XRB

Bottle cooler controller with advanced energy saving algorithms

(V.1.8)

INDEX

1. IMPORTANT USER INFORMATION

- The  symbol is intended to alert the user of a non-insultated voltage source within the product area that is sufficiently high to constitute a risk of electric shock to persons.

- The  symbol is intended to alert the user of important operating and maintenance (servicing) instructions.

- Dixell Srl reserves the right to modify this user's manual at any time without prior notice. The documentation can be downloaded from the Emerson website even prior to purchase.

- This manual is an integral part of the product and must always be kept near the device for easy and quick reference. The product cannot be used as a safety device. Please read this manual very carefully be sure you understand the information provided before using the device.

- Verify that the power supply voltage is correct before connecting the device. Do not expose it to water or humidity: use the controller only within the operating limits, avoiding sudden temperature changes and high atmospheric humidity in order to prevent condensation from forming. Recommendations: disconnect all the electrical connections before performing any maintenance task; insert the probe where it cannot be reached by the End User; the device must not be opened; consider the maximum current that can be applied to each relay; make sure that the wires of the probes, of the loads and the electical power supply cables are sufficiently separated from each other, without crossing or intertwining. In case of applications in industrial environments, it may be useful to use the main filters as well as the inductive loads.

- The customer shall bear full responsibility and risk for product configuration in order to achieve the the final installation of the equipment/system. Upon the customer's request and following a specific agreement, Dixell Srl may be present during the start-up of the final machine/application, as a consultant, however, under no circumstances can the company be held responsible for the correct operation of the final equipment/system.

- Since Dixell products are part of a high-level technology, a qualification and a configuration/programming/commissioning stage is required to best use them. Otherwise, these products may malfunction and Dixell cannot be held responsible. The product must not be used in any way that differs from that stipulated in the documentation.

- The device must always be installed inside an electrical panel that can only be accessed by authorised personnel. For safety purposes, the keyboard must be the only part that can be reached.

- The electrical wiring connections must never be modify while the device is being used.

- It is good practice to bear in mind the following indications for all Dixell products:
    - Prevent the electronic circuits from getting wet as contact made with water, humidity or any other type of liquid can damage them. Comply with the temperature and humidity limits specified in the manual in order to store the product correctly.
    - The device must not be installed in particularly hot environments as high temperatures can damage the electronic circuits and/or plastic components forming part of the casing. Comply with the temperature and humidity limits specified in the manual in order to store the product correctly.
    - Under no circumstances is the device to be opened - the user does not need any internal component. Please contact qualified service personnel for any assistance.
    - Prevent the device from being dropped, knocked or shaken as either can cause irreparable damage.
    - Do not clean the device with corrosive chemical products, solvents or aggressive detergents.
    - The device must not be used in applications that differ from that specified in the following document.

- ***Separate the power supply of the device from the rest of the electrical devices connected inside the electrical panel. The secondary of the transformer must never be connected to the earth.***

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

2. PRODUCT DISPOSAL (WEEE)

In compliance with the Directive 2002/96/EC of the European Parliament and of the Council of January 27th 2003 and to the relative national legislation, please note that:

- There lies the obligation not to dispose of electrical and electronic waste as municipal waste but to separate the waste.
- Public or private collection points must be used to dispose of the goods in accordance with local laws. Furthermore, at the end of the product's life, it is also possible to return this to the retailer when a new purchase is made.
- This equipment may contain hazardous substances. Improper use or incorrect disposal can have adverse effects on human health and the environment.
- The symbol shown on the product or the package indicates that the product has been placed on the market after August 13th 2005 and must be disposed of as separated waste.
- Should the product be disposed of incorrectly, sanctions may be applied as stipulated in applicable local regulations regarding waste disposal.

Please consider the environment before printing this manual.

3. GENERALITIES

The **XRB**, **32x74x60mm format**, is a microprocessor-based family of controllers suitable for applications on medium or low temperature ventilated refrigeration units. The device has up to 4 relay outputs, up to 4 NTC probe inputs and up to 2 configurable digital inputs. By using the **HOT-KEY** it is possible to program the instrument in a quick and easy way.

3.1 ONLINE INFORMATION

	CONTACT: dixell.service@emerson.com

4. USER INTERFACE

The user interface adopt 6 multifunctional buttons, 11 function icons and a 3 digit display with decimal point.
The home screen show one of the probes values (it depens on the par. **Lod**) and is the normal working screen.
NOTE: in some controllers, “ECO” button icon could be replaced by “DEF” button ico. In any case, the function linked to this button are defined by par. **ESC** and **ES2**.

4.1 BUTTONS

SET	Press to display target set point and the real set point. When in programming mode, it selects a parameter or confirms an operation
	(**LIG**) To switch on and off the light. Other functions depending on par. **LGC** and **LG2**.
ECO or	To activate and deactivate the Energy Saving mode. Other functions depending on par. **ESC** and **ES2**.
	(**UP**) In programming mode: it browses through the parameter or increases the displayed value.
	(**DOWN**) In programming mode: it browses the parameter codes or decreases the displayed value. Other functions depending on par. **dnC** and **dn2**.
	(**ONOFF**) Keep it pressed for 3 sec to activate or deactivate the key function (see par. **onF**). Other functions depending on par. **onF** and **on2**.

+	Combination to lock or unlock the keyboard
SET +	Conbination to enter the programming mode
SET +	Combination to exit the programming mode and come back to home screen

4.2 ICONS

	DESCRIPTION	MODE	FUNCTION
	LIGHT	**OFF**	Light output OFF
		FLASH	Not used
		ON	Light output ON

	**COMPRESSOR**	**OFF**	Compressor output OFF
		FLASH	Anti short cycle delay is running
		ON	Compressor output ON
	**FAN**	**OFF**	Evaporator fan output OFF
		FLASH	Activation delay is running
		ON	Evaporator fan output ON
	**DEFROST**	**OFF**	Defrost OFF
		FLASH	Activation delay or drain time is running
		ON	Defrost ON
	**AUX**	**OFF**	Auxiliary output OFF or not available
		FLASH	Not used
		ON	Auxiliary output ON
	**ENERGY SAVING**	**OFF**	Energy saving OFF
		FLASH	Not used
		ON	Energy saving ON
	**PULL DOWN**	**OFF**	Pull Down OFF
		FLASH	Not used
		ON	Pull down ON
	**ALARM**	**OFF**	No alarm is active
		FLASH	Not used
		ON	Some alarm is active
	**Celsius Degree**	**OFF**	Not used
		FLASH	Not used
		ON	Measurement units: Celsius degree
	**Fahrenheit Degree**	**OFF**	Not used
		FLASH	Not used
		ON	Measurement units: Fahrenheit degree

4.3 LOCK THE KEYBOARD

Keep both **UP** and **DOWN** buttons pressed for more than 3 sec.
The "**oFF**" label will be displayed and the keyboard will be locked. If any button is pressed more than 3 sec, the "**oFF**" message will be displayed.

4.4 UNLOCK THE KEYBOARD

Keep both **UP** and **DOWN** buttons pressed together for more than 3 sec till the **"on"** message will be displayed.

4.5 PROGRAMMING MENU

To change the values of the parameters, operate as follows:
Enter the Programming mode by pressing the **SET+DOWN** buttons for 3 sec ("**°C**" LED starts blinking).
Select the parameter to modify. Press the **SET** button to display the current value.
Use **UP** or **DOWN** buttons to change the current value.
Press **SET** to store the new value and move to the following parameter.

To exit: Press **SET+UP** buttons or waits for 15 sec without pressing any key.
NOTE: the set value is stored even when the procedure exits by time-out.

4.5.1 ENTER THE MENU PR2

Enter the Programming mode by pressing **SET+DOWN** buttons for 3 sec ("**°C**" or "**°F**" LED starts blinking).

Released the keys and then push again **SET+DOWN** buttons for more than 7 sec. The "**Pr2**" label will be displayed immediately followed from the **HY** parameter.

NOW YOU ARE IN THE Pr2 MENU.

- Select the required parameter.
- Press the **SET** key to display its value
- Use **UP** or **DOWN** to change its value.
- Press **SET** to store the new value and move to the following parameter.

To exit: Press **SET+UP** or wait for 15 sec without pressing any key.

NOTE1: if there are no parameters in **Pr1**, after 3 sec the "**nP**" label will be displayed. Keep the keys pushed till the "**Pr2**" message will be displayed.

NOTE2: the previous set value will be stored even if the programming mode exits by waiting for the time-out to expire.

4.5.2 MOVE PARAMETERS BETWEEN MENU PR1 AND PR2

Each parameter present in the PR2 menu can be removed or put into PR1 menu (user level) by pressing **SET+DOWN**. If a parameter is visible also in the First Level, in the PR2 menu, the decimal point will be lit.

4.6 SETPOINT MENU

The **SET** button enables to a quick menu where it is possible to see:

- The current Set Point value.
- The real Set Point value (**rSE**)

Push and release the **SET** button five times or wait for 60 sec to return to normal visualisation.

4.6.1 CHANGE THE SETPOINT

- Push the **SET** key for more than 3 sec to change the Set point value;
- The value of the set point will be displayed and the "°C" LED starts blinking;
- To change the value of the Set Point push the **UP** or **DOWN** button.

5. HOTKEY

5.1.1 DOWNLOAD

The DOWNLOAD function permits to copy the parameter maps from a HOTKEY to the internal memory of the controller:

- Turn OFF the instrument.
- Insert a programmed "HOT-KEY" into the 5-PIN receptacle and then turn the Controller ON.
- Automatically the parameter list of the "HOT-KEY" is downloaded into the Controller memory, the
- "do" message is blinking followed a by flashing "End".
- After 10 seconds the instrument will restart working with the new parameters.
- Remove the "HOT-KEY".

NOTE: the message "Err" is displayed 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.

5.1.2 UPLOAD

The UPLOAD function permits to copy the parameter maps from the internal memory of the controller to an extenal HOTKEY:

- Program one controller with the front keypad.
- When the controller is ON, insert the "**HOT-KEY**" and push **UP** button; the "**UP**" message appears followed a by flashing "**End**"
- Push "**SET**" key and the "**End**" will stop flashing.
- Turn OFF the instrument and then remove the "**HOT-KEY**". At the end turn the instrument ON again.

NOTE: the "**Err**" message appears in case of a failed programming operation. In this case push again the **UP** button if you want to restart the upload again or remove the "**HOT-KEY**" to abort the operation**.**

6. PROG-KEY

During 30 after a power on it will be possible to upgrade the internal firmware by using a special tool named PROG-KEY. This operation does not change the internal parameter configuration.

6.1 UPDATE FW

After power-on, and when alarm icon is flashing:
- Insert the PROG-KEY into the HOT-KEY port.
- Keep DOWN button pressed for 3 sec.
- The FW update will start (the display will show the label “ΓΓΓ”).

At the end of the programming phase:
- The message “Err” is displayed in case of a failed FW update.
- The message “End” is displayed in case of successful FW update.
- Remove the PROG-KEY and press DOWN button to reboot the controller.

6.2 IMPORTANT NOTES

- **PAY ATTENTION:** this operation MUST be carried out only from expert personnel to avoid damaging the controller. Please contact your regional reseller to have more information.
- Never switch off the controller during FW update.
- Disconnect all loads before updating the controller to avoid unpredictable output activations.
- After any FW UPDATE, the parameter maps must be updated.

7. PARAMETER TABLE

The controller has an internal memory where are stored a couple of complete parameter maps, normally indicated as “**nt**” and “**Lt**”.
It will be possible to reload values for “**nt**” or “**Lt**” parameters map by using:
- Any button set as “**Lnt**”.
- Modbus command
- Digital input set as “**Lnt**”.

7.1 PARAMETER DESCRIPTION

Here are the descriptions of the device parameters.

