# XR01CX - XR02CX - XR03CX - XR04CX - XR06CX

dixell EMERSON

CE EN13485 S A 1 - 2

XR01CX DIGITAL THERMOSTAT
XR02CX DIGITAL CONTROLLER WITH "OFF CYCLE" DEFROST
XR03CX DIGITAL CONTROLLER WITH AUXILIARY RELAY
XR04CX DIGITAL CONTROLLER WITH DEFROST RELAY
XR06CX DIGITAL CONTROLLER WITH DEFROST AND FANS MANAGEMENT

*SZ02 1599010030 V.1.0 2013.07.17*

GB

## OPERATING MANUAL

## 1. GENERAL WARNINGS

### 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

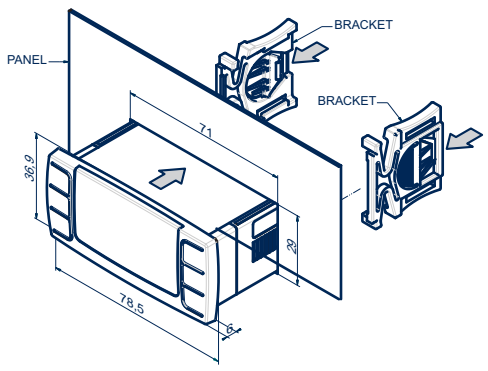
- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation.
- Warning: disconnect all electrical 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.

### 1.3 DISPOSAL OF THE PRODUCT

The appliance (or the product) must be disposed of separately in accordance with the local waste disposal legislation in force.

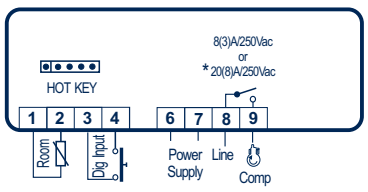
## 2. FRONT PANEL

## 3. DIMENSIONS AND CUT OUT



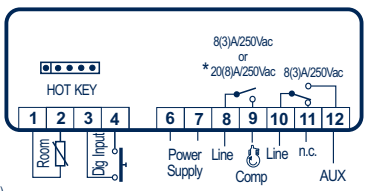

## 4. CONNECTIONS

### XR01CX - XR02CX 8A or 20A COMP.



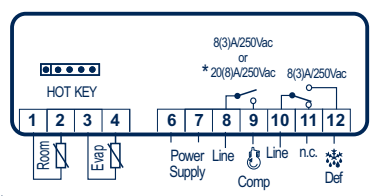

* 16FLA(96LRA) 20(8)A 250V

### XR03CX 8A or 20A COMP.



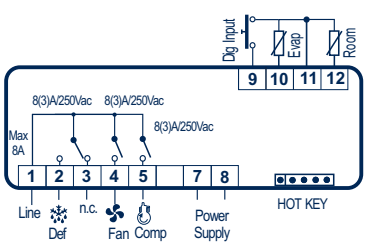

* 16FLA(96LRA) 20(8)A 250V

### XR04CX 8A or 20A COMP.

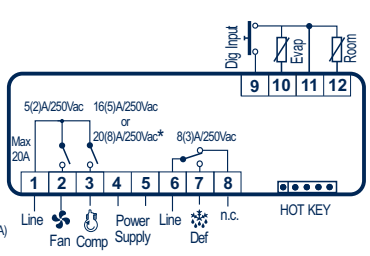



* 16FLA(96LRA) 20(8)A 250V

### XR06CX 8A COMP.




### XR06CX 16A or 20A COMP.




* 16FLA(96LRA) 20(8)A 250V

## 5. GENERAL DESCRIPTION

Model **XR01CX**, in **32x74x50 mm short format**, is a single stage temperature thermostat suitable for applications in the field of refrigeration or heating. It provides a relay output to drive the compressor. It is also provided with 1 NTC probe input and one digital input. The instrument is fully configurable through special parameters that can be easily programmed through the keyboard or by the HOTKEY.

Model **XR02CX**, in **32x74x50 mm short format**, is a digital controller with off cycle defrost designed for refrigeration applications at normal temperature. It provides a relay output to drive the compressor. It is also provided with 1 NTC probe input and one the digital input. The instrument is fully configurable through special parameters that can be easily programmed through the keyboard or by the HOTKEY.

The **XR03CX**, in **32x74x50 mm short format**, is microprocessor based controller suitable for applications on normal temperature refrigerating units. It provides two relay output: one for compressor and the other one for alarm signalling or as auxiliary output. It provides an NTC probe input and a digital input for alarm signalling, for switching the auxiliary output or for start defrost. The instrument is fully configurable through special parameters that can be easily programmed through the keyboard or the by HOTKEY.

