's normal operation. This time allows the evaporator to eliminate water drops that might have formed due to defrost.
dPo **First defrost after start-up: y** = Immediately; **n** = after the IdF time
dAF **Defrost delay after continuous cycle:** (0 - 23.5 h) time interval between the end of the fast-freezing cycle and the following defrost related to it.

PUMP DOWN

Pdt **Pump down type (nu, FAn, F-C)**
nu: pump down disabled
Fan: pump down enabled. Fan is activated for pump down duration, compressor relay/solenoid valve is switched off with CrE = n/Y o or activated with CrE=EUP or EU5.
F - C: pump down enabled. Fan and compressor relay are activated for pump down duration. See above for solenoid valve behaviour.

Pdn **Pump down duration** (0 – 255 min)

ON DEMAND DEFROST

Ctd **Differential for defrost start (**0.1 - 25.5°C, 1 - 45°F)
nbd **Minimum Compressor run time before defrost (**0.0 - 24h 00 min)
Mdb **Maximum Compressor run time before defrost (**0.0 – 24 h 00 min)
nct **Minimum coil temperature to trigger a defrost (**-55 - 150°C; 67 - 302°F)

FAN

FPA **Fan probe A:** (nP; P1; P2, P3, P4, P5) first probe used for fan. If FPA = nP the regulation is performed with real value of FPB
FnC **Fan operating mode: C-n** = running with the solenoid valve, OFF during the defrost; **C-y** = running with the solenoid valve, ON during the defrost;
O-n = continuous mode, OFF during the defrost; **O-y** = continuous mode, ON during the defrost
Fnd **Fan delay after defrost:** (0 - 255 min) The time interval between the defrost end and evaporator fans start.
FCt **Temperature differential avoiding short cycles of fans (**0 - 50°C; 0 - 90°F) If the difference of temperature between the evaporator and the room probes is more than the value of the Fct parameter, the fans are switched on;
FSt **Fan stop temperature:** (-50 - 110°C; -58 - 230°F) setting of temperature, detected by evaporator probe, above which the fan is always OFF.
FHy **Differential to restart fan:** (0.1 - 25.5°C; 1 - 45°F) when stopped, fan restarts when fan probe reaches FSt - FHy temperature
tFE **Fan regulation by temperature during defrost** (n, y)
Fod **Fan activation time after defrost: (**0 - 255 min.) it forces fan activation for indicated time;
Fon **Fan ON time:** (0 - 15 min) **with** Fnc = C_n or C_y, (fan activated in parallel with compressor). it sets the evaporator fan ON cycling time when the compressor is off. With Fon = 0 and FoF ≠ 0 the fan are always off, with Fon = 0 and FoF = 0 the fan are always off.
FoF **Fan OFF time:** (0 - 15 min) **with** Fnc = C_n or C_y, (fan activated in parallel with compressor). it sets the evaporator fan off cycling time when the compressor is off. With Fon = 0 and FoF ≠ 0 the fan are always off, with Fon = 0 and FoF = 0 the fan are always off.

MODULATING OUTPUT (AnOUT) if present

trA **Kind of regulation with PWM output:** (UAL – rEG – AC) it selects the functioning for the PWM output. **UAL=** the output is at FSA value; **rEG =** the output is regulated with fan algorithm described in fan section; **AC** = anti-sweat heaters control (require the XWEB5000 system);
SOA **Fixed value for analog output:** (0 – 100 %) value for the output if **trA=UAL**;
SdP **Default value for Dew point**: (-55 - 50°C; -67 - 122°F) default value of dew point used when there is no supervising system (XWEB5000). Used only when **trA = AC**
ASr **Dew-point offset (trA = AC) / Differential for modulating fan regulation (trA = rEG)**: (-25.5 - 25.5°C) (-45 - 45°F);
PbA **Differential for anti-sweat heaters:** (0.1 - 25.5°C) (1 - 45°F)
AMi **Minimum value for analog output:** (0 - AMA)
AMA **Maximum value for analog output:** (Ami - 100)
AMt **Anti-sweat heaters cycle period (trA = AC)/ Time with fan at maximum speed (trA=rEG):** (0 - 255 s) when the fan starts, during this time the fan is at maximum speed

