

## Digital controller for medium-low temperature refrigeration applications

### XW20LT

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## 1. GENERAL WARNING

### 1.1 PLEASE READ BEFORE USING THIS MANUAL

- This manual is part of the product and should be kept near the instrument for easy and quick reference.
- The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device.
- Check the application limits before proceeding.
- Dixell Srl reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.

### 1.2 SAFETY PRECAUTIONS

- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation
- Warning: disconnect all electrical connections before any kind of maintenance.
- Fit the probe where it is not accessible by the End User. The instrument must not be opened.
- In case of failure or faulty operation send the instrument back to the distributor or to "Dixell Srl" (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 **XW20LT**, format 38x185mm, is microprocessor based controller, suitable for applications on medium or low temperature ventilated refrigerating units. It has 2 relay outputs to control compressor and light. It could be provided with a Real Time Clock which allows programming of up to 6 daily defrost cycles, divided into holidays and workdays. A "Day and Night" function with two different set points is fitted for energy saving. It is also provided with up to four NTC or PTC 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. One of the 2 digital inputs can operate as third temperature probe. The fourth probe is used to signal the condenser temperature alarm or to display a temperature.

The HOT KEY output allows connecting the unit, by means of the external module XJ485-CX, to a network line ModBUS-RTU compatible such as the **dixell** monitoring units of X-WEB family. It allows programming the controller by means the HOT KEY programming keyboard.

The instrument is fully configurable through special parameters that can be easily programmed through the keyboard.

## 3. CONTROLLING LOADS

### 3.1 COMPRESSOR

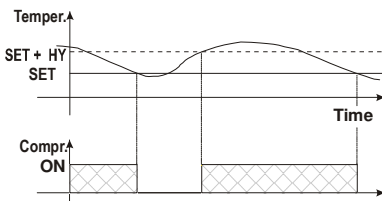
The regulation is performed according to the temperature measured by the thermostat probe with a positive differential from the set point: if the temperature increases and reaches set point plus differential the compressor is started and then turned off when the temperature reaches the set point value again.

In case of fault in the thermostat probe the start and stop of the compressor are timed through parameters **Con** and **CoF**.

### 3.2 DEFROST

Two defrost modes are available through the **tdF** parameter (when present): defrost through electrical heater (**tdF = EL**) and hot gas defrost (**tdF = in**). If **tdF** is not present, the defrost is controlled with time or temperature. If the RTC is present it is controlled by means of parameter **EdF**:

- EdF=in**: a defrost starts after elapsing the **idF** time (standard way for controller without RTC and with not visible **EdF** parameter).



- EdF=rtC**: defrosts are scheduled by using a real time clock system, depending on the hours set in the parameters **Ld1..Ld6**, during workdays, and in **Sd1...Sd6** during holidays.

Other parameters are used to control defrost cycles: its maximum length (**MdF**) and two defrost modes: timed or controlled by the evaporator's probe, depending on which probe is present (parameter **PxP**) and enable for defrost (**dFP=PxP**).

At the end of defrost dripping time is started, its length is set in the **Fdt** parameter. With **Fdt=0** the dripping time is disabled.

## 3.3 AUXILIARY OUTPUT CONFIGURATION

The functioning of the auxiliary relay (default terminals 1-3) can be set by the **oA3** parameters according to the kind of application. In the following paragraph the possible settings are explained.

### 3.3.1 Auxiliary thermostat

A possible use is the anti condensing heater, with the possibility of switching it on and off also by keyboard.

Parameters involved:

- ACH**: kind of regulation for the auxiliary relay: **Ht**: heating; **cL**: cooling;
- SAA**: set point for auxiliary relay;
- SHy**: differential for auxiliary relay;
- ArP**: probe for auxiliary relay;
- Sdd**: auxiliary output off during defrost.

The differential is given by the **SHy** parameter.

The auxiliary relay can be switched on also by using the AUX button. In this case it remains on till it's manually switched off.

**NOTE**: If **oA3=US** and **ArP=nP** (no probe for auxiliary output), the AUX relay can be activated only by pushing the AUX button of the keyboard.

