Multifunction controller
XR60C - XR60D - XR70D

CONTENTS

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.

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

Models **XR60C**, 32x74 mm format, **XR60D** and **XR70D**, DIN rail format, are a microprocessor based controllers, suitable for applications on medium or low temperature ventilated refrigerating units. They have three relay outputs to control compressor, fan, and defrost, which can be either electrical or reverse cycle (hot gas). The XR70D has an additional relay for alarm signalling. They are also provided with two NTC probe inputs, one for temperature control, the other, to be located onto the evaporator, to control the defrost termination temperature and to managed the fan. The instrument is fully configurable through special parameters that can be easily programmed through the keyboard.

3. CONTROLLING LOADS

3.1 THE 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.
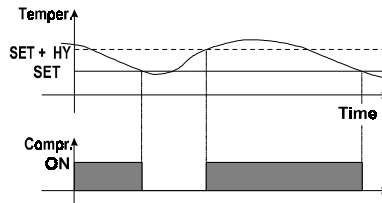
In case of fault in the thermostat probe the start and stop of the compressor are timed through parameters "**COn**" and "**COF**".

3.2 DEFROST

Two defrost modes are available through the "**tdF**" parameter: defrost through electrical heater (tdF = EL) and hot gas defrost (tdF = in). 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).

3.3 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 FAN AND DIGITAL INPUT

When the digital input is used as door switch: **i1F=bAL, nPS=0**, the status of the fan and compressor depends on the **odc** parameter according to the following configuration:
odC=no: normal operating mode; **odC=Fan** Fan OFF; **odC=CPr** = Compressor OFF; **odC=F-C** = Compressor and fan OFF;

4. FRONT PANEL COMMANDS

XR60C

XR60D – XR70D
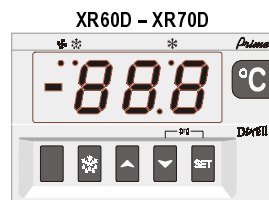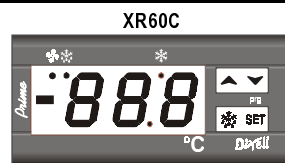
SET: To display target set point; in programming mode it selects a parameter or confirm an operation.

❄ **(DEF)** To start a manual defrost

▲ **(UP)**: To see the max. stored temperature; in programming mode it browses the parameter codes or increases the displayed value.

▼ **(DOWN)**: To see the min stored temperature; in programming mode it browses the parameter codes or decreases the displayed value.

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	-Programming Phase (flashing with ❄) - Anti-short cycle delay enabled
❄	ON	Defrost enabled
❄	Flashing	- Programming Phase (flashing with ❄) - Drip time in progress
✿	ON	Fans enabled
✿	Flashing	Fans delay after defrost in progress.

4.2 HOW TO SEE THE MIN TEMPERATURE

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

4.3 HOW TO SEE THE MAX TEMPERATURE

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

4.4 HOW TO RESET THE MAX AND MIN TEMPERATURE RECORDED

1. Hold press the SET key for more than 3s, while the max. or min temperature is displayed. (rSt message will be displayed)
2. To confirm the operation the "rSt" message starts blinking and the normal temperature will be displayed.

4.5 HOW TO SEE THE SETPOINT

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 seconds to display the probe value again.

4.6 HOW TO CHANGE THE SETPOINT

1. Push the **SET** key for more than 2 seconds to change the Set point value;
2. The value of the set point will be displayed and the ❄ 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.

4.7 HOW TO START A MANUAL DEFROST

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

4.8 HOW TO CHANGE A PARAMETER VALUE

 To change the parameter's value operate as follows:
1. Enter the Programming mode by pressing the Set and DOWN key for 3s (❄ and ❄ start blinking).
2. Select the required parameter.
3. Press the "SET" key to display its value (now only the ❄ LED is blinking).
4. Use "**UP**" or "**DOWN**" to change its value.
5. Press "**SET**" to store the new value and move to the following parameter.

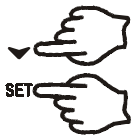**To exit**: Press **SET + UP** or wait 15s without pressing a key.
NOTE: the set value is stored even when the procedure is exited by waiting the time-out to expire.

