CONTROLLERS FOR MULTIPLEXED CABINETS
XM660K- XM670K
-MANUAL FOR THE SW REL. 5. 4d -

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.
- Dixell Srl reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.

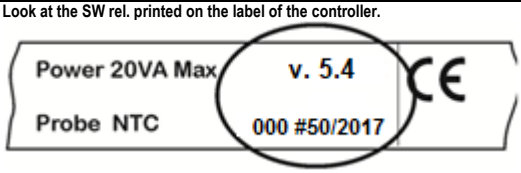
1.2 SAFETY PRECAUTIONS

- 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 "Dixell 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 XM660K, XM670K

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



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

3. GENERAL DESCRIPTION

The **XM660K/XM670K/** are high level microprocessor based controllers for multiplexed cabinets suitable for applications on medium or low temperature. It can be inserted in a LAN of up to 8 different sections which can operate, depending on the programming, as stand alone controllers or following the commands coming from the other sections. The **XM660K/XM670K** are provided with respectively 4 and 6 relay outputs to control the solenoid valve, defrost - which can be either electrical or hot gas - the evaporator fans, the lights, an auxiliary output (XM670K) and an alarm output (XM670K). 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. Finally, the **XM660K/XM670K** 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 Dixell CX660 or CH660 keyboard.

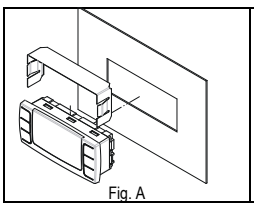
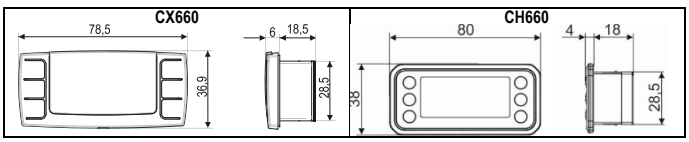


Fig. A

The **CX660 or CH660 keyboard** shall be mounted on vertical panel, in a 29x71 mm hole, and fixed using the special bracket supplied as shown in Fig. A.
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.

4.1 DIMENSIONS

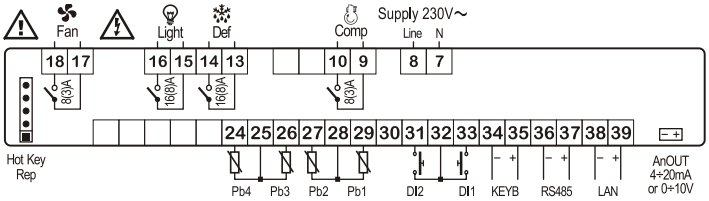


5. WIRING DIAGRAM AND CONNECTIONS

5.1 IMPORTANT NOTE

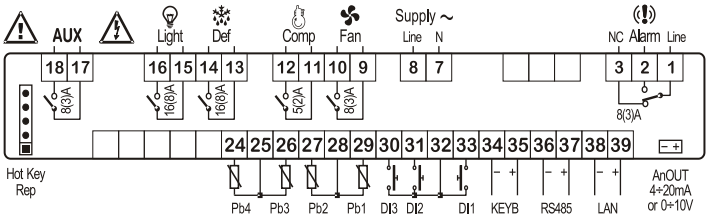
XM device is provided with disconnectable terminal block to connect cables with a cross section up to 1.6 mm^2 for all the low voltage connection: the RS485, the LAN, the probes, the digital inputs and the keyboard. Other inputs, power supply and relay connections are provided with screw terminal block 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. **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



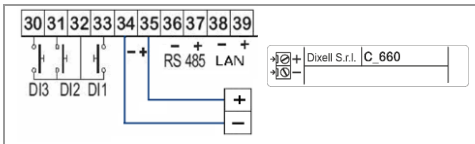
Models with 115V supply: use terminals 8-7 for supply

5.3 XM670K – ALL POWER SUPPLY



Models with 115V supply: use terminals 8-7 for supply

5.4 KEYBOARD DISPLAY CX660 OR CH660



The **XM670/679K** board can operate also without keyboard.