7.1.1 MAIN REGULATION PARAMETERS - rEG

SEt	**Set Point:** range from LS to US
LS	**Minimum Set Point:** (-55.0°C to SET; -67°F to SET) fix the minimum value for the set point.
US	**Maximum Set Point:** (SET to 110.0°C; SET to 230°F) fix the maximum value for the set point.
HY	**Compressor regulation differential in normal mode:** (0.1 to 25.0°C; 1 to 45°F) set point differential. Compressor Cut-IN is **T > SET + HY**. Compressor Cut-OUT is **T<=SET**.
HYE	**Compressor regulation differential in energy saving mode:** (0.1 to 25.0°C; 1 to 45°F) set point differential. Compressor Cut-IN is **T > SET + HES + HYE**. Compressor Cut-OUT is **T<= SET + HES**.
HYd	**Deadband output regulation (oAx=db) differential:** (0.1 to 25.0°C; 1 to 45°F)
rAr	**Delay between compressor and db output (oAx=db) activation and vice versa:** (0 to 255 min)
odS	**Output activation delay at start-up:** (0 to 255 min) this function is enabled after the instrument power-on and delays the output activations.
AC	**Anti-short cycle delay:** (0 to 50 min) minimum interval between a compressor stop and the following restart.
AC1	**Anti-short cycle delay (2nd compressor):** (0 to 999 sec) delay between main and second compressor activation
rtr	**Regulation percentage:** (0 to 100) the regulation value is calculated by using both P1 and P2 temperature probes. If **rtr=100**, only P1 value will be used, if **rtr=0**, only P2 value will be used.
oHt	**Threshold for automatic activation of Pull-Down in normal mode (SET+HY+oHt):** (1.0 to 12.0°C; 1 to 21°F) this is the upper threshold limit used to activate the Pull-Down function.
SCo	**Differential during Pull Down (SET-SCo):** (0.0 to 12°C; 0 to 21°F) this is the special set-point value used during Pull Down (cut-off value for compressor). If **SCo=0**, the Pull-Down function during normal mode is disabled.

tSC	**Maximum duration for Pull Down:** (0.0 to 24h00min, res. 10 min) maximum length for Pull Down mode.
oHE	**Differential during Pull Down in energy saving mode (SET+HES+HYE+oHE):** (1.0 to 12.0°C; 1 to 21°F) this is the upper threshold limit used to activate the Pull Down in energy saving mode
SCE	**Set point differential during Pull-Down in energy saving mode (SET+HES-SCE):** (0.0 to 12°C; 0 to 21°F) this is the special set-point value used during a Pull-Down function (cut-off value for compressor). If **SCE=0**, the Pull-Down function during energy saving mode is disabled.
Con	**Compressor ON time with faulty probe:** (0 to 255 min) time during which the compressor is active in case of faulty thermostat probe. With **Con=0** compressor is always OFF.
CoF	**Compressor OFF time with faulty probe:** (0 to 255 min) time during which the compressor is OFF in case of faulty thermostat probe. With **CoF=0** compressor is always active.

7.1.2 PROBES - Prb

PbC	**Probe selection:** (ntC; PtC)
ot	**Probe P1 calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust any possible offset of the first probe.
P2P	**Probe P2 presence: n** = not present; **Y** = the defrost stops by temperature.
oE	**Probe P2 calibration:** -12.0 to 12.0°C; -21 to 21°F) allows to adjust any possible offset of the second probe.
P3P	**Probe P3 presence: n** = not present; **Y** = the condenser temperature alarm is managed.
o3	**Probe P3 calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust any possible offset of the third probe.
P4P	**Probe P4 presence: n** = not present; **Y** = the condenser temperature alarm is managed.
o4	**Probe P4 calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust any possible offset of the forth probe.

7.1.3 DISPLAY - diS

iCo	**Icon visualization:** (n;Y) Enable or disable icon visualisation.
CF	**Temperature measurement unit:** (°C; °F) **°C** = Celsius; **°F** = Fahrenheit.
rES	**Temperature resolution:** (dE; in) **dE** = decimal; **in** = integer. NOTE: valid only for Cesius degree.
Lod	**Probe default displayed:** (P1; P2; P3; P4; Set; dtr; USr) **Px**=measured value from selected probe. **SEt**=setpoint value; **dtr**=calculated value; **USr**=label “USr”
dLY	**Temperature display delay:** (0.0 to 20min00sec, res. 10 sec) when the temperature increases, the display is updated of 1°C or 1°F after this time.

7.1.4 DEFROST - dEF

EdF	**Defrost mode**: in**=**fixed intervals; **rtC**=following real time clock
tdF	**Defrost type: EL**=electrical heaters; **in**=hot gas.
dFP	**Probe selection for defrost control: nP**=no probe; **Px**=probe “x”. Note: **P4**=Probe on Hot Key plug.
dtE	**End defrost temperature:** (-55 to 50°C; -67 to 122°F) sets the temperature measured by the evaporator probe (**dFP**), which causes the end of defrost cycle.
idF	**Interval between two successive defrost cycles:** (0 to 255 hours) determines the time interval between the beginning of two defrosting cycles.
MdF	**Maximum length of defrost cycle:** (0 to 255 min; 0 means no defrost) when **P2P=n** (no evaporator probe presence) it sets the defrost duration, when **P2P=Y** (defrost end based on evaporator temperature) it sets the maximum length for the defrost cycle.
dSd	**Start defrost delay:** (0 to 255 min) delay in defrost activation.
dFd	**Displaying during defrost:** (rt; it; SP; dF) **rt** = real temperature; **it** = start defrost temperature; **SP** = SET-POINT; **dF** = label “**dF**”.
dAd	**Temperature display delay after any defrost cycle:** (0 to 255 min) delay before updating the temperature on the display after the end of any defrost.
Fdt	**Draining time:** (0 to 255 min) regulation delay after finishing a defrost phase.
dPo	**Defrost cycle enabled at stat-up:** (n; Y) enables defrost at power on.
dAP	**Defrost delay after Pull Down:** (0.0 to 24h00min, res. 10 min) delay before activating a defrost.
od1	**Automatic defrost (at the beginning of any energy saving mode):** (n; Y) **n**=function disabled; **Y**=function enabled.
od3	**Optimized defrost:** (n; Y) **n**=function disabled; **Y**=function enabled.
SYd	**Tipe of synchronized defrost:** (nu; SYn) **nu** = not used; **Syn**=synchronized defrost.
dt1	**Diferential temperature for optimized defrost control:** (0.1 to 25.5 °C)

dt2	**Delta temperature (Treg-Tevap):** (0.1 to 25.5 °C)

7.1.5 EVAPORATOR FANS - FAn

FAP	**Probe selection for evaporator fan:** (nP; P1; P2; P3; P4) **nP**=no probe; **Px**=probe "x". Note: **P4**=Probe on Hot Key plug.
FSt	**Evaporator fan stop temperature:** (-55 to 50°C; -67 to 122°F) setting of temperature, detected by evaporator probe. Above this temperature value fans are always OFF. **NOTE: it works only for the evaporator fan, NOT for the condenser fan.**
HYF	**Evaporator fan regulator differential:** (0.1 to 25.0°C; 1 to 45°F)
oF2	**Evaporator fan offset in energy saving:** (-12 to 12°C; -21.6 to 21.6°F) offset to add during energy saving (**FSt+oF2**)
FnC	**Evaporator fan operating mode:** (Cn; on; CY; oY) • **Cn** = runs with the compressor, duty-cycle when compressor is OFF (see **FoF**, **Fon**, **FF1** and **Fo1** parameters) and OFF during defrost • **on** = continuous mode, OFF during defrost • **CY** = runs with the compressor, duty-cycle when compressor is OFF (see **FoF**, **Fon**, **FF1** and **Fo1** parameters) and ON during defrost • **oY** = continuous mode, ON during defrost
Fnd	**Evaporator fan delay after defrost cycle:** (0 to 255 min) delay before fan activation after any defrosts.
FCt	**Differential temperature for cyclic activation of evaporator fans (0=disabled)**: (0 to 50°C)
FSU	**Evaporator fan operating mode:** (Std; Fon; FoF) **Std** = standard mode, evaporator fan uses par **FnC**; **Fon** = evaporator Fan always on; **FoF** = evaporator fan always off.
Fon	**Evaporator fan ON time in normal mode (with compressor OFF):** (0 to 255 min) used when energy saving status is not active.
FoF	**Evaporator fan OFF time in normal mode (with compressor OFF):** (0 to 255 min) used when energy saving status is not active.
Ft	**Evaporator fan controlled during defrost:** (n; Y) when activated, the evaporator fan will be regulated during any defrost.
Fo1	**Evaporator fan ON time in energy saving mode (with compressor OFF):** (0 to 255 min) used when energy saving status is active.
FF1	**Evaporator fan OFF time in energy saving mode (with compressor OFF):** (0 to 255 min) used when energy saving status is active.

7.1.6 AUXILIARY REGULATOR - AUS

ACH	**Type of control for auxiliary regulator:** (Ht; CL) **Ht** = heating; **CL** = cooling.
SAA	**Set Point for auxiliary regulator:** (-55.0 to 150.0°C; -67 to 302°F) it defines the room temperature set point to switch auxiliary relay.
SHY	**Auxiliary regulator differential:** (0.1 to 25.5°C; 1 to 45°F) differential for auxiliary output set point. - **ACH=CL**, AUX Cut in is [**SAA+SHY**]; AUX Cut out is **SAA**. - **ACH=Ht**, AUX Cut in is [**SAA–SHY]**; AUX Cut out is **SAA**.
ArP	**Probe selection for auxiliary regulator:** (nP; P1; P2; P3; P4) **nP** = no probe, the auxiliary relay is switched only by the digital input; **Px**=probe "x". Note: **P4**=Probe on Hot Key plug.
Sdd	**Auxiliary regulator disabled during any defrost cycle:** (n; Y) **n** = the auxiliary relay operates during defrost. **Y** = the auxiliary relay is switched off during defrost.
btA	**Base time for parameters Ato and AtF:** (SEC; Min) **SEC** = base time is in second; Min = base time is in minutes.
Ato	**Interval of time with auxiliary output ON:** 0 to 255 (base time defined in par. **btA**)
AtF	**Interval of time with auxiliary output OFF:** 0 to 255 (base time defined in par. **btA**)

7.1.7 TEMPERATURE ALARM - ALr

ALP	**Probe selection for temperature alarms:** (nP; P1; P2; P3; P4) **nP**=no probe; **Px**=probe "x". Note: **P4**=Probe on Hot Key plug.
ALC	**Temperature alarms configuration:** (Ab, rE) **Ab** = absolute; **rE** = relative.
ALL	**Low temperature alarm:** when this temperature is reached, the alarm is enabled after the **Ad** delay time. • If **ALC=Ab** → -55.0°C to ALU or -67°F to ALU. • If **ALC=rE** → 0.0 to 50.0°C or 0 to 90°F.

ALU	**High temperature alarm:** when this temperature is reached, the alarm is enabled after the **Ad** delay time. • If **ALC=Ab** → ALL to 110.0°C or ALL to 230°F. • If **ALC=rE** → 0.0 to 50.0°C or 0 to 90°F.
AFH	**Temperature alarm differential:** (0.1 to 25.0°C; 1 to 45°F) alarm differential.
ALd	**Temperature alarm delay:** (0 to 255 min) delay time between the detection of an alarm condition and the relative alarm signaling.
dot	**Temperature alarm delay with open door:** (0.0 to 24min00sec) delay before activating door open alarm. NOTE: digital input delays (par. **dxd**) are not considered when **ixF=dor**.
dAo	**Temperature alarm delay at start-up:** (0.0 to 24h00min, res. 10 min) delay time between the detection of a temperature alarm condition and the relative alarm signaling, after starting up the instrument.
AP2	**Probe selection for 2nd temperature alarm: (nP; P1; P2; P3; P4) nP=**no probe; **Px=**probe "x". **Note: P4=**Probe on Hot Key plug.
AU1	**Pre-alarm threshold for 2nd temperature alarm (absolute value):** (-55.0 to 110.0°C; -67 to 230°F)
AH1	**Second high temperature pre-alarm differential:** (0.1 to 25.0°C; 1 to 45°F)
Ad1	**Second high temperature pre-alarm delay:** (0 to 255 min; 255 = not used) delay time between the detection of a condenser pre-alarm condition and the relative alarm signaling.
AL2	**Second low temperature alarm:** (-55.0 to 110.0°C; -67 to 230°F)
AU2	**Second high temperature alarm:** (-55.0 to 110.0°C; -67 to 230°F)
AH2	**Second temperature alarm differential:** (0.1 to 25.0°C; 1 to 45°F)
Ad2	**Second temperature alarm delay: (**0 to 255 min; 255 = not used) delay time between the detection of a condenser alarm condition and the relative alarm signaling.
dA2	**Second temperature alarm delay at start-up:** (0.0 to 24h00min, res. 10 min)
bLL	**Compressor OFF due to 2nd low temperature alarm: (n; Y) n =** no, the compressor continues to work; **Y =** yes, the compressor is switched off while the alarm is ON; in any case, the regulation restarts after AC time at minimum.
AC2	**Compressor OFF due to 2nd high temperature alarm: (n; Y) n =** no, the compressor continues to work; **Y =** yes, the compressor is switched off while the alarm is ON; in any case, the regulation restarts after AC time at minimum.
tbA	**Alarm relay deactivation: (n; Y) n =** no, it is not possible to deactivate neither the buzzer nor any digital output set as an alarm; **Y =** yes, it is possible to deactivate both the buzzer and the digital output set as an alarm.