### 3.3.2 On/off relay – oA3 = onF

In this case the relay is activated when the controller is turned on and de-activated when the controller is turned off.

### 3.3.3 Neutral zone regulation

With **oA3=db** the AUX relay can control a heater element to perform a neutral zone action.

- output **oAx** cut in = SET-HY;
- output **oAx** cut out = SET.

### 3.3.4 Second compressor

With **oA3=CP2**, the AUX relay operates as second compressor: it is activated in parallel with the relay of the first compressor, with a proper activation delay (set in the **AC1** parameter). Both the compressors are switched off at the same time.

### 3.3.5 Alarm relay

With **oA3=ALr** the AUX relay operates as alarm relay. It is activated every time an alarm happens. Its status depends on the **tbA** parameter:

- tbA=Y**: the relay is silenced by pressing any key;
- tbA=N**: the alarm relay remains on until the alarm condition recovers.

### 3.3.6 Night blind management during energy saving cycles

With **oA3=HES** the AUX relay operates to manage the night blind: the relay is energised when the energy saving cycle is activated by digital input, frontal button or RTC (optional).

## 4. FRONT PANEL 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 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.
	(OFF) To switch the instrument off, if onF=onFF.
	(LiG) To switch the light, if oAx=LiG.

### KEY COMBINATIONS:

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

## 4.1 USE OF LEDS

Each LED function is described in the following table.

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

## 5. AUTOMATIC KEYBOARD LOCK

To avoid accidental modifications of the controller settings, the XW20LT keyboard will be locked automatically if no key will be touched for 60 seconds. The XW20LT will show "LoC" flashing for few seconds when it's locking. The light key is operating even if the keyboard is locked.

### 5.1 TO UNLOCK THE KEYBOARD

1. Touch any key.
2. The keys will be lighted.
3. Keep a key pushed for few seconds till the "on" message is displayed.

## 6. MAX & MIN TEMPERATURE MEMORIZATION

### 6.1 HOW TO SEE THE MIN TEMPERATURE

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

### 6.2 HOW TO SEE THE MAX TEMPERATURE

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

### 6.3 HOW TO RESET THE MAX AND MIN TEMPERATURE RECORDED

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

## 7. MAIN FUNCTIONS


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

When the instrument is switched on, it's necessary to program the time and day.

1. Enter the Pr1 programming menu, by pushing the **SET+DOWN** keys for 3 sec.
2. The rTc parameter is displayed. 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.

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


### 7.2 HOW TO SEE THE SET POINT

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

### 7.3 HOW TO CHANGE THE SETPOINT

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

### 7.4 HOW TO START A MANUAL DEFROST

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- Push the **DEF** key more than 2 sec and to start a manual defrost.

### 7.5 HOW TO CHANGE A PARAMETER VALUE

To change any parameter, operate as follows:

1. Enter the Programming mode by pressing both **SET+DOWN** keys for 3 sec (the "°C" or "°F" LED will start blinking).
2. Select the required parameter and then press the **SET** key to display its value.
3. Use **UP** or **DOWN** keys to change its value.
4. Press **SET** to store the new value and move to the following parameter.

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

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

### 7.6 THE HIDDEN MENU

The hidden menu shows all the parameters of the instrument.

#### 7.6.1 HOW TO ENTER THE HIDDEN MENU (Pr2)

1. Enter the Programming mode by pressing the **SET+DOWN** keys for 3 sec (the "°C" or "°F" LED will start blinking).
2. Released the keys and then push again the **SET+DOWN** keys more than 7 sec. The "Pr2" label will be displayed immediately followed by the **HY** parameter.  
**NOW THE HIDDEN MENU IS DISPLAYED.**

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

To exit: press **SET+UP** keys or waiting for 15 sec without pressing any key.

NOTE1: if no parameters are present in Pr1, after 3 sec the "noP" message will be displayed. Keep the keys pushed till the Pr2 message is displayed.


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

#### 7.6.2 MOVE A PARAMETER FROM Pr2 TO Pr1 AND VICEVERSA.

Each parameter present in the Pr2 (HIDDEN MENU) can be moved to the Pr1 (user level) by pressing both **SET+DOWN** keys.