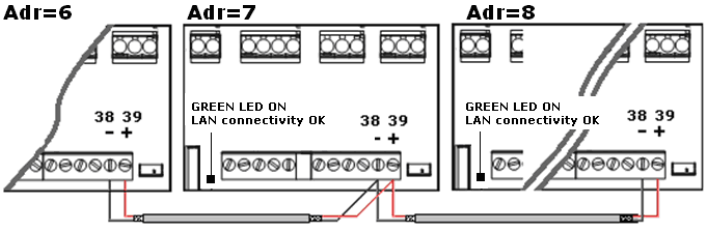
Polarity:
Terminal [**34**] [-]
Terminal [**35**] [+]

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

5.5 LAN CONNECTION - 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):

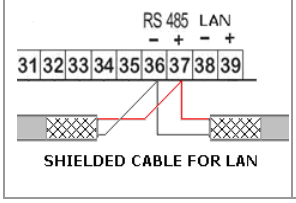
1) connect a shielded cable between terminals [**38**] [-] and [**39**] [+] for a **maximum of 8 sections**;
2) the **Adr** parameter is the number to identify each electronic board. **Address duplication is not permitted**, in this case the synchronized defrost and the communication with monitoring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

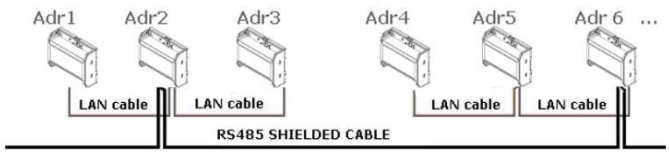
The max distance allowed is 30m

5.6 HOW TO CONNECT MONITORING SYSTEM



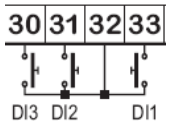
1) Terminals [**36**] [-] and [**37**] [+].
2) Use shielded twisted cable. For example Belden® 8762 o 8772 or cat 5 cables.
3) Maximum distance 1Km.
4) Don't connect the shield to the earth or to GND terminals of the device, avoid accidental contacts by using insulating tape.

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).

5.7 DIGITAL INPUTS

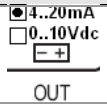


1) The terminals from [**30**] to [**33**] are all free of voltage;
2) Use shielded cable for distance higher than one meter;

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** parameter 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**.

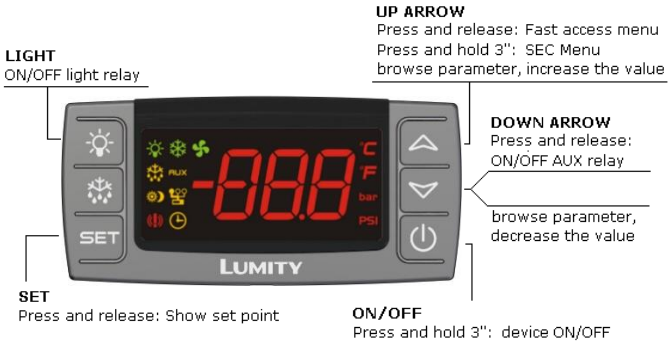
5.8 ANALOG OUTPUT



- 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.

6. USER INTERFACE



6.1 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

6.2 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:

+	Press and hold for about 3 sec 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 sec allow to access to first level of programming mode.

6.3 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.

BEGIN	SET	Press SET button for 3 sec, 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 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.

7. 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).

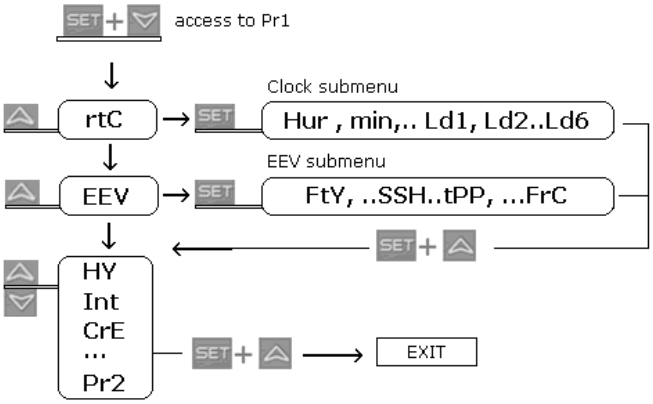
ACCESS to Pr1	SET +	Press and hold for about 3 sec to have access to the first programming level (**Pr1**).
Select item	or	Select the parameter or submenu using the arrows.
Show value	SET	Press **SET** button.
Modify	or	Use the arrows to modify the value.
Confirm and store	SET	Press **SET** key: the 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).

