Digital controller with defrost and fan management
XR44CH

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. GENERAL DESCRIPTION

Model **XR44CH**, format 32 x 74 mm, is microprocessor based controller, suitable for applications on low temperature refrigerating units. It has four relay outputs to control compressor 1 and 2, defrost 1 and 2, which can be either electrical or reverse cycle (hot gas). It is also provided with up to three NTC or PTC probe inputs, the first one for temperature control, the second and third one, to be located onto the evaporator, to control the defrost termination temperature on the evaporator 1 and 2.
It allows to program the controller by means the HOT KEY programming keyboard.

3. CONTROLLING LOADS

3.1 COMPRESSOR

The regulation is performed according to the temperature measured by the thermostat probe with a positive differential from the set point: if the temperature increases and reaches set point plus differential the compressor is started and then turned off when the temperature reaches the set point value again.
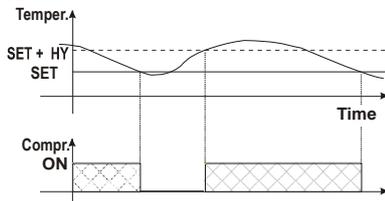
In case of fault in the thermostat probe the start and stop of the compressor are timed through parameters **Con** and **CoF**.

3.2 SECOND COMPRESSOR MANAGEMENT

The relay of the second compressor is activated according to the settings of the following parameters. The **2CC** (SEq; HAF), defines how the second compressor is activated.

3.2.1 Sequence activation
With **2CC = SEq** the second compressor is activated after a delay counter AC1 (parameter). Both compressor are switched off when the temperature set point is reached.

3.2.2 Dual band activation

The second compressor is activated in any case only if the AC1 timer has already expired, where AC1 is the delay between the activation of two compressors
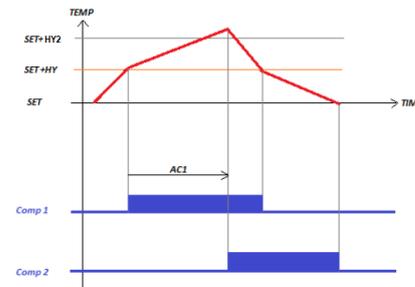
With 2CC = HAF the regulation is changed as follows.

a. **Activation of compressors**
The activation threshold of the first compressor is (where T is temperature):
$$T > SET + Hy$$
The activation threshold of the second compressor is (where T is temperature) :
$$T > SET + Hy + Hy2$$

b. **Deactivation of compressors**
The second compressor is switched off when the temperature drops below
$$T < SET + Hy$$
The first compressor is turned off when:
$$T < SET$$

ROTATION
Once both the compressors are switched off, the activation order of the 2 compressors is reversed in order to balance the working hours.
A cycle is considered as completed even if only one compressor is switched on and off: that is, when the temperature exceeds the first activation threshold, (SET + HY) and then latter returns below the value of the set point (SET).

STALL PREVENTION
The **Mon** parameter defines the maximum time a single compressor can run continuously. When the Mon timer expires the other compressor is activated, to increase capacity and therefore to reduce the temperature, both the compressors are switched off at the same time when the SET point is reached

3.3 DEFROST

3.3.1 THE PRE-DEFROST CYCLE
A pre-defrost cycle, to cool deeper the goods before the defrost can be managed.
If it is enabled the temperature set point (SET) becomes: SET+Hd1 for Ht1 mins, then the defrost starts.
The pre-defrost cycle cannot be performed if the defrost is started manually by keyboard.

3.3.2 THE POST- DEFROST CYCLE
After defrost and dripping time, a post defrost cycle can be managed.
If it is enabled the temperature set point (SET) becomes: SET+Hd2 for Ht2 mins, then the standard regulation starts..
If enabled, the post defrost cycle si always done.

3.3.3 DEFROST MODES
Two defrost modes are available through the **tdF** parameter: defrost through electrical heater (**tdF=EL**) and hot gas defrost (**tdF=in**). In this case by the parameter StC (0÷15min) the compressor can be stopped before the defrost. The compressor is stopped after the pre-defrost cycle.

Other parameters are used to control the interval between defrost cycles (**idF**), its maximum length (**MdF**) and two defrost modes: timed or controlled by the evaporator's probe (**P2P**).
At the end of defrost dripping time is started, its length is set in the **Fdt** parameter. With **Fdt=0** the dripping time is disabled.

3.3.4 SECOND EVAPORATOR CONTROL AND EVAPORATORS CYCLING WITH HOT GAS DEFROST
With **tdF = ALt** a hot gas defrost with double evaporator is managed. The 2 evaporators are alternated according to the following indications:
a. After IdF the COMP+DEF1 are activated
b. After IdF the COMP+DEF2 are activated
c. After IdF the COMP+DEF1 are activated

3.4 CONTROL OF EVAPORATOR FANS

The fan control mode is selected by means of the **FnC** parameter:
FnC=C_n, fans will switch ON and OFF with the compressor and **not run** during defrost.
FnC=o_n, fans will run even if the compressor is off, and not run during defrost.

After defrost, there is a timed fan delay allowing for drip time, set by means of the **Fnd** parameter.
FnC=C_Y, fans will switch ON and OFF with the compressor and **run** during defrost.
FnC=o_Y, fans will run continuously also during defrost.