When in Pr2 (hidden menu) if a parameter is visible in Pr1, then the decimal point will be on.

## 7.7 MANUALLY LOCK AND UNLOCK THE KEYBOARD



**HOW TO LOCK THE KEYBOARD**

1. Keep both **UP+DOWN** keys pressed more than 3 sec.
2. The "PoF" message will be displayed and the keyboard is locked. At this point it is only possible the viewing of the set point or the MAX o Min temperature stored and to switch ON and OFF the light, the auxiliary output and the instrument.


**HOW TO UNLOCK THE KEYBOARD**

Keep both **UP+DOWN** keys pressed more than 3 sec.

## 7.8 THE CONTINUOUS CYCLE

When defrost is not active, a continuous cycle can be activated by keeping the **UP** key pressed for about 3 sec. The compressor operates to maintain the **CCS** set point for the time set through the **CCT** parameter. The cycle can be terminated before the end of the set time by keeping the **UP** key pressed 3 sec.

## 7.9 THE ON/OFF FUNCTION



With **onF=OFF**, after pushing the **ON/OFF** key the instrument is switched off. The "OFF" message will be displayed. In this configuration the regulation is disabled.

To switch the instrument on, push again the **ON/OFF** key.

**WARNING:** Loads connected to the normally closed contacts of the relays are always supplied and under voltage, even if the instrument is in stand by mode.

## 8. PARAMETERS

rTc	Real time clock menu (only for controller with RTC): to set the time, date and defrost start time.
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### REGULATION

HY	Differential: (0.1 to 25.5°C; 1 to 45°F) intervention differential for set point. Compressor Cut IN is Set Point + differential (HY). Compressor Cut OUT is when the temperature reaches the set point.
LS	Minimum set point: (-55°C to SET; -67°F to SET) sets the minimum value for the set point.
US	Maximum set point: (SET to 150°C; SET to 302°F) set the maximum value for set point.
ot	Thermostat probe calibration: (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the thermostat probe.
P2P	Evaporator probe presence: (n; Y) n = not present, the defrost stops by time; Y = present, the defrost stops by temperature.
oE	Evaporator probe calibration: (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the evaporator probe.
P3P	Third probe presence (P3): (n; Y) n = not present, the terminals 18-20 operate as digital input; Y = present, the terminals 18-20 operate as third probe.
o3	Third probe calibration (P3): (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the third probe.
P4P	Fourth probe presence: (n; Y) n = Not present; Y = present.
o4	Fourth probe calibration: (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the fourth probe.
odS	Outputs activation delay at start up: (0 to 255min) this function is enabled at the initial start up of the instrument and inhibits any output activation for the period of time set in the parameter.
AC	Anti-short cycle delay: (0 to 50min) minimum interval between the compressor stop and the following restart.
rtr	Percentage of the second and first probe for regulation: (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	Compressor ON time during continuous cycle: (0.0 to 24h00min, res. 10min) allows to set the length of the continuous cycle. Compressor stays on without interruption during CCT time. This is useful, for instance, when the room is filled with new products.
CCS	Set point for continuous cycle: (-55 to 150°C; -67 to 302°F) it sets the set point used during the continuous cycle.
Con	Compressor ON time with faulty probe: (0 to 255min) time during which the compressor is active in case of faulty thermostat probe. With <b>Con=0</b> compressor is always OFF.
CoF	Compressor OFF time with faulty probe: (0 to 255min) time during which the compressor is OFF in case of faulty thermostat probe. With <b>CoF=0</b> compressor is always active.
CH	Type of regulation: (CL; Ht) CL=cooling; Ht=heating.

