XRi60CH

Digital controller for variable speed drive

FW 24.3

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 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.

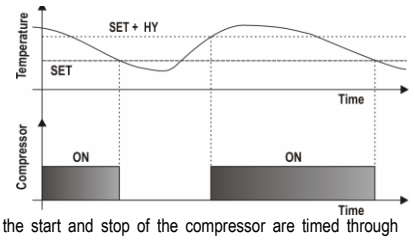
2. GENERAL DESCRIPTION

Model **XRi60CH**, format 32x74mm, is microprocessor-based controller, suitable for applications on medium or low temperature ventilated refrigerating units with variable speed compressors. It has four relay outputs to control compressor, fan, defrost, which can be either electrical or reverse cycle (hot gas) and light (configurable). It could be provided with a Real Time Clock which allows programming of up to 6 daily defrost cycles, divided into holidays and workdays, or selecting weekly energy saving intervals. It is also provided with up to four NTC, PTC or PT1000 probe inputs and a frequency output signal to drive variable speed compressors.
The HOTKEY I/O port allows connecting the unit, by means of the external module XJ485-CX, to a network line **ModBUS-RTU** compatible such as an X-WEB monitoring system. With the HOTKEY port it is possible to modify the configuration of the controller (by using the Wizmate Software).
The instrument is fully configurable, and it can be easily programmed through an external keyboard.

3. CONTROLLING LOADS

3.1 COMPRESSOR

The regulation is performed according to the temperature measured by the thermostat probe with a positive differential (**HY**) over the set point: if the temperature increases and reaches set point plus differential, the compressor will start. It will turn off as soon as 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 DEFROST

Two defrost modes are available through the **tdF** parameter: defrost through electrical heater (**tdF=EL**) and hot gas defrost (**tdF=in**).
The defrost interval depends on the presence of the RTC (optional). The internal RTC is controlled by means of the **EdF** parameter:
- **EdF=in:** the defrost is made every **idF** time – standard way for controller without RTC.
- **EdF=rtC:** the defrost is real time controlled, depending on the hours set in the parameters **Ld1...Ld6** (for workdays).

Other parameters are used to control defrosting cycles: the maximum length (**MdF**) and defrosting 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.

3.2.1 PRE-DEFROST

The par. **dAF** enable a pre-defrost phase. During this interval the regulation setpoint will be moved to the value SET-1°C (or SET-1°F). The defrost phase starts as soon as the regulation temperature reach the pre-defrost setpoint or when the **dAF** timer ends. This function is disable when **dAF=0**.

3.2.2 HOT GAS DEFROST

If **tdF=in**, the defrost phase will act as follow:
- If **dSd>0**, the compressor output will be deactivated
- At the end of **dSd** interval, the defrost output will be activated and timer **StC** will start
- At the end of **StC** interval, the compressor output will be reactivated.

If **dSd=0** or **StC=0**, the relative functions will be disabled.

3.3 RELAY CONFIGURATION

The functioning of the configurable relays (terminals 1-2, 1-3 and 1-7-8) can be set by the **oA1, oA2** and **oA3** parameters, according to the kind of application. In the following paragraph the possible setting:

3.3.1 LIGHT RELAY

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

3.3.2 AUXILIARY RELAY

Relay activation by digital input 1 or digital input 2 (**oAx=AUS**, **i1F=AUS**): with **oAx=AUS** and **i1F=AUS** the AUX relay is switched on and off by digital inputs.

3.3.3 ON/OFF RELAY (OAX = ONF)

When **oAx=onF**, the relative relay is activated when the controller is turned on and de-activated when the controller is turned off.

3.3.4 NEUTRAL ZONE REGULATION

With **oAx=db** the relative relay can control a heater element to perform a neutral zone action.
- **oAx** cut in = **SET-HY**
- **oAx** cut out = **SET**

3.3.5 ALARM RELAY

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

3.3.6 SECOND COMPRESSOR

oAx=CP2 is not supported in this model.

3.3.7 SECOND DEFROST OUTPUT

oAx=dF2 is not supported in this model.

3.3.8 NIGHT BLINDS MANAGEMENT DURING ENERGY SAVING CYCLES

With **oAx=HES,** the relative relay operates to manage the night blind: the relay is energised when the energy saving cycle is activated by digital input or frontal button.

3.3.9 HEATER FOR WATER DRIPPING

If **oAx=HEt**, the relative output will work as heater for water dripping during and after any defrost.

3.3.10 REGULATION OUTPUT

If **oAx=inV**, the relative output will work as regulation output and will stay active as soon as the regulation request is running.

4. EVAPORATOR FAN CONTROL

The evaporator 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

The par. **FAP** is used to select which temperature probe will be used from the evaporator fan regulator. A specific setpoint (par. **FSt**) provides the temperature value, 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-HYF**.

4.1 FORCED ACTIVATION FOR 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. If the difference between the evaporator temperature and the room temperature is higher than the **FCt** value, the controller will activate the fans. This function is disabled if **FCt=0**.

4.2 CYCLIC ACTIVATION OF THE FANS WHEN THE COMPRESSOR IS SWITCHED OFF

When **FnC=C-n** or **C-Y** (fans in parallel to the compressor), the fans will be able to carry out on and off cycles even if the compressor is switched off. The on and off interval of time follow the **Fon** and **FoF** parameters. When the compressor is stopped, the fans will go on working for the **Fon** time. On the other side, with **Fon=0** the fans will stay always off when the compressor is off.

