COPELAND

CONTROLLERS FOR MULTIPLEXED CABINETS
XM670K- XM679K
-MANUAL FOR THE SW REL. 4.2-

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.
- Copeland Controls S.r.l. reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.

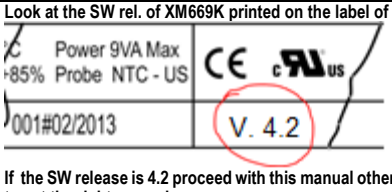
1.2 SAFETY PRECAUTIONS

- 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 "Copeland Controls S.r.l." (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 XM669K

1. **Look at the SW rel. of XM669K printed on the label of the controller.**



2. **If the SW release is 4.2 proceed with this manual otherwise contact Copeland Controls S.r.l. to get the right manual.**

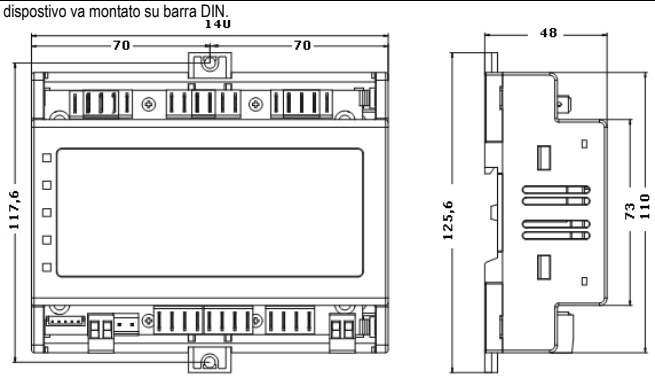
3. GENERAL DESCRIPTION

The **XM660K/XM669K** controllers are designed for medium- and low-temperature ducted applications. These instruments can be fitted into a small Local Area Network (LAN) able to handle up to 8 different sections, which, depending on the relevant programming, may either act as single controllers or execute the commands of other controllers. The **XM660K/XM669K** devices are equipped with 4/6 relay outputs respectively for controlling the solenoid valve, defrost function (either with hot gas or resistors), evaporator fans, light and alarms (XM669K), as well as for controlling an auxiliary configurable output (XM669K). They are also equipped with a specific output for controlling the ON/OFF electronic expansion valve. These instruments offer up to 6 configurable probes for controlling supply and return air, defrost end temperatures and display temperatures, as well as for overheating management. Furthermore, the **XM660K/XM669K** models are equipped with 3 digital potential-free inputs with parameter-based configuration.

Instruments are equipped with HOTKEY that makes it easy to program. The RS485 serial output is used to interface the devices with the XWEB monitoring and supervision systems. A clock (**RTC**) is available as an option. The HOTKEY connector may be used to connect the **X-REP** repeater display.

4. INSTALLATION AND MOUNTING

Il dispositivo va montato su barra DIN.



This device can operate without any user interface, but normal application is with Copeland CX660 keyboard.

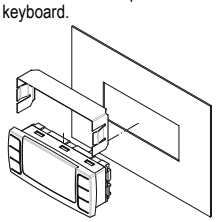


Figure 1a

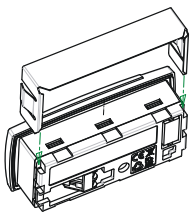


Figure 1b

The **CX660 keyboard** shall be mounted on vertical panel, in a 29x71 mm hole, and fixed using the special bracket supplied as shown in fig. 1a/1b. The temperature range allowed for correct operation is 0 to 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.

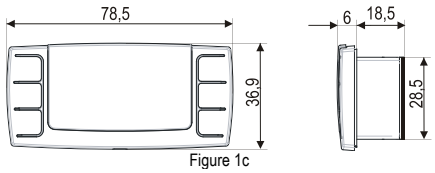


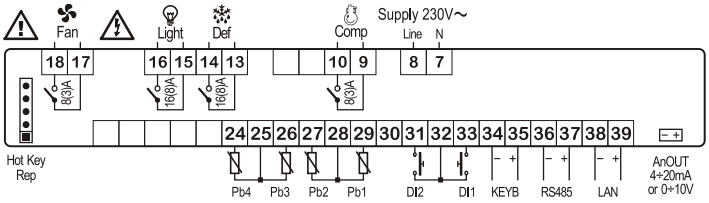
Figure 1c

5. WIRING DIAGRAM AND CONNECTIONS

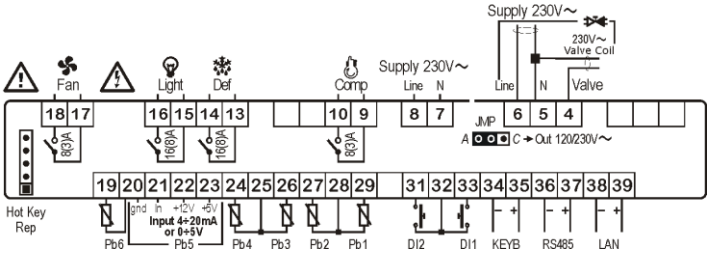
5.1 IMPORTANT NOTE

XM device is provided with disconnectable terminal block to connect cables with a cross section up to 1.6 mm² 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 (6.2 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.
N.B. Maximum current allowed for all the loads is 16A. 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 XM660K – ALL POWER SUPPLY

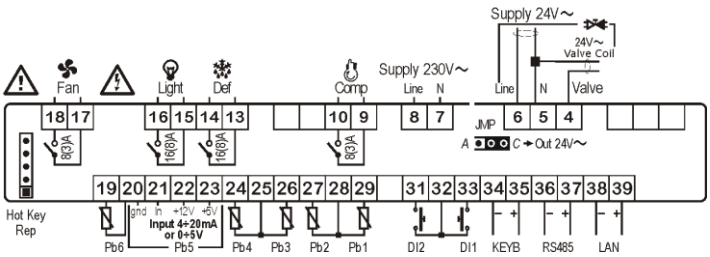


5.3 XM669K – 230VAC VALVES



NOTE: the jumper indicated as JMP is located inside the box; PLEASE DISCONNECT THE POWER SUPPLY BEFORE MOVING IT. This jumper may be closed only in case of 24Vac valve control.

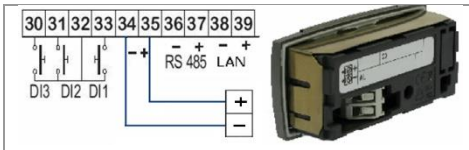
5.4 XM669K – 24VAC VALVES



NOTE: the jumper indicated as JMP is inside the case of the controller PLEASE DISCONNECT THE POWER SUPPLY BEFORE MOVING IT. This jumper has to be closed only in case of driving 24Vac valve.

6. MAIN WIRING CONNECTIONS

6.1 KEYBOARD DISPLAY CX660



The **XM660/669K** board can operate also without keyboard.