### DISPLAY

CF	Temperature measurement unit: (°C; °F) °C = Celsius; °F = Fahrenheit. <b>WARNING:</b> When the measurement unit is changed the SET point and the values of the parameters HY, LS, US, ot, ALU and ALL have to be checked and modified (if necessary).
rES	Resolution (for °C): (in=1°C; dE=0.1°C) allows decimal point display.
Lod	Instrument display: (P1; P2, P3, P4, SET, dtr) it selects which probe is displayed by the instrument. P1 = Thermostat probe; P2 = Evaporator probe; P3 = Third probe (only for model with this option enabled); P4 = Fourth probe, SET = set point; dtr = percentage of visualization.
rEd	X-REP display (optional): (P1; P2, P3, P4, SET, dtr) it selects which probe is displayed by X- REP. P1 = Thermostat probe; P2 = Evaporator probe; P3 = Third probe (only for model with this option enabled); P4 = Fourth probe, SET = set point; dtr = percentage of visualization.
dLY	Display delay: (0 to 20min00s; res. 10s) when the temperature increases, the display is updated of 1°C or 1°F after this time.
dtr	Percentage of the second and first probe for visualization when Lod=dtr: (0 to 99; 100=P1, 0=P2) if Lod=dtr it allows to set the visualization according to the percentage of the first and second probe, as for the following formula (dtr(P1-P2)/100 + P2).

DEFROST	
dFP	<b>Probe selection for defrost termination:</b> (nP; P1; P2; P3; P4) nP = no probe; P1 = thermostat probe; P2 = evaporator probe; P3 = configurable probe; P4 = Probe on Hot Key plug.
dtE	<b>Defrost termination temperature:</b> (-55 to 50°C; -67 to 122°F) (enabled only when EdF=Pb) sets the temperature measured by the evaporator probe, which causes the end of defrost.
idF	<b>Interval between defrost cycles:</b> (0 to 120hours) determines the interval of time between two defrost cycles.
MdF	<b>(Maximum) length for defrost:</b> (0 to 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.
dSd	<b>Start defrost delay:</b> (0 to 99min) this is useful when different defrost start times are necessary to avoid overloading the plant.
dFd	<b>Temperature displayed during defrost:</b> (rt; it; SET; dEF) rt = real temperature; it = temperature at defrost start; SET = set point; dEF = "dEF" label.
dAd	<b>MAX display delay after defrost:</b> (0 to 255min) sets the maximum time between the end of defrost and the restarting of the real room temperature display.
CF	<b>Temperature measurement unit:</b> (°C; °F) °C = Celsius; °F = Fahrenheit. <b>WARNING:</b> 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).
Fdt	<b>Drip time:</b> (0 to 120min) 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	<b>First defrost after start-up:</b> (n; Y) n = after the idF time, Y = immediately.
dAF	<b>Defrost delay after continuous cycle:</b> (0.0 to 24h00min, res. 10min) time interval between the end of the fast freezing cycle and the following defrost related to it.

AUXILIARY THERMOSTAT CONFIGURATION – OAx = AUS	
ACH	<b>Kind of regulation for auxiliary relay:</b> (Ht; CL) Ht = heating; CL = cooling.
SAA	<b>Set Point for auxiliary relay:</b> (-55.0 to 150.0°C; -67 to 302°F) it defines the room temperature set point to switch auxiliary relay.
SHY	<b>Differential for auxiliary output:</b> (0.1 to 25.5°C; 1 to 45°F) intervention differential for auxiliary output set point. <ul style="list-style-type: none"> <li>ACH=CL, AUX Cut in is [SAA+SHY]; AUX Cut out is SAA.</li> <li>ACH=Ht, AUX Cut in is [SAA-SHY]; AUX Cut out is SAA.</li> </ul>
ArP	<b>Probe selection for auxiliary:</b> (nP; P1; P2; P3; P4) nP = no probe, the auxiliary relay is switched only by the digital input; P1 = Probe 1 (Thermostat probe); P2 = Probe 2 (evaporator probe); P3 = Probe 3 (display probe); P4 = Probe 4.
Sdd	<b>Auxiliary relay off during defrost:</b> (n; Y) n = the auxiliary relay operates during defrost. Y = the auxiliary relay is switched off during defrost.