The **XR04CX**, in **32x74x50 mm short format**, is microprocessor based controller suitable for applications on normal or low temperature refrigerating units. It provides two relay output: one for compressor and the other one for defrost. It provides two NTC probe inputs, one for room temperature and other one to control defrost termination. The instrument is fully configurable through special parameters that can be easily programmed through the keyboard or by the HOTKEY.

The **XR06CX, format 32x74x60 mm**, is microprocessor based controller, suitable for applications on medium or low temperature ventilated refrigerating units. It has three relay outputs to control compressor, fan, and defrost, which can be either electrical or reverse cycle (hot gas). It is also provided with 2 NTC probe inputs, the first one for temperature control, the second one, to be located onto the evaporator, to control the defrost termination temperature and to managed the fan and it's provided with a configurable digital input. With the HOTKEY it's possible to program the instrument in a quick and easy way.

## 6. REGULATION

### 6.1 THE REGULATION OUTPUT (Only for XR01CX)

The regulation is performed according to the temperature measured by probe. The instrument is provided with the **CH** programmable parameter wich enables the user to set the regulation both for heating or cooling applications:

- **CH=cL** --> cooling applications;
- **CH=Ht** --> heating applications.

### 6.2 COOLING APPLICATIONS

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.

### 6.3 HEATING APPLICATIONS (Only XR01CX)

The Hy value is automatically subtracted to the SET POINT. If the temperature decreases and reaches set point minus differential the output is started and then turned off when the temperature reaches set point value again.

## 7. DEFROST

**XR02CX - XR03CX**: Defrost is performed through a simple stop of the compressor. Parameter **id** controls the interval between defrost cycles, while its length is controlled by parameter **Md**.

**XR04CX - XR06CX**: Two defrost modes are available through the **td** parameter:

- **td=EL** defrost through electrical heater (compressor OFF);
- **td=in** hot gas defrost (compressor ON).

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

## 8. FANS (Only XR06CX)

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

- **FC=cn** will switch ON and OFF with the compressor and **not run** during defrost
- **FC=on** 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 **Fd** parameter.

- **FC=cy** fans will switch ON and OFF with the compressor and **run** during defrost
- **FC=oY** fans will run continuously also during defrost.

An additional parameter **FS** 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 **FS**.

### 8.1 FANS AND DIGITAL INPUT

When the digital input is configured as door switch **iF=do**, fans and compressor status depends on the **dC** parameter value:

**dC=no** normal regulation;
**dC=Fn** fans OFF;
**dC=cP** compressor OFF;
**dC=Fc** compressor and fans OFF.

When **rd=y**, the regulation restart with door open alarm.

## 9. FRONT PANEL COMMANDS

**SET** To display target set point, in programming mode it selects a parameter or confirm an operation

To start a manual defrost

In programming mode it browses the parameter codes or increases the displayed value

aux In programming mode it browses the parameter codes or decreases the displayed value

**KEYS COMBINATION**

To lock or unlock the keyboard

**SET** + To enter in programming mode

**SET** + To return to room temperature display

| LED | MODE | DESCRIPTION |
|---|---|---|
| | On | Compressor enabled |
| | Flashing | Anti short cycle delay enabled (AC parameter) |
| | On | Defrost in progress |
| | Flashing | Dripping in progress |
| | On | Fans output enabled |
| | Flashing | Fans delay after defrost |
| °C | On | Measurement unit |
| | Flashing | Programming mode |
| °F | On | Measurement unit |
| | Flashing | Programming mode |

### 9.1 HOW TO SEE THE SET POINT

1. Push and immediately release the **SET** key, the set point will be showed;
2. Push and immediately release the **SET** key or wait about 5s to return to normal visualisation.

### 9.2 HOW TO CHANGE THE SETPOINT

1. Push the **SET** key for more than 3 seconds to change the Set point value;
2. The value of the set point will be displayed and the **°C** or **°F** LED starts blinking;
3. To change the **SET** value push the ▲ or ▼ arrows within 10s;
4. To memorise the new set point value push the **SET** key again or wait 10s.

### 9.3 HOW TO START A MANUAL DEFROST

Push the **DEF** key for more than 2 seconds and a manual defrost will start.