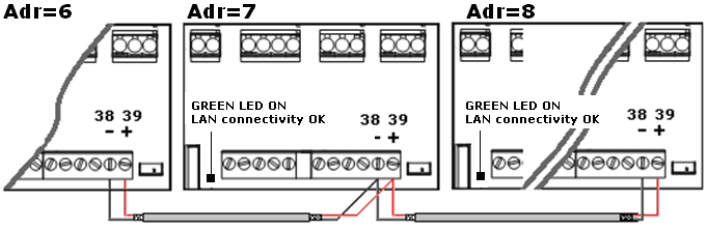
Polarity:
Terminal [**34**] [-]
Terminal [**35**] [+]

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

6.2 SYNCHRONIZED DEFROST – MAXIMUM 8 SECTIONS

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

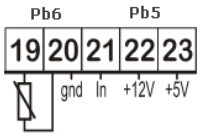
1) connect a shielded cable between terminals [**38**] [-] and [**39**] [+] for a **maximum of 8 sections**;
2) the **Adr** parameter is the number to identify each electronic board. **Address duplication is not permitted**, in this case the synchronized defrost and the communication with monitoring 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 30m

6.3 SENSORS FOR SUPERHEAT CONTROL – ONLY FOR XM679K



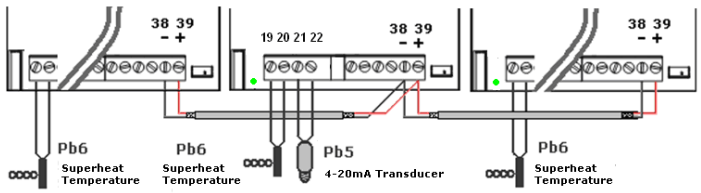
Temperature probe: Pb6 terminals [**19**] - [**20**] without any polarity.

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

Pressure transducer: Pb5 terminals:
[**21**] = input of the signal; [**22**] = Power Supply for 4to20mA transducer; [**20**] = GND; [**23**] = +5Vdc power supply for ratiometric pressure transducer.

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

6.4 HOW TO USE ONLY ONE PRESSURE TRANSDUCER ON MULTIPLEXED APPLICATIONS



A working LAN connection is required (green LED lit on all XM669K boards of the same LAN). Connect and configure a pressure transducer only on **one** XM669K 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:

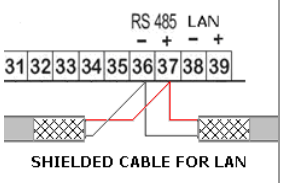
dPP = Err → the local transducer read a wrong value, the pressure is out of the bounds of the pressure transducer or the **P5C** parameter is wrong. Check all these options and eventually change the transducer;

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

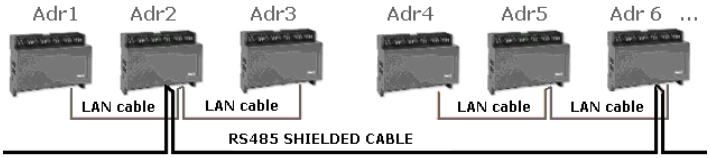
On the fast access menu:
dPP is the value read by the pressure gauge;
dP6 is the value read by the temperature probe, temperature of the gas on the outlet section of the evaporator;
SH is the value of the superheat. The **nA** or **Err** messages mean that the superheat has no sense in that moment and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

6.5 HOW TO CONNECT MONITORING SYSTEM



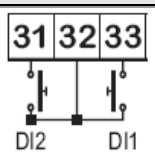
1) Terminals [**36**] [-] and [**37**] [+].
2) Use shielded twisted cable. For example Belden® 8762 o 8772 or cat 5 cables.
3) **Maximum distance 1Km.**
4) Don't connect the shield to the earth or to GND terminals of the device, avoid accidental contacts by using insulating tape.

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).

6.6 DIGITAL INPUTS

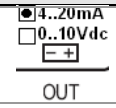


1) The terminals from [**30**] to [**33**] are all free of voltage;
NOTE: the XM660K has only DI1 and DI2 inputs.
2) Use shielded cable for distance higher than one meter;
Maximum distance 1Km.

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 parameter can be configured as follows: EAL = external alarm, Bal = serious lock alarm, PAL = pressure switch alarm, dor = door switch, dEF = external defrost, AUX = 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 the 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

ACCESS to Pr1	SET + ▽	Press and hold for about 3 sec 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 sec, and then the display will show the next parameter.
EXIT	SET + △	Instantaneous exit from the programming mode, otherwise wait for about 10 sec (without press any button).

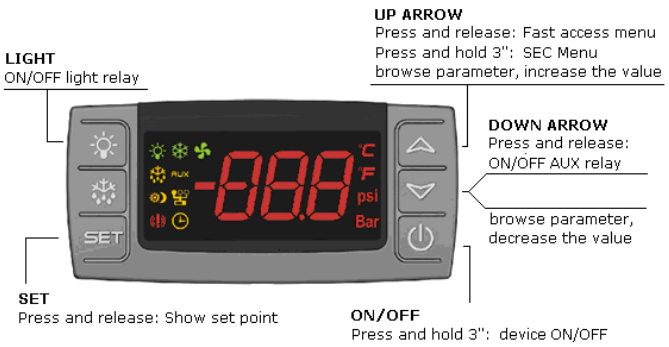
6.7 ANALOG OUTPUT



- Selectable between 4 to 20mA and 0 to 10Vdc.
- 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 (500watt) or family XV...D or XV...K.

7. USER INTERFACE



7.1 ICONS

	Cooling output ↓			
Light →			← Fan	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.
Defrost →		AUX	← Auxiliary relay	
Energy saving →			← Multimaster Enabled	
Generic alarm →			← Clock / time	
DURING PROGRAMMING: blink the measurement units of temperature and pressure				

7.2 KEYBOARD COMMANDS

Single commands:

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

Double commands:

DOWN + UP	Press and hold for about 3 sec to lock (**Pon**) or unlock (**PoF**) the keyboard.
SET + UP	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 + DOWN	Pressed together for 3 sec allow to access to first level of programming mode.

7.3 HOW TO MODIFY THE SET POINT FOR AIR TEMPERATURE REGULATION

The thermostat set is the value set for keeping air temperature constant. The regulation output is controlled by the electronic valve [4-5] or by the cold relay [11-12] (e.g. for remote switch-on).

BEGIN	SET	Press SET button for 3 sec, the measurement units will blink together.
Value modification	UP or DOWN	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 sec.

In any case, it is possible to wait for about 10 sec 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.

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

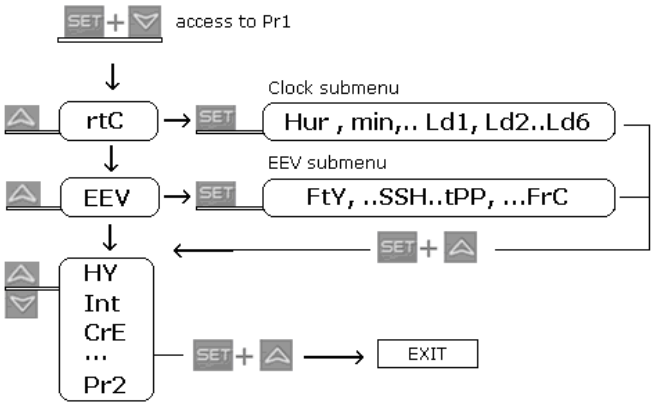
The device provide 2 programming levels: **Pr1** with direct access and **Pr2** protected with a password (intended for experts).

8.1 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 sec, 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 others parameters.



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

8.2 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**).