4.9 THE HIDDEN MENU

The hidden menu includes all the parameters of the instrument.

4.9.1 HOW TO ENTER THE HIDDEN MENU

1. Enter the Programming mode by pressing the Set + ⌄ key for 3s (LED 1 and ❄ start blinking).
2. When a parameter is displayed keep pressed the Set+ ⌄ for more than 7s. The Pr2 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 (Now only the ❄ LED is blinking).
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.

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

4.9.2 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.

4.10 HOW TO LOCK THE KEYBOARD

1. Keep pressed for more than 3 s the UP and DOWN keys.
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 key is pressed more than 3s the "POF" message will be displayed.

4.11 TO UNLOCK THE KEYBOARD

Keep pressed together for more than 3s the UP and DOWN keys.

4.12 THE CONTINUOUS CYCLE

When defrost is not in progress, it can be activated by holding the " ⌃ " key pressed for about 3 seconds. The compressor operates in continuous mode 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 " ⌃ " for 3 seconds.

5. PARAMETERS

NOTE: the parameters preceded by dots are only in the Hidden Menu.

REGULATION

Hy Differential: (0,1 ÷ 25,5°C / 1÷255 °F) Intervention differential for set point. Compressor Cut IN is Set Point Plus Differential (Hy). Compressor Cut OUT is when the temperature reaches the set point.

- **LS Minimum set point**: (-50°C÷SET/-58°F÷SET): Sets the minimum acceptable value for the set point.
- **US Maximum set point**: (SET÷110°C/ SET÷230°F). Set the maximum acceptable value for set point.

Ot Thermostat probe calibration: (-12.0÷12.0°C; -120÷120°F) allows to adjust possible offset of the thermostat probe.

P2P Evaporator probe presence: n= not present: the defrost stops by time; y= present: the defrost stops by temperature.

- **OE Evaporator probe calibration**: (-12.0÷12.0°C; -120÷120°F). allows to adjust possible offset of the evaporator probe.
- **OdS Outputs activation delay at start up**: (0÷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: (0÷50 min) minimum interval between the compressor stop and the following restart.

- **CCt Compressor ON time during continuous cycle**: (0.0÷24.0h; res. 10min) Allows to set the length of the continuous cycle: compressor stays on without interruption for the CCt time. Can be used, for instance, when the room is filled with new products.
- **COn Compressor ON time with faulty probe**: (0÷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÷255 min) 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=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.

- **Prd Evaporator probe read out**: it shows the temperature of the evaporator probe.

DEFROST

tdF Defrost type: EL = electrical heater; in = hot gas

dtE Defrost termination temperature: (-50÷50 °C/ -58÷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÷120h) Determines the time interval between the beginning of two defrost cycles.

MdF (Maximum) length for defrost: (0÷255min) 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.

- **dFd Temperature displayed during defrost**: (rt = real temperature; it = temperature at defrost start; SEt = set point; dEF = "dEF" label)
- **dAd MAX display delay after defrost**: (0÷255min). Sets the maximum time between the end of defrost and the restarting of the real room temperature display.
- **Fdt Drip time**: (0÷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**: (y = immediately; n = after the IdF time)
- **dAF Defrost delay after continuous cycle**: (0÷23.5h) time interval between the end of the fast freezing cycle and the following defrost related to it.

FANS

FnC Fans operating mode:
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÷255min) Time interval between end of defrost and evaporator fans start.

FSt Fans stop temperature: (-50÷50°C/122°F) setting of temperature, detected by evaporator probe, above which fans are always OFF.

ALARMS

- **ALC Temperature alarms configuration**: (Ab; rE) **Ab**= absolute temperature: alarm temperature is given by the ALL or ALU values. **rE** = temperature alarms are referred to the set point. Temperature alarm is enabled when the temperature exceeds the "SET+ALU" or "SET-ALL" values.

ALU MAXIMUM temperature alarm: (SET÷110°C; SET÷230°F) when this temperature is reached the alarm is enabled, after the "ALd" delay time.