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

3.4.1 Forced activation of fans
This function managed by the **FCt** parameter is designed to avoid short cycles of fans, that could happen when the controller is switched on or after a defrost, when the room air warms the evaporator.
How it works: if the temperature difference between evaporator probe and room probe is higher than the **FCt** parameter value, fans will be switched on. With **FCt=0** the function is disabled.

3.4.2 Cyclical activation of the fans with compressor off.
When **FnC=C-n** or **C-Y** (fans working in parallel with the compressor), by means of the **Fon** and **FoF** parameters the fans can carry out on and off cycles even if the compressor is switched off. When the compressor is stopped the fans go on working for the **Fon** time. With **Fon=0** the fans remain always off, also when the compressor is off.

3.4.3 Forced activation of fans

This function managed by the **Fct** parameter is designed to avoid short cycles of fans, that could happen when the controller is switched on or after a defrost, when the room air warms the evaporator.
Functioning: 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. With Fct=0 the function is disabled.

3.4.4 Double humidity function

By means of the parameter FSU is possible to set different actions of the fan.
With **FSU = Std** the fan operates according to Fnc parameter

With **FSU = Fon, FNC = C-n or C-Y** and **i1F = FAn** or by **UP** key pushed for 3s is possible to perform a double humidity action: when the digital input is activated, it keeps evaporator fan continuously working, when d.i. is disable the fan works with compressor.

NOTE2: With this function enabled the LED flashes.

With **FSU = FoF** and **i1F = FAn** or by **UP** key pushed for 3s when the digital input is activated, it stops the fan, when d.i. is disable the fan works according to the **FnC** parameter.

NOTE2: With this function enabled the LED flashes.

3.5 DRIPPING HEATERS

With **oAx=HEt**, the relay will work as dripping heater to eliminate the humidity/water after a defrost. The relay is on during Stc time and for hot gas defrost during defrost and dripping time.

4. FRONT PANEL COMMANDS

SET	To display target set point; in programming mode it selects a parameter or confirm an operation.
	Dual temperature function Pushed for 5s within the first min after power on, it switches from negative temperature (Lt) to positive temperature (Pt)
	(**UP/Dual Humidity**)In programming mode it browses the parameter codes or increases the displayed value. Hold pushed for 5s enable/disabled the fan according to the setting.
	(**DOWN**) In programming mode it browses the parameter codes or decreases the displayed value. Hold pushed for 5s to start a manual defrost
	Hold pushed for 5s to switch the instrument on and off (when **onF=oFF**).
	To switch on and off the light output (if present).

KEY COMBINATIONS:

+	To lock & unlock the keyboard.
SET +	To enter in programming mode.
SET +	To return to the room temperature display.

4.1 USE OF LEDS

Each LED function is described in the following table.

LED	MODE	FUNCTION
❄	ON	Compressor enabled
	Flashing	Anti-short cycle delay enabled
❄	ON	Defrost enabled
	Flashing	Drip time in progress
🔔	ON	An alarm is occurring
❄	ON	Continuous cycle is running
°C/°F	ON	Measurement unit
	Flashing	Programming phase
🌀	ON	Fans enabled
	Flashing	Fans delay after defrost in progress.
ECO	ON	Energy saving enabled
AUX	ON	AUX relay on

LED	MODE	FUNCTION
	Flashing	Fan stopped by key

5. MAX & MIN TEMPERATURE MEMORIZATION

5.1 HOW TO: SEE THE MIN TEMPERATURE

1. Press and release the **DOWN** key.
2. The "**Lo**" message will be displayed followed by the minimum temperature recorded.
3. By pressing the **DOWN** key again or by waiting 5 sec the normal display will be restored.

5.2 HOW TO: SEE THE MAX TEMPERATURE

1. Press and release the **UP** key.
2. The "**Hi**" message will be displayed followed by the maximum temperature recorded.
3. By pressing the **UP** key again or by waiting 5 sec the normal display will be restored.

5.3 HOW TO: RESET THE MAX AND MIN TEMPERATURE RECORDED

1. Keep the **SET** key pressed more than 3 sec, while the max or min temperature is displayed. ("**rSt**" message will be displayed)
2. To confirm the operation the "**rSt**" message will start blinking and the normal temperature will be displayed.

6. DUAL TEMPERATURE FUNCTION

6.1.1 How to see which temperature function is used

Push and release the [key], controller will display:
- **Pt**: positive temperature
- **Lt**: negative temperature

6.1.2 How to switch from LT to PT and vice versa

To modifiy the operating temperature, keep pushed for 5s the [key] key within the first minute after start up: controller will move from negative temperature (**LT**) to positive temperature (**Pt**) and vice versa.

NB: after switching the temperature the controller is switched off and on to load the new configuration.

7. MAIN FUNCTIONS

7.1 HOW TO: SEE THE SET POINT

1. Push and immediately release the **SET** key: the display will show the Set point value.
2. Push and immediately release the **SET** key or wait for 5 sec to display the probe value again.

7.2 HOW TO CHANGE THE SET POINT

1. Push the **SET** key more than 2 sec to change the Set point value.
2. The value of the set point will be displayed and the "**°C**" or "**°F**" LED will start blinking.
3. To change the Set value push the **UP** or **DOWN** arrows within 10 sec.
4. To save the new set point value, push the **SET** key again or wait for 10 sec.