ALARMS	
ALP	<b>Probe selection for alarm:</b> (nP; P1; P2; P3; P4) nP = no probe, the temperature alarms are disabled; P1 = Probe 1 (Thermostat probe); P2 = Probe 2 (evaporator probe); P3 = Probe 3 (display probe); P4 = Fourth probe.
ALC	<b>Temperature alarms configuration:</b> (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	<b>MAXIMUM temperature alarm:</b> <ul style="list-style-type: none"> <li>If ALC=Ab: [ALL to 150.0°C or ALL to 302°F]</li> <li>If ALC=rE: [0.0 to 50.0°C or 0 to 90°F]</li> </ul> when this temperature is reached the alarm is enabled, after the ALd delay time.
ALL	<b>Minimum temperature alarm:</b> <ul style="list-style-type: none"> <li>If ALC=Ab: [-55°C to ALU; -67 to ALU]</li> <li>If ALC=rE: [0.0 to 50.0°C or 0 to 90°F]</li> </ul> when this temperature is reached the alarm is enabled, after the ALd delay time.
AFH	<b>Differential for temperature alarm recovery:</b> (0.1 to 25.5°C; 1 to 45°F) intervention differential for recovery of temperature alarm.
ALd	<b>Temperature alarm delay:</b> (0 to 255 min) time interval between the detection of an alarm condition and alarm signalling.
dAo	<b>Exclusion of temperature alarm at start-up:</b> (0.0 to 24h00min, res. 10min) time interval between the detection of the temperature alarm condition after instrument power on and alarm signalling.

CONDENSER TEMPERATURE ALARM	
AP2	<b>Probe selection for temperature alarm of condenser:</b> (nP; P1; P2; P3; P4) nP = no probe; P1 = thermostat probe; P2 = evaporator probe; P3 = configurable probe; P4 = Probe on Hot Key plug.
AL2	<b>Low temperature alarm of condenser:</b> (-55 to 150°C; -67 to 302°F) when this temperature is reached the LA2 alarm is signalled, possibly after the Ad2 delay.
Au2	<b>High temperature alarm of condenser:</b> (-55 to 150°C; -67 to 302°F) when this temperature is reached the HA2 alarm is signalled, possibly after the Ad2 delay.
AH2	<b>Differential for temperature condenser alarm recovery:</b> 0.1 to 25.5°C; 1 to 45°F
Ad2	<b>Condenser temperature alarm delay:</b> (0 to 255 min) time interval between the detection of the condenser alarm condition and alarm signalling.
dA2	<b>Condenser temperature alarm exclusion at start up:</b> 0.0 to 24h00min, res. 10min.
bLL	<b>Compressor off with low temperature alarm of condenser:</b> (n; Y) n = compressor keeps on working; Y = compressor is switched off till the alarm is present, in any case regulation restarts after AC time at minimum.
AC2	<b>Compressor off with high temperature alarm of condenser:</b> (n; Y) n = compressor keeps on working; Y = compressor is switched off till the alarm is present, in any case regulation restarts after AC time at minimum.

AUXILIARY RELAYS	
tbA	<b>Alarm relay silencing (with oAx =ALr):</b> (n; Y) n = silencing disabled: alarm relay stays on till alarm condition lasts. Y = silencing enabled: alarm relay is switched OFF by pressing a key during an alarm.

oA3	<b>Third relay configuration (1-3):</b> (dEF; FAn; ALr; LiG; AUS; onF; db; dEF2; HES) dEF = defrost; FAn = do not select it; ALr = alarm; LiG = light; AUS = Auxiliary relay; onF = always on with instrument on; db = neutral zone; dEF2 = do not select it; HES = night blind.
AoP	<b>Alarm relay polarity:</b> (CL; oP) it set if the alarm relay is open or closed when an alarm occurs. CL = terminals closed during an alarm; oP = terminals open during an alarm.