9. FAST ACCESS MENU

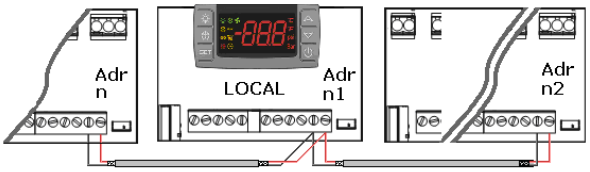
This menu contains the list of probes and some values that are automatically evacuate by the board such as the superheat and the percentage of valve opening. The values: **NP** or **PON** stands for probe not present or value not evacuate, **Err** value out of range, probe damaged not connected or incorrectly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

Entering fast access menu	UP	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 UP *or* DOWN *arrows to select an entry, then press* SET *to see the value or to go on with other value.*		**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. **L°t** Minimum room temperature; **H°t** Maximum room temperature; **dPr** Virtual probe for room temperature regulation [**rPA** and **rPb**]; **dPd** Virtual probe for defrost management [**dPA**]; **dPF** Virtual probe for fan management [**FPA**]; **rSE** Real thermoregulation set point: the value includes the sum of **SET**, **HES** and/or the dynamic set point if the functions are enabled.
Exit	SET + UP	Pressed together or wait the timeout of about 60 sec

10. MENU FOR MULTIMASTER FUNCTION: SEC

The function "section" **SEC** is enabled when icon is lit. It allows entering in the remote programming mode, from a keyboard not physically connected to the board, through the LAN functionality.



Action	Button or display		Notes
Enter menu	UP		Press UP arrow for about 3 sec, 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	UP Or DOWN	**LOC** **ALL** **SE1** **SEn** **SE8**	To gain access only to the local device. To gain access to all the devices connected to the LAN. To gain access to the device with 1st **Adr** (*) … To gain access to the device with 8th **Adr** (*)
Confirm	SET		Select and confirm an entry by pressing **SET** button.
Exit menu	SET + UP		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).

EXAMPLES:

1. To modify the same parameter values in all the devices connected to the LAN: enter multimaster menu. Select and confirm **ALL**. Exit from multimaster menu. Enter the programming menu and change the required parameter values.
   The new values will be changed on all devices connected to the LAN.
2. To modify a parameter value in the device with [**Adr = 35**]: find the relevant indexed section (the one linked to [**Adr = 35**]). Enter multimaster menu. Select and confirm this section from the multimaster menu. Exit from multimaster menu. Enter the programming menu and change the required parameter value.
3. If the alarm **nod** is present: enter the multimaster menu. Select and confirm the **LOC** section. Exit from multimaster menu.

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

11. COMMISSIONING

11.1 CLOCK SETTING AND RTC ALARM RESET

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

BEGIN	UP	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 + UP	Press for about 10 sec. The operation resets the RTC alarm.

Note: the **rtC** clock menu is present also on the second.
Warning: if the board shows the RTF alarm, the device has to be changed.

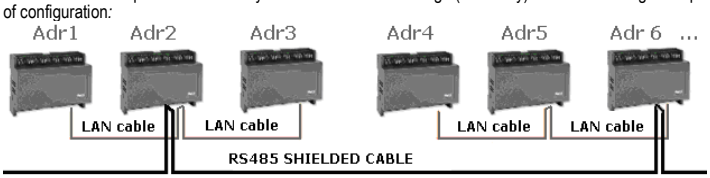
11.2 SYNCHRONIZED DEFROST

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.

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). Se 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°

11.3 ⚠ ELECTRONIC VALVE SETTINGS – ONLY FOR XM669K

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 to 20mA] 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: [-0.5/7Bar] or [0.5/8Bar abs] the correct setup is relative pressure with PA4 = -0.5 and P20 = 7.0. The [0.5/12Bar abs] the correct setup is relative pressure with PA4 = -0.5 and P20 = 11.00.
[4] Virtual pressure: the unit connected to the **P5C= 420** transducer or **5Vr** (for ratiometric control) may be defined as master pressure by setting **LPP=Y**, while a slave-pressure board will automatically read the pressure value from the LAn cable.
Example of virtual pressure with unique [4 to 20mA] transducer:

Param.	XM6x9K_1 without transducer	XM6x9K_2 + with transducer	XM6x9K_3+ without transducer
Adr	n	n + 1	n + 2
LPP	LPP = n	LPP = Y	LPP = n
P5C	LAN or not connect the probe	P5C= 420 or 0-5V	LAN or not connect the probe
PA4	Not used	-0.5 bar	Not used
P20	Not used	7.0 bar	Not used

[4] From EEV submenu: select the correct kind of gas with **FTY parameter.**

Example with **4..20mA transducer for each board,** with -0,5..7bar. In this case, all boards are configured in the same way

Param.	XM600K_1	XM600K_2	XM600K_3
Adr	n	n + 1	n + 2
LPP	LPP=n	LPP=n	LPP=n
P5C	P5C= 420	P5C= 420	P5C= 420
PA4	-0,5 bar	-0,5 bar	-0,5 bar
P20	7.0 bar	7.0 bar	7.0 bar

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

1. *After wiring the XM679K, **set the proper gas** via **Fty** parameter. Pre-set gas is R404A.*

2. ***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÷11bar) 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:** check 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.*

3. ***Set the parameters for self adaptive regulation of superheat***
   ***NOTE:** the parameters **Pb** (regulation band) and **Int** (integral time) are automatically calculated by the controller*
   - *Set **CrE = no,** this disable the continuos regulation of the temperature. Default is CrE = no.*
   - *Set **SSH**, **superheating setpoint**: a value between 4 and 8 is acceptable. Default is SSH=8*
   - *Set **AMS = y** to start the **self adaptive regulation**. Default is AMS = y*
   - *Set **ATU = y** to start the search of the **lowest stable superheat**. Default is ATU = y. 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 = 3*
   - *Set **SUb, pressure filter**: Default is SUb = 10. The value can be increased up to 20 in case of too fast response of the pressure variations.*

4. ***Set the parameters for the temperature regulation***
   - *Set the temperature **setpoint**. Default is -5°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 witdh*

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 **AMS, autotuing enabling.**

- *With **AMS = n: overheating is adjusted in manual mode, and PID values are defined by the user.***
- *With **AMS = y: overheating is adjusted in automatic self-adaptive mode by the controller.***

13.2 MANUAL OPERATING MODE - AMS = 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 (dfferential) 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 **6°C.**
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 – AMS = 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 **AMS** 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 **AMS = 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 **SFd** (percentage) and **SFd** (time).
- **Forced opening of the valve after defrost,** parameter **oPd** (percentage) and **Pdd** (time).

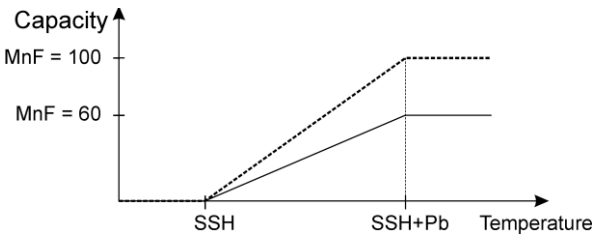
13.4 MINIMUM STABLE SUPERHEAT SEARCH - AMS = YES, ATU = YES

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

With ATU = yES controllers start searching the mimimum 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 capcity 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 oPE and oPd, respectively**.**

13.6 PRESSURE FILTERING – SUB PARAMETER

For a good SH regulation, it's important to use a filtered value of the pressure.
This can be done by the parameter Sub.
Suggested values:
From 1-5 evaporators for each racks: Sub = 20
From 6-30 evaporators for each racks: Sub = 15
More than 30 evaporators for each racks: Sub =10

14. CONTROLLING LOADS

14.1 COOLING TIME

The regulation is performed according to the temperature measured by the thermostat probe that can be physical probe or virtual probe obtained by an average between two probes following the formula:

temperature_for_regulation = (rPA*rPE + rPb*(100-rPE))/100

If the temperature reaches and exceeds the set point value plus differential value, the cold call is triggered, which will end as soon as the temperature drops to the set point value.
In case of temperature control probe fault, the cooling time is controlled via the "**Con**" and "**CoF**" parameters.