ALARMS

rAL **Probe for temperature alarm:** (nP - P1 - P2 - P3 - P4 - P5 – tEr) it selects the probe used to signal alarm temperature
ALC **Temperature alarm configuration: rE** = High and Low alarms related to Set Point; **Ab** = High and low alarms related to the absolute temperature.
ALU **High temperature alarm setting:** (ALC = rE, 0 - 50°C or 90°F / ALC = Ab, ALL - 150°C or 302°F) when this temperature is reached and after the **ALd** delay time the **HA** alarm is enabled.
ALL **Low temperature alarm setting:** (ALC = rE , 0 - 50 °C or 90°F / ALC = Ab , - 55°C or - 67°F - ALU) when this temperature is reached and after the **ALd** delay time, the **LA** alarm is enabled.
AHy **Differential for temperature alarm**: (0.1 - 25.5°C; 1 - 45°F) Intervention differential for recovery of temperature alarm
ALd **Temperature alarm delay:** (0 - 255 min) time interval between the detection of an alarm condition and the corresponding alarm signalling.
rA2 **Probe for second temperature alarm:** (nP - P1 - P2 - P3 - P4 - P5 – tEr) it selects the probe used to signal alarm temperature
A2U **Second high temperature alarm setting:** (A2L - 150°C or 302°F) when this temperature is reached and after the **A2d** delay time; **HA2** alarm is signalled.
A2L **Second Low temperature alarm setting:** (- 55°C or - 67°F - A2U) when this temperature is reached and after the **A2d** delay time, **LA2** alarm is signalled.
A2H **Differential for second temperature alarm**: (0.1 - 25.5°C / 1 - 45°F) Intervention differential for recovery of second temperature alarm
Ad2 **Second temperature alarm delay:** (0 - 255 min) time interval between the detection of second temperature alarm condition and the corresponding alarm signalling.
dAO **Delay of temperature alarm at start-up:** (0 min – 23 h 50 min) time interval between the detection of the temp. alarm condition after the instrument power on and the alarm signalling.
EdA **Alarm delay at the end of defrost:** (0 - 255 min) Time interval between the detection of the temp. alarm condition at the end of defrost and the alarm signalling.
dot **Temperature alarm exclusion after door open:** (0 - 255 min.)
Sti **Stop regulation interval: (0 - 24 h: tens of minutes)** after regulating continuously **Sti** time, the valve closes for **Std** time in order to prevent ice creation.
Std **Stop duration:** (0 - 60 min.) it defines stop regulation time after **Sti.**
tbA **Disabling alarm relay by pressing a key**: (n; Y)

OPTIONAL OUTPUT (AnOUT) if present

oA5 **relay at term. 1-2-3 configuration: (nP – CPr -CP2- -dEF-Fan-ALr-LiG-AUS-Htr-OnF - AC): nP =** not used; **CPr =** relay works as a compressor or solenoid valve relay; **CP2 =** relay works as second **dEF =** relay works as defrost relay; **Fan =** relay works as a Fan relay; **ALr =** activation with alarm conditions; **LiG =** light activation; **AUS =** auxiliary relay, it can be switched ON/OFF also by key; **Htr =** dead band regulation (**not compatible with CrE = y**); **OnF =** ON/OFF functioning, **AC =** anti sweat heaters
oA6 **relay at term. 17-18 configuration: nP – CPr -CP2- -dEF-Fan-ALr-LiG-AUS-Htr-OnF - AC): nP =** not used; **CPr =** relay works as a compressor or solenoid valve relay; **CP2 =** relay works as second **dEF =** relay works as defrost relay; **Fan =** relay works as a Fan relay; **ALr =** activation with alarm conditions; **LiG =** light activation; **AUS=** auxiliary relay, it can be switched ON/OFF also by key; **Htr =** dead band regulation (**not compatible with CrE = y**); **OnF =** ON/OFF functioning, **AC =** anti sweat heaters
CoM **Type of functioning modulating output:**
- **For models with PWM / O.C. output → PM5=** PWM 50 Hz; **PM6 =** PWM 60 Hz; **OA7 =** not set it;
- **For models with 4 - 20 mA / 0 - -10 V output → Cur=** 4 – 20 mA current output; **tEn =** 0 – 10 V voltage output;

AOP **Alarm relay polarity: cL =** normally closed; **oP =** normally opened;
iAU **Auxiliary output is unrelated to ON/OFF device status: n =** if the instrument is switched off also the auxiliary output is switched off; **Y =** the auxiliary output state is unrelated to the ON/OFF device status