7.1.8 DIGITAL OUTPUTS - oUt

oAx (x=1,2,3,4)	**Relay output oAx configuration:** - **nu**= not used - **CP1**= compressor management - **dEF**= defrost - **FAn**= evaporator fan - **ALr**= alarm - **LiG**= light output - **AUS**= auxiliary output - **db**= dead band output - **onF**= onoff output - **HES**= energy saving output - **CP2**= second compressor management
AoP	**Alarm relay polarity:** (CL; oP) **oP** = alarm activated by closing the contact; **CL** = alarm activated by opening the contact.

7.1.9 DIGITAL INPUTS – inP

ibt	**Base times for digital inputs:** (SEC; Min) **SEC** = seconds; **Min** = minutes. Delay in activating the function linked to the digital inputs.
i1P	**Digital input 1 polarity:** (CL; oP) **oP** = activated by closing the contact; **CL** = activated by opening the contact.

i1F	**Digital input 1 configuration:** • **nu**=not used • **dor** = door switch function • **dEF** = defrost activation • **AUS** = auxiliary output • **ES** = energy saving mode activation • **EAL** = external warning alarm • **bAL** = external lock alarm • **PAL** = external pressure alarm • **FAn** = evaporator fan control • **HdF** = holiday defrost • **onF** = ON/OFF status change • **LiG** = light output control • **Lnt** = change configuration (between map LT and map NT)
d1d	**Digital inputs 1 alarm delay:** (0 to 255 min) delay between the detection of an external event and the activation of the relative function.
i2P	**Digital input 2 polarity:** (CL; oP) **oP** = activated by closing the contact; **CL** = activated by opening the contact.
i2F	**Digital input 2 configuration:** • **nu**=not used • **dor** = door switch function • **dEF** = defrost activation • **AUS** = auxiliary output • **ES** = energy saving mode activation • **EAL** = external warning alarm • **bAL** = external lock alarm • **PAL** = external pressure alarm • **FAn** = evaporator fan control • **HdF** = holiday defrost • **onF** = ON/OFF status change • **LiG** = light output control • **Lnt** = change configuration (between map LT and map NT) • **EMt** = Motion sensor
d2d	**Digital inputs 2 alarm delay:** (0 to 255 min) delay between the detection of an external event and the activation of the relative function.
nPS	**Number of external pressure switch alarms before stopping the regulation:** (0 to 15) after reaching nPS events in the digital input alarm delay (par. dxd), the regulation will be stopped and a manual restart (ON/OFF, power OFF and power ON) will be required.
odC	**Compressor and fan status after door opening:** (no; FAn; CPr; F-C): **no** = normal; **FAn** = Fans OFF; **CPr** = Compressor OFF; **F-C** = Compressor and fans OFF.
rrd	**Regulation restart after door alarm:** (n; Y) **n** = no regulation if the door is open; **Y** = when the rrd timer elapses, the regulation restarts even if a door open alarm is ON.
CLi	**Light output activation from door input:** (n; Y)
LCi	**Time with light output forced ON:** (0 to 255 min) set how much time the light outputs will stay on after door input activation (**ixF=dor**). 0 = function disabled.
n01	**Number of motion detections before activating light output (valid if ixF=EMt):** (0 to 10) set how many detections from motion sensor will activate light outputs
t01	**Time with light output forced ON after motion detection:** (0 to 255 min) set how much time light outputs will stay on after motion detection activation.
MSF	**Function linked with the motion sensor:** (nu; LiG; ES; ALL) - **nu**= not used - **LiG**= motion sensor can modify only light outputs - **ES**= motion sensor can modify only energy saving status - **ALL**= motion sensor can modify both light outputs and energy saving status
EMF	**Motion sensor stop reading interval:** (0 to 255 min) after switching off the light output by button, serial command or energy saving algorithm the motion sensor will be inhibited for this interval (valid if **ixF=EMt**)

7.1.10 ENERGY SAVING – ES

ErA	**Energy saving algorithm:** (nu; bAS; Aut) **nu**=no energy saving algorithm used; **bAS**=basic energy saving algorithm; **Aut**=automatic energy saving algorithm.
nbo	**Door opening events, in percentage and respect to the daily average value, required to activate energy saving mode:** (0 to 10)
HES	**Temperature differential in energy saving:** (-30.0 to 30.0°C; -54 to 54°F) it sets the increasing value of the set point during the Energy Saving cycle.
LdE	**Energy saving controls the lights (lights OFF when energy saving is active):** (n; Y) the light status depends on the energy saving mode and is managed from **ErA**.
Aid	**Period of analysis for energy saving (valid if ErA=Aut):** (1 to 14 days) set the interval of time for temperature variation analysis.
nCA	**Number of contiguous cells to activate energy saving (valid if ErA=Aut):** (1 to 8) minimum pattern (1 cell = 30 min) without activity for energy saving activation
nCC	**Number of contiguous cells with energy saving for Set-Point variation (valid if ErA=Aut):** (1 to 12) minimum interval of time for SET-POINT variation by steps (1°C or 1°F every 30 minutes)
Pdt	**Automatic Pull-Down activation before energy saving mode ends (1=30min):** (1 to 8) energy saving mode is deactivated before the ES pattern defined end.
nEC	**Maximum number of consecutives cells with energy saving activated (valid only if ErA=Aut):** (0 to 48) use this parameter to define the maximum duration of ES mode. Set **nEC=0** if ES deactivation by RTC is used.
nrC	**Minimum number of consecutive cells in normal mode (valid only if ErA=Aut):** (0 to 48) set a minimum interval with normal mode functioning. Set **nEC=0** to disable this function.
tUn	**System tuning: Lo**=low sensitivity**; Hi**=high sensitivity
PPv	**Temperature probe used by automatic energy saving algorithm (valid if ErA=Aut):** (P1, P2, P3, P4) which probe is used from Energy Reduction Algorithm
FEn	**Force status change from energy saving mode to normal mode (valid if ErA=Aut):** (1 to 15) number of intervals with activity for mode changing
FnE	**Force status change from normal mode to energy saving mode (valid if ErA=Aut):** (1 to 15) number of intervals without activity for mode changing
StE	**Period to switch from normal mode to energy saving mode (valid if ErA=bAS):** (0.0 to 24h00min, res. 10 min) if door stay closed for **StE** time, the energy saving mode will be activated. NOTE: this will require a door switch to work.
EtS	**Period to switch from energy saving mode to normal mode (valid if ErA=bAS):** (0.0 to 24h00min, res. 10 min) maximum time for energy saving mode. NOTE: this will require a door switch to work.
dS	**Open door time to switch from EtS to StE (valid if ErA=bAS):** (0 to 999 sec) the energy saving mode will be immediately deactivated as soon as the door stay open more than the **dS** time. NOTE: this will require a door switch to work.
nES	**Number of motion detections before disabling energy saving:** (0 to 255)

7.1.11 COUNTERS – Cnt

nH1	**Number of activations for compressor relay (thousands of)**
nL1	**Number of activations for compressor relay (units of)**
nH2	**Number of activations for relay output oA1 (thousands of)**
nL2	**Number of activations for relay output oA1 (units of)**
nH3	**Number of activations for relay output oA2 (thousands of)**
nL3	**Number of activations for relay output oA2 (units of)**
nH4	**Number of activations for relay output oA3 (thousands of)**
nL4	**Number of activations for relay output oA3 (units of)**
n7d	**Number of daily activations of digital input 1**
n7H	**Number of total activations of digital input 1 (thousands of)**
n7L	**Number of total activations of digital input 1 (units of)**
n8d	**Number of daily activations of digital input 2**
n8H	**Number of total activations of digital input 2 (thousands of)**
n8L	**Number of total activations of digital input 2 (units of)**
rSd	**Daily counters reset**
rSC	**Total counters reset**

7.1.12 REAL TIME CLOCK

Hur	**Hours:** 0 to 23 hours
Min	**Minutes:** 0 to 59 minutes
dAY	**Day of the week:** Sun to Sat
dYM	**Day of the month:** 1 to 31
Mon	**Month:** 1 to 12
YAr	**Year:** 00 to 99
Hd1	**First day of weekend:** (Sun to SAt; nu) set the first day of the weekend.
Hd2	**Second day of weekend:** (Sun to SAt; nu) set the second day of the weekend.
iLE	**Energy saving cycle start time on working days:** (00h00min to 23h50min) set the activation time of the Energy Saving cycle on working days.
dLE	**Energy saving cycle duration on working days:** (00h00min to 24h00min) set the duration of the Energy Saving cycle on working days. NOTE: see the ES paragraph to more information about interaction with RTC and energy saving mode.
iSE	**Energy saving cycle start time on weekends:** (00h00min to 23h50min) set the activation time of the Energy Saving during the weekend.
dSE	**Energy saving cycle duration on weekends:** (00h00min to 24h00min) set the duration of the Energy Saving cycle during the weekend.
ddx	**Daily defrost enabled:** (n; Y) to enable the **Ld1 to Ld6** defrost operations for any day of the week. • **dd1** = Sunday defrost • **dd2** = Monday defrost • **dd3** = Tuesday defrost • **dd4** = Wednesday defrost • **dd5** = Thursday defrost • **dd6** = Friday defrost • **dd7** = Saturday defrost
Ldx	**Defrost start time:** (00h00min to 23h50min) these parameters set the beginning of the programmable defrost cycles during any **ddx** day. Example: when **Ld2=12.4,** the second defrost starts at 12:40 am during working days.

7.1.13 SERIAL COMMUNICATION

Adr	**Serial address:** (1 to 247) device address for Modbus communication.
bAU	**Baudrate:** (9.6; 19.2) 9.6=9600baud; 19.2=19200baud. Select the correct baudrate for serial communication.

7.1.14 USER INTERFACE

onC	**OFF button configuration (right lower side): nu**=not used; **oFF**=ON/OFF function; **ES**=energy saving mode activation and deactivation.
on2	**OFF button timed (3sec) configuration (right lower side): nu**=not used; **oFF**=ON/OFF function; **ES**= energy saving mode activation and deactivation.
LGC	**Light button configuration (left upper side): nu**=not used; **Lig**=light output; **AUS**=auxiliary output; **Lnt**=change configuration
LG2	**Light button timed (3sec) configuration (left upper side): nu**=not used; **ErA**=reset energy saving pattern; **Lnt**=change configuration.
ESC	**AUS or ES button configuration (left middle side): nu**=not used; **Pb2**=Probe Pb2 visualization; **AUS**=auxiliary output; **ES**=energy saving mode activation and deactivation.
ES2	**DEFROST or ES button timed (3sec) configuration (left middle side): nu**=not used; **dEF**=defrost activation; **AUS**=auxiliary output; **ES**=energy saving mode activation and deactivation
dnC	**DOWN button configuration: nu**=not used; **Std**=standard functions; **Lnt**=change configuration.
dn2	**DOWN button configuration: nu**=not used; **Std**=standard functions; **Lnt**=change configuration; **Pdn**=Pull Down activation.

7.1.15 INFORMATION (READ ONLY)

d1	**Probe P1 value visualization**
d2	**Probe P2 value visualization**
d3	**Probe P3 value visualization**
d4	**Probe P4 value visualization**

rSE	**Real regulation Set Point**
FdY	**Firmware release date: day**
FMt	**Firmware release date: month**
FYr	**Firmware release date: year**
rEL	**Firmware Release**
Ptb	**Parameter code table**

8. PARAMETER CONFIGURATION

Label	Description	LT	NT	Level
rtC	Real time clock menu	0	0	Pr1
SET	Setpoint	3.0	36	
LS	Minimum Set point	-50.0	-58	Pr1
US	Maximum Set point	50.0	122	Pr1
Hy	Compressor regulation differential in normal mode	3.0	6	Pr1
HyE	Compressor regulation differential in energy saving mode	3.0	6	Pr1
Hyd	Deadband output regulation (oAx=db) differential	3.0	6	Pr2
rAr	Delay between compressor and db output (oAx=db) activation and vice versa	0	0	Pr2
odS	Output activation delay at start-up	1	1	Pr1
AC	Anti-short cycle delay	1	1	Pr1
AC1	Anti-short cycle delay (2nd compressor)	15	15	Pr2
rtr	Regulation percentage=F(P1; P2) (100=P1; 0=P2)	100	100	Pr1
oHt	Threshold for automatic activation of Pull Down in normal mode (SET+HY+oHt)	10.0	20	Pr1
SCo	Differential during Pull Down (SEt-SCo)	1.0	2	Pr1
tSC	Maximum duration for Pull Down	00:30	00:30	Pr1
oHE	Threshold for automatic activation of Pull Down in energy saving mode (SET+HES+HYE+oHE)	0.0	0	Pr1
SCE	Pull Down phase differential in energy saving (SEt+HYE-SCE)	0.0	0	Pr1
Con	Compressor ON time with faulty probe	5	5	Pr1
CoF	Compressor OFF time with faulty probe	10	10	Pr1
PbC	Probe selection	ntC	ntC	Pr2
ot	Probe P1 calibration	0.0	0	Pr2
P2P	Probe P2 presence	yes	yes	Pr2
o2	Probe P2 calibration	0.0	0	Pr2
P3P	Probe P3 presence	no	no	Pr2
o3	Probe P3 calibration	0.0	0	Pr2
P4P	Probe P4 presence	no	no	Pr2
o4	Probe P4 calibration	0.0	0	Pr2
iCO	Icon visualization	yes	yes	Pr2
CF	Temperature measurement unit: Celsius; Fahrenheit	°C	°F	Pr2
rES	Temperature resolution: decimal, integer	dE	dE	Pr2
Lod	Probe default displayed	P1	P1	Pr1
dLy	Temperature display delay (resolution 10 sec)	00:00	00:00	Pr2
dtr	Probe visualization percentage=F(P1;P2) (ex: dtr=1 means VALUE=0.01*P1+0.99*P2)	99	99	Pr2
EdF	Defrost mode	in	in	Pr2
tdF	Defrost type: electric heating, hot gas	EL	EL	Pr1
dFP	Probe selection for defrost control	P2	P2	Pr1
dtE	End defrost temperature	10.0	50	Pr1