14.2 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;

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.

14.3 DISTRIBUTED DEFROST WITH CONTINUOUS TEMPERATURE REGULATION (CRE = YES)

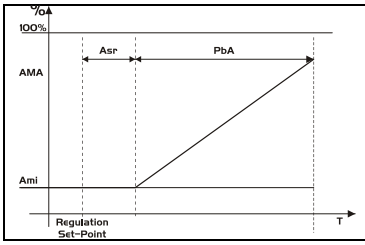
With continuous temperature regulation, thermostatic pauses are reduced. In this way, in case of normal-temperature applications a greater formation of ice on the evaporator may occur.
*In these situations, we recommend using the **Sti** and **Sdt** parameters to force thermostatic pauses and achieve a distributed defrost effect, thus optimizing the evaporator performance.*
Sti **Regulation stop interval: (0.0÷24.0 hours: tens of minutes)** if regulation is active for the entire **Sti** time, the valve will be closed for the **Std** time in order to prevent an excessive strain on the evaporator.
Std **Regulation pause time:** (0÷60 min.) it defines regulation stop time after **Sti.**

14.4 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)



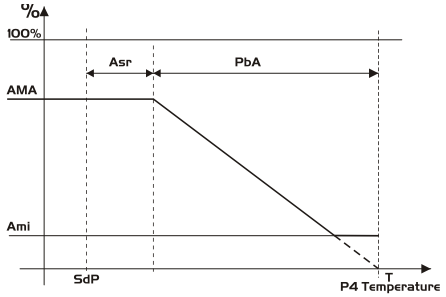
The modulating output (**trA=rEG**) works in proportional way (excluding the first **AMt** seconds where the fans speed is the maximum). The regulation set point is relative to regulation set point and is indicated by **ASr,** the proportional band is always located above **SET+ASr** value and its value 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**.

14.5 ANTI SWEAT HEATERS (IF PRESENT)

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.

15. 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 sec 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)	
		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 ALU parameter on rAL probe	
8	**LA**	Temperature alarm from ALL parameter on rAL probe	
9	**"HAd**	Alarm from dLU parameter on defrost probe [dPa / dPb]	
10	**"LAd"**	Alarm from dLU parameter on defrost probe [dPa / dPb]	
11	**"HAF"**	Alarm from FLU parameter on defrost probe [FPa / FPb]	
12	**LAF**	Alarm from FLL parameter on defrost probe [FPa / FPb]	
		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	**MSn**	Regulation lock due to nMS pause limit	Manual reset

15.1 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.

16. USE OF THE PROGRAMMING "HOT KEY"

The XM units can UPLOAD or DOWNLOAD the parameter list from its own E2 internal memory to the "quick access key" **and** vice-versa through a TTL connector. If the **quick access key is used, the Adr will not change**.

16.1 HOT KEY - PARAMETERS KEY

Transferring parameters from the instrument to the key [UPLOAD]

1. Program the instrument with the desired parameters:
2. Insert the HOT KEY 4K DK00000100
3. Press the UP arrow button; the message UPL will appear. Wait for the End message.

Err: please try again, the hot key is either incompatible or faulty.

Transferring parameters from the key to the instrument [UPLOAD]

1. Insert the HOT KEY 4K DK00000100 when the instrument is switched off: set to OFF using the button or from the power supply.
2. Switch on the instrument; the doL message will appear. Wait for the End message; the instrument will resume operations with the new program.

Err: attempt unsuccessful: the instrument and version data loaded on the key do not match the version of the instrument.

17. PARAMETER LIST

REGULATION

rtC **Access to CLOCK submenu (if present);**
EEU **Access to EEV submenu (only XM679K);**
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 (Only XM679K):** (0 ÷ 255 s) integral time for room temperature PI regulator. 0= no integral action;
CrE **Continuous regulation activation (Only XM679K):** (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÷24.0h; 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. **(Only XM669K)**
PMU **Pressure measurement unit:** (bAr – PSI - MPA) it selects the pressure measurement units. MPA= the value of pressure measured by kPA*10. **(Only XM669K)**
PMd **Way of displaying pressure :** (tEM - PrE) it permits showing the value measured by pressure probe with **tEM=** temperature or by **PrE=** pressure; **(Only XM669K)**
rES **Resolution (for °C)**: (in = 1°C; dE = 0.1 °C) allows decimal point display;
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, P5) 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
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 (Only XM679K)

FtY **Kind of gas:**

LABEL	REFRIGERANT	OPERATING RANGE
R22	r22	-50-60°C/-58÷120°F
134	r134A	-50-60°C/-58÷120°F
404	r404A	-70-60°C/-94÷120°F
47A	r407A	-50-60°C/-58÷120°F
410	r410A	-50-60°C/-58÷120°F
507	r507	-70-60°C/-94÷120°F
47C	r407C	-50-60°C/-58÷120°F
47F	r407F	-50-60°C/-58÷120°F
290	r290 – Propane	-50-60°C/-58÷120°F
CO2	r744 - Co2	-50-60°C/-58÷120°F
450	r450A	-45-60°C/-69÷120°F
513	r513A	-45-60°C/-69÷120°F
448	r448A	-45-60°C/-69÷120°F
449	r449A	-45-60°C/-69÷120°F

Atu **Minimum STABLE superheat search (**No; yES) This parameter enables the search of the minimum stable superheat. The lowest admitted value is LSH+2°C
AMS **Self self adaptive SH regulation enabling** (No; yES).
SSH **Superheat set point:** [0.1°C ÷ 25.5°C] [1°F ÷ 45°F] it's the value used to regulate superheat
CyP **Cycle Period:** (1 ÷ 15s) it permits to set cycle time;
Pb **Proportional band:** (0.1 ÷ 60.0 / 1÷108°F) PI proportional band**;**
rS **Band Offset:** (-12.0 ÷ 12.0°C / -21÷21°F) PI band offset;
inC **Integration time:** (0 ÷ 255s) PI integration time;
PEO **Probe Error opening percentage:** (0÷100%) if a temporary probe error occurs, valve opening percentage is **PEo** until **PEd** time is elapsed;
PEd **Probe Error delay before stopping regulation:** (0÷239 sec. – On=unlimited) if probe error duration is bigger than **PEd** then valve totally closes. **Pf** message is showed. If **PEd=On** valve opening is **PEo** until probe error finishes;
OPE **Start opening Percentage:** (0÷100%) Opening valve percentage when start function is active. This phase duration is **SFd time**;
SFd **Start Function duration:** (0.0 ÷ 42.0 min: resolution 10s) It sets start function duration and post-defrost duration. **During this phase the alarms are neglected**;
OPd **Opening Percentage after defrost phase:** (0÷100%) Opening valve percentage when after defrost function is active. This phase duration is **Pdd time**;
Pdd **Post Defrost Function duration:** (0.0 ÷ 42.0 min: resolution 10s) It sets start function duration and post-defrost duration. **During this phase the alarms are neglected**;
MnF **Maximum opening percentage at normal Functioning:** (0÷100%) during regulation it sets the maximum valve opening percentage;
dCL **Delay before stopping valve regulation:** (0 ÷ 255s) When the cooling request goes off, the electronic valve regulation can go on for the dCL time in order to prevent uncontrolled superheat variation;
Fot **Forced opening percentage:** (0÷100% - **nu**) it permits to force the valve opening to the specified value. This value overwrite the value calculated by PID algorithm. **!!!! WARNING !!!!** to obtain the correct superheat regulation you have to set **Fot=nu**;
PA4 **Probe value At 4mA or At 0V:** (-1.0 ÷ P20 bar / -14 ÷ PSI / -10 ÷ P20 kPA*10) pressure value measured by probe at 4mA or at 0V (related to PrM parameter) **Referred to Pb5**
P20 **Probe value 20mA or At 5V:** (PA4 ÷ 60.0 bar / 870 psi / 600 kPA*10) pressure value measured by probe at 20mA or at 5V (related to PrM parameter) **Referred to Pb5**
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)
LOP **Lowest 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)
dML **delta MOP-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.
MSH **Maximum Superheat alarm:** (LSH ÷ 80.0°C / LSH ÷ 144°F) when superheat exceeds this value an high superheat alarm is signalled after interval **SHd**
LSH **Lowest Superheat alarm:** (0.0 ÷ MSH °C / 0÷MSH °F) when superheat goes down to this value a low superheat alarm is signalled after interval **SHd**
SHy **Superheat alarm Hysteresis:** (0.1÷25.5°C/1÷45°F) hysteresis for superheat alarm deactivation
SHd **Superheat alarm activation delay:** (0.0 ÷ 42.0 min: resolution 10s) when a superheat alarm occurs, the time SHd have to pass before signalling alarm;
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.
Sub **Pressure filter** (0÷100) It uses the last average values of the pressure to calculate the superheat.
SLb **Reaction time** (0÷255s): time to update the valve open percentage.
EI. With SLb = 24: the valve open percentage is updated every 24s.