5. CONDENSER FAN CONTROL

The condenser fan control mode is selected by means of the **FCC** parameter:
- **FCC = C_n:** fans will switch ON and OFF with the compressor and **not run** during defrost

- **FCC = o_n:** fans will run even if the compressor is off, and not run during defrost
- **FCC = C_Y:** fans will switch ON and OFF with the compressor and **run** during defrost
- **FCC = o_Y:** fans will run continuously also during defrost

The par. **FAC** is used to select which temperature probe will be used from the condenser fan regulator. This regulator uses a specific setpoint (par. **St2**) and differential (par. **HY2**) to activate and deactivate the condenser fans:
- If **T>St2+HY2** the condenser fans are activated
- If **T<St2** the condenser fans are deactivated

The par. **FCo** can be used to keep the ventilators active for a period after compressor OFF.

6. AUXILIARY REGULATOR

The auxiliary regulator can be be linked to a digital output (relay) for ONOFF regulation.
The parameters used to configure the auxiliary regulators are the following:

ACH	Kind of action for auxiliary regulator
SAA	Set point for auxiliary regulator
SHY	Differential for auxiliary regulator
ArP	Probe selection for auxiliary regulator
Sdd	Auxiliary regulator disabled during any defrost

7. DUAL MAP FEATURE

The controller is programmed with 2 different parameter maps. In this way, it is possible to choose the right map to meet both LT and NT applications. There are two different way to do this:
- If **i1F=nt**, it will be possible to change the working map by using the digital input.
- By using button if it is linked to the map changing function (for example: **d2n=Lnt**).

8. VARIABLE SPEED COMPRESSOR CONTROL

8.1 FREQUENCY MODE

The controller can drive variable speed compressors with frequency control input. The frequency output port can issue a frequency signal from 30 to 200Hz, duty cycle=50%. A special cable must be used to connect the frequency output of the controller to the frequency input of the specific inverter.
- CAB/EM1: cable **DD900002 20** for Embraco models
- CAB/SE1: cable **DD900002 22** for SECOP NLV models

NOTE:
- An inverter compressor can be completely controlled from the frequency output only.
- Only one compressor can be connected when frequency mode is used

1.1 PARAMETERS

The regulation band is from **SET** to **SET+HY+HY1**. When the regulation is running, the compressor speed is continuously calculated and updated by the PI regulator.
In case of regulation probe error, the compressor speed will be set to the value of par. **SPi**.
It is possible to enable a cyclic or a continuous mode operation both during normal mode and energy saving mode:
- **CMn, CME = Y**: after reaching the SETPOINT the VSC will keep on running
- **CMn, CME = n**: after reaching the SETPOINT the VSC will be stopped

1.2 HOT GAS DEFROST

If hot gas defrost is selected, it will be possible to set the compressor speed by using par. **Aod**.

1.3 PULL DOWN

An automatic function named PULL DOWN is implemented. This function forces the controller to work at **FMA** until reaching a specific SETPOINT (par. **CCS**) for a maximum interval of time (par. **CCt**). The PULL-DOWN function is activated:
- At start-up if the temperature measured from the regulation probe is higher than the **SET+HY+HY1**
- After any defrost
- If the temperature measured from regulation probe go over the **SET+HY+HY1+oHt** value.

If one of the above conditions happens, the controller will maintain the maximum compressor speed (**FMA**) until reaching the **CCS** setpoint. The maximum interval of time for any PULL DOWN is defined from par. **CCt**.

8.2 OIL MIGRATION CONTROL (VALID ONLY FOR VSC)

To avoid oil migration during variable speed compressor operation, a lubrication control is implemented. If the compressor works with a speed lower than the **MnP** threshold for **tMi** time, then the compressor speed will be increased to **FMA** for **tMA** time.
NOTES:
- **MnP= FMi to FMA, nu, OFF**
- If **MnP=nu**, then this function is disabled
- If **MnP=oFF**, then the compressor will be stopped for **tMA** if it works continuously for **tMi**.

8.3 PI ALGORITHM

The VSC regulator implements a PI (Proportional-Integral) algorithm to guarantee temperature stability always near the setpoint. Here below there are some advises for parameter settings in some applications.

	Low Temperature Applications	Normal Temperature Applications
HY	0.3	2
HY1	0.7	1
tSt	1 to 3 min	1 to 3 min
iSt	10 to 20 min	5 to 10 min
rSr	20 to 60	90 to 180
Str	40 to 80 sec	10 to 20 sec
voS	1 to 3	3 to 5
vo2	3 to 7	5 to 10
vo3	5 to 10	5 to 10
tHv	90 to 120 sec	20 to 30 sec
tLv	30 to 60 sec	5 to 10 sec
dPt	2 to 4	1 or 2
SAt	5 to 10 min	1 to 3 min

NOTE:
- Every application needs specific tuning tests to find the optimal values.
- Use **HY < HY1** (better if **2*HY <= HY1**) in Low Temp Applications
- Use **HY > HY1** (better if **HY >= 2*HY1**) in Normal Temp Applications

9. FRONT PANEL AND COMMANDS

SET	To display target set point; in programming mode it selects a parameter or confirm an operation.
❄	(**DEF**) To start a manual defrost.
∧	(**UP**) To see the used parameter map. When in programming mode, it browses the parameter codes or increases the displayed value.
∨	(**DOWN**) To see the used parameter map. When in programming mode, it browses the parameter codes or decreases the displayed value. Keep it pressed 5 sec to change parameter map from "nt" to "Lt" and vice-versa (valid when button properly configured).
⏻	To switch the instrument on and off (when **onF=oFF**).
💡	To switch on and off the light (when **oAx=LiG**).