DIGITAL INPUTS

i1P **Digital input 1 polarity:** (cL – oP) **CL**: the digital input is activated by closing the contact; **OP**: the digital input is activated by opening the contact.
i1F **Digital input 1 function:** (nu - EAL – bAL – PAL – dor – dEF – AUS – LiG – OnF – Htr – FHU – ES – Hdy) **nu** = not used; **EAL =** external alarm; **bAL =** serious external alarm; **PAL =** pressure switch activation; **dor =** door open; **dEF =** defrost activation; **AUS =** auxiliary activation; **LiG =** light activation; **OnF =** switch on/off the instrument; **FHU =** not used; **ES =** activate energy saving; **nt =** second map enabling; **cLn =** clean function **dEn =** defrost off, **CP1 =** compressor 1 safety, **CP2 =** compressor 2 safety;
d1d **Time interval/delay for digital input alarm:** (0 - 255 min.) Time interval to calculate the number of the pressure switch activation when i1F = **PAL**. If I1F = **EAL** or **bAL** (external alarms), "**d1d**" parameter defines the time delay between the detection and the successive signalling of the alarm. If **i1F = dor** this is the delay to activate door open alarm
i2P **Digital input 2 polarity:** (cL – oP) **CL** : the digital input is activated by closing the contact; **OP**: the digital input is activated by opening the contact.
i2F **Digital input 2 function:** (nu - EAL – bAL – PAL – dor – dEF – AUS – LiG – OnF – Htr – FHU – ES – Hdy) **nu** = not used; **EAL =** external alarm; **bAL =** serious external alarm; **PAL =** pressure switch activation; **dor =** door open; **dEF =** defrost activation; **AUS =** auxiliary activation; **LiG =** light activation; **OnF =** switch on/off the instrument; **FHU =** not used; **ES =** activate energy saving; **nt =** second map enabling; **cLn =** clean function **dEn =** defrost off, **CP1 =** compressor 1 safety, **CP2 =** compressor 2 safety;
d2d **Time interval/delay for digital input alarm:** (0÷255 min.) Time interval to calculate the number of the pressure switch activation when i2F = **PAL**. If I2F = **EAL** or **bAL** (external alarms), "**d2d**" parameter defines the time delay between the detection and the successive signalling of the alarm. If **i2F = dor** this is the delay to activate door open alarm
i3P **Digital input 3 polarity:** (cL – oP) **CL** : the digital input is activated by closing the contact; **OP**: the digital input is activated by opening the contact.
i3F **Digital input 3 function:** (nu - EAL – bAL – PAL – dor – dEF – AUS – LiG – OnF – Htr – FHU – ES – Hdy) **nu** = not used; **EAL =** external alarm; **bAL =** serious external alarm; **PAL =** pressure switch activation; **dor =** door open; **dEF =** defrost activation; **AUS =** auxiliary activation; **LiG =** light activation; **OnF =** switch on/off the instrument; **FHU =** not used; **ES =** activate energy saving; **nt =** second map enabling; **cLn =** clean function **dEn =** defrost off, **CP1 =** compressor 1 safety, **CP2 =** compressor 2 safety;
d3d **Time interval/delay for digital input alarm:** (0 - 255 min.) Time interval to calculate the number of the pressure switch activation when i3F = **PAL**. If i3F = **EAL** or **bAL** (external alarms), "**d3d**" parameter defines the time delay between the detection and the successive signalling of the alarm. If **i3F = dor** this is the delay to activate door open alarm
nPS **Pressure switch number:** (0 - 15) Number of activations of the pressure switch, during the "**d#d**" interval, before signalling the alarm event (I2F = PAL). **If the nPS activation in the did time is reached, switch off and on the instrument to restart normal regulation.**
odc **Compressor and fan status when open door: no** = normal; **Fan** = Fan OFF; **CPr** = Compressor OFF; **F_C** = Compressor and fan OFF.
rrd **Outputs restart after doA alarm: no =** outputs not affected by the doA alarm; **yES =** outputs restart with the doA alarm;

RTC SUBMENU (if present)

CbP **Clock Presence** (n - y): it permits to disable or enable the clock;
Hur **Current hour** (0 - 23 h)
Min **Current minute** (0 – 59 min)
dAY **Current day** (Sun - SAt)
Hd1 **First weekly holiday** (Sun - nu) Set the first day of the week which follows the holiday times.
Hd2 **Second weekly holiday** (Sun - nu) Set the second day of the week which follows the holiday times.
Hd3 **Third weekly holiday** (Sun - nu) Set the third day of the week which follows the holiday times.
ILE **Energy Saving cycle start during workdays**: (0 – 23 h 50 min.) During the Energy Saving cycle the set point is increased by the value in HES so that the operation set point is SET + HES.
dLE **Energy Saving cycle length during workdays**: (0 – 24 h 00 min.) Sets the duration of the Energy Saving cycle on workdays.
ISE **Energy Saving cycle start on holidays**. (0 - 23 h 50 min.)
dSE **Energy Saving cycle length on holidays** (0 - 24 h 00 min.)
HES **Temperature increase during the Energy Saving cycle**
(-30 - 30°C; -54 - 54°F) sets the increasing value of the set point during the Energy Saving cycle.
Ld1-Ld6: **Workday defrost start** (0 - 23 h 50 min.) These parameters set the beginning of the 6 programmable defrost cycles during workdays. Ex. When **Ld2** = 12.4 the second defrost starts at 12.40 during workdays.
Sd1-Sd6: **Holiday defrost start** (0 - 23 h 50 min.) These parameters set the beginning of the 6 programmable defrost cycles on holidays. Ex. When **Sd2** = 3.4 the second defrost starts at 3.40 on holidays.

ENERGY SAVING

HES **Temperature increase during the Energy Saving cycle:**
(-30 - 30°C; -54 - 54°F) sets the increasing value of the set point during the Energy Saving cycle.

PEL **Energy saving activation when light is switched off:** (n - Y) n = function disabled; Y = energy saving is activated when the light is switched off and vice versa;

LAN MANAGEMENT

LMd **Desfrost synchronisation: y** = the section sends a command to start defrost to oher controllers, **n** = the section doesn't send a global defrost command

dEM **Type of end defrost: n =** the of the LAN defrost are indipendent; **y =** the end of the defrost are synchronisated;

LSP **L.A.N. set-point synchronisation**: **y** = the section set-point, when modified, is updated to the same value on all the other sections; **n** = the set-point value is modified only in the local section

LdS **L.A.N. display synchronisation**: **y** = the value displayed by the section is sent to all the other sections; **n** = set-point value is modified only in the local section

LOF **L.A.N. On/Off synchronisation** this parameter states if the On/Off command of the section will act on all the other ones too: **y** = the On/Off command is sent to all the other sections; **n**= the On/Off command acts only in the local section

LLi **L.A.N. light synchronisation** this parameter states if the light command of the section will act on all the other ones too: **y** = the light command is sent to all the other sections; **n** = the light command acts only in the local section

LAU **L.A.N. AUX output synchronisation** this parameter states if the AUX command of the section will act on all the other ones too: **y** = the light command is sent to all the other sections; **n** = light command acts only in the local section

LES **L.A.N. energy saving synchronisation** this parameter states if the energy saving command of the section will act on all the other ones too: **y** = the Energy Saving command is sent to all the other sections; **n** = the Energy Saving command acts only in the local section

LSd **Remote probe display:** this parameter states if the section has to display the local probe value or the value coming from another section: **y** = the displayed value is the one coming from another section (which has parameter LdS = y); **n** = the displayed value is the local probe one.