### 9.4 HOW TO CHANGE A PARAMETER VALUE

To change the parameter's value operate as follows:

1. Enter the Programming mode by pressing the **SET+** ▼ keys for 3s (**°C** or **°F** LED starts blinking);
2. Select the required parameter. Press the **SET** key to display its value;
3. Use ▲ or ▼ to change its value;
4. Press **SET** to store the new value and move to the following parameter.

**To exit**: Press **SET+** ▲ or wait 15s without pressing a key.
**NOTE**: the set value is stored even when the procedure is exited by waiting the time-out to expire.

### 9.5 HIDDEN MENU

The hidden menu includes all the parameters of the instrument.

**HOW TO ENTER THE HIDDEN MENU**

1. Enter the Programming mode by pressing the **SET+** ▼ keys for 3s (**°C** or **°F** LED starts blinking);
2. Released the keys, then push again the **SET+** ▼ keys for more than 7s. The L2 label will be displayed immediately followed from the Hy parameter.

**NOW YOU ARE IN THE HIDDEN MENU.**

3. Select the required parameter;
4. Press the **SET** key to display its value;
5. Use ▲ or ▼ to change its value;
6. Press **SET** to store the new value and move to the following parameter.

**To exit**: Press **SET+** ▲ or wait 15s without pressing a key.
**NOTE1:** if none parameter is present in L1, after 3s the **nP** message is displayed. Keep the keys pushed till the L2 message is displayed.
**NOTE2**: the set value is stored even when the procedure is exited by waiting the time-out to expire.

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

Each parameter present in the HIDDEN MENU can be removed or put into "THE FIRST LEVEL" (user level) by pressing **SET+** ▼ . In HIDDEN MENU when a parameter is present in First Level the decimal point is on.

### 9.6 TO LOCK THE KEYBOARD

Keep pressed for more than 3s the ▲ and ▼ keys.
The **OF** message will be displayed and the keyboard will be locked. If a key is pressed more than 3s the OF message will be displayed.

### 9.7 TO UNLOCK THE KEYBOARD

Keep pressed together for more than 3s the ▲ and ▼ keys till the **On** message will be displayed.

## 10. DIGITAL INPUTS

The free voltage digital input is programmable in different configurations by the **iF** parameter.

### 10.1 DOOR SWITCH (iF=do)

It signals the door status and the corresponding relay output status through the **dC** parameter: **no** = normal (any change); **Fn** = Fan OFF; **CP** = Compressor OFF; **FC** = Compressor and fan OFF.

Since the door is opened, after the delay time set through parameter **di**, the door alarm is enabled, the display shows the message **dA** and **the regulation restarts if rd = 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.

### 10.2 EXTERNAL ALARM (iF=EA)

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

### 10.3 SERIOUS ALARM (iF=bA)

When the digital input is activated, the unit will wait for **di** 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.

### 10.4 SWITCHING SECOND RELAY ON (iF=Au) (Only XR03CX)

When **o1=Au** it switches on and off the second relay.

### 10.5 START DEFROST (iF=dF)

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 **dd** safety time is expired.

### 10.6 INVERSION OF THE KIND OF ACTION: HEATING - COOLING (iF=Hc)

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

## 11. INSTALLATION AND MOUNTING

Instruments 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÷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 instruments are provided with screw terminal block to connect cables with a cross section up to 2,5 mm$^2$. 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 PROBES

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. HOW TO USE THE HOT KEY

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

1. Program one controller with the front keypad;
2. When the controller is ON, insert the Hot key and push ▲ key; the **uP** message appears followed a by flashing **Ed**;
3. Push **SET** key and the **Ed** will stop flashing;
4. Turn OFF the instrument remove the Hot Key, then turn it ON again.

**NOTE**: the **Er** message is displayed for failed programming. In this case push again ▲ key 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 HOT KEY (DOWNLOAD)

1. Turn OFF the instrument;
2. Insert a **programmed Hot Key into the 5 PIN receptacle** and then turn the Controller ON;
3. Automatically the parameter list of the Hot Key is downloaded into the Controller memory, the **do** message is blinking followed a by flashing **Ed**;
4. After 10 seconds the instrument will restart working with the new parameters;
5. Remove the Hot Key.

**NOTE**: the **Er** message is displayed for failed programming. In this case push again ▲ key if you want to restart the upload again or remove the Hot key to abort the operation.