DEFROST

dPA **defrost Probe A:** (nP; P1; P2, P3, P4, P5) 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, P5) second probe used for defrost. If rPB=nP the regulation is performed with real value of dPA.
dPE **defrost virtual probe percentage:** (0÷100%) it defines the percentage of the dPA respect to dPb. The value used to regulate room temperature is obtained by:

value_for_defrost= (dPA*dPE + dPb*(100-dPE))/100

tdF **Defrost type**: (EL – in) EL = electrical heater; in = hot gas;
EdF **Defrost mode**: (rtc – in) **(only if RTC is present) rtc=** defrost activation via RTC; **in=** defrost activation with **idf**.
Srt **Heater set point during defrost:** (-55.0 ÷ 150.0°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°C ÷ 25.5°C , 1°F ÷ 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;
dtP **Minimum temperature difference to start defrost:** [0.1°C ÷ 50.0°C] [1°F ÷ 90°F] if the difference between the two defrost probes stays lower than **dtP** for all **ddP** time the defrost is activated;
ddP **Delay before starting defrost (related to dtP):** (0 ÷ 60 min) delay related to **dtP**.
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):** (-55,0÷50,0°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):** (-55,0÷50,0°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;
MdF **Maximum duration of defrost:** (0÷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÷23.5h) time interval between the end of the fast freezing cycle and the following defrost related to it.

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;
FPB **Fan probe B:** (nP; P1; P2, P3, P4, P5) second probe used for defrost. If FPB=nP the regulation is performed with real value of FPB;
FPE **Fan virtual probe percentage:** (0÷100%) it defines the percentage of the FPA respect to FPb. The value used to regulate room temperature is obtained by:
value_for_defrost= (FPA*FPE + FPb*(100-FPE))/100
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 (**0.0°C ÷ 50.0°C; 0°F ÷ 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°C ÷ 25.5°C) (1°F ÷ 45°F) when stopped, fan restarts when fan probe reaches FSt-FHy temperature;
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**: (-55,0÷50,0°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°C ÷ 25.5°C) (-45°F ÷ 45°F);
PbA **Differential for anti-sweat heaters:** (0.1°C ÷ 25.5°C) (1°F ÷ 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°C ÷ 25.5°C / 1°F ÷ 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.
dLU **High temperature alarm (defrost probe):** (ALC= rE, 0 ÷ 50°C or 90°F / ALC= Ab, ALL ÷ 150°C or 302°F) when this temperature is reached and after the **ddA** delay time the **HAd** alarm is enabled.
dLL **Low temperature alarm (defrost probe):** (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 **LAd** alarm is enabled.
dAH **Differential for temperature alarm (defrost probe):** (0.1°C ÷ 25.5°C / 1°F ÷ 45°F) Intervention differential for recovery of temperature alarm;
ddA **Temperature alarm delay (defrost probe):** (0÷255 min) time interval between the detection of an alarm condition and the corresponding alarm signalling.
FLU **High temperature alarm (defrost probe):** (ALC= rE, 0 ÷ 50°C or 90°F / ALC= Ab, ALL ÷ 150°C or 302°F) when this temperature is reached and after the **FAd** delay time the **HAF** alarm is enabled.
FLL **Low temperature alarm (defrost probe):** (ALC = rE , 0 ÷ 50 °C or 90°F / ALC = Ab , - 55°C or - 67°F ÷ ALU) when this temperature is reached and after the **FAd** delay time, the **LAF** alarm is enabled.
FAH **Differential for temperature alarm (defrost probe):** (0.1°C ÷ 25.5°C / 1°F ÷ 45°F) Intervention differential for recovery of temperature alarm;
FAd **Temperature alarm delay (defrost probe):** (0÷255 min) time interval between the detection of an alarm condition and the corresponding alarm signalling.
dAO **Delay of temperature alarm at start-up:** (0min÷23h 50min) time interval between the detection of the temperature 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 temperature alarm condition at the end of defrost and the alarm signalling.
dot **Temperature alarm exclusion after door open:** (0min÷23h 50min)
Sti **Stop regulation interval: (0.0÷24.0 hours: tens of minutes)** after regulating continuously for **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.**
nMS **Maximum number of regulation pauses** (nu, 1÷255)
CAUTION: This signal requires a **MANUAL RESET**; the device must be power cycled for reset.

OPTIONAL OUTPUT (AnOUT) if present

OA7 **Modulating output configuration (valid only if CoM=0A7):** (CPr - dEF - FAn - ALr - LiG - AUS – db) it selects the function of the modulating output. Only if the parameter **CoM=OA7**: **CPr=** compressor; **dEF=** defrost; **FAn=** fans; **Alr=** alarm; **LiG=** light; **AUS=** auxiliary; **db=** neutral zone (**do not use with CrE=Y**);
CoM **Type of functioning modulating output:**
- **For models with PWM / O.C. output → PM5=** PWM 50Hz; **PM6=** PWM 60Hz; **OA7=** not set it;
- **For models with 4÷20mA / 0÷10V output → Cur=** 4÷20mA current output; **tEn=** 0÷10V voltage output;

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:** (EAL – bAL – PAL – dor – dEF – AUS – LiG – OnF – Htr – FHU – ES – Hdy) **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; **Htr=** change type of action ; **FHU=** not used; **ES=** activate energy saving; **Hdy=** activate holiday function;
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:** (EAL – bAL – PAL – dor – dEF – AUS – LiG – OnF – Htr – FHU – ES – Hdy) **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; **Htr=** change type of action ; **FHU=** not used; **ES=** activate energy saving; **Hdy=** activate holiday function;
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
nPS **Pressure switch number:** (0 ÷15) Number of activation 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 ÷ 59min)
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 ÷ 23h 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 ÷ 24h 00 min.) Sets the duration of the Energy Saving cycle on workdays.
ISE **Energy Saving cycle start on holidays**. (0 ÷ 23h 50 min.)
dSE **Energy Saving cycle length on holidays** (0 ÷ 24h 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 ÷ 23h 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 ÷ 23h 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

ESP **Energy saving probe selection:** (nP - P1 - P2 - P3 - P4 - P5 – tEr).
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 actived when the light is switched off and vice versa;

LAN MANAGEMENT

LMd **Desfrost synchronisation: y=** the section send a command to start defrost to oher controllers, **n=** the section don'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=** the 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
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 **Probe P4 data is sent via LAN (hot wires)** (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 **Cooling call from LAN always enabled (even with compressor lock)** (n – Y)

PROBE CONFIGURATION

P1C **Probe 1 configuration:** (nP – Ptc – ntc – PtM) **nP=** not present; **PtC=** Ptc; **ntc=** NTC; **PtM=** Pt1000;
Ot **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;
OE **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;
o3 **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;
o4 **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÷ 20mA; **5Vr=** 0÷5V ratiometric;
o5 **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.
o6 **Probe 6 calibration:** (-12.0÷12.0°C/ -21÷21°F) allows to adjust possible offset of the probe 6.