KEY COMBINATIONS:

∧ + ∨	To lock & unlock the keyboard
SET + ∨	To enter in programming mode
SET + ∧	To exit the programming mode

9.1 USE OF LEDS

Icon functions are 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
fan	ON	Fans enabled
	Flashing	Fans delay activation (for example after any defrost)
(!)	ON	An alarm is occurring
❄	ON	A PULL DOWN is running
ECO	ON	Energy saving enabled
💡	ON	Light on
AUX	ON	Auxiliary relay on
°C,°F	ON	Measurement unit
	Flashing	Programming phase

10. MAX & MIN TEMPERATURE MEMORIZATION

10.1 HOW TO SEE THE MIN TEMPERATURE

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

10.2 HOW TO SEE THE MAX TEMPERATURE

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

10.3 HOW TO RESET THE MAX AND MIN TEMPERATURE RECORDED

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

11. MAIN FUNCTIONS

11.1 TO SET THE CURRENT TIME AND DAY (ONLY WITH RTC)

When the instrument is switched on, it could be required to set the real-time clock.

1. Enter the Pr1 programming menu by keeping both **SET+DOWN** buttons pressed for 3 sec.
2. Browse to the **rtC** menu and then push the **SET** key to enter the real time clock menu.
3. The **Hur** (hour) parameter is displayed.
4. Push the **SET** and set current hour by the **UP** and **DOWN** keys, then push **SET** to confirm the value.
5. Repeat the same operations with **Min** (minutes) and **dAy** (day) parameters and other parameters.

To exit: Push both **SET+UP** buttons or wait for 15 sec without pushing any button.

11.2 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

11.3 HOW TO CHANGE THE SET POINT

1. Push the **SET** button for 3 sec to change the Set point value.
2. The value of the set point will be displayed and the **°C** or **°F** icon will start blinking
3. Use the **UP** or **DOWN** buttons to modify the current value
4. Use the **SET** button to store the new value into memory

11.4 HOW TO START A MANUAL DEFROST

Keep the **DEF** button pressed for 3 sec to start a manual defrost.

11.5 HOW TO ENTER PARAMETER PROGRAMMING MENU "PR1"

Follow these steps:

1. Enter the Programming mode by pressing the **SET+DOWN** buttons for 3 sec (the **°C** or **°F** LED will start blinking)
2. Browse to the required parameter and then press the **SET** button to display its current 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 wait for 15 sec without pressing any key.

NOTE: the set value is stored even when the procedure exits by waiting for the time-out

11.6 HOW TO ENTER PARAMETER PROGRAMMING MENU "PR2"

The manufacturer menu (Pr2) includes all the parameters of the instrument.

11.6.1 ENTERING THE PARAMETER PROGRAMMING MENU "PR2"

1. Enter the Programming mode by pressing the **SET+DOWN** buttons for 3 sec (the **°C** or **°F** icon will start blinking).
2. Released the buttons and then push again the **SET+DOWN** buttons for more than 7 sec. The Pr2 label will be displayed immediately followed from the **HY** parameter.

   NOW THE PARAMETER MENU "PR2" IS AVAILABLE FOR ANY MODIFICATION

3. Browse to 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 for 15 sec without pressing any 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 ends by waiting for the time-out

11.6.2 HOW TO MOVE A PARAMETER FROM "PR2" MENU TO "PR1" MENU AND VICE-VERSA

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

11.7 HOW TO LOCK THE KEYBOARD

1. Keep both **UP** and **DOWN** buttons pressed 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.

11.8 HOW TO: UNLOCK THE KEYBOARD

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

11.9 THE ON/OFF FUNCTION

By pushing the **ON/OFF** key, the instrument will go in stand-by.
During the stand-by status, all the relays are switched OFF and the regulations are stopped; if a monitoring system is connected, it does not record the instrument data and alarms.

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.

12. PARAMETERS

rtC	**Real time clock menu (only for controller with RTC):** to set the time and date and defrost start time.

REGULATION

LS	**Minimum Set Point:** (-100.0°C to SET; -148°F to SET) fix the minimum value for the set point.
US	**Maximum Set Point:** (SET to 150.0°C; SET to 392°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**.
HY1	**Variable Speed Compressor Differential in normal mode:** 0.1 to 25.5°C; 1 to 45°F
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 999 sec) minimum interval between a compressor stop and the following restart.
AC1	**Anti-short cycle delay (2nd compressor):** (0 to 999 sec) delay before activating second compressor.
MCo	**Maximum time with compressor ON:** (0 to 255min) maximum time with ONOFF compressor active. With **MCo=0** this function is disabled.
rtr	**Regulation percentage=F(P1; P2):** (0 to 100; 100=P1, 0=P2) it allows to set the regulation according to the percentage of the first and second probe, as for the following formula (rtr(P1-P2)/100 + P2).
CCt	**Maximum duration for Pull Down:** (0.0 to 23h50min, res. 10min) after elapsing this time interval, the super cooling function is immediately stopped.
CCS	**Pull Down phase differential (SET+CCS or SET+HES+CCS):** (-12.0 to 12.0°C; -21 to 21°F) during any super cooling phase the regulation SETPOINT is moved to **SET+CCS** (in normal mode) or to **SET+HES+CCS** (in energy saving mode)
oHt	**Threshold for automatic activation of Pull Down in normal mode (SET+HY+oHt):** (0.1 to 25.5°C; 1 to 45°F) this is the upper limit used to activate the super cooling function.
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.

PROBE MENU

PbC	**Probe selection:** (ntC; PtC; Pt1) **ntC**=NTC type; **PtC**=PTC type; **Pt1**=PT1000 type
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** = present.
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 defrost is present.
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** = present.
o4	**Probe P4 calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust any possible offset of the fourth probe.