Label	Description	LT	NT	Level
idF	Interval between two successive defrost cycles	8	8	Pr1
MdF	Maximum length of defrost cycle	20	20	Pr1
dSd	Start defrost delay	0	0	Pr1
dFd	Displaying during defrost	dEF	dEF	Pr1
dAd	Temperature display delay after any defrost cycle	0	0	Pr1
Fdt	Draining time	2	2	Pr1
dPo	Defrost cycle enebled at stat-up	no	no	Pr1
dAP	Defrost delay after Pull Down	0	0	Pr1
od1	Automatic defrost (at the beginning of any energy saving)	no	no	Pr2
od3	Optimized defrost	nu	nu	Pr2
Syd	Tipe of synchronized defrost	nu	nu	Pr2
dt1	Differential temperature for latent heating control	0.3	1	Pr2
dt2	Delta=Troom-Tevap (used if od3=Y)	0.5	1	Pr2
FAP	Probe selection for evaporator fan	nP	nP	Pr1
FSt	Evaporator fan stop temperature	16.0	60	Pr1
HYF	Evaporator fan regulator differential	2.0	20	Pr1
OF2	Evaporator fan offset in energy saving	0.1	1	Pr1
FnC	Evaporator fan operating mode	C_n	C_n	Pr1
Fnd	Evaporator fan delay after defrost cycle	2	2	Pr1
FCt	Differential temperature for cyclic activation of evaporator fans (0=disabled)	0	0	Pr1
Fon	Evaporator fan ON time in normal mode (with compressor OFF)	1	1	Pr1
FoF	Evaporator fan OFF time in normal mode (with compressor OFF)	1	1	Pr1
Ft	Evaporator fan controlled during defrost	no	no	Pr1
Fo1	Evaporator fan ON time in energy saving (with compressor OFF)	1	1	Pr1
FF1	Evaporator fan OFF time in energy saving (with compressor OFF)	2	2	Pr1
ACH	Type of control for auxiliary regulator	CL	CL	Pr2
SAA	Set point for auxiliary regulator	12.0	60	Pr2
SHy	Auxiliary regulator differential	1.0	1	Pr2
ArP	Probe selection for auxiliary regulator	nP	nP	Pr2
Sdd	Auxiliary regulator disabled during any defrost cycle	no	no	Pr2
btA	Base time for parameters Ato and AtF	sec	sec	Pr2
Ato	Interval of time with auxiliary output ON	0	0	Pr2
Atf	Interval of time with auxiliary output OFF	0	0	Pr2
ALP	Probe selection for temperature alarms	P1	P1	Pr1
ALC	Temperature alarms configuration: relative, absolute	Ab	Ab	Pr1
ALL	Low temperature alarm	-20.0	-4	Pr1
ALU	High temperature alarm	20.0	68	Pr1
AFH	Temperature alarm differential	2.0	4	Pr1
ALd	Temperature alarm delay	1	1	Pr1
dot	Temperature alarm delay with open door	00:10	00:10	Pr1
dAo	Temperature alarm delay at start-up	01:00	01:00	Pr1
AP2	Probe selection for 2nd temperature alarm	nP	nP	Pr2
AU1	Pre-alarm threshold for 2nd temperature alarm (absolute value)	0.0	0	Pr2
AH1	2nd high temperature pre-alarm differential	2.0	4	Pr2
Ad1	2nd high temperature pre-alarm delay	0	0	Pr2
AL2	2nd low temperature alarm	-10.0	-67	Pr2

Label	Description	LT	NT	Level
AU2	2nd high temperature alarm	20.0	302	Pr2
AH2	2nd temperature alarm differential	2.0	4	Pr2
Ad2	2nd temperature alarm delay	0	0	Pr2
dA2	2nd temperature alarm delay at start-up	00:00	00:00	Pr2
bLL	Compressor OFF due to 2nd low temperature alarm	no	no	Pr2
AC2	Compressor OFF due to 2nd high temperature alarm	no	no	Pr2
tbA	Alarm relay deactivation	yes	yes	Pr2
oA1	Relay output oA1 configuration	CP1	CP1	Pr2
oA2	Relay output oA2 configuration	Def	Def	Pr2
oA3	Relay output oA3 configuration	Fan	Fan	Pr2
oA4	Relay output oA4 configuration	LiG	LiG	Pr2
AoP	Alarm relay polarity	CL	CL	Pr2
ibt	Base times for digital inputs	min	min	Pr2
i1P	Digital input 1 polarity	CL	CL	Pr2
i1F	Digital input 1 configuration	nu	nu	Pr2
d1d	Digital inputs 1 alarm delay (base time depends on par. ibt)	0	0	Pr2
i2P	Digital input 2 polarity	CL	CL	Pr2
i2F	Digital input 2 configuration	nu	nu	Pr2
d2d	Digital inputs 2 alarm delay (base time depends on par. ibt)	0	0	Pr2
nPS	Number of external pressure switch alarms before stopping the regulation	15	15	Pr2
OdC	Compressor and fan status after door opening	F-C	F-C	Pr2
rrd	Regulation restart after door alarm	no	no	Pr2
CLI	Light output activation from door input	no	no	Pr2
Lci	Time with light output forced ON (0=function disabled)	0	0	Pr2
n01	Motion sensor detections before activating a light output (valid if ixF=EMt and MSF=LiG or ALL)	5	5	Pr2
t01	Time with light output forced ON after motion detection	15	15	Pr2
MSF	Function linked with the motion sensor	nu	nu	Pr2
EMF	Motion sensor stop reading interval after switching off the light output by button, serial command or energy saving algorithm (valid if ixF=EMt)	2	2	Pr2
ErA	Energy saving algorithm	Aut	Aut	Pr2
nbo	Number of virtual door openings of a single cell for energy saving activation	3	3	Pr2
HES	Temperature differential in energy saving	4.0	8	Pr2
LdE	Energy saving controls the lights (lights OFF when energy saving goes active)	yes	yes	Pr2
Aid	Period of analysis for ErA (valid if ErA=Aut)	1	1	Pr2
nCA	Number of contiguous cells to activate energy saving (valid if ErA=Aut)	2	2	Pr2
nCC	Number of contiguous cells with energy saving for Set-Point variation (valid if ErA=Aut)	4	4	Pr2
Pdt	Automatic Pull Down activation after energy saving (1=30min)	1	1	Pr2
nEC	Maximum number of consecutives cells with energy saving activated (valid only if ErA=Aut)	0	0	Pr2
nrC	Minimum number of consecutive cells in normal mode (valid only if ErA=Aut)	0	0	Pr2
tUn	System tuning: 0=low sensibility; 1=high sensibility	Hi	Hi	Pr2
PPv	Temperature probe used by automatic energy saving algorithm (valid if ErA=Aut)	P1	P1	Pr2
FEn	Force status change from energy saving mode to normal mode (valid if ErA=Aut)	1	1	Pr2

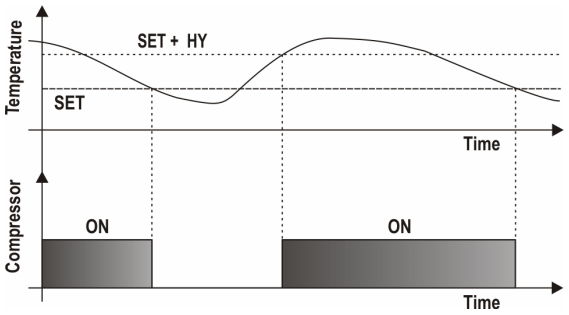
Label	Description	LT	NT	Level
FnE	Force status change from normal mode to energy saving mode (valid if ErA=Aut)	2	2	Pr2
StE	Period to switch from normal mode to energy saving (valid if ErA=bAS)	04:00	04:00	Pr2
EtS	Period to switch from energy saving mode to normal (valid if ErA=bAS)	08:00	08:00	Pr2
dS	Open door time to switch from EtS to StE (valid if ErA=bAS)	3	3	Pr2
nES	Number of motion detections before disabling energy saving (valid if ixF=EMt)	15	15	Pr2
n1H	Number of activations for relay output oA1 (thousands of)	r.o.	r.o.	Pr1
n1L	Number of activations for relay output oA1 (units of)	r.o.	r.o.	Pr1
n2H	Number of activations for relay output oA2 (thousands of)	r.o.	r.o.	Pr1
n2L	Number of activations for relay output oA2 (units of)	r.o.	r.o.	Pr1
n3H	Number of activations for relay output oA3 (thousands of)	r.o.	r.o.	Pr1
n3L	Number of activations for relay output oA3 (units of)	r.o.	r.o.	Pr1
n4H	Number of activations for relay output oA4 (thousands of)	r.o.	r.o.	Pr1
n4L	Number of activations for relay output oA4 (units of)	r.o.	r.o.	Pr1
n7d	Number of daily activations of digital input 1	r.o.	r.o.	Pr1
n7H	Number of total activations of digital input 1 (thousands of)	r.o.	r.o.	Pr1
n7L	Number of total activations of digital input 1 (units of)	r.o.	r.o.	Pr1
n8d	Number of daily activations of digital input 2	r.o.	r.o.	Pr1
n8H	Number of total activations of digital input 2 (thousands of)	r.o.	r.o.	Pr1
n8L	Number of total activations of digital input 2 (units of)	r.o.	r.o.	Pr1
rSd	Daily counters reset	no	no	Pr2
rSC	Total counters reset	no	no	Pr2
Hur	Hours	0	0	Pr2
Min	Minutes	0	0	Pr2
dAY	Day of the week	0	0	Pr2
dYM	Day of the month	0	0	Pr2
Mon	Month	0	0	Pr2
YAr	Year	0	0	Pr2
Hd1	First day of weekend	Sat	Sat	Pr2
Hd2	2nd day of weekend	Sun	Sun	Pr2
iLE	Energy saving cycle starting time on working days	nu	nu	Pr2
dLE	Energy saving cycle duration on working days	nu	nu	Pr2
iSE	Energy saving cycle starting time on weekends	nu	nu	Pr2
dSE	Energy saving cycle duration on weekends	nu	nu	Pr2
dd1	Sunday defrost	no	no	Pr2
dd2	Monday defrost	no	no	Pr2
dd3	Tuesday defrost	no	no	Pr2
dd4	Wednesday defrost	no	no	Pr2
dd5	Thursday defrost	no	no	Pr2
dd6	Friday defrost	no	no	Pr2
dd7	Saturday defrost	no	no	Pr2
Ld1	1st defrost starting time	00:00	00:00	Pr2
Ld2	2nd defrost starting time	00:00	00:00	Pr2
Ld3	3rd defrost starting time	00:00	00:00	Pr2
Ld4	4th defrost starting time	00:00	00:00	Pr2
Ld5	5th defrost starting time	00:00	00:00	Pr2

Label	Description	LT	NT	Level
Ld6	6th defrost starting time	00:00	00:00	Pr2
Adr	Serial address	1	1	Pr1
bAU	Baudrate	96	96	Pr1
OnC	ONOFF button configuration (right lower side)	nu	nu	Pr2
On2	ONOFF button timed (3sec) configuration (right lower side)	OFF	OFF	Pr2
LGC	Light button configuration (left upper side)	LiG	LiG	Pr2
LG2	Light button timed (3sec) configuration (left upper side)	LiG	LiG	Pr2
ESC	Energy saving button configuration (left middle side)	nu	nu	Pr2
ES2	Energy saving button timed (3sec) configuration (left middle side)	ES	ES	Pr2
dnC	Down button configuration	nu	nu	Pr2
dn2	Down button timed (3sec) configuration	Lnt	Lnt	Pr2
dP1	Probe P1 value visualization	r.o.	r.o.	Pr1
dP2	Probe P2 value visualization	r.o.	r.o.	Pr1
dP3	Probe P3 value visualization	r.o.	r.o.	Pr1
dP4	Probe P4 value visualization	r.o.	r.o.	Pr1
rSE	Real regulation Set Point (SET + HES + SETd)	r.o.	r.o.	Pr1
FdY	Firmware release date: day	r.o.	r.o.	Pr1
FMn	Firmware release date: month	r.o.	r.o.	Pr1
FYr	Firmware release date: year	r.o.	r.o.	Pr1
rEL	Firmware release	r.o.	r.o.	Pr1
Ptb	Parameter map version	r.o.	r.o.	Pr1

NOTES:
- "r.o." stands for read only values
- Default factory settings here indicated are valid for XRB77CH and XRB70CH only
- Some parameters could not be present in other versions (for example XRB30CH) due to platform specific limitations
- RTC parameters are present only in models equipped with RTC option.