ALL Minimum temperature alarm: (-50.0 ÷ SET°C; -58÷230°F when this temperature is reached the alarm is enabled, after the "ALd" delay time.

- **ALd Temperature alarm delay**: (0÷255 min) time interval between the detection of an alarm condition and alarm signalling.
- **dAO Exclusion of temperature alarm at startup**: (from 0.0 min to 23.5h) time interval between the detection of the temperature alarm condition after instrument power on and alarm signalling.

DIGITAL INPUT

i1P Digital input polarity: **oP**: the digital input is activated by opening the contact; **CL**: the digital input is activated by closing the contact.

i1F Digital input configuration:
EAL = external alarm: "EA" message is displayed;
bAL = the kind of action depends on the Nps value.
dEF = activation of a defrost cycle;
AUS =not enabled.

did Digital input alarm delay: (0÷255 min) delay between the detection of the external alarm condition (i1F= EAL or i1F = bAL) and its signalling.

- **Nps kind of action when i1F=bAL.** (0÷15). When i1F=bAL, the action of the controller depends on the Nps parameter.
  Nps=0: door-switch: when the digital input is enabled fans and compressor are switched off.
  Nps=1 lock alarm: when the digital input is enabled all the outputs are switched off and the regulation is locked (after the did delay).
  Nps=2÷15: pressure-switch function: when the digital input is enabled the regulation is locked (all the outputs off), if the d.i. is activated Nps times in the did interval, the instrument is definetively lock. To restart the regulation switch the instrument off and on.
- **odc Compressor and fan status when open door**: **no** = normal; **Fan** = Fan OFF; **CPr** = Compressor OFF; **F_C** = Compressor and fan OFF.
- **Ptb Parameter table code**: readable only.
- **rEL Software release** for internal use.

6. INSTALLATION AND MOUNTING

Instrument **XR60C** shall be mounted on panel, in a 29x71 mm hole, and fixed using the special bracket supplied.
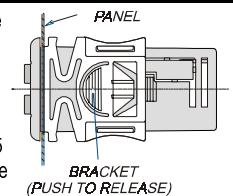
To obtain an IP65 protection grade use the front panel rubber gasket (mod. RG-C) as shown in figure.
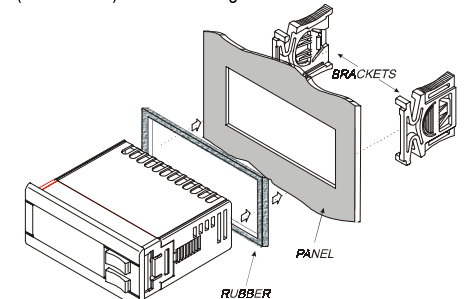
Instruments **XR60D** and **XR70D** shall be mounted on an omega DIN rail

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.

7. ELECTRICAL CONNECTIONS

The instrument is provided with screw terminal block to connect cables with a cross section up to 2,5 mm². 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.

7.1 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.

8. ALARM SIGNALS

Message	Cause	Outputs
"EE"	Data or memory failure	
"P1"	Room probe failure	Compressor output according to par. "Con" and "COF"
"P2"	Evaporator probe failure	Defrost end is timed
"HA"	Maximum temperature alarm	Outputs unchanged.
"LA"	Minimum temperature alarm	Outputs unchanged.
"EA"	External alarm	Output unchanged.
"CA"	Serious external alarm	All outputs OFF.

8.1 ALARM "EE"

The instrument is provided with an internal check verifying memory integrity. Alarm "EE" flashes when a failure in the internal memory is detected. In such case call the service.

8.2 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 thermostat temperature returns to normal values and when defrost starts.
Alarm "EA" recovers as soon as the digital input is disabled.
Alarm "CA" recovery depends on the value of Nps par.
- with Nps=1 "CA" recovers automatically as soon as the digital input is disabled.
- with Nps>1 "CA" recover only if the instrument is **switch off and on**.