VARIABLE SPEED COMPRESSOR

FMi	**Minimum value for Variable Speed Compressor (RPM * 10):** (0 to FMA) select according to the VSC in use
FMA	**Maximum value for Variable Speed Compressor (RPM * 10):** (FMi to 500) select according to the VSC in use
Fr0	**Value when Variable Speed Compressor is shut down (RPM * 10):** (0 to 200) select according to the VSC in use
tSt	**PI regulator, temperature sampling time:** (00:00 to 42min:30sec)
iSt	**PI regulator, integral sampling time:** (00:00 to 42min:30sec)
vdC	**Type of Variable Speed Drive:** (nu; FrE) **nu** = no VSC in use; **FrE** = VSC with frequency control mode is used
voS	**Signal output variation for Variable Speed Compressor:** (1 to 255 RPM*30) VSC variation when **SET-HY ≤ T ≤ SET+HY**
vo2	**Signal output variation for Variable Speed Compressor:** (1 to 255 RPM*30) VSC variation when **SET-HY-HY1≤T<SET-HY and SET+HY<T≤SET+HY+HY1**
vo3	**Signal output variation for Variable Speed Compressor:** (1 to 255 RPM*30) VSC variation when **SET-HY-HY1<T and T>SET+HY+HY1**
PdP	**Variable Speed Compressor (in %) during any Pull Down:** (0 to 100%)
SPi	**Compressor speed (in %) in case of any probe error during Con interval:** (0 to 100%)
Aod	**Compressor speed (in %) during any defrost cycle (valid if tdf=in):** (0 to 100%)
AoF	**Compressor speed (in%) during a pre-defrost phase (valid if tdf=in):** (0 to 100%)
tHv	**PI regulator, max interval for output variation:** (tLv to 255 sec)
tLv	**PI regulator, min interval for output variation:** (1 sec to tHv)
rSr	**PI regulator, range for output value calculation (RPM * 10):** (0=disabled; 1 to 255 RPM*10)
Str	**PI regulator, delay before range drift:** (0 to 255 sec)
dPt	**PI regulator, divisor for PI response time reduction (acts on both par. tSt and iSt):** (1 to 10)
CMn	**Continuous control ON in normal mode:** (n;Y) **Y** = VSC is never stopped during regulation
CME	**Continuous control ON in energy saving mode:** (n;Y) **Y** = VSC is never stopped during regulation
MnP	**Compressor speed threshold to activate lubrication (valid for variable speed compressors only, 0=disabled):** (nu; 1 to 100%; OFF) nu = not used; 1 to 100% = select the percentage to activate function; OFF = compressor is stopped when the condition is reached
tMi	**Time range with compressor speed below MnP to activate lubrication cycle:** (00:00 to 24h00min) time before activating the lubrication function
tMA	**Time range with compressor speed at 100% to activate lubrication cycle:** (0 to 255 min) VSC will be forced to 100%, for **tMA**, after activating the lubrication function. NOTE: if **MnP=OFF**, VSC will be stopped for **tMA**

DISPLAY

CF	**Temperature measurement unit:** (°C; °F) **°C** = Celsius; **°F** = Fahrenheit.
rES	**Temperature resolution (°C only):** (dE; in) **dE** = decimal; **in** = integer.
Lod	**Local probe displayed:** (P1; P2; P3; P4; Set; dtr) **Px** = probe "x"; **SEt** = set point; **dtr** = percentage selected by par. **dtr**.
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.
dtr	**Probe visualization percentage, F(P1; P2):** (0 to 100) with **dtr=1** the display will show this value **VALUE=0.01*P1+0.99*P2**

DEFROST

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; P1; P2; P3; P4) **nP**=no probe; **Px**=probe "x". Note: **P4**=Probe on Hot Key plug.
dtE	**End defrost temperature:** (-100 to 150°C; -148 to 302°F) sets the temperature measured by the evaporator probe (**dFP**), which causes the end of defrost cycle.
idF	**Interval between two consecutives defrost cycles:** (0 to 120 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 sec) delay in defrost activation.
StC	**Compressor stop before starting any defrost:** (0 to 255 sec) interval with compressor OFF before activating hot gas cycle
dFd	**Displaying during any defrost:** (rt; it; SEt; dEF) **rt** = real temperature; **it** = start defrost temperature; **SEt** = set point; **dEF** = label "**dEF**"
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
Hon	**Drain heater enabled after draining time (par. Fdt):** (0.0 to 24h00min, res. 10 min) the relative output will stay on after draining time.
dPo	**Defrost cycle enebled at stat-up:** (n; Y) enables defrost at power on.
dAF	**Pre-defrost time**: (0 to 255 min) it is used to sub freeze the goods before activating any defrost. The regulation setpoint is modified to SET-1°C or SET-2°F during this interval. If **dAF=0** this function is disabled.

FANS

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:** (-100 to 150°C; -148 to 302°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 25.5°C; 1 to 45°F) evaporator fan will stop when the measured temperature (from FAP) is T<FSt-HYF.
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 for cyclic activation of evaporator fans:** (0 to 50°C)
Ft	**Evaporator fan controlled during any defrost:** (n;Y)
Fon	**Evaporator fan ON time in normal mode (with compressor OFF):** (0 to 15 min) used when energy saving status is not active.
FoF	**Evaporator fan OFF time in normal mode (with compressor OFF):** (0 to 15 min) used when energy saving status is not active.
FAC	**Probe selection for condenser fan:** (nP; P1; P2; P3; P4) **nP**=no probe; **Px**=probe "x". Note: **P4**=Probe on Hot Key plug.
St2	**Set Point 2 regulation (for condenser fan):** (-100 to 150°C; -148 to 302°F) setting of temperature detected by evaporator probe. Above this value of temperature fans are always OFF.
HY2	**Set Point 2 differential (for condenser fan):** (0.1 to 25.5°C; 1 to 45°F) differential for evaporator ventilator regulator
FCC	**Condenser fan operating mode:** (Cn; on; CY; oY) • **Cn** = runs with the compressor and OFF during defrost • **on** = continuous mode, OFF during defrost • **CY** = runs with the compressor and ON during defrost • **oY** = continuous mode, ON during defrost
Fd4	**Condenser fan activated when compressor off:** (0 to 999 sec) interval with condenser fan on after stopping compressor and when **FCC=C-n** or **C-Y**

AUXILIARY

ACH	**Type of control for auxiliary regulator:** (Ht; CL) **Ht** = heating; **CL** = cooling.
SAA	**Set Point for auxiliary regulator:** (-100.0 to 150.0°C; -148 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.