## 14. ALARM SIGNALLING

| MESS. | CAUSE | OUTPUTS |
|---|---|---|
| "P1" | Room probe failure | Compressor output according to "Cy" and "Cn" |
| "P2" | Evaporator probe failure | Defrost end is timed |
| "HA" | Maximum temperature alarm | Outputs unchanged |
| "LA" | Minimum temperature alarm | Outputs unchanged |
| "EA" | External alarm | Outputs unchanged |
| "CA" | Serious external alarm | All outputs OFF |
| "dA" | Door Open | Compressor and fans restarts |

### 14.1 ALARM RECOVERY

Probe alarms **P1** and **P2** 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 iF=bL) recover as soon as the digital input is disabled.

## 15. TECHNICAL DATA

**Housing:** self extinguishing ABS.
**Case:** frontal 32x74 mm; depth 50 or 60mm.
**Mounting:** panel mounting in a 71x29mm panel cut-out.
**Protection:** IP20.
**Frontal protection:** IP65.
**Connections:** Screw terminal block 2,5 mm$^2$ wiring.
**Power supply:** according to the model: 12Vac/dc, ±10%; 24Vac/dc, ±10%; 230Vac 10%, 50/60Hz, 110Vac 10%, 50/60Hz.
**Power absorption:** 3,5VA max.
**Display**: 2 digits, red LED, 14,2 mm high.
**Inputs**: Up to 2 NTC.
**Digital input:** free voltage contact.
**Relay outputs:** **compressor:** SPST 8(3) A, 250Vac; SPST 16(6)A 250Vac or 20(8)A 250Vac;
**defrost/aux:** SPDT 8(3) A, 250Vac;
**fan:** SPST 8(3) A, 250Vac or SPST 5(2) A.
**Data storing**: on the non-volatile memory (EEPROM).
**Kind of action:** 1B.
**Pollution grade:** 2.
**Software class:** A.
**Rated impulsive voltage**: 2500V.
**Overvoltage Category**: II.
**Operating temperature:** 0÷60 °C.
**Storage temperature:** -30÷85 °C.
**Relative humidity:** 20÷85% (no condensing).
**Measuring and regulation range: NTC** -40÷110°C (-40÷230°F).
**Resolution:** 0,1 °C or 1°C or 1 °F (selectable).
**Accuracy (ambient temp. 25°C)**: ±0,7 °C ±1 digit.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**DEFAULT SETTING VALUES**