SERVICE – READ ONLY

CLt **Cooling time percentage:** it shows the effective cooling time calculated by XM600 during regulation;
tMd **Time to next defrost:** it shows time before the next defrost if interval defrost is selected;
LSn **L.A.N. section number** (1 ÷ 8) Shows the 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.
Rel **Release software:** (read only) Software version of the microprocessor.
Ptb **Parameter table:** (read only) it shows the original code of the Copeland Controls S.r.l. parameter map.
Pr2 **Access to the protected parameter list** (read only).

18. DIGITAL INPUTS

The XM600 series can support up to 2 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 "**d#d**" 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 "**d#d**" 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 "**d#d**" 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** = Compressor OFF; **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 KIND OF ACTION (HTR)

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

18.10 FHU – NOT USED

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

18.11 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.

18.12 CONFIGURABLE INPUT - HOLIDAY FUNCTION (HDY)

In Holiday function Energy saving and defrost cycles follow holiday times. **(Sd1…Sd6)**

19. TECHNICAL DATA

CX660 keyboard
Housing: self extinguishing ABS.
Case: CX**660** facia 35x77 mm; depth 18mm
Mounting: panel mounting in a 29x71 mm panel cut-out
Maximum keyboard-base distance: up to 30m with shielded cable, section 0.5mm²
Protection: IP20; **Frontal protection:** IP65
Power supply: from **XM600K** 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 mm² heat-resistant wiring and 5.0mm Faston
Power supply: depending on the model 12Vac – 24Vac - 110Vac ± 10% - 230Vac ± 10% or 90÷230Vac with switching power supply.
Power absorption: 9VA max.
Inputs: up to 6 NTC/PTC/Pt1000 probes
Digital inputs: 3 free of voltage
Maximum digital input distance: up to 15m with shielded cable, section 0.5mm²
Relay outputs: ***Total current on loads MAX. 16A***
Solenoid Valve: relay SPST 5(3) A, 250Vac
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 **(Only XM679K)**

Optional output (AnOUT) DEPENDING ON THE MODELS:
- **PWM / Open Collector outputs:** PWM or 12Vdc max 40mA
- **Analog output:** 4÷20mA or 0÷10V

Serial output: RS485 with ModBUS - RTU and LAN
Data storing: on the non-volatile memory (EEPROM).
Kind of action: 1B. **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

20. DEFAULT SETTING VALUES

Lab	Val	Menù	Description	Range
SEt	2.0	---	Set point	LS - US
Regulation				
Hy	2.0	Pr1	Differential	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
Int	150	Pr1	Integral time for room temperature regulation	0 ÷ 255 s
CrE	n	Pr1	Continuous regulation activation	n– Y
LS	-30	Pr2	Minimum set point	[-55.0°C ÷ SET] [-67°F ÷ SET]
US	20	Pr2	Maximum set point	[SET ÷ 150.0°C] [SET ÷ 302°F]
odS	0	Pr1	Outputs activation delay at start up	0 ÷ 255 (min.)
AC	0	Pr1	Anti-short cycle delay	0 ÷ 60 (min.)
CCt	0.0	Pr2	Continous cycle duration	0 ÷ 24.0(144) (hour.10min)
CCS	2.0	Pr2	Continuous cycle set point	[-55.0°C ÷ 150,0°C] [-67°F ÷ 302°F]
Con	15	Pr2	Compressor ON time with faulty probe	0 ÷ 255 (min.)
CoF	30	Pr2	Compressor OFF time with faulty probe	0 ÷ 255 (min.)
CF	°C	Pr2	Measurement unit: Celsius , Fahrenheit	°C- °F
PrU	rE	Pr2	Pressure Mode	rE- Ab
PMU	bAr	Pr2	Pressure measurement unit	bAr– PSI - MPA
PMd	PrE	Pr2	Pressure displaying mode: temperature or pressure	tEM- PrE
rES	dE	Pr2	Resolution (only °C) : decimal, integer	dE- in
Lod	P1	Pr2	Local display: default display	nP- P1 - P2 - P3 - P4 - P5 - P6 – tEr - dEF
rEd	P1	Pr2	Remote display: default display	nP- P1 - P2 - P3 - P4 - P5 - P6 – tEr - dEF
dLy	0	Pr1	Display delay	0 ÷ 24.0(144) (Min.10s)
rPA	P1	Pr1	Regulation probe A	nP- P1 - P2 - P3 - P4 - P5
rPb	nP	Pr1	Regulation probe B	nP- P1 - P2 - P3 - P4 - P5
rPE	100	Pr1	Virtual probe percentage (room temperature)	0 ÷ 100 (100=rPA, 0=rPb)
Electronic Expansion Valve				
Fty	404	Pr1	Kind of gas	R22- 134- 404- 47A-47C- 47F -290 - 410- 507 - CO2 – 450 - 513 – 448- 449R22- 134 - 404 - 47A - 47F - 410 - 507 - CO2
Atu	YES	Pr2	Minimum STABLE superheat search	n– Y
AMS	YES	Pr2	Self self adaptive SH regulation enabling	n– Y
SSH	8.0	Pr1	Superheat set point	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
CyP	6	Pr1	Cycle Period	1 ÷ 15 s
Pb	5.0	Pr1	Proportional band for superheat regulator	[0.1°C ÷ 60.0 °C] [1°F ÷ 108 °F]
rS	0.0	Pr1	Band Offset for superheat regulator	[-12.0°C ÷ 12.0°C] [-12°C ÷ 12°C] [-21°F ÷ 21°F]
inC	120	Pr1	Integration time for superheat regulator	0 ÷ 255 s
PEO	50	Pr1	Probe error opening percentage	0 ÷ 100
PEd	On	Pr1	Probe error delay before stopping regulation	0 ÷ 239 s - On(240)
OPE	85	Pr1	Start opening percentage	0 ÷ 100
SFd	1.3	Pr1	Start function duration	0 ÷ 42.0(252) (min.10sec)
OPd	100	Pr1	Opening percentage after defrost phase	0 ÷ 100
Pdd	1.3	Pr1	Post defrost function duration	0 ÷ 42.0(252) (min.10sec)
MnF	100	Pr1	Maximum opening percentage at normale functioning	0 ÷ 100
dCL	0	Pr1	Delay before stopping valve regulation	0 ÷ 255 s
Fot	nu	Pr1	Forced opening percentage	0 ÷ 100 - "nu"(101)