9. REGULATION

The regulation is based on the temperature measured by the thermostat probe (P1) with a positive differential compared to the set point: if the temperature increases and reaches the set point plus differential, the compressor will start. The compressor will stop when the temperature reaches the set point value again. In case of fault because of the thermostat probe, the start and stop of the compressor are timed through parameters **CoF** and **Con**.



10. ENERGY SAVING ALGORITHMS

The device permits to set different temperature to be used during normal and reduced power use. The standard SET-POINT (**SET**) is used to maintain the temperature at a certain value when the energy saving status (ES) is not active. On the other side, when the ES status is active a different SET-POINT (**SET_ES**), higher than the standard one, will be used. The parameter **HES** will have to be set to change the regulation temperature according to the following formula: **SET_ES = SET + HES**
There are also two different differential values for SET and SET_ES, which are used for compressor cut-in and cut-out: when ES status is active the **HYE** parameter will be used instead of the **HY** parameter.

The device uses special **E**nergy **r**eduction **A**lgorithms (par. **ErA**) to optimize loads activation during the regulation. It is possible to set two different algorithms (**ErA=bAS or Aut).** They differ for the used sensors and for the total length of the intervals involved.

10.1 BASIC ENERGY SAVING ALGORITHM – ERA=BAS

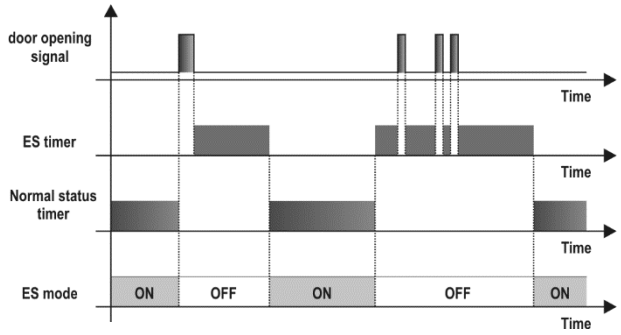
This will be used when **ErA=bAS**. The energy saving status will be always saved in the internal memory to resume previous operation if a power failure occurs. It needs the presence of a door switch to work (**i1F=dor**).

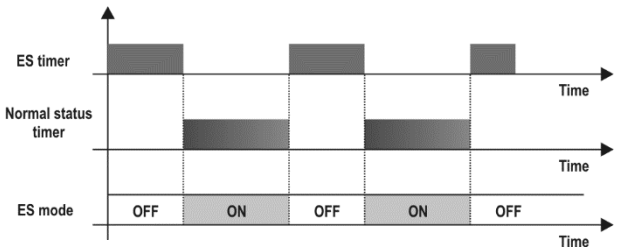
10.1.1 PARAMETER INVOLVED AND SUGGESTED VALUES

- **ErA = bAS**
- **i1F = dor**
- **StE** = 4.0 hours
- **EtS** = 6.0 hours
- **HES** = 3.0 to 5.0 °C
- **HYE** = 3 to 4°C
- **dS** = 5 to 10 sec
- **LdE = Y** for having light output automatically OFF when energy saving mode starts.

FROM	TO	CHANGED BY
Normal mode	Energy Saving	- Keeping the **DOWN** button pressed for 3 sec (if enabled). - Door continuously closed for the **StE** time. - Number of motion events detected during **StE** interval minor than **nES**.
Energy Saving	Normal mode	- Keeping the **DOWN** button pressed for 3 sec (if enabled). - Controller in ES mode for the **EtS** time without any door opening or with motion events detected minor than **nES**. - If the controller is in ES mode, it returns in Standard mode (normal set-point) after opening the door more than **dS** time. - If the controller is in ES mode, it returns in Standard mode (normal set-point) after detecting **nES** motion events.

NOTE: the cycling mode (ES - Normal mode - ES - etc.) works if **i1F=dor** and **EtS** and **StE** are different from zero. If **EtS=0** or **StE=0,** the controller will not change the operating mode, and it will be possible to change from the normal mode to the energy saving mode by using ES button or by setting **i1F=ES**. See the below diagrams where the status changing is depicted:





10.1.2 INTERACTION WITH OTHER SENSORS

The following table indicates the interaction between energy saving mode (**ErA=bAS**) and various digital input functions.

i1F	i2F	MSF	How it works
dor	Any ≠ **EMt**, **ES**	Any	The function of digital input 1 changes the ES status according to par. **EtS** and **StE** or after opening the door for a time greater than **dS**.
dor	**ES**	Any	Digital input 1 has priority. The function of the second digital input is disabled.

dor	**EMt**	**ES** or **ALL**	Digital input 1 always has priority for the transition from normal to ES and vice versa. When in ES mode, after **nES** motion detections it switches from ES to normal mode. When in normal mode, after **nES** motion detections the timer **StE** is reloaded.
Any ≠ **dor**, **ES**	**dor**	Any	Digital input 2 changes the ES status according to **EtS** and **StE** or after opening the door for a time greater than **dS**.
Any ≠ **dor**, **ES**	**EMt**	**ES** or **ALL**	Digital input 2 changes the ES status. When in ES mode, after **nES** motion detections it switches from ES to normal mode. When in normal mode, after **nES** motion detections, the timer **StE** is reloaded.
ES	**dor**	Any	Digital input 1 has priority. The ES algorithm and the function of the second digital input are disabled. The counter of the number of activations of digital input 2 stays active.
ES	**EMt**	**ES** or **ALL**	The function of digital input 1 has priority. The ES algorithm and the function of the second digital input are disabled. The counter of the number of activations of digital input 2 remains active.
Any ≠ **dor**, **ES**	**ES**	Any	Digital input 2 changes the ES status.

10.1.3 RULE TABLES FOR ACTIVATION AND DEACTIVATION

		Energy saving activation				
		Button	Serial command	Digital input	Real time clock	Algorithm
Energy Saving deactivation	Button	**Y**	**Y**	**Y**	**Y**	**Y**
	Serial command	**Y**	**Y**	**Y**	**Y**	**Y**
	Digital input	**Y**	**Y**	**Y**	**Y**	**Y**
	Real time clock	**N**	**N**	**N**	**Y**	**N.A.**
	Algorithm	**N**	**N**	**N**	**N.A.**	**Y**

NOTES:
- **Y**: a previous energy saving activation command can be modified (for example: serial command activation can be modified from ECO button)
- **N**: a previous energy saving activation command cannot be modified (for example: serial command activation cannot be modified from algorithm)
- **N.A.**: When real time clock is enabled, the energy saving algorithm (**ErA=bAS**) will be automatically disabled.

10.2 AUTOMATIC ENERGY SAVING ALGORITHM

This energy saving algorithm will be used when **ErA=Aut**. The operations are controlled by using the **Aid** parameter which define the total pattern interval. After powering on the device, it automatically starts to analyze the temperature variations by using the **PPv** temperature probe. In this way it can build the best energy saving model according to the specific application. The device uses the energy saving model built during the previous **Aid** interval to manage the loads in the current period. When **Aid** is set to use long periods (**Aid>1**), a day-by-day energy saving model will be used during the first interval of time.

10.2.1 PARAMETER INVOLVED AND SUGGESTED VALUES

- **ErA = Aut**
- **Aid =** 1 or 7
- **LdE = Y**
- **HES =** 4.0 to 5.0°C
- **HYE =** 3 to 4°C

NOTES:

- In case of any blackout, the calculated energy saving model will be reset.
- **ErA** can exclusively drive the light output by using the **LdE** parameter. When **LdE=YES**, the light output status will change according to the energy saving (ES) status:
    - OFF if ES is active
    - ON if ES is not active
- It is always possible to override the light output status by using the frontal button. Anyway, this modification will have a temporary impact on the lights if **LdE=YES**. In fact, **ErA** will take the control after the next ES status change.
- **ErA <u>does not</u> need and <u>does not use</u> any door switch input or motion sensor (i2F=EMt) to work**.
- Be sure to place the room temperature probe in near the upper zone of the cabinet: this gives the best results in terms of temperature variation analysis.
- The **Aid** parameter indicates the interval of analysis as “number of days”. The suggested values for it are 1 or 7, depending on the application.
- When **Aid=1**, the first day will be used to analyze the temperature behavior and to build the model to apply to the second day. The model will be updated every day to better match the working conditions.
- When **Aid=7**, the first 7 days will be used to analyze the temperature behavior and to build the model to apply to the next 7 days. The model will be updated every 7 days to better match the working conditions.
- When **Aid=7**, the first 7 days after power on will use a sub analysis base on 1-day model.

10.2.2 INTERACTION WITH OTHER SENSORS

The following table indicates the interaction between advanced energy saving mode (**ErA=Aut**) and various digital input functions. Par. **EtS**, **StE** are not considered when **ErA=Aut**.

i1F	i2F	MSF	How it works
dor	Any ≠ **EMt**, **ES**	Any	The function of digital input 1 does not interact with ES algorithm.
dor	**ES**	Any	The function of digital input 1 does not interact with ES algorithm. The function of the second digital input is disabled.
dor	**EMt**	**ES**	The function of digital input 1 and 2 does not interact with ES algorithm.
dor	**EMt**	**LiG** or **ALL**	The function of digital input 1 and 2 does not interact with ES algorithm. Digital input 2 can activate light output according with par. **n01** and **t01**.
Any ≠ **dor**, **ES**	**dor**	Any	The function of digital input 2 does not interact with ES algorithm.
Any ≠ **dor**, **ES**	**EMt**	**ES**	The function of digital input 2 does not interact with ES algorithm.
Any ≠ **dor**, **ES**	**EMt**	**LiG** or **ALL**	The function of digital input 2 does not interact with ES algorithm. Digital input 2 can activate light output according with par. **n01** and **t01**.
ES	**dor**	Any	Digital input 1 has priority. The ES algorithm and the function of the second digital input are disabled. The counter of the number of activations of digital input 2 stays active.
ES	**EMt**	**ES** or **ALL**	The function of digital input 1 has priority. The ES algorithm and the function of the second digital input are disabled. The counter of the number of activations of digital input 2 remains active.
Any ≠ **dor**, **ES**	**ES**	Any	ES algorithm is disabled. Digital input 2 changes the ES status.

10.2.3 RULE TABLES FOR ACTIVATION AND DEACTIVATION

		Energy saving activation				
		Button	Serial command	Digital input	Real time clock	Algorithm
Energy Saving deactivation	Button	Y	Y	Y	Y	Y
	Serial command	Y	Y	Y	Y	Y
	Digital input	Y	Y	Y	Y	Y
	Real time clock	N	N	N	Y	D.O.
	Algorithm	N	N	N	N.A.	Y

NOTES:
- **Y**: a previous energy saving activation command can be modified (for example: serial command activation can be modified from ECO button)
- **N**: a previous energy saving activation command cannot be modified (for example: serial command activation cannot be modified from algorithm)
- **N.A.**: When the energy saving algorithm (**ErA=Aut**) is enabled, the real time clock activation (par. **iLE**, **iSE**) will be automatically disabled.
- **D.O.**: deactivation only. This specific condition uses only par. **dLE** and force ES OFF at predefined times. It temporary overwrites the ES pattern defined by the algorithm. RTC needs to be properly configured.

10.3 ENERGY SAVING AND REAL TIME CLOCK

When **ErA=nu**, the energy saving status (ES) can be controlled by RTC using the parameters:
- **iLE**: Energy saving cycle starting time on working days
- **dLE**: Energy saving cycle duration on working days
- **iSE**: Energy saving cycle starting time on weekends
- **dSE**: Energy saving cycle duration on weekends

When **ErA=bAS** or **Aut**, follow the below instrunction to set up properly the RTC parameters.