7.1 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 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.

7.2 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**).

8. 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.

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; **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. **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

9. 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	▲		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	▲ 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).

EXAMPLES:

1. 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!!**

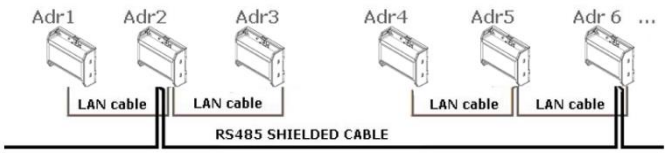
9.1 SYNCHRONIZED DEFROST

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.

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). See the following example of configuration:



DAILY DEFROST FROM RTC: : [CbP= 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 [CbP= 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°

10. COMMISSIONING

10.1 CLOCK SETTING AND RTC ALARM RESET

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

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** other parameters if present.	
EXIT	SET + ▲	Press for about 10 sec. 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.

11. DISPLAY MESSAGES

Display	Causes	Notes
	KEYBOARD	
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.
Pon	Keyboard is unlocked	
PoF	Keyboard is locked	
rSt	Alarm reset	Alarm output deactivated
noP, nP **nA**	Not present (configuration) Not available (evaluation)	
noL	The keyboard is not able to communicate with the XM660K-XM670K	Verify the connection. Call the Service
	ALARM FROM PROBE INPUT	
P1 **P2** **P3** **P4** **CPF**	Sensor brake down, value out of range or sensor incorrectly configured **P1C**, **P2C** to **P6C**. **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.
	TEMPERATURE ALARM	
HA	Temperature alarm from parameter ALU on probe **rAL**.	Outputs unchanged.
LA	Temperature alarm from parameter ALL on probe **rAL**.	Outputs unchanged.
HA2	Second high temperature alarm	Outputs depends on setting.
LA2	Second low temperature alarm	Outputs depends on setting.
	DIGITAL INPUT ALARM	
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.
EA	Generic alarm from digital input **i1F**, **i2F**, **i3F** = **EAL**.	
CA	Severe alarm of regulation lock from digital input **i1F**, **i2F**, **i3F** = **bAL**.	Regulation output OFF.
PAL	Pressure switch lock **i1F**, **i2F** o **i3F** = **PAL**.	All the outputs are OFF.
	CLOCK ALARM	
rtC	Clock settings lost.	Defrost will be performed with **IdF** till restoring the settings of RTC.
rtF	Clock damaged.	Defrost will be performed with **IdF**.

Display	Causes	Notes
	OTHERS	
EE	EEPROM serious problem.	Output OFF.
Err	Error with upload/download parameters.	Repeat the operation.
End	Parameters have been correctly transferred.	
dEF	Defrost is progress	
cLn	Cleaning function active	

11.1 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.

12. CONTROLLING LOADS

12.1 TEMPERATURE PROBE REFERENCE FOR REGULATION

Up to 5 temperature probe can be used for the temperature regulation.
It's possible to set the probes used for temperature regulation. Up to 4 Temperature inputs Pb1, Pb2, Pb3, Pb4, can be used. To support above function, the parameters rPA, rPb, rP3, rP4, are used.
Which temperature probe methods of combine is set by par. rPd among the following: Average, Minimum, Maximum, First, or Mix.

rPd = rPA: temperature detected by the probe set in the parameter rPA
rPd = rAb: mix between rPA and rPb defined by rPE parameter
rPd = AUr: average temperature of all the probes defined as Regulation Probe in the parameters rPA, rPb, rP3, rP4
rPd = LoE: minimum value among all the temperature probes defined as Regulation Probe in the parameters rPA, rPb, rP3, rP4
rPd = HiE: maximum value among all the temperature probes defined as Regulation Probe in the parameters rPA, rPb, rP3, rP4

12.1.1 Sensors failure

In case of multiple temperature sensor regulation: (rPd = rAb, Aur, LoE, HiE), and with sensor failure, the remaining sensors are used for the regulation.
In case of all sensor failure, the regulation will be performed according to Con and COF parameters

12.2 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 MP1.
In this way a dual temp case can be easily set and controlled.