LPP **Remote pressure probe: n =** the value of pressure probe is read from local probe; **Y=** the value of pressure probe is sent via LAN;

LCP **P4 probe sent via LAN** (n, y)

StM **Solenoid activation via LAN: n =** not used; **Y =** a generic cooling requests from LAN activate the solenoid valve connected to compressor relay;

ACE **Cold Calling in LAN always enabled even if the compressor block:** (n, y)

PROBE CONFIGURATION

P1C **Probe 1 configuration:** (nP – Ptc – ntc – PtM) **nP=** not present; **PtC =** Ptc **ntc =** NTC; **PtM =** Pt1000;

OF1 **Probe 1 calibration:** (-12.0 - 12.0°C/ -21 - 21°F) allows to adjust possible offset of the thermostat probe.

P2C **Probe 2 configuration:** (nP – Ptc – ntc – PtM) **nP=** not present; **PtC=** Ptc; **ntc =** NTC; **PtM =** Pt1000;

OE2 **Probe 2 calibration:** (-12.0 - 12.0°C/ -21 - 21°F) allows to adjust possible offsets of the evaporator probe.

P3C **Probe 3 configuration: (**nP – Ptc – ntc – PtM) **nP=** not present; **PtC =** Ptc; **ntc =** NTC; **PtM =** Pt1000;

OF3 **Probe 3 calibration:** (-12.0 - 12.0°C/ -21 - 21°F) allows to adjust possible offset of the probe 3.

P4C **Probe 4 configuration: (**nP – Ptc – ntc – PtM) **nP =** not present; **PtC =** Ptc **ntc =** NTC; **PtM =** Pt1000;

OF4 **Probe 4 calibration:** (-12.0 - 12.0°C/ -21 - 21°F) allows to adjust possible offset of the probe 4.

P5C **Probe 5 configuration:** (nP – Ptc – ntc – PtM – 420 – 5Vr) **nP =** not present; **PtM=** Pt1000; **420=** 4 – 20 mA; **5 Vr =** 0 - 5V ratiometric

OF5 **Probe 5 calibration:** (-12.0 - 12.0°C/ -21 - 21°F) allows to adjust possible offset of the probe 5.

P6C **Probe 6 configuration: (**nP – Ptc – ntc – PtM) **nP=** not present; **PtC =** Ptc **ntc =** NTC; **PtM =** Pt1000;

OF6 **Probe 6 calibration:** (-12.0 - 12.0°C/ -21 - 21°F) allows to adjust possible offset of the probe 6.

PA4 **Probe value at 4 mA or at 0 V:** (-1.0 - P20 bar / -14 - PSI / -10 - P20 kPA*10) pressure value measured by probe at 4 mA or at 0 V (related to PrM parameter) **Referred to Pb5**

P20 **Probe value 20 mA or at 5 V:** (PA4 - 50.0 bar / 725 psi / 500 kPA*10) pressure value measured by probe at 20 mA or at 5 V (related to PrM parameter) **Referred to Pb5**

SERVICE – OTHERS

LCL **Light on during cleaning mode** (n, y)

FCL **Fan on during cleaning mode** (n, y)

MAP **Map used during standard operation (1°M, 2°M, 3°M, 4°M**) It sets the map used by the controller among the four possible maps

MP1 **Alternate Map enabled by digital input or Modbus command** (1°M, 2°M, 3°M, 4°M) It sets the alternate map enabled by digital input or Modbus command among the four possible maps

CLt **Coling time percentage:** it shows the effective cooling time calculated by EC3-XM678D during regulation

tMd **Time to next defrost:** time before the next defrost if interval defrost is selected;

LSn **L.A.N. section number** (1 - 8) number of sections available in the L.A.N.

Lan **L.A.N. serial address** (1 - LSn) Identifies the instrument address inside local network of multiplexed cabinet controller.

Adr **RS485 serial address** (1 - 247) Identifies the instrument address when connected to a ModBUS compatible monitoring system.

br **It sets the baud rate among: (**96 = 9.6 bit/s; 192 = 19.2 bit/s)

EMU **Previous versions emulation (**2V8 , 3V8 , 4V2). It allows the controller to be used in a LAN of controllers with previous versions:
2V8 = it emulates version 2.8 **3V8** = it emulates version 3.8
4V2 = it emulates version 4.2

rEL **Release software:** (read only) Software version of the microprocessor.

SrL **Software subrelease:** (read only) for internal use

Ptb **Parameter table:** (read only) it shows the original code of the parameter map.

Pr2 **Access to the protected parameter list** (read only).

18. DIGITAL INPUTS

The EC3-XM678D series can support up to 3 free of voltage contact configurable digital inputs (depending on the models). They are configurable via i#F parameter

18.1 GENERIC ALARM (EAL)

As soon as the digital input 1, 2, or 3 is activated the unit will wait for "**d1d**" or "**d2d**" or "**d3d**"time delay before signalling the "**EAL**" alarm message. The outputs status don't change. The alarm stops just after the digital input is de-activated.