| LABEL | DESCRIPTION | RANGE | XR01CX | XR02CX | XR03CX | XR04CX | XR06CX |
|---|---|---|---|---|---|---|---|
| **Set** | Set Point | LS - US | 5.0 | 3.0 | 3.0 | -5.0 | -5.0 |
| **Hy** | Differential | 0.1÷25°C/ 1÷45°F | 2.0°C/4°F | 2.0°C/4°F | 2.0°C/4°F | 2.0°C/4°F | 2.0°C/4°F |
| **LS** | Minimum Set Point | -55°C÷SET/ -67°F÷SET | -55°C/ -55°F | -55°C/ -55°F | -55°C/ -55°F | -55°C/ -55°F | -55°C/ -55°F |
| **US** | Maximum Set Point | SET÷99°C/ SET÷99°F | 99 °C / 99°F | 99 °C / 99°F | 99 °C / 99°F | 99 °C / 99°F | 99 °C / 99°F |
| **ot** | First probe calibration | -9.9÷9.9°C/ -17÷17°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **P2** | Second probe presence: n= not present; y= present | n-y | – | – | – | y | y |
| **oE** | Second probe calibration | -9.9÷9.9°C/ -17÷17°F | – | – | – | 0.0 | 0.0 |
| **od** | Outputs activation delay at start up | 0 ÷ 99 min | 0 | 0 | 0 | 0 | 0 |
| **AC** | Anti-short cycle delay | 0 ÷ 50 min | 1 | 1 | 1 | 1 | 1 |
| **Cy** | Comp. ON time faulty probe. Cy= 0 comp. always OFF | 0 ÷ 99 min | 15 | 15 | 15 | 15 | 15 |
| **Cn** | Comp. OFF time faulty probe. Cn= 0 comp. always active | 0 ÷ 99 min | 30 | 30 | 30 | 30 | 30 |
| **CH** | Kind of action | cL ÷ Ht | cL | cL | cL | – | – |
| **CF** | Measurement units: °C= Celsius; °F= Fahrenheit | °C / °F | °C / °F | °C / °F | °C / °F | °C / °F | °C / °F |
| **rE** | Resolution (only for °C): dE= decimal between -9.9 and 9.9°C; in= integer | dE – in | dE | dE | dE | dE | dE |
| **Ld** | Default display: P1= thermostat probe; P2= evaporator probe; SP= Set point | P1-P2-SP | – | – | – | P1 | P1 |
| **dy** | Display delay | 0 ÷ 15 min | 0 | 0 | 0 | 0 | 0 |
| **td** | Defrost type: EL= electrical heater, compressor OFF; in= hot gas, compressor ON | EL-in | – | – | – | EL | EL |
| **dE** | Defrost termination temp. | -55÷50°C/ -67÷99°F | – | – | – | 8.0 °C/ 46 °F | 8.0 °C/ 46 °F |
| **id** | Interval between def. cycles | 0 ÷ 99 h | – | 8 | 8 | 6 | 6 |
| **Md** | Max length for def. When ot= n, not evap. probe: timed def. it sets the def. duration; when ot= y (def. end based on temp.) it sets the max length for def. | 0 ÷ 99 min | – | 20 | 20 | 30 | 30 |
| **dd** | Start defrost delay | 0 ÷ 99 min | – | – | – | 0 | 0 |
| **dF** | Display during def.: rt= real temp.; it= start def. temp; St= SET-POINT; dF= label Df | rt-in-SP-dF | – | it | it | it | it |
| **dt** | Drip time | 0 ÷ 99 min | – | – | – | 0 | 0 |
| **dP** | Defrost at power-on: y= at power on defrost starts; n= defrost doesn't start at power-on | y-n | – | – | – | n | n |
| **FC** | Fans operating mode: cn= in runs with the comp., OFF during def.; on= continuous mode, OFF during def.; cY= runs with the comp, ON during def.; oY= continuous mode, ON during def. | cn–on –cY–oY | – | – | – | – | o-n |
| **Fd** | Fans delay after defrost | 0 ÷ 99 min | – | – | – | – | 10 |
| **FS** | Fans stop temperature | -55÷50°C/ -67÷99°F | – | – | – | – | 2.0 °C/ 36 °F |
| **AU** | Max temperature alarm | ALL÷99°C/ ALL÷99°F | 99 °C/ 99 °F | 99 °C/ 99 °F | 99 °C/ 99 °F | 99 °C/ 99 °F | 99 °C/ 99 °F |
| **AL** | Min temperature alarm | -55°C÷ALU/ -67°F÷ALU | -55 °C/ -55 °F | -55 °C/ -55 °F | -55 °C/ -55 °F | -55 °C/ -55 °F | -55 °C/ -55 °F |
| **Ad** | Temperature alarm delay | 0 ÷ 99 min | 15 | 15 | 15 | 15 | 15 |
| **dA** | Exclusion of temp. alarm at startup | 0 ÷ 99 min | 60 | 90 | 90 | 90 | 90 |
| **tb** | Silencing buzzer: n= silencing disabled, alarm relay stays on till alarm conditions lasts; y= silencing enabled: alarm relay is switched OFF by pressing a key during an alarm | y – n | – | – | y | – | – |
| **o1** | Auxiliary relay configuration: dF= defrost; Fn= Fans; AL= Alarm; AU= auxiliary; db= neutral zone | dF / Fn / AL / Au / db | – | – | AU | – | – |
| **Ap** | Alarm relay polarity: cL= when active is closed; OP= when active is opened | cL – OP | – | – | cL | – | – |
| **iP** | Digital input polarity: oP= activated by closing the contact; cL= activated by opening the contact | cL – oP | cL | cL | cL | – | cL |
| **iF** | Digital input configuration: EA= external alarm: "EA" message is displayed; bA= serious alarm "CA" message is displayed; do= door switch function; dF= def. activation; Au= not used; Hc= inversion of the kind of action | EA / bA / do / dF / Au / db / Hc | EA | EA | do | – | do |
| **di** | Digital input delay. With iF= EL or bA delay between the detection of the external alarm condition and its signalling. With iF= do it represents the delay to activate the door open alarm | 0 ÷ 99 min | 5 | 5 | 15 | – | 15 |
| **dC** | Comp. and fan status when open door: no= normal; Fn= Fans OFF; cP= Comp. OFF; Fc= Comp. and fans OFF | no / Fn / cP / Fc | no | no | no | – | FC |
| **rd** | Regulation with door open: n= no regulation if door is opened; Y= when di is elapsed regulation restarts even if door open alarm is present | n - Y | y | y | y | – | y |
| **d1** | Thermostat probe display | Read only | – | – | – | – | – |
| **d2** | Evaporator probe display | Read only | – | – | – | – | – |
| **Pt** | Parameter code table | Read only | – | – | – | – | – |
| **rL** | Firmware release | Read only | – | – | – | – | – |