9. TECHNICAL DATA

Housing: self extinguishing ABS.
Case: XR60C frontal 32x74 mm; depth 60mm;
XR60D, XR70D 4 DIN modules 70x85 mm; depth 61mm
Mounting
    XR60C panel mounting in a 71x29mm panel cut-out
    XR60D, XR70D DIN RAIL mounted in a omega (3) din rail
Protection: IP20.
Frontal protection:
    XR60C IP65 with frontal gasket RG-C (optional).
Connections: Screw terminal block ≤ 2,5 mm² wiring.
Power supply: according to the model: 12Vac/dc, ±10%; 24Vac/dc, ±10%; 230Vac ±10%, 50/60Hz, 110Vac ±10%, 50/60Hz
Power absorption: 3VA max
Display: 3 digits, red LED, 14,2 mm high.
Inputs: 2 NTC probes.
Relay outputs
    compressor: SPDT relay 8(3) A, 250Vac or SPST relay 20(8)A; 250Vac
    defrost: SPDT relay 8(3) A, 250Vac
    fan: SPST relay 8(3) A, 250Vac
    alarm: SPDT relay 8(3) A, 250Vac
Data storing: on the non-volatile memory (EEPROM).
Kind of action: 1B.
Pollution grade: normal
Software class: A.
Operating temperature: 0÷60 °C.
Storage temperature: -30÷85 °C.
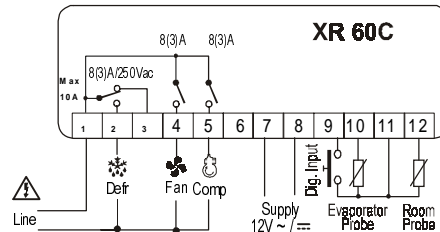**Relative humidity:** 20÷85% (no condensing)
Measuring and regulation range:
    -40÷110°C (-58÷230°F)
Resolution: 0,1 °C or 1°C or 1 °F (selectable).
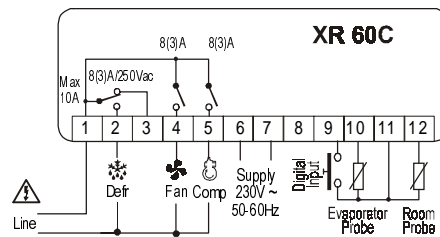**Accuracy (ambient temp. 25°C):** ±0,7 °C ±1 digit

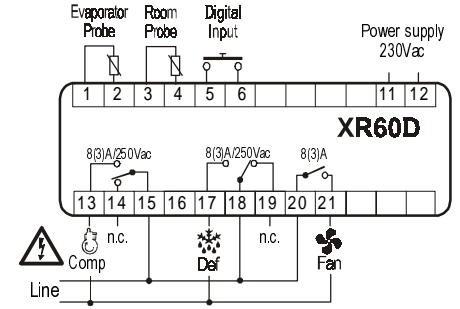### 10. CONNECTIONS

10.1 XR60C: 12VAC/DC; COMPRESS. 8A

24Vac: supply the instrument to the terminals 7 - 8.
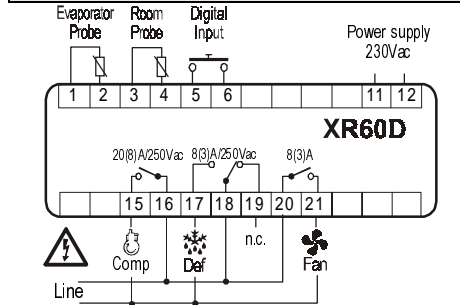
10.2 XR60C: 230VAC; COMPRESS. 8A

120Vac: supply the instrument to the terminals 6 - 7.

10.3 XR60D: COMPRESSOR 8A

24Vac: supply the instrument to the terminals 11 - 12.
120Vac: supply the instrument to the terminals 11 - 12.