18.2 SERIOUS ALARM MODE (BAL)

When the digital input is activated, the unit will wait for "**d1d**" or "**d2d**" or "**d3d**" delay before signalling the "**BAL**" alarm message. The relay outputs are switched OFF. The alarm will stop as soon as the digital input is de-activated.

18.3 PRESSURE SWITCH (PAL)

If during the interval time set by "**d1d**" or "**d2d**" or "**d3d**" parameter, the pressure switch has reached the number of activation of the "**nPS**" parameter, the "**CA**" pressure alarm message will be displayed. The compressor and the regulation are stopped. When the digital input is ON the compressor is always OFF. **If the nPS activation in the d#d time is reached, switch off and on the instrument to restart normal regulation.**

18.4 DOOR SWITCH INPUT (dor)

It signals the door status and the corresponding relay output status through the "**odc**" parameter: **no** = normal (any change); **Fan** = Fan OFF; **CPr** = CompressorOFF; **F_C** = Compressor and fan OFF. Since the door is opened, after the delay time set through parameter "**d#d**", the door alarm is enabled, the display shows the message "**dA**" and **the regulation restarts after rrd time.** The alarm stops as soon as the external digital input is disabled again. With the door open, the high and low temperature alarms are disabled.

18.5 START DEFROST (DEF)

It executes a defrost if there are the right conditions. After the defrost is finished, the normal regulation will restart only if the digital input is disabled otherwise the instrument will wait until the "**Mdf**" safety time is expired.

18.6 RELAY AUX ACTUATION (AUS)

This function allows to turn ON and OFF the auxiliary relay by using the digital input as external switch.

18.7 RELAY LIGHT ACTUATION (LIG)

This function allows to turn ON and OFF the light relay by using the digital input as external switch.

18.8 REMOTE ON/OFF (ONF)

This function allows to switch ON and OFF the instrument.

18.9 FHU – NOT USED

This function allows to change the kind of regulation from cooling to heating and viceversa.

18.10 ENERGY SAVING INPUT (ES)

The Energy Saving function allows to change the set point value as the result of the SET+ HES (parameter) sum. This function is enabled until the digital input is activated.

18.11 MAP SWITCHING (NT)

In this configuration, the digital input activates the map selected by the MP1 parameter. The "MAP CHANGE" ModBus command has higher priority compared to the digital input.

18.12 CLEANING FUNCTION ACTIVATION (CLN)

In this configuration, the digital input activates the CLEANING function. It can be activated only if the device is ON.
This function has the following characteristics:

- the display visualizes the "CLn" label
- The light status depends on the LCL parameter (no/yes), however the light can be modified both via button and ModBus command.
- The fans status depends on the FCL parameter (no/yes), furthermore they are not thermo-regulated (par.FST).

The "CLEANING MODE" ModBus command has higher priority compared to the digital input.

18.13 DEFROST END (DEN)

The digital input ends the defrost cycle in progress. The drip time will follow the defrost end. A further defrost request with the digital input active won't be managed.

18.14 DIGITAL INPUTS POLARITY

The digital inputs polarity depends on "**I#P**" parameters: **CL**: the digital input is activated by closing the contact; **OP**: the digital input is activated by opening the contact.

19. USE OF THE PROGRAMMING "HOT KEY"

The XM units can UPLOAD or DOWNLOAD the parameter list from its own E2 internal memory to the **"Hot Key"** and vice-versa through a TTL connector.

19.1 DOWNLOAD (FROM THE "HOT KEY" TO THE INSTRUMENT)

1. Turn OFF the instrument by means of the ON/OFF key ,insert the **"Hot Key"** and then turn the unit ON.
2. Automatically the parameter list of the **"Hot Key"** is downloaded into the controller memory, the "**doL**" message is blinking. After 10 seconds the instrument will restart working with the new parameters. At the end of the data transfer phase the instrument displays the following messages: "**end**" for right programming. The instrument starts regularly with the new programming. "**err**" for failed programming. In this case turn the unit off and then on if you want to restart the download again or remove the "**Hot key**" to abort the operation.

19.2 UPLOAD (FROM THE INSTRUMENT TO THE "HOT KEY")

1. When the XM unit is ON, insert the "**Hot key**" and push **"UP"** key.
2. The UPLOAD begins; the "**uPL**" message is blinking.
3. Remove the **"Hot Key".**
   At the end of the data transfer phase the instrument displays the following messages:
   "**end** " for right programming.
   "**err**" for failed programming. In this case push "SET" key if you want to restart the programming again or remove the not programmed "**Hot key**".

20. TECHNICAL DATA

CH660 keyboard

Housing: self-extinguishing ABS.
Case: CH**660** facia 38x80 mm; depth 18mm
Mounting: panel mounting in a 29x71 mm panel cut-out
Protection: IP20; **Frontal protection:** IP65
Power supply: from **EC3-XM678D** power module
Display: 3 digits, red LED, 14,2 mm high;
Optional output: buzzer

Power modules

Case: **8 DIN**
Connections: Screw terminal block ≤ 1,6 mm^2 heat-resistant wiring and 5.0 mm Faston
Power supply: 24 VAC ± 10%
Power absorption: 20 VA max.
Inputs: up to 6 NTC/PTC/Pt1000 probes
Digital inputs: 3 free of voltage
Relay outputs: **Total current on loads MAX. 16A**
Solenoid Valve: relay SPST 5(3) A, 250 VAC
defrost: relay SPST 16 A, 250Vac
fan: relay SPST 8 A, 250Vac
light: relay SPST 16 A, 250Vac
alarm: SPDT relay 8 A, 250Vac
Aux: SPST relay 8 A, 250Vac
Valve output: A.C. output up to 30W
Optional output (AnOUT) DEPENDING ON THE MODELS:

- **PWM / Open Collector outputs:** PWM or 12 VDC max 40 mA
- **Analog output:** 4 - 20 mA or 0 – 10 V

Serial output: RS485 with ModBUS - RTU and LAN
Data storing: on the non-volatile memory (EEPROM).
Kind of action: 1 B
Pollution degree: 2
Software class: A
Operating temperature: 0 - 60 °C.
Storage temperature: -25- 60 °C.
Relative humidity: 20 - 85% (no condensing).
Measuring and regulation range:
NTC probe: -40 - 110°C (-58 - 230°F).
PTC probe: -50 - 150°C (-67 - 302°F)
Pt1000 probe: -100 - 100°C (-148 - 212°F)
Resolution: 0.1 °C or 1 °C or 1 °F (selectable).
Accuracy (ambient temp. 25°C): ±0.5 °C ±1 digit

21. DEFAULT SETTING VALUES

CODE	M1	M2	M3	M4	MENUE	PARAMETER DESCRIPTION
rtc	- - -				Pr1	Access to RTC submenu
EEU	- - -				Pr1	Access to EEV submenu
SEt	2.0	2.0	-18.0	-18.0	- - -	Set point
SEC	LOC				- - -	LAN mode selection: Local or Global
Hy	2.0	2.0	2.0	2.0	Pr1	Differential
int	150	150	150	150	Pr2	Integral time for room temperature regulation
CrE	n				Pr2	Continuous regulation activation
LS	-30	-30	-30	-30	Pr2	Minimum set point
US	10	10	10	10	Pr2	Maximum set point
odS	1				Pr2	Outputs activation delay at start up
AC	0				Pr2	Anti-short cycle delay
CCt	0.0				Pr2	Continuous cycle duration
CCS	2.0				Pr2	Continuous cycle set point
Con	5				Pr2	Compressor ON time with faulty probe
CoF	10				Pr2	Compressor OFF time with faulty probe
CF	°C				Pr2	Measurement unit: Celsius, Fahrenheit
PrU	rE				Pr2	Pressure Mode
PMU	bAr				Pr2	Pressure measurement unit
PMd	PrE				Pr2	Pressure displaying mode: temperature or pressure
rES	dE				Pr2	Resolution (only C): decimal, integer
Lod	P1				Pr2	Local display: default display
rEd	P1				Pr1	Remote display: default display
dLy	0				Pr2	Display delay
rPA	P1				Pr2	Regulation probe A
rPb	nP				Pr2	Regulation probe B
rP3	nP				Pr2	Regulation probe 3
rP4	nP				Pr2	Regulation probe 4
rP5	nP				Pr2	Regulation probe 5
rPd	rPA				Pr2	Temperature Regulation Strategy
rPE	100				Pr2	Virtual probe percentage (rPd = rAb)
Fty	448				Pr2	Refrigerant gas type
Atu	n	n	n	n	Pr2	Regulator auto tuning
AMS	n	n	n	n	Pr2	Min stable Superheat search
SSH	6.0	6.0	6.0	6.0	Pr2	Superheat set point
SHy	0.0	0	0	0	Pr2	Differential for low superheat function
Pb	8	8	8	8	Pr2	Regulation proportional band
PbH	0.2	0.2	0.2	0.2	Pr2	Death band for superheat regulation
rS	0	0.0	0.0	0.0	Pr2	Band Offset
inC	220	220	220	220	Pr2	PID integration time
dFC	1	1	1	1	Pr2	PID derivation constant time
PEd	On				Pr2	Delay before stopping regulation with probe error
PEO	50				Pr2	Probe Error opening percentage
SFd	0.3				Pr2	Duration of Soft Start phase
SFP	40.0				Pr2	Open percentage for soft start phase
OHG	45.0	45.0	45.0	45.0	Pr2	Open percentage for inversion defrost
Pdd	0.4				Pr2	Duration for post defrost phase
OPd	50.0				Pr2	Open percentage for post defrost phase
LnF	10.0	10.0	10.0	10.0	Pr2	Minimum open percentage for stepper valve
MnF	100	100	100	100	Pr2	Maximum open percentage for stepper valve
dCL	0				Pr2	Regulation off delay, when the set point is reached 2
Fot	nu				Pr2	Enable for forcing open valve to a fixed value
LPL	-0.5				Pr2	Minimum value threshold of pressure for regulation
MOP	4.5	4.5	4.5	4.5	Pr2	Maximum value threshold of suction pressure
dMP	10				Pr2	Delay for high pressure alarm activation (MOP)
LOP	-0.5	-0.5	-0.5	-0.5	Pr2	Minimum value threshold of suction pressure
dLP	10				Pr2	Delay for low pressure alarm activation (LOP)
dML	2.0	2.0	2.0	2.0	Pr2	Opening steps variation during MOP and LOP
AAS	n				Pr2	Low superheat alarm with "XeCO2 function active
HSH	60				Pr2	Threshold for maximum superheat alarm
LSH	2				Pr2	Threshold for minimum superheat alarm
dHS	0.3				Pr2	Delay for high superheat alarm
dLS	0.3				Pr2	Delay for low superheat alarm
LSA	1.0				Pr2	Subtracting percentage with low superheat alarm
FrC	50				Pr2	Additional integration constant for fast recovery
AnP	3	3	3	3	Pr2	Number of average values for converted temperature (pressure)
Ant	1	1	1	1	Pr2	Number of average values for temperature
SLb	1	1	1	1	Pr2	Reaction time (interval for valve PID management)
tEP	nU				Pr2	Predefined valve selection
tEU	bP				Pr2	Kind of valve.
bdM	noM				Pr2	Bipolar valve pilot mode: Wave Mode - Normal Mode
HFS	FUL				Pr2	Kind of motor movement
LSt	0				Pr2	Minimum number of steps where the valve can be considered as completely closed.
USt	0				Pr2	Maximum number of steps that can be performed.
Est	0				Pr2	Extra steps in closing phase
Sr	10				Pr2	Step rate: is the speed to change step. A too high value causes a wrong driving.
CPP	0				Pr2	Current per phase during bipolar valve driving.
CHd	0				Pr2	Current per phase to maintain the actual position (Holding current).
GtC	0				Pr2	Interval between cycles to reset the valve
GtH	10				Pr2	Autozero function
dtY	100				Pr2	Pilot duty
dPA	P2				Pr2	Defrost probe A
dPb	nP				Pr2	Defrost probe B
tdF	EL	EL	EL	EL	Pr2	Kind of defrost: air, resistors, inversion
EdF	in				Pr2	Defrost mode: Clock or interval
Srt	150				Pr2	Differential for heater
Hyr	2.0				Pr2	Time out for heater (if temp > Srt)
tod	255				Pr2	Defrost with two probes
d2P	n	n	n	n	Pr2	Defrost with two probes
dtE	8.0	8.0	8.0	8.0	Pr2	First defrost termination temperature
dtS	8.0	8.0	8.0	8.0	Pr2	Second defrost termination temperature
idF	6	6	6	6	Pr2	Interval between defrosts
idE	y				Pr2	Storage in eeprom defrost interval
ndt	3	3	3	3	Pr2	Minimum Defrost Time
MdF	30	30	30	30	Pr2	Maximum defrost duration
dSd	0				Pr2	Delay for defrost on call
dFd	it				Pr2	Visualization during defrost
dAd	30				Pr2	Visualization delay for temperature after defrost
Fdt	0	0	2	2	Pr2	Dripping time