ALARMS

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 alarm configuration:** (Ab, rE) **Ab** = absolute; **rE** = relative.
ALU	**High temperature alarm:** when this temperature is reached, the alarm is enabled after the **Ad** delay time. • 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.
ALL	**Low temperature alarm:** when this temperature is reached, the alarm is enabled after the **Ad** delay time. • If **ALC=Ab** → -100.0°C to ALU or -148°F to ALU. • 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 signalling.
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 signalling, after starting up the instrument.

SECOND TEMPERATURE ALARM

AP2	**Probe selection for second temperature alarm:** (nP; P1; P2; P3; P4) **nP**=no probe; **Px**=probe "x". Note: **P4**=Probe on Hot Key plug.
AL2	**Second low temperature alarm:** (-100.0 to 150.0°C; -148 to 302°F)
Au2	**Second high temperature alarm:** (-100.0 to 150.0°C; -148 to 302°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 second 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 second 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.
SAF	**Differential for anti-freezing control:** (-12.0 to 12.0°C; -21.0 to 21.0°F) the regulation stops if **T<SET+SAF**.

CONFIGURABLE RELAYS

oA1 to oA3	**Relay output oAx configuration:** • **nu** = not used • **onF** = always on with instrument on • **dEF** = defrost • **Fan** = evaporator Fan • **Alr** = alarm • **LiG** = light • **AUS** = auxiliary output • **db** = neutral zone • **CP1** = ONOFF compressor • **CP2** = second ONOFF compressor • **dF2** = second defrost • **HES** = energy saving • **HEt** = heater output control • **inV** = inverter output • **Cnd** = condenser fan.
1Ao	**Analogue output configuration:** (n;Y) **n** = 5-pin port is used as HOT-KEY only; **Y** = 5-pin port is used as frequency output.
AoP	**Alarm relay polarity:** (oP; CL) **oP** = alarm activated by closing the contact; **CL** = alarm activated by opening the contact.

DIGITAL INPUTS

ibt	**Base time for digital inputs:** (SEC; Min) **SEC** = seconds; **Min** = minutes. Delay in activating the function linked to the digital inputs.
i1P	**Digital input 1 polarity:** (oP; CL) **oP** = activated by closing the contact; **CL** = activated by opening the contact.
i1F	**Digital input 1 configuration:** • **EAL** = external warning alarm • **bAL** = external lock alarm • **PAL** = external pressure alarm • **dor** = door switch function • **dEF** = defrost activation • **AUS** = auxiliary output • **Htr** = type of inverting action (cooling or heating) • **ES** = energy saving mode activation • **HdF** = holiday defrost • **onF** = ON/OFF status change • **Lnt** = change configuration (between Lt and nt)
did	**Digital input 1 alarm delay:** (0 to 255) 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.

ENERGY SAVING

HES	**Energy saving mode temperature differential:** (-30 to 30°C; -54 to 54°F) 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) lights off when energy saving mode is active

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) setting for the first day of the weekend.
Hd2	**Second day of weekend:** (Sun to SAt; nu) setting for the second day of the weekend.
iLE	**Energy saving cycle start time on working days:** (00h00min to 23h50min) during the Energy Saving cycle, the set point is increased by the value in HES so that the operation set point is **SET+HES**.
dLE	**Energy saving cycle duration on working days:** (00h00min to 24h00min) sets the duration of the Energy Saving cycle on working days.
iSE	**Energy saving cycle start time on weekends:** 00h00min to 23h50min
dSE	**Energy saving cycle duration on weekends:** 00h00min to 24h00min
dd1…dd6	**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** = Sunday defrost
Ld1…Ld6	**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.

N.B.: <u>To disable a defrost cycle set it to "nu" (not used).</u> ***Ex:*** *if* ***Ld6=nu****; the sixth defrost cycle will be disabled.*

OTHER

Adr	**Serial address:** (1 to 247) device address for Modbus communication
bAU	**Baudrate:** (9.6; 19.2) select the correct baudrate for serial communication
onC	**ONOFF button configuration:** • **nU** = not used • **oFF** = to switch on and off the device • **ES** = energy saving mode
on2	**ONOFF button timed configuration (3 sec):** • **nU** = disabled • **oFF** = to switch on and off the device • **ES** = energy saving mode
LGC	**Light button (left upper side) configuration:** • **nu** = not used • **LiG** = to activate and deactivate light output • **AUS** = to activate and deactivate the auxiliary output • **Lnt** = configuration map change
LG2	**Light button (left upper side) timed configuration (3 sec):** • **nu** = not used • **LiG** = to activate and deactivate light output • **AUS** = to activate and deactivate the auxiliary output • **Lnt** = configuration map change
dFC	**DEF button (left middle side) configuration:** • **nu** = not used • **Pb2** = show current Probe Pb2 value • **AUS** = to activate and deactivate the auxiliary output
dF2	**DEF button (left middle side) timed configuration (3 sec):** • **nu** = not used • **dEF** = defrost activation • **AUS** = to activate and deactivate the auxiliary output
dnC	**Down button configuration:** • **nU** = not used • **Std** = lower temperature value • **Lnt** = configuration map change • **Pdn** = force Pull Down mode
dn2	**Down button timed configuration (3 sec):** • **nU** = not used • **Std** = lower temperature value • **Lnt** = configuration map change • **Pdn** = force Pull Down mode
dP1	**Probe P1 value visualization**
dP2	**Probe P2 value visualization**
dP3	**Probe P3 value visualization**
dP4	**Probe P4 value visualization**
SPd	**Real regulation Speed**
rSE	**Real set point**: it shows the set point used during the energy saving cycle or during the continuous cycle.
rEL	**Firmware release** for internal use.
Ptb	**Parameter table code**: readable only.