DIGITAL INPUTS	
i1P	<b>First digital input polarity:</b> (oP; CL) oP = the digital input is activated by opening the contact; CL = the digital input is activated by closing the contact.
i1F	<b>First digital input configuration:</b> (EAL; bAL; PAL; dor; dEF; ES; AUS; Htr; FAn; HdF; onF; Sbt) EAL = external alarm: "EA" message is displayed; bAL = serious alarm "CA" message is displayed; PAL = pressure switch alarm, "CA" message is displayed; dor = door switch function; dEF = activation of a defrost cycle; ES = energy saving; AUS = auxiliary relay activation with oA2=AUS; Htr = type of inverting action (cooling or heating); FAn = fan; HdF = Holiday defrost (enable only with RTC); onF = to switch the controller off; Sbt = to activate Sabbath mode.
i2P	<b>Second digital input polarity:</b> (oP; CL) oP = the digital input is activated by opening the contact; CL = the digital input is activated by closing the contact.
i2F	<b>Second digital input configuration:</b> (EAL; bAL; PAL; dor; dEF; ES; AUS; Htr; FAn; HdF; onF; Sbt) EAL = external alarm: "EA" message is displayed; bAL = serious alarm "CA" message is displayed; PAL = pressure switch alarm, "CA" message is displayed; dor = door switch function; dEF = activation of a defrost cycle; ES = energy saving; AUS = auxiliary relay activation with oA2=AUS; Htr = type of inverting action (cooling or heating); FAn = fan; HdF = Holiday defrost (enable only with RTC); onF = to switch the controller off; Sbt = to activate Sabbath mode.
did	<b>Digital input 1 alarm delay:</b> (0 to 255 min) delay between the detection of the external alarm condition and its signalling. When i1F= PAL, it is the interval of time to calculate the number of pressure switch activation.
doA	<b>Door open alarm delay:</b> 0 to 255 min.
nPS	<b>Number of pressure switch activation:</b> (0 to 15) Number of activation, during the did or d2d interval, before signalling an alarm event (i1F, i2F=PAL). If the nPS activation during did or d2d time is reached, switch off and on the instrument to restart normal regulation.
odC	<b>Compressor status when open door:</b> (no; FAn; CP; F_C;) no = normal; FAn = normal; CP = compressor OFF; F_C = compressor OFF.
rrd	<b>Outputs restart after door open alarm:</b> (n; Y) n = outputs follow the odC parameter. Y = outputs restart with a door open alarm.
HES	<b>Delta temperature during an Energy Saving cycle:</b> (-30.0 to 30.0°C; -54 to 54°F) it sets the increasing value of the set point [SET+HES] during the Energy Saving cycle.

CURRENT TIME AND WEEKLY HOLIDAYS (ONLY FOR MODELS WITH RTC)	
Hur	<b>Current hour:</b> 0 to 23h.
Min	<b>Current minute:</b> 0 to 59min.
dAY	<b>Current day:</b> Sun to SAT.
Hd1	<b>First weekly holiday:</b> (Sun to nu) set the first day of the week which follows the holiday times.
Hd2	<b>Second weekly holiday:</b> (Sun to nu) set the second day of the week which follows the holiday times.

N.B.: Hd1, Hd2 can be set also as "nu" value (Not Used).

ENERGY SAVING TIMES (only for models with rtc)	
ILE	<b>Energy Saving cycle start during workdays:</b> (0 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	<b>Energy Saving cycle length during workdays:</b> (0 to 24h00min) sets the duration of the Energy Saving cycle on workdays.
ISE	<b>Energy Saving cycle start on holidays:</b> 0 to 23h50min.
dSE	<b>Energy Saving cycle length on holidays:</b> 0 to 24h00min.

TO SET DEFROST TIMES (ONLY FOR MODELS WITH RTC)	
Ld1+Ld6	<b>Workday defrost start:</b> (0 to 23h50min) these parameters set the beginning of the 6 programmable defrost cycles during workdays. Ex: when Ld2=12.4 the second defrost starts at 12.40 during workdays.
Sd1+Sd6	<b>Holiday defrost start:</b> (0 to 23h50min) these parameters set the beginning of the 6 programmable defrost cycles on holidays. Ex: when Sd2=3.4 the second defrost starts at 3.40 on holidays.

N.B.: to disable a defrost cycle set it to "nu" (not used).

OTHER	
LoC	<b>Lock keyboard timer:</b> nu(9) = keyboard never blocked, or 10 to 255 sec
Adr	<b>Serial address:</b> (1 to 247) identifies the instrument address when connected to a ModBUS compatible monitoring system.
PbC	<b>Type of probe:</b> (PtC; nTC) it allows to set the kind of probe used by the instrument. PtC = PTC probe, nTC = NTC probe.
onF	<b>On/Off key enabling:</b> (nU; oFF; ES) nU = disabled; oFF = enabled; ES = not set it.
dP1	Thermostat probe display.
dP2	Evaporator probe display.
dP3	Third probe display.
dP4	Fourth probe display.
rSE	Real set point: it shows the set point used during the energy saving cycle or during the continuous cycle.
rEL	Software release for internal use.
Ptb	Parameter table code: readable only.