12.2.1 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 MP1is loaded when the digital input is enabled.

12.3 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.

12.4 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):
i. will be closed with CrE = n, y
ii. 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):
i. will be closed with CrE = n, y
ii. 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 to 255 min)

12.5 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.

12.5.1 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.

12.6 ON DEMAND DEFROST

Description
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.

Parameters & 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

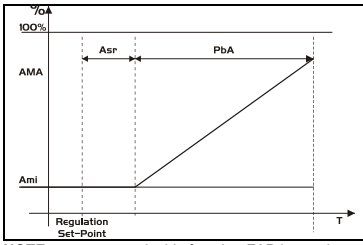
Exceptions:
1. A defrost cannot be triggered if the compressor has not ran more than minimum time (***nbd** parameter*) since the last defrost or initial power up. (Resolution hh.m)
2. If the compressor has ran for more than maximum time since the last defrost or initial power up (***Mbd** parameter*), 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.

12.7 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 regulation probe is set in the parameter **FAP**



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**.

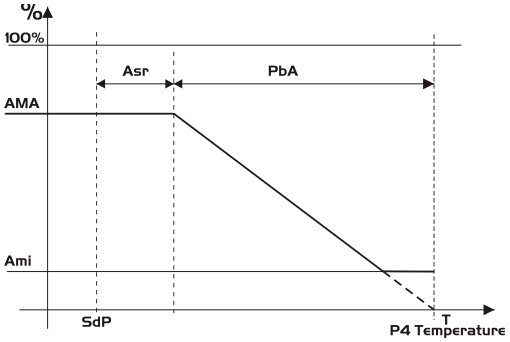
NOTE: to use properly this function FAP has to be set as the thermostat probe.

12.8 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.	**XM6x0K_1** Without probe 4	**XM6x0K_2 +** with probe 4	**XM6x0K_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		

The OA6 relay is switched on and off with a 60min time base.
ON time: (60*AO%)/100
OFF time: 60 – ON time

HOW TO WORK WITHOUT PROBE 4:

Param.	**XM6x0K** Without probe 4
P4C	nP
AMt	% of ON

In this case, the regulation is performed by switching on and off the auxiliary relay on a 60 minutes time base. The ON time will be the **AMt** value, so that the relay will be ON for **AMt** minutes and OFF for **[60-AMt]** minutes.

12.9 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.

12.9.1 Display

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

12.10 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.

13. PARAMETER LIST

REGULATION

rtC **Access to CLOCK submenu (if present);**
Set **Temperature set point** (LS÷US)
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.
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**.
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, 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 = rAb, Aur, LoE, HiE
rP4 **Regulation probe 4:** (nP; P1; P2, P3, P4, P6) fourth probe used to regulate room temperature, with rPd = rAb, Aur, LoE, HiE
rPd **Temperature Regulation Strategy:** (rPA, rAb, Aur, LoE, HiE)
rPA: temperature detected by the probe set in the parameter rPA
rAb: mix between rPA and rPb defined by rPE parameter
AUr: average temperature of all the probes defined as Regulation Probe in the parameters rPA, rPb, rP3, rP4
LoE: minimum value among all the temperature probes defined as Regulation Probe in the parameters rPA, rPb, rP3, rP4
HiE: maximum value among all the temperature probes defined as Regulation Probe in the parameters rPA, rPb, rP3, rP4
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

DEFROST

dPA **defrost Probe A:** (nP; P1; P2, P3, P4, P6) first probe used for defrost.
dPb **defrost Probe B:** (nP; P1; P2, P3, P4, P6) second probe used for defrost.
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:** (-55.0 ÷ 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;
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;
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 hours.
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÷23.5h) 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÷255min)

ON DEMAND DEFROST

Ctd **Differential for defrost start (**0.1°C ÷ 25.5°C , 1°F ÷ 45°F)
nbd **Minimum Compressor run time before defrost** 0.0 to 24h00min)
Mdb **Maximum Compressor run time before defrost (**0.0 to 24h00min)
nct **Minimum coil temperature to trigger a defrost (**-55.0°C to 150.0°C; 67°F to 302°F]