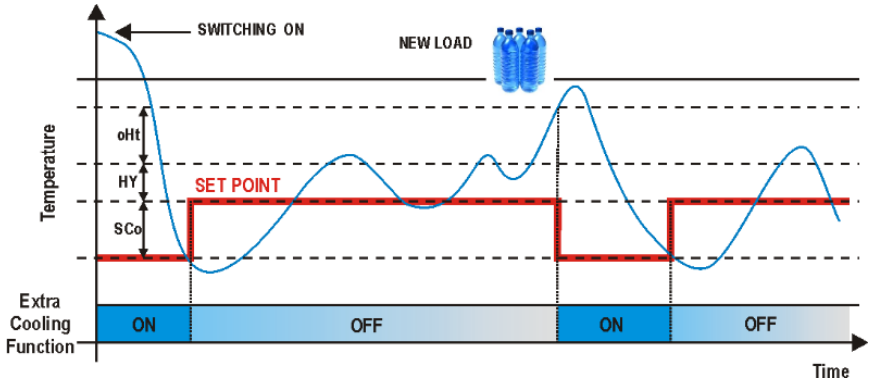
		RTC parameters			
		iLE	**dLE**	**iSE**	**dSE**
Energy Saving	**ErA=nu**	Energy saving cycle starting time on working days	Energy saving cycle duration on working days	Energy saving cycle starting time on weekends	Energy saving cycle duration on weekends
	ErA=bAS	Set **iLE=nu** to use ES algorithm	Set **dLE=nu** to use ES algorithm	Set **iSE=nu** to use ES algorithm	Set **dSE=nu** to use ES algorithm
	ErA=Aut	Set **iLE=nu** to use ES algorithm	**dLE≠nu** will force ES deactivation at the specified time (hh:mm of the current day)	Set **iSE=nu** to use ES algorithm	Set **dSE=nu** to use ES algorithm

NOTES:
- When **Hd1=nu** and **Hd2=nu**, all days will be set as working days.
- Value 00:00 means midnight.
- Parameters **dLE** is independent from par. **iLE**. This means that even if **iLE=nu** and RTC iss disabled or not present, **dLE** will be used: **dLE≠nu** will always deactivate the energy saving status after the specified interval, even if energy saving was previously activated by button, motion sensor or digital input.

- Parameters **dLE** and **dSE** must be intended as pure intervals (maximum duration of energy saving mode) if RTC is present and configurated.
- Energy saving algorithms and Real Time Clock are mutually influenced in the following ways:
    - When **ErA=bAS**: if **iLE**, **dLE≠nu** and/or **iSE**, **dSE≠nu**, energy saving status will always modified by RTC. In this case the basic energy saving algorithm is formally disabled.
    - When **ErA=Aut**: only par. **dLE** will be taken into consideration. This means that the status of energy saving will always be activated and deactivated by the **ErA=Aut** algorithm, but it can also be deactivated by RTC and using par. **dLE**. In this specific case, **dLE** will have the meaning of "exact time – hh:mm – for deactivating energy saving". After deactivation from RTC, the energy saving algorithm will take imeddiately the control of the operating status.

11. PULL DOWN

11.1.1 NORMAL MODE

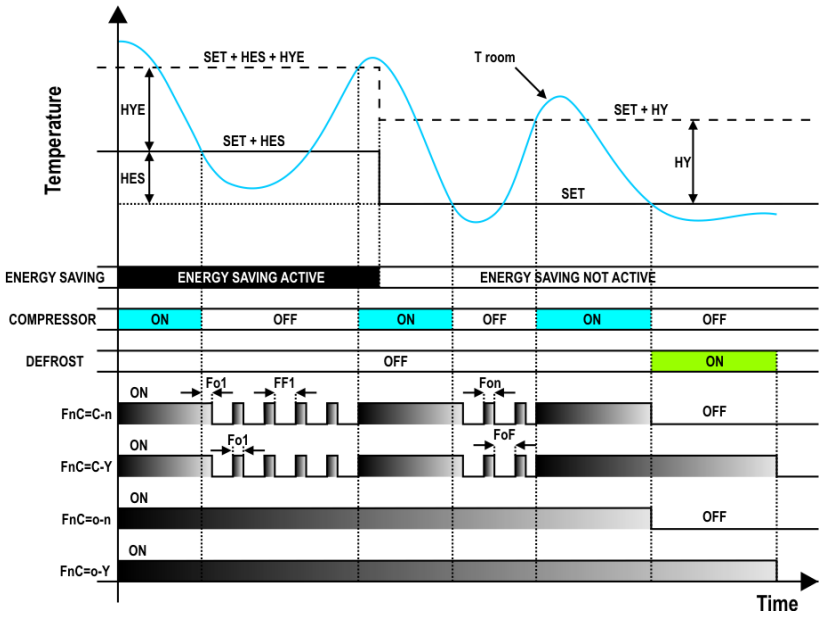


The PULL DOWN function is active when the room temperature measured from the regulation probe goes over the **SET+oHt+HY** value. In this case, a special set-point value, lower than the normal **SET** value, will be enabled. As soon as the room temperature reaches the **SET-SCo** value, the compressor will be stopped and the normal regulation will restart. **N.B.:** Pull Down function is disabled when **SCo=0**.
The **tSC** parameter sets the maximum activation time for Pull Down. When **tSC** expires, the Pull Down will be stopped and the standard SET-POINT will be restored. **NOTE:** in case of energy saving mode active, the used values will be: **SET_ES=SET+HES, oHE** and **SCE.**

11.1.2 EXITING FROM ADVANCED ENERGY SAVING MODE

The PULL DOWN function can be activated when working mode change from ES (valid only if **ErA=Aut**) to normal mode. The par. **Pdt** has to be set properly to anticipate the ES mode ends: it permits to switch the working mode to normal mode before the ES end pattern defined by the **ErA=Aut** algorithm. This function is automatically activated only if the current ES interval is larger than par. **nCC**.

12. EVAPORATOR FANS



With **FnC** parameter it can be selected the fans functioning:

- **FnC=C-n** → fans will switch ON and OFF with the compressor and not run during defrost; when compressor is OFF, fans will enter a duty-cycle working mode (see **FoF**, **Fon**, **FF1** and **Fo1** parameters).
- **FnC=o-n** → fans will run even if the compressor is off, and not run during defrost;
- **FnC=C-Y** → fans will switch ON and OFF with the compressor and **run** during defrost; when compressor is OFF all fans will enter a duty-cycle working mode (see **FoF**, **Fon**, **FF1** and **Fo1** parameters).
- **FnC=o-Y** → fans will run continuously also during defrost.

After any defrost, a timed fan delay can be used for dripping phase. It can be set by using par. **Fnd**.
An additional parameter **FSt** provides the setting of temperature, detected by the evaporator probe, above which the fans are always OFF. By using this parameter, it is possible to assure air circulation only if air temperature is lower than **FSt** value.

12.1 EVAPORATOR FAN AND DIGITAL INPUT

When the digital input is configured as door switch (**i1F=dor**), fans and compressor status will depend on the **odC** parameter value:

- **odC=no** → normal regulation
- **odC=FAn** → evaporator fan OFF
- **odC=CPr** → compressor OFF
- **odC=F-C** → compressor and evaporator fan OFF

When **rrd=Y** the regulation will restart after a door open alarm.

13. DEFROST

Any defrost operation can be controlled in the following way:

- **EdF=rtC**: by using an internal real-time clock (only for models equipped with RTC).
- **EdF=in**: timed defrost, in this case a new defrost will start as soon as the idF timer elapses.
- **EdF=Aut**: automatic management, in this case the controller will start a new defrost any time a change from normal to energy saving mode will occur (valid if **ErA=Aut**).

13.1 TIMED OR PROBE CONTROLLED MODE

Two defrost modes are available: timed or controlled by the evaporator's probe. A couple of parameters is used to control the interval between defrost cycles (**idF**) and its maximum length (**MdF**). During the defrost cycle is possible to select some different display indications by using the **dFd** parameter. These modes are available with any kind of defrost type:

- **tdF=EL**: electric heater defrost
- **tdF=in**: hot gas defrost.

13.2 OPTIMIZED DEFROST

When a defrost operation is performed by compressor stop (means by stopping the compressor and by activating the internal ventilators), it will be possible to use an automatic defrost mode by setting **od3=Y**. In this case the device will use the evaporator probe (which MUST to be present and properly mounted on the evaporator surface) to detect the end of the running defrost phase. In any case, a maximum period (**MdF**) and an maximum evaporator temperature value will be used as safeties to stop the defrost phase. If **ErA=Aut**, the automatic defrost mode will activate a defrost at the beginning of any energy saving mode period. In this case the **idF** delay is used as safety function. It forces the controller to activate a defrost operation when **idF** runs. **NOTE:** during the defrost phase the loads (compressor and evaporator fans) will be controlled from the defrost algorithm.

13.3 SYNCRONIZED DEFROST

The Synchronized defrost mode is enabled by setting par. **SYd=SYn**. After any defrost request (received by RTC, timed by par. **idF,** manually by defrost button or by digital input set as dEF), all controllers will activate their own defrost phase. The first controller which ends its defrost phase will release the defrost line and load its dripping time. At the end of the dripping time the normal regulation will restart.
The other controllers follow the same logic.

This defrost function requires:
- Two or more controllers connected (by wire)
- Set all networked controllers with a digital input as **ixF=dEF**
- Connect (by wire) all digital inputs of the networked controllers and set as **ixF=dEF**

14. LIGHT OUTPUT CONTROL

Light output can be managed in different ways:
- By button set as "**LiG**"
- By digital input set as **ixF=dor, LiG**
- By motion sensor (**i2F=EMt**)
- By energy saving mode and only if par. **LdE=Y**
- By serial command

Par. **CLY** activates the light output control from door input (**i1F=dor**).
Par. **LCi** sets the maximum interval with light output ON from door or light input (**i1F=dor, LiG**). If **LCi=0**, the light output will stay ON until door or light input stay active.
If light output is ON due to **ixF=dor** or **LiG**, any OFF command from button, serial command, the other digital input or energy saving will take effect.

The following table show the interaction between digital inputs and light output status:

i1F	i2F	MSF	How it works
dor	**EMt**	**ES**	Digital input 2 can modify light status, when ES mode starts (par. **nES**), only if **LdE=Y**.
dor	**EMt**	**LiG, ALL**	Digital input 1 change light out only if **CLY=Y** Digital input 2 change light out only if **t01>0** and **n01>0** If digital input 2 activates light out (par. **t01>0** and **n01>0**), a subsequent digital input 1 command will not change light status when **LCi=0**. Timers **LCi** and **t01** can overlap. If one of them is active, the activation of the other one will be able to prolong the light out ON status. Digital input 2 can modify light out, when ES mode starts (par. **nES**), only if **LdE=Y**.
dor	**LiG**	**n.a.**	With **CLi=Y**: - Digital input 1 change light out - Digital input 2 does not change light out With **CLi=n**: - Digital input 1 does not change light out - Digital input 2 change light out

LiG	**EMt**	**LiG, ALL**	With **LCi=0**: - Digital input 1 activates light out. Any OFF command from button, serial command or energy saving will take effect. - If **n01>0** and **t01>0**, digital input 2 can switch OFF light out when **t01** ends. With **LCi>0**: - Digital input 1 activates light out until **LCi** ends. Any OFF command from button, serial command or energy saving will take effect. - If **n01>0** and **t01>0**, timers **LCi** and **t01** can overlap. If one of them is active, the activation of the other one will be able to prolong the light out ON status.
LiG	**ES**	**n.a.**	Digital input 1 change light output. If **LCi=0**, light output will be activated and deactivated with digital input. Il **LCi>0**, light output will be activated with digital input and forced OFF when **LCi** ends. Digital input 2 can change light output status if **LdE=Y**.
ES	**dor**	**n.a.**	Digital input 1 will change light output only if **LdE=Y**. Digital input 2 can change light output, only if **CLY=Y**, and in the following ways: - If **LCi=0** then light output will be switched ON and OFF following the digital input 2 status - If **LCi>0** then light output will be switched ON following the digital input 2 status and switched OFF when **LCi** ends.
ES	**LiG**	**n.a.**	Digital input 1 will change light output only if **LdE=Y**. Digital input 2 can change light output in the following ways: - If **LCi=0** then light output will be switched ON and OFF following the digital input 2 status - If **LCi>0** then light output will be switched ON following the digital input 2 status and switched OFF when **LCi** ends.
ES	**EMt**	**ES**	Digital input 1 will change lights only if **LdE=Y**. Digital input 2 will be inhibited.
ES	**EMt**	**LiG**	Digital input 1 will change light status only if **LdE=Y**. Digital input 2 can change light status only if **t01>0** and **n01>0**. If time **t01** is running, a light OFF command from digital input 1 will take effect only when **t01** ends. If light is OFF due to digital input 1, after **n01** motion detections the light will be switched ON for **t01** (temporary activation in energy saving). If digital input 2 activates light (par. **t01>0** and **n01>0**), a subsequent digital input 1 command will change light status when **LdE=Y**.
ES	**EMt**	**ALL**	Digital input 1 will change light status only if **LdE=Y**. Digital input 2 can change light status only if **t01>0** and **n01>0**. If time **t01** is running, a light OFF command from digital input 1 will take effect only when **t01** ends. If light is OFF due to digital input 1, after **n01** motion detections the light will be switched ON for **t01** (temporary activation in energy saving). If digital input 2 activates light (par. **t01>0** and **n01>0**), a subsequent digital input 1 command will change light status when **LdE=Y**. Digital input 2 does not change ES status (the energy saving functions are inhibited, par. **nES** is not take into consideration).