13. DIGITAL INPUTS

The first digital input (terminals 18-20) is enabled with **P3P=n**.
The free voltage digital inputs are programmable by the **i1F** parameter.

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

13.2 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.

13.3 EXTERNAL PRESSURE ALARM (i1F =PAL)

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

13.4 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 <u>the regulation restarts is</u> **rtr=Y**. 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.

13.5 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.

13.6 SWITCH THE AUXILIARY RELAY (i1F = AUS)

With **oAx=AUS** the digital input switched the status of the auxiliary relay.

13.7 INVERSION OF THE KIND OF ACTION: HEATING-COOLING (i1F = Htr)

This function allows inverting the regulation of the controller: from cooling to heating and viceversa.

13.8 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.

13.9 ON OFF FUNCTION (i1F = onF)

To switch the controller on and off.

13.10 CHANGE PARAMETER MAP (i1F = Lnt)

To move from LT to NT parameter map.

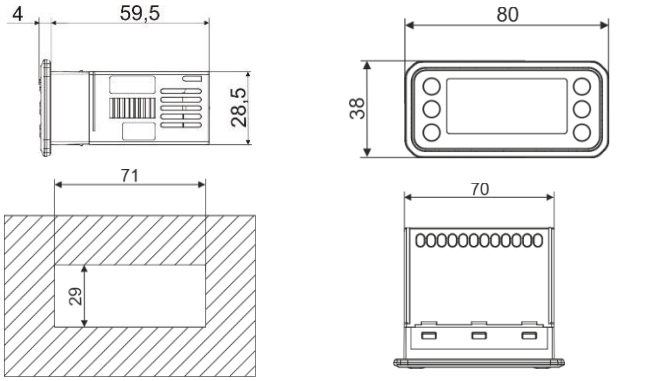
13.11 DIGITAL INPUTS POLARITY

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.

14. SERVICE SERIAL PORT

A specific serial tool (XJ485CX) can be connected to the HOTKEY port to change parameter configuration. To do this, set par **1Ao=n**: the frequency output must be disabled to use the service serial port.

15. INSTALLATION AND MOUNTING



Instrument **XRi60CH** 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.

16. 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.

16.1 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.

17. HOW TO USE THE HOT KEY

To enable the HOT-KEY port (5-pin connector), set the par. **oAn=n**.

17.1 PROGRAM A HOT KEY FROM AN INSTRUMENT (UPLOAD)

1. Program one controller with the front keypad.
2. When the controller is ON, 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. Turn OFF 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.

17.2 PROGRAM AN INSTRUMENT BY 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.

18. ALARM SIGNALING

Message	Cause	Outputs
P1	Room probe failure	Compressor output works with 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
HA2	Condenser high temperature	It depends on the AC2 parameter
LA2	Condenser low temperature	It depends on the bLL parameter
dA	Door open	Compressor restarts
EA	Warning	Output unchanged
CA	Lock alarm (ixF=bAL, PAL)	All outputs OFF
rtC	Real time clock parameter error	Output unchanged, defrost follows idF, need to set RTC parameters
rtF	Real time clock malfunctioning	Output unchanged, defrost follows idF

18.1 BUZZER MUTING OR ALARM RELAY OUTPUT DEACTIVATION

If **tbA=Y**, the buzzer and the relay are silenced by pressing any key.
If **tbA=n**, only the buzzer is silenced while the alarm relay is on until the alarm condition recovers.

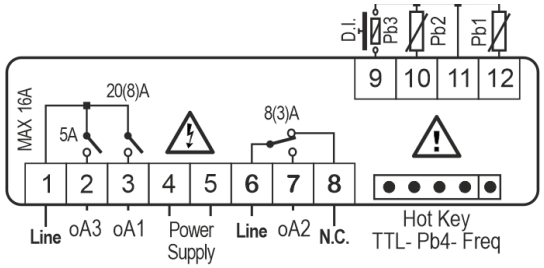
18.2 ALARM RECOVERY

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 **ixF=bAL, PAL**) recover as soon as the digital input is disabled.

18.3 OTHER MESSAGES

Pon	Keyboard unlocked.
PoF	Keyboard locked
noP	In programming mode: no parameter in Pr1. On the display or in dP2, dP3, dP4: the selected probe is not enabled.

19. WIRING DIAGRAM



1.4 PIN DESCRIPTION

I/O	DESCRIPTION
oA1 to oA3	Relay outputs
P1 to P4	Temperature probes
D.I.	Digital input 1
Hot Key / Freq	Hotkey connector and Frequency output for VSC
Line	Relay Power Supply "Line"
Terminal 4	Neutral for high and low voltage power supply
Terminal 5	Line for high voltage power supply @[110 or 230VAC]