FAN

FAP **Fan probe:** (nP; P1; P2, P3, P4, P5) first probe used for fan.
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;
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 - 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.
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 the **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, the **LA2** alarm is signalled.
A2H **Differential for second temperature alarm**: (0.1°C ÷ 25.5°C / 1°F ÷ 45°F) Intervention differential for recovery of second temperature alarm;
A2d **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:** (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:** (0 ÷ 255 (min.)
tbA **Disabling alarm relay by pressing a key**: (n; Y)

OPTIONAL OUTPUT (only for XM670K)

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 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;

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 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.)
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

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;
Lig= energy saving is activated when the light is switched off and vice versa;
AUS= energy saving is activated when the AUX is switched off and vice versa;
LEA= energy saving is activated when the light & the AUX relays are 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
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=** 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.
LCP **P4 probe sent via LAN** (n, y)
StM **Cooling activation via LAN: n=** not used; **Y=** a generic cooling requests from LAN activate the solenoid valve connected to compressor relay;
ACE **Cooling by LAN always enabled even if the compressor block:** (n, y)

PROBE CONFIGURATION

P1C **Probe 1 configuration:** (nP – Ptc – ntc – CPC - PtM) **nP=** not present; **PtC=** Ptc; **ntc=** NTC; **CPC=** NTC-US; **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 – CPC - PtM) **nP=** not present; **PtC=** Ptc; **ntc=** NTC; **CPC=** NTC-US; **PtM=** Pt1000;
OF2 **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 – CPC - PtM) **nP=** not present; **PtC=** Ptc; **ntc=** NTC; **CPC=** NTC-US; **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 – CPC - PtM) **nP=** not present; **PtC=** Ptc; **ntc=** NTC; **CPC=** NTC-US; **PtM=** Pt1000;;
OF4 **Probe 4 calibration:** (-12.0÷12.0°C/ -21÷21°F) allows to adjust possible offset of the probe 4.

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

14. DIGITAL INPUTS

The XM600 series can support up to 3 free of voltage contact configurable digital inputs (depending on the models). They are configurable via i#F parameter

14.1 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 doesn't change. The alarm stops just after the digital input is de-activated.

14.2 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.

14.3 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.**

14.4 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.

14.5 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.

14.6 RELAY AUX ACTUATION (AUS)

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

14.7 RELAY LIGHT ACTUATION (LIG)

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

14.8 REMOTE ON/OFF (ONF)

This function allows to switch ON and OFF the instrument.

14.9 FHU – NOT USED

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

14.10 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.

14.11 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.

14.12 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.

14.13 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.

14.14 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.

15. USE OF THE PROGRAMMING "HOT KEY" – 64 K

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.

15.1 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.

15.2 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**".

16. TECHNICAL DATA

CX660 and CH660 keyboard
Housing: self extinguishing PC+ABS.
Case: CX660 facia 35x77 mm; depth 18mm; **CH660** facia 38x80 mm; depth 18mm
Mounting: panel mounting in a 29x71 mm panel cut-out
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
Housing: 8 DIN
Power supply: depending on the model 110Vac ± 10% - 230Vac ± 10%
Overvoltage Category: III
Rated power: 9VA max.
Rated Impulse Voltage: 2500V
Software class: A
Terminal connections: Screw terminal block ≤ 1,6 mm² heat-resistant wiring and 5.0mm Faston, wire section <= a 2.5mm2
Data storing: on the non-volatile memory (EEPROM)
Type of action: 1B
Pollution Degree: 2
Ambient operating temperature: -10T60°C
Shipping and storage temperature: -40T85°C
Relative humidity: 20÷85% (no condensing)
Resolution: 0,1 °C or 1°C or 1 °F (selectable)
Measuring and regulation range:
NTC / NTC-US probe: -40÷110°C (-58÷230°F).
PTC probe: -50÷150°C (-67 ÷ 302°F)
Pt1000 probe: -100 ÷ 100°C (-148 ÷ 212°F)
Accuracy (ambient temp. 25°C): ±0,5 °C ±1 digit
Digital inputs: 3 free of voltage
Inputs: up to 4 NTC/PTC/Pt1000 probes
Serial output: RS485 with ModBUS - RTU and LAN
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 (XM670K): SPDT relay 8 A, 250Vac
Aux (XM670K): SPST relay 8 A, 250Vac
Optional output (AnOUT) DEPENDING ON THE MODELS:

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

Purpose of control: operating control
Construction of control: incorporated control, intended to be used in Class I or Class II equipment.