PA4	-0.5	Pr2	Probe value at 4 mA or at 0V	BAR : [PrM=rEL] -1.0 ÷ P20 [PRM=Abs] 0.0 ÷ P20 PSI : [PrM=rEL] -14 ÷ P20 [PRM=Abs] 0 ÷ P20 dKP : [PrM=rEL] -10 ÷ P20 [PRM=Abs] 0 ÷ P20
P20	11.0	Pr2	Probe value at 20 mA or at 5V	BAR : [PrM=rEL] PA4 ÷ 60.0 [PrM=AbS] PA4 ÷ 60.0 PSI : [PrM=rEL] PA4 ÷ 870 [PrM=AbS] PA4 ÷ 870 dKP : [PrM=rEL] PA4 ÷ 600 [PrM=AbS] PA4 ÷ 600
LPL	-0.5	Pr1	Lower pressure limit for superheat regulation	PA4 ÷ P20
MOP	11.0	Pr1	Maximum operating pressure threshold	LOP ÷ P20
LOP	-0.5	Pr1	Lowest operating pressure threshold	PA4 ÷ MOP
dML	30	Pr1	Delta MOP-LOP opening variation	0 ÷ 100
MSH	80.0	Pr1	Maximum superheat alarm threshold	[LSH ÷ 80,0°C] [LSH ÷ 144°F]
LSH	1.0	Pr1	Minimum superheat alarm threshold	[0.0 ÷ MSH °C] [0 ÷ MSH °F]
SHy	0.5	Pr1	Superheat alarm hysteresis	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
SHd	3.0	Pr1	Superheat alarm activation delay	0 ÷ 42.0(252) (min.10sec)
FrC	100	Pr1	Fast-recovery costant	0 ÷ 100
SUb	10	Pr2	Pressure filter	1 ÷ 60
SLb	0	Pr2	Reaction time	0 ÷ 255 (sec.)
Defrost				
dPA	P2	Pr1	Defrost probe A	nP- P1 - P2 - P3 - P4 - P5
dPb	nP	Pr1	Defrost probe B	nP- P1 - P2 - P3 - P4 - P5
dPE	100	Pr1	Virtual probe percentage (defrost temperature)	0 ÷ 100 (100=dPA, 0=dPb)
tdF	EL	Pr1	Defrost type	EL- in(0)
EdF	in	Pr1	Defrost mode: Clock or interval	rtc- in
Srt	150	Pr1	Heater set point during defrost	[-55.0°C ÷ 150°C] [-67°F ÷ 302°F]
Hyr	2.0	Pr1	Differential for heater	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
tod	255	Pr1	Time out for heater	0 ÷ 255 (min.)
dtP	0.1	Pr1	Minimum temperature difference to start defrost	[0.1°C ÷ 50.0°C] [1°F ÷ 90°F]
ddP	60	Pr1	Delay before starting defrost	0 ÷ 60 (min.)
d2P	n	Pr1	Defrost with two probes	n– Y
dtE	8.0	Pr1	Defrost termination temperature (Probe A)	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]
dtS	8.0	Pr1	Defrost termination temperature (Probe B)	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]
idF	6	Pr1	Interval between defrosts	0 ÷ 120 (hours)
MdF	30	Pr1	Defrost Maximum duration	0 ÷ 255 (min.)
dSd	0	Pr1	Start defrost delay	0 ÷ 255 (min.)
dFd	it	Pr1	Display during defrost	rt- it - SEt - dEF
dAd	30	Pr1	Defrost display time out	0 ÷ 255 (min.)
Fdt	0	Pr1	Drain down time	0 ÷ 255 (min.)
dPo	n	Pr1	Defrost at start-up	n– Y
dAF	0.0	Pr1	Defrost delay after continuous cycle	0 ÷ 24.0(144) (hours.10min)
Fan				
FPA	P2	Pr1	Fan probe A	nP- P1 - P2 - P3 - P4 - P5
FPb	nP	Pr1	Fan probe B	nP- P1 - P2 - P3 - P4 - P5
FPE	100	Pr1	Virtual probe percentage (fan management)	0 ÷ 100 (100=FPA, 0=FPb)
FnC	O-n	Pr1	Fan operating mode	C-n- O-n - C-y - O-y
Fnd	10	Pr1	Fan delay after defrost	0 ÷ 255 (min.)
FCt	10	Pr1	Temperature differential to avoid short cycles of fans	[0.0°C ÷ 50.0°C] [0°F ÷ 90°F]
FSt	2.0	Pr1	Fan stop temperature	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]
FHy	1.0	Pr1	Fan stop differential	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
Fod	0	Pr1	Fan activation time after defrost (without compressor)	0 ÷ 255 (min.)
Fon	0	Pr1	Fan ON time	0÷15 (min.)
FoF	0	Pr1	Fan OFF time	0÷15 (min.)
trA	UAL	Pr2	Kind of regulation for modulating output	UAL- rEG - AC
SOA	80	Pr2	Fixed speed for fan	AMi ÷ AMA
SdP	30.0	Pr2	Default Dew Point value	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]
ASr	1.0	Pr2	Differential for fan / offset for anti sweat heater	[-25.5°C ÷ 25.5°C] [-45°F ÷ 45°F]
PbA	5.0	Pr2	Proportional band for modulating output	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
AMi	0	Pr2	Minimum output for modulating output	0 ÷ AMA
AMA	100	Pr2	Maximum output for modulating output	AMi ÷ 100
AMt	200	Pr2	Time with fan at maximum speed	0 ÷ 255 s
Alarm				
rAL	P1	Pr1	Probe for temperature alarm	nP- P1 - P2 - P3 - P4 - P5 - tEr
ALC	Ab	Pr1	Temperature alarm configuration	rE- Ab
ALU	10	Pr1	High temperature alarm setting	[0.0°C ÷ 50.0°C o ALL ÷ 150.0°] [0°F ÷ 90°F o ALL ÷ 302°F]
ALL	-30	Pr1	Low temperature alarm setting	[0.0°C ÷ 50.0°C o -55,0°C ÷ ALU] [0°F ÷ 90°F o -67°F ÷ ALU°F]
AHy	1.0	Pr1	Differential for temperature alarm	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
ALd	15	Pr1	Temperature alarm delay	0 ÷ 255 (min.)
dLU	150	Pr2	High temperature alarm setting (defrost probe)	[0.0°C ÷ 50.0°C o dLL ÷ 150.0°] [0°F ÷ 90°F o dLL ÷ 302°F]
dLL	-55	Pr2	Low temperature alarm setting (defrost probe)	[0.0°C ÷ 50.0°C o -55,0°C ÷ dLU] [0°F ÷ 90°F o -67°F ÷ dLU°F]
dAH	1.0	Pr2	Differential for temperature alarm (defrost probe)	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
ddA	15	Pr2	Temperature alarm delay (defrost probe)	0 ÷ 255 (min.)
FLU	150	Pr2	High temperature alarm setting (fan probe)	[0.0°C ÷ 50.0°C o FLL ÷ 150.0°] [0°F ÷ 90°F o FLL ÷ 302°F]
FLL	-55	Pr2	Low temperature alarm setting (fan probe)	[0.0°C ÷ 50.0°C o -55,0°C ÷ FLU] [0°F ÷ 90°F o -67°F ÷ FLU°F]
FAH	1.0	Pr2	Differential for temperature alarm (fan probe)	[0.1°C ÷ 25.5°C] [1°F ÷ 45°F]
FAd	15	Pr2	Temperature alarm delay (fan probe)	0 ÷ 255 (min.)
dAo	1.3	Pr1	Delay of temperature alarm at start-up	0 ÷ 24.0(144) (hours.10min)
EdA	30	Pr1	Alarm delay at the end of defrost	0 ÷ 255 min
dot	15	Pr1	Temperature alarm exclusion after door open	0 ÷ 255 min
Sti	1.3	Pr2	Stop regulation interval	"nu"÷ 24.0(144) (hour.10min)
Std	3	Pr2	Stop duration	1 ÷ 255 min
oA6	AUS	Pr2	Sixth relay output configuration	CPr- dEF - FAn - ALr - LiG - AUS - db - OnF
oA7	ALr	Pr2	(when CoM=oA7) PWM output configuration	CPr- dEF - FAn - ALr - LiG - AUS - db - OnF
CoM	Cur	Pr2	Modulating output configuration	CUr- tEn - PM5 - PM6 - oA7
Digital Inputs				
i1P	cL	Pr1	Digital input 1 polarity	OP- CL
i1F	dor	Pr1	Digital input 1 configuration	EAL- bAL - PAL - dor - dEF - AUS - LiG - OnF - Htr - FHU - ES - Hdy
d1d	15	Pr1	Digital input 1 activation delay	0 ÷ 255 (min.)
i2P	cL	Pr1	Digital input 2 polarity	OP- CL
i2F	LiG	Pr1	Digital input 2 configuration	EAL- bAL - PAL - dor - dEF - AUS - LiG - OnF - Htr - FHU - ES - Hdy
d2d	5	Pr1	Digital input 2 activation delay	0 ÷ 255 (min.)
nPS	15	Pr1	Number of pressure switch activation before lock	0 ÷ 15
OdC	F-C	Pr1	Compressor and fan status when open door	no- FAn - CPr - F-C
rrd	30	Pr1	Outputs restart after door open alarm	0 ÷ 255 (min.)
Clock				
CbP	Y	Pr1	Clock presence	n(0) – Y(1)
Hur	- - -	Pr1	Current hour	- - -
Min	- - -	Pr1	Current minutes	- - -
dAY	- - -	Pr1	Current day	Sun(0) - SAt(6)
Hd1	nu	Pr1	First weekly day	Sun(0) - SAt(6) - nu(7)
Hd2	nu	Pr1	Second weekly day	Sun(0) - SAt(6) - nu(7)
Hd3	nu	Pr1	Third weekly day	Sun(0) - SAt(6) - nu(7)
ILE	0.0	Pr1	Energy saving cycle start during workdays	0 - 23.5(143) (hours.10min)
dLE	0.0	Pr1	Energy saving cycle length during workdays	0 ÷ 24.0(144) (hours.10min)
ISE	0.0	Pr1	Energy saving cycle start during holidays	0 - 23.5(143) (hours.10min)
dSE	0.0	Pr1	Energy saving cycle length during holidays	0 ÷ 24.0(144) (hours.10min)