7.3 HOW TO START A MANUAL DEFROST

Push the [key] key for more than 2 sec and a manual defrost will start.

7.4 HOW TO: CHANGE A PARAMETER VALUE

To change a parameter value, operate as follows:
1. Enter the Programming mode by pressing the **SET+DOWN** buttons for 3s (the **°C** or **°F** LED will start blinking).
2. Select the required parameter. Press the **SET** button to display its actual value.
3. Use **UP** or **DOWN** buttons to change its value.
4. Press **SET** button to store the new value and move to the following parameter.

To exit: Press **SET + UP** buttons or waiting for 15s without pressing any key.

NOTE: the set value is stored even when the procedure is exited by waiting for the time-out to expire.

7.5 THE HIDDEN MENU

The hidden menu includes all the parameters of the instrument.

7.5.1 HOW TO: ENTER THE HIDDEN MENU

1. Enter the Programming mode by pressing the **SET+DOWN** buttons for 3 sec (the **°C** or **°F** LED will start blinking).
2. Released the buttons and then push again the **SET+DOWN** buttons for more than 7s. The Pr2 label will be displayed immediately followed from the **HY** parameter.
   Now it is possible to browse the hidden menu.
3. Select the required parameter.
4. Press the **SET** button to display its value.
5. Use **UP** or **DOWN** to change its value.
6. Press **SET** to store the new value and move to the following parameter.

To exit: Press **SET+DOWN** or wait 15 sec without pressing a key.

NOTE1: if no parameter is present in Pr1 menu, after 3 sec the "**noP**" message will be displayed. Keep the buttons pushed till the Pr2 message will be displayed.

NOTE2: the set value is stored even when the procedure is exited by waiting for the time-out to expire

7.5.2 HOW TO: MOVE A PARAMETER FROM THE HIDDEN MENU TO THE FIRST LEVEL AND VICEVERSA.

Each parameter present in the hidden menu (Pr2) can be moved into the user level (Pr1) by pressing **SET+DOWN** buttons. If a parameter is part of the user level, when showed in the hidden menu the decimal point will be lit.

7.6 HOW TO: LOCK THE KEYBOARD

1. Keep both **UP** and **DOWN** buttons pressed for more than 3 sec.
2. The "PoF" message will be displayed and the keyboard will be locked. At this point it will be possible only to see the set point or the MAX o Min temperature stored
3. If a button is pressed more than 3 sec the "PoF" message will be displayed

7.7 HOW TO: UNLOCK THE KEYBOARD

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

7.8 THE CONTINUOUS CYCLE

When defrost is not in progress, it can be activated by holding the **UP** key pressed for about 3 sec. The compressor operates to maintain the **CCS** set point for the time set through the **CCt** parameter. The cycle can be terminated before the end of the set time using the same activation key **UP** for 3 sec.

7.9 THE ON/OFF FUNCTION

With "onF = oFF", pushing the **ON/OFF** key, the instrument is switched off. The **"OFF"** message is displayed. In this configuration, the regulation is disabled.
To switch the instrument on, push again the ON/OFF key.
WARNING: Loads connected to the normally closed contacts of the relays are always supplied and under voltage, even if the instrument is in stand by mode.

7.10 SECOND DIGITAL INPUT OR PROBE 4.

The input normally used as fourth probe can be used as second digital input according to the setting of the parameter P4C.
With P4C = Pb the input works as probe.
With P4C = i2F the input works as second digital input (par. i2F)

8. PARAMETERS

REGULATION

HY	**Differential:** (0.1 to 25.5°C; 1 to 45°F) intervention differential for set point. Compressor Cut IN is Set Point + differential (**HY**). Compressor Cut OUT is when the temperature reaches the set point.
LS	**Minimum set point:** (-100°C to SET; -148°F to SET) sets the minimum value for the set point.
US	**Maximum set point:** (SET to 150°C; SET to 302°F) set the maximum value for set point.
ot	**Thermostat probe calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the thermostat probe.
P2P	**First evaporator probe presence:** (n; Y) **n** = not present, the defrost stops by time; **Y** = present, the defrost stops by temperature.
oE	**First evaporator probe calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the evaporator probe.
P3P	**Second evaporator probe presence (P3):** (n; Y) **n** = not present, the terminals operate as digital input; **Y** = present, the terminals operate as third probe.
o3	**Second evaporator probe calibration (P3):** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the third probe.
P4P	**Fourth probe presence (P4):** (n; Y) **n** = not present, **Y** = present
O4	**Fourth probe calibration (P4):** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the fourth probe.
P4C	**Probe 4 setting** (Pb = temperature probe: id4 = second digital input)
odS	**Outputs activation delay at start up:** (0 to 255min) 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.
AC	**Anti-short cycle delay for first compressor:** (0 to 50 min) minimum interval between the compressor stop and the following restart.
AC1	**Anti-short cycle delay for second compressor:** (0 to 50 min) minimum interval between the compressor stop and the following restart.
Mon	**Maximum time single compressor on :** (0÷255min; with 0 function not enabled). When Mon is expired the second compressor is activated.
2CC	**Dual compressor management: SEq** = sequence – **HAF=** Dual band
rtr	**Percentage of the third and first probe for regulation (0÷100; 100 = P1, 0 = P3):** it allows to set the regulation according to the percentage of the first and third probe, as for the following formula (rtr(P1-P3)/100 + P3)
CCt	**Compressor ON time during continuous cycle:** (0.0 to 24h00min, res. 10 min) allows to set the length of the continuous cycle. Compressor stays on without interruption during **CCt** time. This is useful, for instance, when the room is filled with new products.
CCS	**Set point for continuous cycle:** (-55 to 150°C; -67 to 302°F) it sets the set point used during the continuous cycle.
Con	**Compressor ON time with faulty probe:** (0 to 255min) 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 255min) time during which the compressor is OFF in case of faulty thermostat probe. With **CoF=0** compressor is always active.