15. INTERNAL COUNTERS

The next table shows the available counters.

n1H	Number of activations for relay output oA1 (thousands of)
n1L	Number of activations for relay output oA1 (units of)
n2H	Number of activations for relay output oA2 (thousands of)
n2L	Number of activations for relay output oA2 (units of)
n3H	Number of activations for relay output oA3 (thousands of)
n3L	Number of activations for relay output oA3 (units of)

n4H	Number of activations for relay output oA4 (thousands of)
n4L	Number of activations for relay output oA4 (units of)
n7d	Number of daily activations of digital input 1
n7H	Number of total activations of digital input 1 (thousands of)
n7L	Number of total activations of digital input 1 (units of)
n8d	Number of daily activations of digital input 2
n8H	Number of total activations of digital input 2 (thousands of)
n8L	Number of total activations of digital input 2 (units of)

In this way it is possible to monitor the application and discovering bad functioning that could lead to damages. All counters are saved into memory every hour. It is possible to reset them by using par. **rSd** (reset daily counters) and **rSC** (reset total counters).

16. DIGITAL OUTPUTS

Depending on the model, one or more digital outputs (relays) can be configurated with one of the following functionalities.

16.1 COMPRESSOR OUTPUT (oAx = CP1)

With **oAx=CP1** the relay operates as the main regulation output.

16.2 DEFROST OUTPUT (oAx = dEF)

With **oAx=dEF** the relay operates as a defrost output.

16.3 EVAPORATOR FAN OUTPUT (oAx = FAn)

With **oAx=FAn** the relay operates as an evaporator fan output.

16.4 ALARM OUTPUT (oAx = ALr)

With **oAx=ALr** the output operates as an alarm output. It is activated every time an alarm happens. Its status depends on the **tbA** parameter: if **tbA=Y**, the output is deactivated by pressing any key.
If **tbA=n**, the alarm output stays on until the alarm condition recovers.

16.5 LIGHT OUTPUT (oAx = LiG)

With **oAx=LiG** the relay operates as a light output.

16.6 AUXILIARY OUTPUT (oAx = AUS)

The auxiliary output can be managed by digital inputs (**oAx=AUS**, **i1F or i2F=AUS**): the output is switched on and off following the relative digital input status.

16.6.1 AUXILIARY REGULATOR

The auxiliary regulator can be used to manage the auxiliary output. Here are the involved parameters:
- **ACH:** type of regulation for the auxiliary relay: **Ht** = heating; **CL** = cooling
- **SAA:** set point for auxiliary relay
- **SHY:** auxiliary relay differential
- **ArP:** probe for auxiliary relay
- **Sdd:** auxiliary output off during defrost

16.6.2 TIMED ACTIVATION

The following parameters can be used to define fixed activation and deactivation intervals.
- **btA:** base time for auxiliary output activation and deactivation intervals
- **Ato:** auxiliary activation interval
- **AtF:** auxiliary deactivation interval

16.6.3 GENERAL NOTES

if **oAx=AUS** and **ArP=nP** (no probe for auxiliary digital output) the AUX output can be managed:
- By digital input if **i1F=AUS** or **i2F=AUS**
- By auxiliary button (if set as **AUS**)
- By serial command (Modbus protocol)
- By fixed interval of time if **Ato>0** and **AtF>0** (if **Ato=0** or **AtF=0** the auxiliary output is disabled)

16.7 DEAD BAND REGULATION (oAx = db)

With **oAx=db** the output can be used to control a heater element, for example. It is used to implement a dead band regulation. If so:
- **oAx=db** cut in is **SET-HY**
- **oA1=db** cut out is **SET**

16.8 ON/OFF OUTPUT (oAx = onF)

When **oAx=onF**, the output is activated when the controller is switched on and deactivated when the controller is switched off.

16.9 ENERGY SAVING OUTPUT (oAx = HES)

When **oAx=HES**, the output is activated when the energy saving mode is active and vice-versa.

16.10 SECOND COMPRESSOR OUTPUT (oAx = CP2)

With **oAx=CP2** the relay operates as a second regulation output. This function is available only for special models and normally must be not selected.

17. DIGITAL INPUTS

The digital inputs are programmable by using par. **i1F** and **i2F**.

17.1 DOOR SWITCH (ixF=dor)

It signals the door status. Some relay outputs can be toggled depending on the **odC** parameter:
- **odC = no** no change
- **odC = FAn** evaporator fan will be switched off
- **odC = CPr** compressor will be switched off
- **odC = F-C** both compressor and evaporator fan will be switched off

Since the door is opened:
- The door alarm is enabled
- The display shows the message “dA”
- The regulation restarts only if **rrd = Y**.

The alarm stops as soon as the external digital input is disabled again. During open door conditions, the high and low temperature alarms are disabled.

17.2 START DEFROST (ixF=dEF)

It starts a defrost if all conditions are fulfilled (temperature, delays, etc.). After finishing a defrost, the normal regulation will restart only if the digital input is disabled, otherwise the instrument will wait until the **MdF** safety time is expired.

17.3 AUXILIARY OUTPUT (ixF=AUS)

The AUX output (if present and configured) will be enabled / disabled following the status of the relative digital input.

17.4 ENERGY SAVING (ixF=ES)

The energy saving mode will be enabled / disabled following the status of the relative digital input.

17.5 EXTERNAL WARNING ALARM (ixF=EAL)

It is used to detect an external alarm. It does not lock the regulation.

17.6 EXTERNAL LOCK ALARM (ixF=bAL)

It is used to detect any critical external alarm. It locks immediately the regulation.

17.7 EXTERNAL PRESSURE ALARM (ixF=PAL)

It is used to detect any pressure external alarm. This signal locks the regulation after detecting **nPS** events in the interval **dxd**.

17.8 EVAPORATOR FAN MODE (ixF=FAn)

It is used to control the evaporator fan.

17.9 REMOTE HOLIDAY MODE (ixF=HdF)

It is used to force the holiday mode.

17.10 REMOTE ONOFF (ixF=onF)

It is used to switch ON and OFF the device remotely.

17.11 LIGHT OUTPUT (ixF=LiG)

It is used to control the light output.

17.12 CHANGE CONFIGURATION (ixF=Lnt)

It is used to change the controller configuration.

17.13 MOTION SENSOR DETECTOR (ixF=EMt)

It is used to connect an X-MOD motion sensor. Please note that motion sensor can be connected only to the HOTKEY port, so digital input 2 must be properly configured.

18. ALARM SIGNALLING

Label	Cause	Outputs
P1	P1 probe failure	Compressor output according to **Con** e **CoF**
P2	P2 probe failure	Depends on the relative function
P3	P3 probe failure	Depends on the relative function
P4	P4 probe failure	Depends on the relative function
HA	High temperature alarm	Outputs unchanged
LA	Low temperature alarm	Outputs unchanged
H2	Second high temperature alarm	Outputs unchanged
L2	Second low temperature alarm	Outputs unchanged
dA	Open door alarm	Compressor and fan follows par. **odC**
EA	Warning external alarm	Outputs unchanged
CA	Lock external alarm	Outputs disabled
EE	Internal memory alarm	Outputs unchanged
rtC	Real time clock error	Clock parameters are not configured
rtF	Real time clocl failure	Clock not present or clock circuit damaged

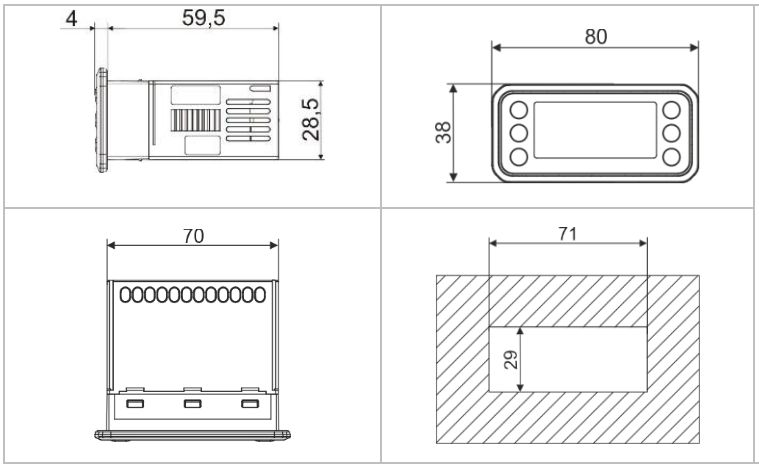
18.1 ALARM RECOVERY

Probe alarms **P1**, **P2**, **P3** and **P4** are activated some seconds after detecting a fault condition in the relative probe. These alarms are automatically reset some seconds after the relative probe restarts normal operations. Always check the connections (probe – device terminals) before replacing the probe. Temperature alarms **HA**, **LA**, **H2** and **L2** are automatically reset as soon as the temperature is within the normal working range. It is possible to reset the "**EE**" alarm by pressing any button.
The alarms **EA**, **CA** and **dA** are automatically reset as soon as the relative digital input is disabled.
The internal buzzer can be muted by touching any area of the display and only if parameter **tbA=Y**.

19. SERIAL COMMUNICATION

The device supports different baudrates (par. **bAU**). Please check the serial network to adapt them according to the other devices. The **XJ485CX** serial interface is required to convert the TTL output into an RS485 signal.

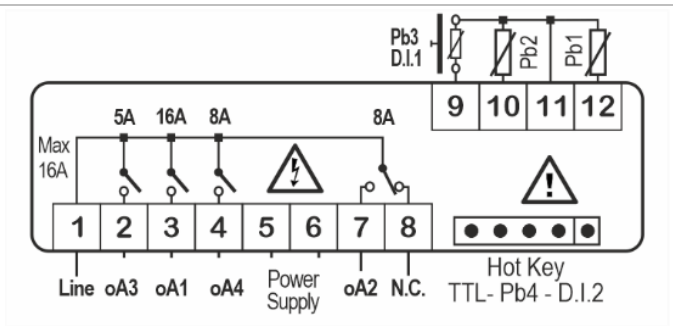
20. INSTALLATION AND MOUNTING



Instrument **XRB** shall be mounted on vertical panel, in a 29x71 mm hole, and fixed using the special bracket supplied. 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 through the cooling holes.

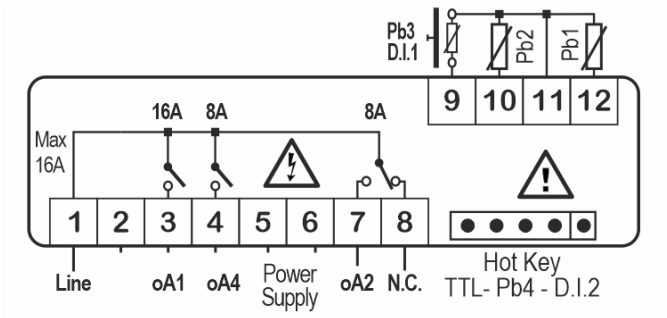
21. WIRING DIAGRAM

21.1 XRB70CH

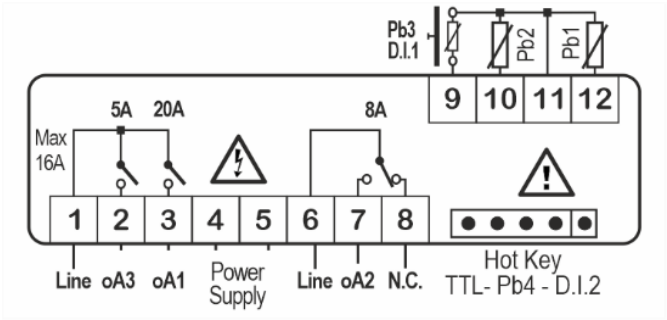


Power Supply: 110VAC or 230VAC, 50-60Hz
oA1: always set as main compressor output (CP1)

21.2 XRB60CH

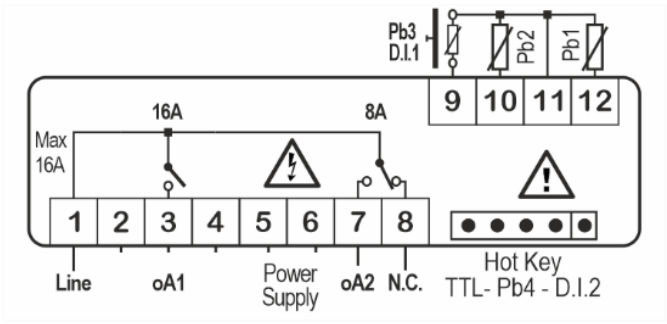


Power Supply: 110VAC or 230VAC, 50-60Hz
oA1: always set as main compressor output (CP1)