20. DEFAULT SETTING VALUES

Label	Description	LT	NT	Level	Unit
SEt	Set Point	-20.0	3.0		°C
rtC	Real time clock settings menu			Pr1	
LS	Minimum Set point	-50.0	-50.0	Pr2	°C
US	Maximum Set point	50.0	50.0	Pr2	°C
Hy	Compressor regulation differential in normal mode	0.3	2.0	Pr1	°C
Hy1	Variable Speed Compressor Differential in normal mode	0.7	1.0	Pr1	°C
odS	Output activation delay at start-up	1	1	Pr1	min
AC	Anti-short cycle delay	30	1	Pr1	sec
MCo	Maximum time with compressor on (0=disabled)	0	0	Pr2	min
rtr	Regulation percentage=F(P1; P2) (100=P1; 0=P2)	100	0	Pr2	
CCt	Maximum duration for Pull Down	00:00	01:00	Pr2	hh:mm
CCS	Pull Down phase differential (SET+CCS or SET+HES+CCS)	0.0	0.0	Pr2	°C
oHt	Threshold for automatic activation of Pull Down in normal mode (SET+HY+oHt)	0.0	0.0	Pr2	°C
Con	Compressor ON time with faulty probe	20	20	Pr2	min
CoF	Compressor OFF time with faulty probe	5	5	Pr2	min
PbC	Probe selection	ntC	ntC	Pr2	
ot	Probe P1 calibration	0.0	0.0	Pr1	°C
P2P	Probe P2 presence	no	no	Pr2	
oE	Probe P2 calibration	0.0	0.0	Pr2	°C
P3P	Probe P3 presence	no	no	Pr2	
o3	Probe P3 calibration	0.0	0.0	Pr2	°C
P4P	Probe P4 presence	no	no	Pr2	
o4	Probe P4 calibration	0.0	0.0	Pr2	°C
FMi	Minimum value for Variable Speed Compressor (RPM * 10)	200	200	Pr2	RPM*10
FMA	Maximum value for Variable Speed Compressor (RPM * 10)	450	450	Pr2	RPM*10
Fr0	Output value when Variable Speed Compressor is OFF	0	0	Pr2	RPM*10
tSt	PI regulator: temperature sampling time	01:00	01:00	Pr2	sec
iSt	PI regulator: integral sampling time	10.00	05:00	Pr2	sec
voS	Signal output variation for Variable Speed Compressor (SET-HY≤T≤SET+HY)	2	3	Pr2	RPM*30
vo2	Signal output variation for Variable Speed Compressor (SET-HY-HY1≤T<SET-HY e SET+HY<T≤SET+HY+HY1)	5	7	Pr2	RPM*30
vo3	Signal output variation for Variable Speed Compressor (SET-HY-HY1<T e T>SET+HY+HY1)	7	10	Pr2	RPM*30
PdP	Variable Speed Compressor (in percentage) during any Pull Down	90	nU	Pr2	%
t1F	Time with Variable Speed Compressor at minimum before stopping it	0	0	Pr2	min
SPi	Compressor speed (in %) in case of any probe error during Con interval	30	80	Pr2	%
Aod	Compressor speed (in %) during any defrost cycle (valid if tdf=in)	70	0	Pr2	%
AoF	Compressor speed during any pre-defrost phase (valid if tdf=in)	50	0	Pr2	%
tHv	PI regulator: max interval for output variation	90	30	Pr2	sec
tLv	PI regulator: min interval for output variation	30	10	Pr2	sec

rSr	PI regulator: range for output value calculation (RPM * 10)	40	120	Pr2	RPM*10
Str	PI regulator: delay before range drift	60	20	Pr2	sec
dPt	PI regulator: divisor for PI response time reduction (acts on both par. tSt and iSt)	2	1	Pr2	
SAt	Sampling time to calculate the average compressor speed before any desfrost cycle	8	1	Pr2	min
CMn	Continuous control ON in normal mode	yes	no	Pr2	
CME	Continuous control ON in energy saving	yes	no	Pr2	
MnP	Compressor speed threshold to activate lubrication (valid only for variable speed compressors, 0=disabled)	nu	nu	Pr2	%
tMi	Time range with compressor speed below MnP to activate lubrication cycle	00:00	00:00	Pr2	hh:mm
tMA	Time range with compressor speed at 100% to activate lubrication cycle	0	0	Pr2	min
CF	Temperature measurement unit: Celsius; Fahrenheit	°C	°C	Pr2	
rES	Temperature resolution: decimal, integer	dE	dE	Pr2	
Lod	Probe default displayed	P1	P1	Pr2	
dLy	Temperature display delay (resolution 10 sec)	00:00	00:00	Pr2	min
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	in	in	Pr2	
dFP	Probe selection for defrost control	P2	P2	Pr1	
dtE	End defrost temperature	8.0	12.0	Pr2	°C
idF	Interval between two successive defrost cycles	12	12	Pr1	hh
MdF	Maximum length of defrost cycle	30	30	Pr1	min
dSd	Start defrost delay	0	0	Pr2	sec
StC	Compressor off-cycle before starting any defrost	0	0	Pr2	sec
dFd	Displaying during defrost	dEF	dEF	Pr2	
dAd	Temperature display delay after any defrost cycle	0	0	Pr2	min
Fdt	Draining time	5	5	Pr2	min
Hon	Drain heater enabled after draining time (par. Fdt)	00:00	00:00	Pr2	hh:mm
dPo	Defrost cycle enebled at stat-up	no	no	Pr2	
Pd2	Defrost output deactivation delay	0	0	Pr2	sec
dAF	Pre-defrost time	0	0	Pr2	min
FAP	Probe selection for evaporator fan	nP	nP	Pr2	
FSt	Evaporator fan stop temperature	0.0	10.0	Pr2	°C
HyF	Evaporator fan regulator differential	1.0	2.0	Pr2	°C
FnC	Evaporator fan operating mode	C_n	C_n	Pr2	
Fnd	Evaporator fan delay after defrost cycle	5	0	Pr2	min
FCt	Differential temperature for cyclic activation of evaporator fans (0=disabled)	1	0	Pr2	°C
Ft	Evaporator fan controlled during defrost	no	no	Pr2	
Fon	Evaporator fan ON time in normal mode (with compressor OFF)	0	0	Pr2	min
FoF	Evaporator fan OFF time in normal mode (with compressor OFF)	0	0	Pr2	min
FAC	Probe selection for condenser fan	nP	nP	Pr2	
St2	Set Point 2 Regulation (for condenser fan)	0.0	15.0	Pr2	°C
Hy2	Set Point 2 differential (for condenser fan)	1.0	10.0	Pr2	°C