HES	0.0	Pr1	Temperature increasing during Energy Saving cycle	[-30.0°C ÷ 30.0°C] [-54°F ÷ 54°F]
Ld1	nu	Pr1	Workdays First defrost start	0.0 ÷ 23.5(143) - nu(144) (hours.10min)
Ld2	nu	Pr1	Workdays Second defrost start	Ld1 ÷ 23.5(143) - nu(144) (hours.10min)
Ld3	nu	Pr1	Workdays Third defrost start	Ld2 ÷ 23.5(143) - nu(144) (hours.10min)
Ld4	nu	Pr1	Workdays Fourth defrost start	Ld3 ÷ 23.5(143) - nu(144) (hours.10min)
Ld5	nu	Pr1	Workdays Fifth defrost start	Ld4 ÷ 23.5(143) - nu(144) (hours.10min)
Ld6	nu	Pr1	Workdays Sixth defrost start	Ld5 ÷ 23.5(143) - nu(144) (hours.10min)
Sd1	nu	Pr1	Holidays First defrost start	0.0 ÷ 23.5(143) - nu(144) (hours.10min)
Sd2	nu	Pr1	Holidays Second defrost start	Sd1 ÷ 23.5(143) - nu(144) (hours.10min)
Sd3	nu	Pr1	Holidays Third defrost start	Sd2 ÷ 23.5(143) - nu(144) (hours.10min)
Sd4	nu	Pr1	Holidays Fourth defrost start	Sd3 ÷ 23.5(143) - nu(144) (hours.10min)
Sd5	nu	Pr1	Holidays Fifth defrost start	Sd4 ÷ 23.5(143) - nu(144) (hours.10min)
Sd6	nu	Pr1	Holidays Sixth defrost start	Sd5 ÷ 23.5(143) - nu(144) (hours.10min)
Energy Saving				
ESP	P1	Pr1	Energy saving probe selection	nP- P1 - P2 - P3 - P4 - P5 - tEr
HES	0.0	Pr1	Temperature increasing during Energy Saving	[-30.0°C ÷ 30.0°C] [-54°F ÷ 54°F]
PEL	n	Pr1	Energy saving activation when Light switched off	n– Y
L.A.N. Management				
LMd	y	Pr2	Defrost Synchronisation	n– Y
dEM	y	Pr2	Defrost end Synchronisation	n– Y
LSP	n	Pr2	SET-POINT Synchronisation	n– Y
LdS	n	Pr2	Display Synchronisation (temperature sent via LAN)	n– Y
LOF	n	Pr2	ON/OFF Synchronisation	n– Y
LLi	y	Pr2	Light Synchronisation	n– Y
LES	n	Pr2	Energy Saving Synchronisation	n– Y
LSd	n	Pr2	Remote probe displaying	n– Y
LPP	n	Pr2	Pressure value sent in LAN	n– Y
StM	n	Pr2	Cooling request from LAN enable compressor relay	n– Y
ACE	n	Pr2	Chiamata freddo in LAN sempre abilitata (anche se blocco compressore)	n– Y
Probe Configurations				
P1C	NtC	Pr2	P1 configuration	nP- Ptc - ntc -ntP- PtM
ot	0.0	Pr2	P1 calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]
P2C	NtC	Pr2	P2 configuration	nP- Ptc - ntc -ntP- PtM
oE	0.0	Pr2	P2 calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]
P3C	NtC	Pr2	P3 configuration	nP- Ptc - ntc -ntP- PtM
o3	0.0	Pr2	P3 calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]
P4C	NtC	Pr2	P4 configuration	nP- Ptc - ntc -ntP- PtM
o4	0.0	Pr2	P4 calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]
P5C	420	Pr2	P5 configuration	nP - PtC - ntC - ntP - PtM - 420 - 5Vr - LAn
o5	0.0	Pr2	P5 calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]
P6C	PtM	Pr2	P6 configuration	nP- Ptc - ntc -ntP- PtM
o6	0.0	Pr2	P6 calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]
Service				
CLt	- - -	Pr1	ON/OFF percentage (C.R.O.)	(read only)
tMd	- - -	Pr1	Time remaining before next defrost activation (only for interval defrost)	(read only)
LSn	- - -	Pr1	Number of devices in LAN	1 ÷ 8 (read only)
LAn	- - -	Pr1	List of address of LAN devices	1 ÷ 247 (read only)
Other				
Adr	1	Pr1	Modbus address	1 ÷ 247
rEL	- - -	Pr1	Firmware release	(read only)
Ptb	4	Pr1	Parameter table	(read only)
Pr2	- - -	Pr1	PR2 menu access	(read only)

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