CODE	M1	M2	M3	M4	MENUE	PARAMETER DESCRIPTION
dPo	n				Pr2	Defrost at power ON
dAF	0.0				Pr2	Delay defrost after freezing
Pdt	F-C				Pr2	Pump down type
Pdn	0				Pr2	Pump down duration
Ctd	6	6	6	6	Pr2	Differential for defrost start
nbd	4.0	4	4	4	Pr2	Minimum Compressor run time before defrost
Mdb	16.0	16.0	16.0	16.0	Pr2	Maximum Compressor run time before defrost
nct	-30	-30	-30	-30	Pr2	Minimum coil temperature to trigger a defrost
FAP	P2				Pr2	Fan probe A
FnC	O-y	o-y	o-n	o-n	Pr2	Fan operating mode
Fnd	0	0	0	0	Pr2	Fan delay after defrost
FCt	10				Pr2	Temperature differential to avoid short cycles of fans
FSt	15.0	15.0	2.0	2.0	Pr2	Fan stop temperature
FHy	1.0				Pr2	Fan stop hysteresis
tFE	n				Pr2	Fan regulation by temperature in defrost
Fod	0				Pr2	Fan activation time after defrost (without compressor)
Fon	0				Pr2	Fan ON time
FoF	0				Pr2	Fan OFF time
trA	UAL				Pr2	Kind of regulation with PWM output
SOA	0				Pr2	Fixed speed for fan
SdP	30.0				Pr2	Default Dew Point value
ASr	1.0				Pr2	Differential for fan / offset for anti-sweat heater
PbA	5.0				Pr2	Proportional band for modulating output
AMi	0				Pr2	Minimum output for modulating output
AMA	100				Pr2	Maximum output for modulating output
AMt	3				Pr2	1:Time with fan at maximum speed - 2:Tempo uscita on Cavi Caldi
rAL	tEr				Pr2	Probe for temperature alarm
ALC	Ab				Pr2	Temperature alarm configuration: relative / absolute
ALU	10	10	10	10	Pr2	High temperature alarm setting
ALL	-30	-30	-30	-30	Pr2	Low temperature alarm setting
AHy	1.0				Pr2	Differential for temperature alarm
ALd	15	15	15	15	Pr2	Temperature alarm delay
rA2	nP				Pr2	Probe for temperature alarm 2
A2U	150	150	150	150	Pr2	High temperature alarm 2 setting
A2L	-40	-40	-40	-40	Pr2	Low temperature alarm 2 setting
A2H	2				Pr2	Differential for temperature alarm 2
A2d	15	15	15	15	Pr2	Temperature alarm delay 2
dAO	1.0	1.0	1.0	1.0	Pr2	Delay of temperature alarm at start-up
EdA	60				Pr2	Alarm delay at the end of defrost
dot	30				Pr2	Temperature alarm exclusion after door open
Sti	nu	nu	nu	nu	Pr2	Time for compressor ON before regulation break
Std	10	3	3	3	Pr2	Time for compressor OFF for regulation break
tbA	n				Pr2	Silencing alarm relay with buzzer
oA5	ALr				Pr2	Relay 5 configuration
oA6	AUS				Pr2	Relay 6 configuration
CoM	Cur				Pr2	Modulating output configuration
AOP	CL				Pr2	Alarm relay polarity
iAU	n				Pr2	Auxiliary output independent from ON/OFF state
i1P	cL				Pr2	Digital input 1 polarity
i1F	dor				Pr2	Digital input 1 configuration
d1d	15				Pr2	Digital input 1 activation delay
i2P	cL				Pr2	Digital input 2 polarity
i2F	LiG				Pr2	Digital input 2 configuration
d2d	5				Pr2	Digital input 2 activation delay
i3P	cL				Pr2	Digital input 3 polarity
i3F	ES				Pr2	Digital input 3 configuration
d3d	0				Pr2	Digital input 3 activation delay
nPS	15				Pr2	Pressure switch number
OdC	F-C				Pr2	Compressor and fan status when open door
rrd	30				Pr2	Outputs restart after door open alarm
CbP	y				Pr2	Clock presence
Hur	- - -				Pr1	Current hour
Min	- - -				Pr1	Current minutes
dAY	- - -				Pr1	Current day
Hd1	nu				Pr1	First weekly day
Hd2	nu				Pr1	Second weekly day
Hd3	nu				Pr1	Third weekly day
ILE	0.0				Pr1	Energy saving cycle start during workdays
dLE	0.0				Pr1	Energy saving cycle length during workdays