DISPLAY

CF	**Temperature measurement unit:** (°C; °F) **°C** = Celsius; **°F** = Fahrenheit. **WARNING:** When the measurement unit is changed the SET point and the values of the parameters **HY**, **LS**, **US**, **ot**, **ALU** and **ALL** have to be checked and modified (if necessary).
rES	**Resolution (for °C):** (in=1°C; dE=0.1°C) allows decimal point display.
Lod	**Instrument display:** (P1; P2, P3, P4, SET, dtr) it selects which probe is displayed by the instrument. **P1** = Thermostat probe; **P2** = Evaporator probe; **P3** = Third probe (only for model with this option enabled); **P4** = Fourth probe, **SET** = set point; **dtr** = percentage of visualization.
rEd	**X- REP display (optional):** (P1; P2, P3, P4, SET, dtr): it selects which probe is displayed by X- REP: **P1** = Thermostat probe; **P2** = Evaporator probe; **P3** = Third probe(only for model with this option enabled); **P4** = Fourth probe, **SET** = set point; **dtr** = percentage of visualization.
dLy	**Display delay:** (0 ÷20.0m; risul. 10s) when the temperature increases, the display is updated of 1 °C/1°F after this time.
dtr	**Percentage of the third and first probe for visualization when Lod = dtr (0÷100; 100 = P1, 0 = P3): if Lod = dtr** it allows to set the visualization according to the percentage of the first and third probe, as for the following formula (dtr(P1-P3)/100 + P3).

DEFROST

tdF	**Defrost type:** (EL; in) **EL** = electrical heater; **in** = hot gas.
dFP	**Probe selection for first defrost termination:** (nP; P1; P2; P3; P4) **nP** = no probe; **P1** =thermostat probe; **P2** = second probe; **P3** =configurable probe; **P4** = Fourth probe.
dSP	**Probe selection for second defrost termination:** (nP; P1; P2; P3; P4) **nP** = no probe; **P1** =thermostat probe; **P2** = second probe; **P3** =configurable probe; **P4** = Fourth probe.
dtE	**First defrost termination temperature:** (-55 to 50°C; -67 to 122°F) (enabled only when **EdF=Pb**) sets the temperature measured by the evaporator probe, which causes the end of defrost.
dtS	**Second defrost termination temperature:** (-55 to 50°C; -67 to 122°F) (enabled only when **EdF=Pb**) sets the temperature measured by the evaporator probe, which causes the end of defrost.
idF	**Interval between defrost cycles:** (0 to 120 hours) determines the interval of time between two defrost cycles.
MdF	**(Maximum) length for first defrost:** (0 to 255 min) when **P2P=n**, (not evaporator probe: timed defrost) it sets the defrost duration. When **P2P=Y** (defrost end based on temperature) it sets the maximum length for defrost.
MdS	**(Maximum) length for second defrost:** (0 to 255 min) when **P2P=n**, (not evaporator probe: timed defrost) it sets the defrost duration. When **P2P=Y** (defrost end based on temperature) it sets the maximum length for defrost.
dSd	**Start defrost delay:** (0 to 99 min) this is useful when different defrost start times are necessary to avoid overloading the plant.
StC	**Compressor stop before defrost:** (da 0 a 30 min) with hot gas defrost it sets compressor stop vefore defrost.
dFd	**Temperature displayed during defrost:** (rt; it; SEt; dEF) **rt** = real temperature; **it** = temperature at defrost start; **SEt** = set point; **dEF** = "dEF" label.
dAd	**MAX display delay after defrost:** (0 to 255 min) sets the maximum time between the end of defrost and the restarting of the real room temperature display.
Fdt	**Drip time:** (0 to 120 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:** (n; Y) **n** = after the idF time, **Y** = immediately.
Hd1	**Pre-defrost cycle differential** (-12.0÷12.0°C/-24÷24°F)
Ht1	**Pre-defrost cycle duration** (0÷120min)
Hd2	**Post-defrost cycle differential** (-12.0÷12.0°C/-24÷24°F)
Ht2	**Post-defrost cycle duration** (0÷120min)
dAF	**Defrost delay after continuous cycle:** (0.0 to 24h00min, res. 10min) time interval between the end of the fast freezing cycle and the following defrost related to it.