10.4 XR60D: COMPRESSOR 20A

24Vac: supply the instrument to the terminals 11 - 12.
120Vac: supply the instrument to the terminals 11 - 12.
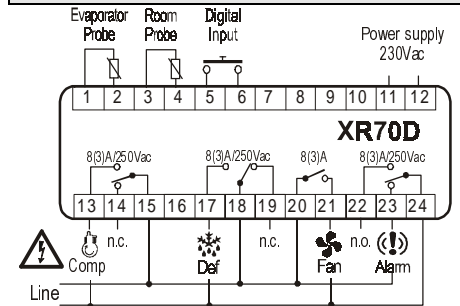
10.5 XR70D: COMPRESSOR 8A

24Vac: supply the instrument to the terminals 11 - 12.
120Vac: supply the instrument to the terminals 11 - 12.
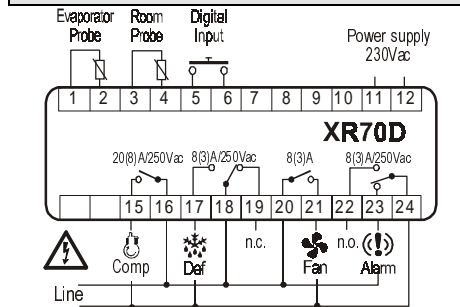
10.6 XR70D: COMPRESSOR 20A

24Vac: supply the instrument to the terminals 11 - 12.
120Vac: supply the instrument to the terminals 11 - 12.

11.   DEFAULT SETTING VALUES

Label	Name	Range	°C/°F
Set	Set point	LS÷US	-5/0
Hy	Differential	0,1÷25.5°C/ 1÷ 255°F	2/4
LS	Minimum set point	-50°C÷SET/-58°F÷SET	-50/-58
US	Maximum set point	SET÷110°C/ SET ÷ 230°F	110/230
Ot	Thermostat probe calibration	-12÷12°C /-120÷120°F	0
P2P	Evaporator probe presence	n=not present; Y=pres.	y
OE	Evaporator probe calibration	-12÷12°C /-120÷120°F	0
OdS	Outputs delay at start up	0÷255 min	0
AC	Anti-short cycle delay	0 ÷ 50 min	1
CCt	Continuos cycle duration	0.0÷24.0h	0.0
COn	Compressor ON time with faulty probe	0 ÷ 255 min	15
COF	Compressor OFF time with faulty probe	0 ÷ 255 min	30
CF	Temperature measurement unit	°C ÷ °F	°C/°F
rES	Resolution	in=integer; dE= dec.point	dE/-
Prd	Second probe read out	--	--
tdF	Defrost type	EL=el. heater; in= hot gas	EL
dtE	Defrost termination temperature	-50 ÷ 50 °C	8/46
IdF	Interval between defrost cycles	1 ÷ 120 ore	6
MdF	(Maximum) length for defrost	0 ÷ 255 min	30
dFd	Displaying during defrost	rt, it, SEt, DEF	it
dAd	MAX display delay after defrost	0 ÷ 255 min	30
Fdt	Draining time	0÷120 min	0
dPo	First defrost after startup	n=after IdF; y=immed.	n
dAF	Defrost delay after fast freezing	0 ÷ 23h e 50'	0.0
Fnc	Fan operating mode	C-n, o-n, C-y, o-Y	o-n
Fnd	Fan delay after defrost	0÷255min	10
FSt	Fan stop temperature	-50÷50°C/-58÷122°F	2/35
ALc	Temperat. alarms configuration	rE= related to set; Ab = absolute	Ab
ALU	MAXIMUM temperature alarm	Set÷110.0°C; Set÷230°F	110/230
ALL	Minimum temperature alarm	-50.0°C÷Set/ -58°F÷Set	-50/-58
ALd	Temperature alarm delay	0 ÷ 255 min	15
dAO	Delay of temperature alarm at start up	0 ÷ 23h e 50'	1.30
i1P	Digital input polarity	oP=opening;CL=closing	CL
i1F	Digital input configuration	EAL=extern. ALr bAL=lock regulat dEF=defrost; AUS=disabled	bAL
did	Digital input alarm delay	0÷255min	5
Nps	Kind of action when i1F=bAL	0 = door-switch 1 = lock regulation 2÷15 = pressure -switch	0
odc	Compressor and fan status when open door:	no = normal; Fan = Fan OFF; CPr = Compr. OFF; F_C = Compr & fan OFF	F-C
rEL	Software release	--	2.7
Ptb	Map code	--	-

Hidden parameters

CE   EN 03 XR60C   c UL US XR60C 120Vac