17. DEFAULT SETTING VALUES

Label	M1	M2	M3	M4	Menù	Parameter description
rtc	- - -				Pr1	Access to RTC submenu
SEC	LOC				- - -	LAN mode selection : Local or Global
SEt	2.0	2.0	-18.0	-18.0	- - -	Set point
Hy	2.0	2.0	2.0	2.0	Pr1	Differential
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	1				Pr2	Anti-short cycle delay
CCt	0.0				Pr2	Continous 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
rES	dE				Pr2	Resolution (only C) : decimal, integer
Lod	P1				Pr2	Local display: default display
rEd	P1				Pr1	Remote display: default display
dLy	0				Pr1	Display delay
rPA	P1				Pr1	Regulation probe A
rPb	nP				Pr1	Regulation probe B
rP3	nP				Pr2	Regulation probe 3
rP4	nP				Pr2	Regulation probe 4
rPd	rPA				Pr2	Temperature Regulation Strategy
rPE	100				Pr2	Virtual probe percentage (rPd=rAb)
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	Pr1	First defrost termination temperature
dtS	8.0	8.0	8.0	8.0	Pr2	Second defrost termination temperature
idF	6	6	6	6	Pr1	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
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	4.0	4.0	4.0	Pr2	Minimum Compressor run time before defrost
Mdb	16.0	16.0	16.0	16.0	Pr2	Maximum Compressor run time before defrost
nct	-30.0	-30.0	-30.0	-30.0	Pr2	Minimum coil temperature to trigger a defrost
FAP	P2				Pr2	Fan probe
FnC	O-y	o-y	o-n	o-n	Pr1	Fan operating mode
Fnd	0	0	5	5	Pr1	Fan delay after defrost
FCt	10				Pr2	Temperature differential to avoid short cycles of fans
FSt	15.0	15.0	2.0	2.0	Pr1	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

Label	M1	M2	M3	M4	Menù	Parameter description
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: Time output ON anti sweat heater
rAL	tEr				Pr2	Probe for temperature alarm
ALC	Ab				Pr1	Temperature alarm configuration : relative / absolute
ALU	10	10	10	10	Pr1	High temperature alarm setting
ALL	-30	-30	-30	-30	Pr1	Low temperature alarm setting
AHy	1.0				Pr2	Differential for temperature alarm
ALd	15	15	15	15	Pr1	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
tbA	n				Pr2	Silencing alarm relay with buzzer
oA5*	ALr				Pr2	Relay 5 configuration
oA6*	AUS				Pr2	Relay 6 configuration
CoM	420				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				Pr1	Digital input 1 configuration
d1d	15				Pr1	Digital input 1 activation delay
i2P	CL				Pr2	Digital input 2 polarity
i2F	LiG				Pr1	Digital input 2 configuration
d2d	5				Pr1	Digital input 2 activation delay
i3P	CL				Pr2	Digital input 3 polarity
i3F	ES				Pr1	Digital input 3 configuration
d3d	0				Pr1	Digital input 3 activation delay
nPS	15				Pr1	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
ISE	0.0				Pr1	Energy saving cycle start during holidays
dSE	0.0				Pr1	Energy saving cycle length during holidays
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				Pr1	Workdays Fourth defrost start (minimum as Ld3)
Ld5	nu				Pr1	Workdays Fifth defrost start (minimum as Ld4)
Ld6	nu				Pr1	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				Pr1	Temperature increasing during Energy Saving
PEL	n				Pr1	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)

Label	M1	M2	M3	M4	Menù	Parameter description
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
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	nu				Pr2	P3 configuration
OF3	0.0				Pr2	P3 calibration
P4C	nu				Pr2	P4 configuration
OF4	0.0				Pr2	P4 calibration
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

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