FCC	Condenser fan operating mode	O_n	C_n	Pr2	
Fd4	Condenser fan deactivation delay	0	0	Pr2	sec
ALP	Probe selection for temperature alarms	P1	P1	Pr1	
ALC	Temperature alarms configuration: relative, absolute	Ab	Ab	Pr1	
ALU	High temperature alarm	150.0	150.0	Pr1	°C
ALL	Low temperature alarm	-100.0	-100.0	Pr1	°C
AFH	Temperature alarm differential	2.0	2.0	Pr1	°C
ALd	Temperature alarm delay	0	0	Pr1	min
dAo	Temperature alarm delay at start-up	00:00	00:00	Pr1	hh:mm
AP2	Probe selection for 2nd temperature alarm	nP	nP	Pr2	
AL2	2nd low temperature alarm	-20.0	0.0	Pr2	°C
AU2	2nd high temperature alarm	20.0	0.0	Pr2	°C
AH2	2nd temperature alarm differential	2.0	0.1	Pr2	°C
Ad2	2nd temperature alarm delay	0	0	Pr2	min
dA2	2nd temperature alarm delay at start-up	00:00	00:00	Pr2	hh:mm
bLL	Compressor OFF due to 2nd low temperature alarm	no	no	Pr2	
AC2	Compressor OFF due to 2nd high temperature alarm	no	no	Pr2	
SAF	Differential for anti-freezing control	0.0	0.0	Pr2	°C
tbA	Alarm relay deactivation	yes	yes	Pr2	
oA1	Relay output oA1 configuration	dEF	dEF	Pr2	
oA2	Relay output oA2 configuration	LiG	LiG	Pr2	
oA3	Relay output oA3 configuration	Fan	Fan	Pr2	
AOP	Alarm relay polarity	CL	CL	Pr2	
1Ao	Analogue output 1 configuration	FrE	FrE	Pr2	
ibt	Base times for digital inputs	SEC	SEC	Pr1	
i1P	Digital input 1 polarity	CL	CL	Pr1	
i1F	Digital input 1 configuration	nu	EAL	Pr1	
d1d	Digital inputs 1 alarm delay (base time depends on par. ibt)	0	0	Pr1	sec
nPS	Number of external pressure switch alarms before stopping the regulation	15	0	Pr2	
OdC	Compressor and fan status after door opening	F-C	no	Pr2	
rrd	Regulation restart after door alarm	no	no	Pr2	
HES	Temperature differential in energy saving	0.0	0.0	Pr1	°C
LdE	ErA controls the lights in energy saving (lights OFF when energy saving goes active)	yes	no	Pr1	
Hur	Hours			Pr1	
Min	Minutes			Pr1	
dAY	Day of the week			Pr1	
dyM	Day of the month			Pr1	
Mon	Month			Pr1	
yAr	Year			Pr1	
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	00:00	00:00	Pr2	hh:mm

dLE	Energy saving cycle duration on working days	00:00	00:00	Pr2	hh:mm
iSE	Energy saving cycle starting time on weekends	00:00	00:00	Pr2	hh:mm
dSE	Energy saving cycle duration on weekends	00:00	00:00	Pr2	hh:mm
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	nu	00:00	Pr2	hh:mm
Ld2	2nd defrost starting time	nu	00:00	Pr2	hh:mm
Ld3	3rd defrost starting time	nu	00:00	Pr2	hh:mm
Ld4	4th defrost starting time	nu	00:00	Pr2	hh:mm
Ld5	5th defrost starting time	nu	00:00	Pr2	hh:mm
Ld6	6th defrost starting time	nu	00:10	Pr2	hh:mm
Adr	Serial address	1	1	Pr2	
bAU	Baudrate	9.6	9.6	Pr2	
onC	ONOFF button configuration (left upper side)	nU	nU	Pr2	
on2	ONOFF button timed (3sec) configuration (left upper side)	oFF	oFF	Pr2	
LGC	Light button configuration (left upper side)	LiG	LiG	Pr2	
LG2	Light button timed (3sec) configuration (left upper side)	nU	nU	Pr2	
dFC	DEF button configuration (left upper side)	Pb2	Pb2	Pr2	
dF2	DEF button timed (3sec) configuration (left upper side)	dEF	dEF	Pr2	
dnC	Down button configuration	Std	Std	Pr2	
dn2	Down button timed (3sec) configuration	Lnt	Lnt	Pr2	
dP1	Probe P1 value visualization			Pr1	°C
dP2	Probe P2 value visualization			Pr1	°C
dP3	Probe P3 value visualization			Pr1	°C
dP4	Probe P4 value visualization			Pr1	°C
SPd	Instantaneous compressor speed (RPM * 10)			Pr1	Hz
rSE	Real regulation Set Point (SET + HES + SETd)			Pr1	°C
FdY	Firmware release date: day			Pr1	
FMn	Firmware release date: month			Pr1	
FYr	Firmware release date: year			Pr1	
rEL	Firmware release			Pr1	
Ptb	Parameter map version	1	1	Pr1	

21. TECHNICAL DATA

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%; 24VAC/DC, ±10%; 110VAC ±10%, 50/60Hz; 230VAC ±10%, 50/60Hz			
Overvoltage Category	II			
Rated Power	12VAC/DC: 3VA max; 24VAC/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**	0T60°C; 20-85 rH% (non-condensing humidity)		
	UL-CAN/CSA	-20T60°C; 20-85 rH% (non-condensing humidity)		
Shipping and storage temperature	-40T85°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) **PT1000:** -100T150°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, PTC or PT1000 (configurable); 1 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 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, 30K cycles
	oA2	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, 30K 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, 30K cycles
Maximum ampacity (common terminal 1)	16A			
Analogue Outputs	**Freq**	Frequency output; Supply max voltage = 12Vdc; Max supply current = 10mA; Duty cycle = 50%; Range = 0 to 166 Hz; Maximum cable length = 10m		
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			

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