FANS

FnC	**Fans operating mode:** (C-n; o-n; C-Y; o-Y) **C-n** = runs with the compressor, OFF during defrost; **o-n** = continuous mode, OFF during defrost; **C-Y** = runs with the compressor, ON during defrost; **o-Y** = continuous mode, ON during defrost.
Fnd	**Fans delay after defrost:** (0 to 255min) interval between end of defrost and evaporator fans start.
FCt	**Temperature differential to avoid fan short cycles:** (0 to 59°C; 0 to 90°F) (N.B.: if **FCt=0** function disabled) if the difference of temperature between the evaporator and the room probes is higher than **FCt** value, the fans will be switched on.
FSt	**Fans stop temperature:** (-55 to 50°C; -67 to 122°F) setting of temperature, detected by evaporator probe, above which fans are always OFF.
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.
FSU	**Kind of action of fan:** **Std** = standard, according to the Fnc parameter **Fon** = with i1F = FAn and Fnc = Cn or C-y, by means of digital input the fan works according to the Fnc parameter or are always on. **FoF** = with i1F = FAn by means of digital input the fan are enabled or switched off.

ALARMS

ALU	**MAXIMUM temperature alarm:** • If **ALC=Ab**: [ALL to 150.0°C or ALL to 302°F] • If **ALC=rE**: [0.0 to 50.0°C or 0 to 90°F] when this temperature is reached the alarm is enabled, after the **ALd** delay time.
ALL	**Minimum temperature alarm:** • If **ALC=Ab**: [-100°C to ALU; -148 to ALU] • If **ALC=rE**: [0.0 to 50.0°C or 0 to 90°F] when this temperature is reached the alarm is enabled, after the **ALd** delay time.
AFH	**Differential for temperature alarm recovery:** (0.1 to 25.5°C; 1 to 45°F) intervention differential for recovery of temperature alarm.
ALd	**Temperature alarm delay:** (0 to 255 min) time interval between the detection of an alarm condition and alarm signalling.

dAo	**Exclusion of temperature alarm at start-up:** (0.0 to 24h00min, res. 10min) time interval between the detection of the temperature alarm condition after instrument power on and alarm signalling.

OUTPUT RELAYS

oA1	**First relay configuration AUX1:** (dEF; FAn; ALr; LiG; AUS; onF; db; CP2; dEF2) **dEF** = defrost; **FAn** = do not select it; **ALr** = alarm; **LiG** = light; **AUS** = Auxiliary relay; **onF** = always on when instrument on; **CP2** = second compressor; **dEF2** = second defrost.
oA2	**Second relay configuration AUX2:** (dEF; FAn; ALr; LiG; AUS; onF; db; CP2; dEF2) **dEF** = defrost; **FAn** = do not select it; **ALr** = alarm; **LiG** = light; **AUS** = Auxiliary relay; **onF** = always on when instrument on; **CP2** = second compressor; **dEF2** = second defrost.
oA3	**Third relay configuration AUX3:** (dEF; FAn; ALr; LiG; AUS; onF; db; CP2; dEF2) **dEF** = defrost; **FAn** = do not select it; **ALr** = alarm; **LiG** = light; **AUS** = Auxiliary relay; **onF** = always on when instrument on; **CP2** = second compressor; **dEF2** = second defrost.

DIGITAL INPUTS

i1P	**Second digital input polarity:** (oP; CL) **oP** = the digital input is activated by opening the contact; **CL** = the digital input is activated by closing the contact.
i1F	**Second digital input configuration:** (EAL; bAL; PAL; dor; dEF; AUS; Htr; FAn; ES) **EAL** = external alarm: "**EA**" message is displayed; **bAL** = serious alarm "**CA**" message is displayed; **PAL** = pressure switch alarm, "**CA**" message is displayed; **dor** = door switch function; **dEF** = activation of a defrost cycle; **AUS** = auxiliary relay activation with **oAx=AUS**; **Htr** = type of inverting action (cooling or heating); **FAn** = fan; **ES** = energy saving.
did	**Digital input 1 alarm delay:** (0 to 255 min) delay between the detection of the external alarm condition and its signalling. When **i1F= PAL**, it is the interval of time to calculate the number of pressure switch activation.
nPS	**Number of pressure switch activation:** (0 to 15) Number of activation, during the **did** or **d2d** interval, before signalling an alarm event (**i1F, i2F=PAL**). If the **nPS** activation during **did** or **d2d** time is reached, switch off and on the instrument to restart normal regulation.
odC	**Compressor status when open door:** (no; FAn; CPr;F_C;) **no** = normal; **FAn** = normal; **CPr** = compressor OFF; **F_C** = compressor OFF.
rrd	**Outputs restart after door open alarm:** (n; Y) **n** = outputs follow the **odC** parameter. **Y** = outputs restart with a door open alarm.
HES	**Delta temperature during an Energy Saving cycle:** (-30.0 to 30.0°C; -54 to 54°F) it sets the increasing value of the set point **[SET+HES]** during the Energy Saving cycle.

OTHER

HES	**Temperature increase during the Energy Saving cycle :** (-30,0°C÷30,0°C/-22÷86°F) it sets the increasing value of the set point during the Energy Saving cycle
o-F	**Display during stand by: OFF** = "OFF"; **Lin:** "- - -"
Adr	**Serial address:** (1 to 247) identifies the instrument address when connected to a ModBUS compatible monitoring system.
PbC	**Type of probe:** (PtC; ntC) it allows to set the kind of probe used by the instrument: **PtC** = PTC probe, **ntC** = NTC probe.
onF	**On/Off key enabling:** (nU; oFF; ES) **nU** = disabled; **oFF** = enabled; **ES** = not set it.
dP1	Thermostat probe display.
dP2	Evaporator probe display.
dP3	Third probe display- optional.
dP4	Fourth probe display- optional.
rEL	Software release for internal use.
Ptb	Parameter table code: readable only.