Power Supply: 110VAC or 230VAC, 50-60Hz
oA1: always set as main compressor output (CP1)

21.3 XRB30CH

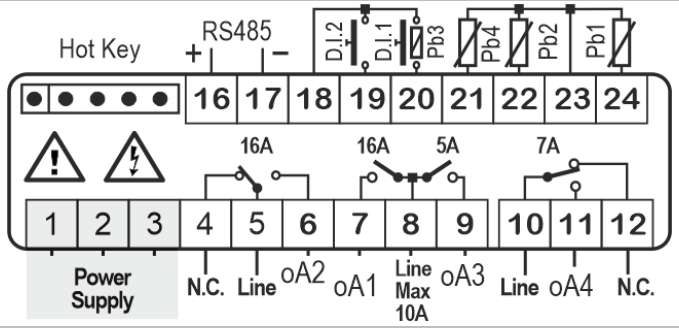


Power Supply: 110VAC or 230VAC, 50-60Hz
oA1: always set as main compressor output (CP1)

21.3.1 PIN DESCRIPTION

I/O	DESCRIPTION
oA1 to oA4	Relay outputs
P1 to P4	Temperature probes
D.I. 1	Digital input 1
D.I. 2	Digital input 2
Hot Key	Hotkey, TTL, digital input 2 or probe Pb4 connector (depending on th specific model)
Line	Relay Power Supply “Line”
Terminal 5	Neutral for high voltage power supply @[110 or 230VAC]
Terminal 6	Line for high voltage power supply @[110 or 230VAC]

21.4 XRB77CH



Power Supply: 110VAC or 230VAC, 50-60Hz
oA1: always set as main compressor output (CP1)

21.4.1 PIN DESCRIPTION

I/O	DESCRIPTION
oA1 to oA4	Relay outputs
P1 to P4	Temperature probes
D.I. 1	Digital input 1
D.I. 2	Digital input 2
Hot Key	Hotkey connector
Line	Relay Power Supply “Line”
Terminal 2	Neutral for high voltage power supply @[110 or 230VAC]
Terminal 3	Line for high voltage power supply @[110 or 230VAC]
RS485 +	2-wire RS485 port for monitoring systems, positive line
RS485 -	2-wire RS485 port for monitoring systems, negative line

22. TECHNICAL SPECIFICATIONS

22.1 XRB30-60-70CH

FEATURES	DESCRIPTION			
Housing	Self-extinguishing PC/PC+ABS			
Dimensions	Frontal 38x80 mm; depth 62mm			
Mounting	Panel mounting device in a 71x29mm panel cut-out			
Degree of Protection	**NEMA (UL 50e)**	Indoor use only, type 1 enclosure (on request)		
	IP (IEC/EN 60529)	Front panel: IP65; Rear housing: IP00		
Power Supply	According to the model: 24VAC, ±10%; 110VAC ±10%, 50/60Hz; 230VAC ±10%, 50/60Hz			
Overvoltage Category	III			
Rated Power	24VAC: 3.5VA max; 110VAC or 230VAC: 3.5VA max			
Rated Impulse Voltage	2500V			
Software Class	A			
Terminal blocks / Terminal Connections	Plug-in or screw terminal block, wire section between 1 and 2,5 mm2 Max tightening force: 0.5 N*m for 5,0mm pitch			
Data Storing	**Real Time Clock:** Data maintenance up to 6 months with lithium battery. **Other parameters:** internal EEPROM.			
Type of Action	1.B			
Pollution Degree	3, non-condensing humidity			
Ambient Operating Temperature and Humidity	**IEC/EN**	0T60°C; 20-85 rH% (non-condensing humidity)		
	UL-CAN/CSA	-10T60°C; 20-85 rH% (non-condensing humidity)		
Shipping and storage temperature	-25T60°C; 20-85 rH% (non-condensing humidity)			
Resistance to Heat	UL 94 V-0			
Measurement range	**NTC:** -40T110°C, resolution 0.1°C or 1°C (selectable); **PTC:** -50T150°C, resolution 0.1°C or 1°C (selectable)			
Accuracy	±0.7°C ±1 digit and relative to the full scale			
Inputs	4 NTC or PTC (configurable); Up to 2 voltage free contacts			
I/O port	HOT-KEY: MAX voltage allowed is 5 VDC. DO NOT CONNECT ANY EXTERNAL POWER SUPPLY.			
Buzzer	Optional			
Serial Outputs	TTL standard available on 5-pin port (HOT-KEY connector); Maximum cable length = 2m			
Relay Outputs (standard)	**Ref**	**Nominal**	**UL**	**IEC**
	oA1	SPST 16A, 250VAC	Resistive load 16A, 120/250Vac, 30K cycles Motor load 10FLA/60LRA, 120/250Vac, 30K cycles	16(8)A, 230Vac, 100K cycles
		SPST 20A, 250VAC	Resistive load 16A, 120/250Vac, 100K cycles Motor load 1HP (16FLA/96LRA), 120Vac, 30K cycles Motor load 2HP (12FLA/72LRA), 240Vac, 30K cycles	20A, 250Vac, 100K cycles

FEATURES	DESCRIPTION			
	oA2	SPDT 8A, 250VAC	Resistive load 10A, 120/240Vac, 30K cycles Motor load 1/4HP, 120Vac, 30K cycles Motor load 1/2HP, 240Vac, 30K cycles Resistive load 8A, 30Vdc, 30K cycles	8(3)A, 230Vac, 100K cycles
	oA3	SPST 5A, 250VAC	Resistive load 5A, 120/250Vac, 30K cycles Inductive (general purpose) 5A, 120/250Vac, 30K cycles Motor load 1.9FLA/11.4LRA, 120/250Vac, 30K cycles Pilot duty 180VA, 250V, 30K cycles	5A, 230Vac, 100K cycles
	oA4	SPST 8A, 250VAC	Resistive load 10A, 120/240Vac, 30K cycles Motor load 1/4HP, 120Vac, 30K cycles Motor load 1/2HP, 240Vac, 30K cycles Resistive load 8A, 30Vdc, 30K cycles	8(3)A, 230Vac, 100K cycles
Relay Outputs (optional, on request only)	**oA1**	SPST 8A, 250VAC	Resistive load 10A, 120/240Vac, 30K cycles Motor load 1/4HP, 120Vac, 30K cycles Motor load 1/2HP, 240Vac, 30K cycles Resistive load 8A, 30Vdc, 30K cycles	8(3)A, 230Vac, 100K cycles
	oA1	SPST 16A inrush, 250VAC	Resistive load 16A, 120/250Vac, 30K cycles Motor load 10FLA/60LRA, 120/250Vac, 30K cycles	16(8)A, 230Vac, 100K cycles
Maximum ampacity (common terminal 1)	16A			
Display	3 digits, red LED, 14.2 mm high			
Purpose of control	Operating control			
Construction of control	Incorporated control, intended to be used in Class I or Class II equipment			
Approvals	R290/R600a: relays tested according to IEC EN60079:0 and IEC EN60079:15 IEC/EN 60730-1; IEC/EN 60730-2-9 UL 873 CAN/CSA C22.2 No. 24-15			

22.2 XRB77CH

FEATURES	DESCRIPTION			
Housing	Self-extinguishing PC/PC+ABS			
Dimensions	Frontal 38x80 mm; depth 62mm			
Mounting	Panel mounting device in a 71x29mm panel cut-out			
Degree of Protection	**NEMA (UL 50e)**	Indoor use only, type 1 enclosure		
	IP (IEC/EN 60529)	Front panel: IP65; Rear housing: IP00		
Power Supply	According to the model: 12VAC/DC, ±10%; 110VAC ±10%, 50/60Hz; 230VAC ±10%, 50/60Hz			
Overvoltage Category	II			
Rated Power	12VAC/DC: 3VA max; 110VAC or 230VAC: 4VA			
Rated Impulse Voltage	2500V			
Software Class	A			
Terminal blocks / Terminal Connections	Plug-in or screw terminal block, wire section between 1 and 2,5 mm2 Max tightening force: 0.5 N*m for 5,0mm pitch			
Data Storing	**Real Time Clock:** Data maintenance up to 6 months with lithium battery. **Other parameters:** internal EEPROM.			
Type of Action	1.B			
Pollution Degree	2, non-condensing humidity			
Ambient Operating Temperature and Humidity	**IEC/EN**	0T50°C; 20-85 rH% (non-condensing humidity)		
	UL-CAN/CSA	-10T50°C; 20-85 rH% (non-condensing humidity)		
Shipping and storage temperature	-40T85°C; 20-85 rH% (non-condensing humidity)			
Resistance to Heat	UL94 V-0			
Measurement range	**NTC:** -40T110°C, resolution 0.1°C or 1°C (selectable); **PTC:** -50T150°C, resolution 0.1°C or 1°C (selectable)			
Accuracy	±0.7°C ±1 digit and relative to the full scale			
Inputs	4 NTC or PTC (configurable); Up to 2 voltage free contacts			
I/O port	HOT-KEY: MAX voltage allowed is 5 VDC. DO NOT CONNECT ANY EXTERNAL POWER SUPPLY.			
Buzzer	Optional			
Serial Outputs	TTL standard available on 5-pin port (HOT-KEY connector); Maximum cable length = 2m			
Relay Outputs (standard)	**Ref**	**Nominal**	**UL**	**IEC**
	oA1	SPST 16A, 250VAC	Resistive load 16A (NO), 120/250Vac, 30k cycles; Motor load 10FLA/60LRA (NO), 250Vac, 30k cycles	10(4)A (NO), 250Vac, 50k cycles
	oA2	SPDT 16A, 250VAC	Resistive load 16A (NO), 120/250Vac, 30k cycles; Motor load 10FLA/60LRA (NO), 250Vac, 30k cycles	10(4)A (NO), 250Vac, 50k cycles
	oA3	SPST 5A, 250VAC	Resistive load 5A, 120/250Vac, 50k cycles; Motor load 1.9FLA/11.4LRA, 250Vac, 30k cycles; Pilot duty B300, 30k cycles	7A, 250Vac, 10k cycles
	oA4	SPDT 7A 250VAC	Resistive load 5A, 250Vac, 100k cycles	7A, 250Vac, 20k cycles

FEATURES	DESCRIPTION			
Relay Outputs (optional, on request only)	**oA1**	SPST 8A, 250VAC	Resistive load 10A (NO), 120/250Vac, 30k cycles; Motor load 1/2HP (NO), 240Vac, 30k cycles; Pilot duty B300 (NO); 6k cycles	8(3)A (NO), 250Vac, 100k cycles
	oA1	SPST 16A inrush, 250VAC	Resistive load 10A (NO), 120/250Vac, 30k cycles; Motor load 10FLA/60LRA (NO), 250Vac, 30k cycles	10(4)A (NO), 250Vac, 50k cycles
	oA2	SPDT 16A inrush, 250VAC	Resistive load 10A (NO), 120/250Vac, 30k cycles; Motor load 10FLA/60LRA (NO), 250Vac, 30k cycles	10(4)A (NO), 250Vac, 50k cycles
Maximum ampacity (common terminal 8)	10A			
Purpose of control	Operating control			
Construction of control	Incorporated control, intended to be used in Class I or Class II equipment			
Approvals	R290/R600a: relays tested according to IEC EN60079:0 and IEC EN60079:15 IEC/EN 60730-1; IEC/EN 60730-2-9 UL 60730-1; UL 60730-2-9 CAN/CSA-E60730-1; CAN/CSA-E60730-2-9			

23. APPENDIX

23.1 TOOLS

23.1.1 X-MOD

The **X-MOD** is a motion detection sensor that allows to detect the proximity of customers or service staff. 5Vdc power supply version must be used. The X_MOD usage will disable the serial communication.

23.1.2 WIZMATE

WIZMATE software, used in combination with the XJ485USB, allows to manage the configuration of the controller.

23.1.3 HOTKEY

The **HOT-KEY** is used for a quick and easy upload (from device to **HOT-KEY**) or download (from **HOT-KEY** to device) of the parameter map. The 4K version must be used (code **DK00000100**).

23.1.4 PROGKEY

The **PROG-KEY for XRB** must used exclusively for FW updating (code **DK00000350**).

23.1.5 USB TO RS485 CONVERTER

XJ485USB is an optically isolated converter with 2.5kV maximum voltage isolation on data channels. It has a small plastic box with 2 indication LEDs, RX and TX, to quickly monitor the network communication. Power supply directly from USB port.

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