CODE	M1	M2	M3	M4	MENUE	PARAMETER DESCRIPTION
ISE	0.0				Pr1	Energy saving cycle start during holidays
dSE	0.0				Pr1	Energy saving cycle length during holidays
HES	0.0				Pr2	Temperature increasing during Energy Saving
Ld1	6.0				Pr1	Workdays First defrost start
Ld2	13.0				Pr1	Workdays Second defrost start (minimum as Ld1)
Ld3	21.0				Pr1	Workdays Third defrost start (minimum as Ld2)
Ld4	nu				Pr2	Workdays Fourth defrost start (minimum as Ld3)
Ld5	nu				Pr2	Workdays Fifth defrost start (minimum as Ld4)
Ld6	nu				Pr2	Workdays Sixth defrost start (minimum as Ld5)
Sd1	6.0				Pr1	Holidays First defrost start
Sd2	13.0				Pr1	Holidays Second defrost start
Sd3	21.0				Pr1	Holidays Third defrost start
Sd4	nu				Pr1	Holidays Fourth defrost start
Sd5	nu				Pr1	Holidays Fifth defrost start
Sd6	nu				Pr1	Holidays Sixth defrost start
HES	0.0				Pr2	Temperature increasing during Energy Saving
PEL	n				Pr2	Energy saving activation when Light switched off
LMd	y				Pr2	Defrost Synchronisation
dEM	y				Pr2	Defrost end Synchronisation
LSP	n				Pr2	SET-POINT Synchronisation
LdS	n				Pr2	Display Synchronisation (temperature sent via LAN)
LOF	n				Pr2	ON/OFF Synchronisation
LLi	y				Pr2	Light Synchronisation
LAU	n				Pr2	AUX Synchronisation
LES	n				Pr2	Energy Saving Synchronisation
LSd	n				Pr2	Remote probe displaying
LPP	y				Pr2	Pressure value sent in LAN
LCP	n				Pr2	P4 probe sent via LAN
StM	n				Pr2	Cooling request from LAN enable compressor relay
ACE	n				Pr2	Cold Calling in LAN always enabled even if the compressor block
P1C	ntC				Pr2	P1 configuration
OF1	0.0				Pr2	P1 calibration
P2C	ntC				Pr2	P2 configuration
OF2	0.0				Pr2	P2 calibration
P3C	nP				Pr2	P3 configuration
OF3	0.0				Pr2	P3 calibration
P4C	nP				Pr2	P4 configuration
OF4	0.0				Pr2	P4 calibration
P5C	420				Pr2	P5 configuration
OF5	0.0				Pr2	P5 calibration
P6C	PtM				Pr2	P6 configuration
OF6	0.0				Pr2	P6 calibration
PA4	-0.5				Pr2	Probe value at 4 mA or/at 0 V (P5)
P20	11.0				Pr2	Probe value at 20 mA or/at 5 V (P5)
LCL	y				Pr2	Light on during cleaning mode
FCL	y				Pr2	Fan on during cleaning mode
MAP	1°M				Pr2	Map selection
MP1	1°M				Pr2	Map selection loaded by digital input
Adr	1				Pr1	Modbus address
br	96				Pr2	Baud Rate selection for ModBus: 9600 or 19200
EMU	nu				Pr2	Emulation previous version: 2V8, 3V8, 4V2
rEL	5.4				Pr2	Release code firmware (only read)
SrL	-				Pr2	Sub-release firmware (only read)
Ptb	-				Pr2	Map EEPROM ID
Pr2	321				Pr1	Password

Emerson Climate Technologies GmbH
Am Borsigturm 31 I 13507 Berlin I Germany
www.climate.emerson.com/en-gb