9. DIGITAL INPUTS

The free voltage digital input is programmable by the **i1F** parameter.

9.1 GENERIC ALARM (I1F = EAL)

As soon as the digital input is activated the unit will wait for **did** time delay before signalling the **EAL** alarm message. The outputs statuses don't change. The alarm stops just after the digital input is de-activated.

9.2 SERIOUS ALARM MODE (I1F = BAL)

When the digital input is activated, the unit will wait for **did** delay before signalling the **CA** alarm message. The relay outputs are switched OFF. The alarm will stop as soon as the digital input is de-activated.

9.3 PRESSURE SWITCH (I1F = PAL)

If during the interval time set by **did** 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 did time is reached, switch off and on the instrument to restart normal regulation.**

9.4 DOOR SWITCH INPUT (I1F = 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 **doA**, the door alarm is enabled, the display shows the message **dA** and **the regulation restarts is rtr=YES**. 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.

9.5 START DEFROST (I1F = DEF)

It starts 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.

9.6 SWITCH THE AUXILIARY RELAY (I1F = AUS)

With oA3 = AUS the digital input switched the status of the auxiliary relay

9.7 ENERGY SAVING (I1F = 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.

### 9.8 ON OFF FUNCTION (I1F = ONF)

To switch the controller on and off.

9.9 DIGITAL INPUT POLARITY

The digital input polarity depends on the **i1P** parameter.
i1P = CL: the input is activated by closing the contact.
i1P = oP: the input is activated by opening the contact

10. TTL SERIAL LINE – FOR MONITORING SYSTEMS

The TTL serial line, available through the HOT KEY connector, allows to connect the instrument to a monitoring system **ModBUS-RTU** compatible such as the **XWEB500**. The connection needs a special TTL/RS485 adapter: the **XJ485CX**.

11. INSTALLATION AND MOUNTING
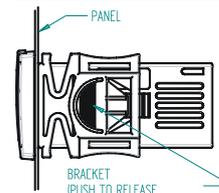
Instrument **XR44CX** shall be mounted on vertical panel, in a 29x71 mm hole, and fixed using the special bracket supplied.
The temperature range allowed for correct operation is 0 to 60°C. Avoid places subject to strong vibrations, corrosive gases, excessive dirt or humidity. The same recommendations apply to probes. Let air circulate by the cooling holes.

12. ELECTRICAL CONNECTIONS

The instrument is provided with screw terminal block to connect cables with a cross section up to 2.5mm². 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.

12.1 PROBE CONNECTION

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.

13. USE THE HOT KEY

13.1 HOW TO: PROGRAM A HOT KEY FROM THE INSTRUMENT (UPLOAD)

1. Program one controller with the front keypad.
2. When the controller is <u>ON</u>, insert the "**HOT-KEY**" and push **UP** button; the "**uPL**" message appears followed a by a flashing "**End**" label.
3. Push **SET** button and the "**End**" will stop flashing.
4. <u>Turn OFF</u> the instrument, remove the "**HOT-KEY**" and then turn it ON again.

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

13.2 HOW TO: PROGRAM AN INSTRUMENT USING A HOT KEY (DOWNLOAD)

1. Turn OFF the instrument.
2. Insert a **pre-programmed** "**HOT-KEY**" **into the 5-PIN receptacle** and then turn the Controller ON.
3. The parameter list of the "**HOT-KEY**" will be automatically downloaded into the Controller memory. The "**doL**" message will blink followed a by a flashing "**End**" label.
4. After 10 seconds the instrument will restart working with the new parameters.
5. 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.

14. ALARM SIGNALS

Message	Cause	Outputs
P1	Room probe failure	Compressor output acc. to par. **Con** and **CoF**
P2	Evaporator probe failure	Defrost end is timed
P3	Third probe failure	Outputs unchanged
P4	Fourth probe failure	Outputs unchanged
HA	Maximum temperature alarm	Outputs unchanged.
LA	Minimum temperature alarm	Outputs unchanged.
dA	Door open	Compressor and fans restarts
EA	External alarm	Output unchanged.
CA	Serious external alarm (**i2F=bAL**)	All outputs OFF.
CA	Pressure switch alarm (**i2F=PAL**)	All outputs OFF
oFF	Controller in stand by	All outputs OFF
- - -	Controller in stand by	All outputs OFF

14.1 ALARM 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**" and "**LA**" 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.

14.2   OTHER MESSAGES

Pon	Keyboard unlocked.
PoF	Keyboard locked
noP	**In programming mode**: none parameter is present in Pr1
	On the display or in dP2, dP3, dP4: the selected probe is nor enabled

15.   TECHNICAL DATA

Housing: self extinguishing ABS.
Case: frontal 32x74 mm; depth 60mm;
Mounting: panel mounting in a 71x29mm panel cut-out
Protection: IP20; **Frontal protection:** IP65
Connections: Screw terminal block ≤ 2.5 mm² wiring
Power supply: 12VAC/DC, ±10%
Power absorption: 3VA max
Display: 3 digits, red LED, 14.2 mm high
Inputs: Up to 3 NTC or PTC probes
Digital inputs: free voltage contact
Relay outputs:
    Compressor SPST 16(6) A 250VAC
    AUX1: SPST 16(6) A, 250VAC
    AUX2: SPST 16(6) A, 250VAC
    Aux3: SPST 16(6) A, 250VAC
Buzzer: optional
Data storing: on the non-volatile memory (EEPROM)
Kind of action: 1B
Pollution degree: 2
Software class: A
Rated impulsive voltage: 2500V
Overvoltage Category: II
Operating temperature: 0 to 55°C
Storage temperature: -25 to 60°C
Relative humidity: 20 to 85% (no condensing)
Measuring and regulation range:
    NTC probe: -40 to 110°C (-40 to 230°F)
    PTC probe: -100 to 150°C (-148 to 302°F)
Resolution: 0.1°C or 1°C or 1°F (selectable)
Accuracy (ambient temp. 25°C): ±0.7°C ±1 digit

16.   CONNECTIONS
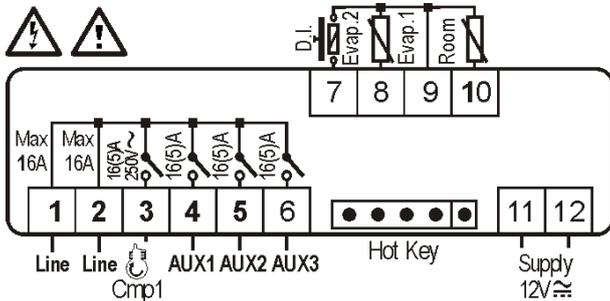
17.   DEFAULT SETTING VALUES

Label	Name	Range	Nt	Liv
SEt	Set point	LS-US	-5.0	
HY	Differential	[0,1°C ÷ 25,5°C] [1°F ÷ 45°F]	2.0	Pr2
LS	Minimum set point	[-55,0°C ÷ SET] [-67°F ÷ SET]	-40.0	Pr2
US	Maximum set point	[SET ÷ 150,0°C] [SET ÷ 302°F]	110.0	Pr2
ot	Thermostat probe calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]	0.0	Pr2
P2P	Evaporator probe presence	n(0) – Y(1)	yes	Pr2
oE	Evaporator probe calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]	0.0	Pr2
P3P	Third probe presence	n(0) – Y(1)	no	Pr2
o3	Third probe calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]	0.0	Pr2
P4P	Fourth probe presence	n(0) – Y(1)	no	Pr2
o4	Fourth probe calibration	[-12,0°C ÷ 12,0°C] [-21°F ÷ 21°F]	0.0	Pr2
P4C	Fourth probe function	Pb – id4	Pb	Pr2
odS	Outputs delay at start up	0 ÷ 255 (min.)	0	Pr2
AC	Anti-short cycle delay for first compressor	0 ÷ 50 (min.)	1	Pr2
AC1	Anti-short cycle delay for second compresor	0 ÷ 255 (sec.)	10	Pr2
Mon	Max time compressor 1 on	0 ÷ 255 (min.)	0	Pr2
2CC	Dual compressor management	SEq(0) – HAF (1)	HAF	Pr2
rtr	P1-P3 percentage for regulation	0 ÷ 100 (100=P1, 0=P3)	100	Pr2
CCt	Continuous cycle duration	0 ÷ 24H0(144)	00:00	Pr2
CCS	Set point for continuous cycle	[-55,0°C ÷ 150,0°C] [-67°F ÷ 302°F]	0.0	Pr2
Con	Compressor ON time with faulty probe	0 ÷ 255 (min.)	15	Pr2
CoF	Compressor OFF time with faulty probe	0 ÷ 255 (min.)	15	Pr2
CH	Kind of action	CL(0) - Ht(1)	CL	Pr2
CF	Temperature measurement unit	°C(0) - °F(1)	°C	Pr2
rES	Resolution	dE(0) - in(1)	dE	Pr2
Lod	Probe displayed	P1(0) - P2(1) - P3(2) - P4(3) - SEt(4) - dtr(5)	P1	Pr2
rED	Local display: default display	P1(0) - P2(1) - P3(2) - P4(3) - SEt(4) - dtr(5)	P1	Pr2

Label	Name	Range	Nt	Liv
dLy	Display temperature delay	0 ÷ 255 (sec)	0	Pr2
dtr	P1-P3 percentage for display	1 ÷ 99	50	Pr2
tdF	Defrost type	EL(0) - in(1) - ALt(2)	in	Pr2
dFP	Probe for first defrost	nP(0) - P1(1) - P2(2) - P3(3) - P4(4)	P2	Pr2
dSP	Probe for second defrost	nP(0) - P1(1) - P2(2) - P3(3) - P4(4)	nP	Pr2
dtE	First defrost termination temperature	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]	8.0	Pr2
dtS	Second defrost termination temperature	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]	8.0	Pr2
idF	Interval between defrost cycles	0 ÷ 120 (hours)	6	Pr2
MdF	(Maximum) length for first defrost	0 ÷ 255 (min.)	30	Pr2
MdS	(Maximum) length for second defrost	0 ÷ 255 (min.)	0	Pr2
dSd	Start defrost delay	0 ÷ 255 (min.)	0	Pr2
dFd	Displaying during defrost	rt(0) - it(1) - SEt(2) - dEF(3)	it	Pr2
dAd	Display delay after defrost	0 ÷ 255 (min.)	30	Pr2
Fdt	Draining time	0 ÷ 255 (min.)	2	Pr2
dPo	First defrost after start-up	n(0) - Y(1)	no	Pr2
dFd	Displaying during defrost	rt(0) - it(1) - SEt(2) - dEF(3)	it	Pr2
Hd1	Differenziale rispetto al set per ciclo pre-sbrinamento	-12.0÷12.0°C/-24÷24°F	-5.0	Pr2
Ht1	Durata ciclo pre-sbrinamento	0÷120min	5	Pr2
Hd2	Differenziale rispetto al set per ciclo post-sbrinamento	-12.0÷12.0°C/-24÷24°F	-5.0	Pr2
Ht2	Durata ciclo post-sbrinamento	0÷120min	5	Pr2
dAF	Defrost delay after fast freezing	0 ÷ 24H0(144)	00:00	Pr2
FnC	Fan operating mode	C_n(0) - O_n(1) - C_Y(2) - O_Y(3)	O_n	Pr2
Fnd	Fan delay after defrost	0 ÷ 255 (min.)	2	Pr2
FCt	Differential of temperature for forced activation of fans	[0°C ÷ 50°C] [0°F ÷ 90°F]	0	Pr2
FSt	Fan stop temperature	[-55.0°C ÷ 50.0°C] [-67°F ÷ 122°F]	4.0	Pr2
Fon	Time is ON when compressors oFF	0÷15 (min.)	0	Pr2
FoF	Time is OFF when compressors oFF	0÷15 (min.)	0	Pr2
FSU	Fan operating type	Std(0) - FoF(1) - Fon(2)	Std	Pr2
ALC	Temperat. alarms configuration	rE(0) - Ab(1)	Ab	Pr2
ALU	MAXIMUM temperature alarm	°C[0.0° ÷ 50.0° o ALL ÷ 150,0°] °F[0° ÷ 90° o ALL ÷ 302°]	110.0	Pr2
ALL	Minimum temperature alarm	°C[0.0° ÷ 50.0° o -55.0° ÷ ALU] °F[0° ÷ 90° o 67.0° ÷ ALU]	-50.0	Pr2
AFH	Differential for temperat. alarm recovery	[0,1°C ÷ 25,5°C] [1°F ÷ 45°F]	1.0	Pr2
ALd	Temperature alarm delay	0 ÷ 255 (min.)	10	Pr2
dAo	Delay of temperature alarm at start up	0 ÷ 24H0(144)	01:30	Pr2
oA1	AUX1 relay configuration	dEF(0) - FAn(1) - ALr(2) - LiG(3) - AUS(4) - OnF(5) - db(6) - CP2(7) - dF2(8) - HES(9)	CP2	Pr2
oA2	AUX2 configuration	dEF(0) - FAn(1) - ALr(2) - LiG(3) - AUS(4) - OnF(5) - db(6) - CP2(7) - dF2(8) - HES(9)	FAn	Pr2
oA3	AUX3 relay configuration	dEF(0) - FAn(1) - ALr(2) - LiG(3) - AUS(4) - OnF(5) - db(6) - CP2(7) - dF2(8) - HES(9)	dF2	Pr2
i1P	Digital input polarity	OP(0) - CL(1)	OP	Pr2
i1F	Digital input configuration	EAL(0) - bAL(1) - PAL(2) - dor(3) - dEF(4) - AUS(5) - Htr(6) - FAn(7) - ES(8) - nt(9) - onF(10)	BAL	Pr2
did	Digital input alarm delay	0 ÷ 255 (min.)	0	Pr2
i2P	Second digital input polarity	OP(0) - CL(1)	CL	Pr2
i2F	Second digital input function	EAL(0) - bAL(1) - PAL(2) - dor(3) - dEF(4) - AUS(5) - Htr(6) - FAn(7) - ES(8) - nt(9) - onF(10)	EAL	Pr2
d2d	Alarm delay of configurable digital input	0 ÷ 255 (min.)	0	Pr2
nPS	Number of activations of pressure switch	0 ÷ 15	15	Pr2
odC	Compress and fan status when open door	no(0) - FAn(1) - CPr(2) - F-C(3)	no	Pr2
rrd	Regulation restart with door open alarm	n(0) - Y(1)	yes	Pr2
HES	Differential for Energy Saving	[-30°C ÷ 30°C] [-54°F ÷ 54°F]	0	Pr2
o-F	Visualization on stand-by	n(0) - Y(1)	OFF	Pr2
Adr	Serial address	0 ÷ 247	1	Pr2
PbC	Kind of probe	PtC(0) - ntC(1)	ntC	Pr2
dP1	Room probe display	probe value	-	Pr1
dP2	Evaporator probe display	probe value	-	Pr1
dP3	Third probe display	probe value	-	Pr1
dP4	Fourth probe display	probe value	-	Pr1
rSE	Visualization of regulation set (SET + ES + SETd)	Read only	-	Pr2
rEL	Software release	read only	1.6	Pr2
Ptb	Map code	read only	-	Pr2