## 9. DIGITAL INPUTS

The first digital input (terminals 13-14) is enabled if **P3P=n**.  
With **P3P=n** and **i1F=i2F** the second digital input will be disabled.  
The free voltage digital inputs are programmable by the **i1F** and **i2F** parameters.

### 9.1 GENERIC ALARM (i1F or i2F = 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 deactivated.

### 9.2 SERIOUS ALARM MODE (i1F or i2F = 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 deactivated.

### 9.3 PRESSURE SWITCH (i1F or i2F = PAL)

If during the interval time set by **did** parameter, the pressure switch has reached the number of activation of the **nPS** parameter; the "CA" pressure alarm message will be displayed. The compressor and the regulation are stopped. When the digital input is ON the compressor is always OFF. If the **nPS** activation in the **did** time is reached, switch off and on the instrument to restart normal regulation.

### 9.4 DOOR SWITCH INPUT (i1F or i2F = dor)

It signals the door status and the corresponding relay output status through the **odC** parameter: **no**: normal (any change); **FAn**: Fan OFF; **CP**: Compressor OFF; **F\_C**: Compressor and fan OFF. Since the door is opened, after the delay time set through parameter **did**, the door alarm is enabled, the display shows the message "dA" and the regulation restarts if **rtr=YES**. The alarm stops as soon as the external digital input is disabled again. With the door open, the high and low temperature alarms are disabled.

### 9.5 START DEFROST (i1F or i2F = dEF)

It starts a defrost if there are the right conditions. After the defrost is finished, the normal regulation will restart only if the digital input is disabled otherwise the instrument will wait until the **MdF** safety time is expired.

### 9.6 SWITCH THE AUXILIARY RELAY (i1F or i2F = AUS)

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

### 9.7 INVERSION OF THE KIND OF ACTION: HEATING-COOLING (i1F or i2F=Htr)

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

### 9.8 ENERGY SAVING (i1F or i2F = ES)

The Energy Saving function allows to change the set point value as the result of the **SET+HES** (parameter) sum. This function is enabled until the digital input is activated.

### 9.9 HOLIDAY DEFROST (i1F or i2F = HDF) (ONLY FOR MODELS WITH RTC)

This function enabled the holiday defrost setting.

### 9.10 ON OFF FUNCTION (i1F or i2F = onF)

To switch the controller on and off.

### 9.11 DIGITAL INPUTS POLARITY

The digital input polarity depends on the **i1P** and **i2P** parameters.

- **i1P** or **i2P =CL**: the input is activated by closing the contact.
- **i1P** or **i2P=OP**: the input is activated by opening the contact.

## 10. TTL SERIAL LINE – FOR MONITORING SYSTEMS

The TTL serial line, available through the HOT KEY connector, allows by means of the external TTL/RS485 converter, **XJ485-CX**, to connect the instrument to a monitoring system **ModBUS-RTU** compatible such as the X-WEB500/3000/300.

## 11. X-REP OUTPUT – OPTIONAL

As optional, an X-REP can be connected to the instrument, trough the dedicated connector.

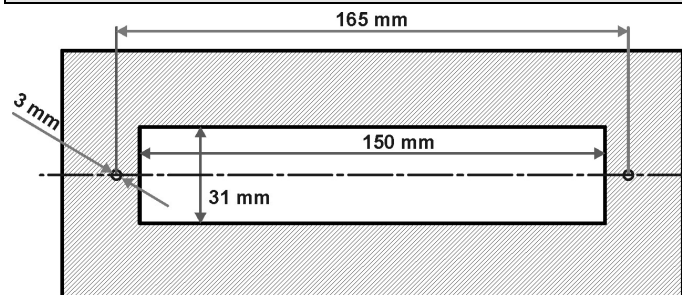


To connect the X-REP to the instrument the following connectors must be used CAB/REP1(1m), CAB/REP2 (2m), CAB/REP5 (5m),

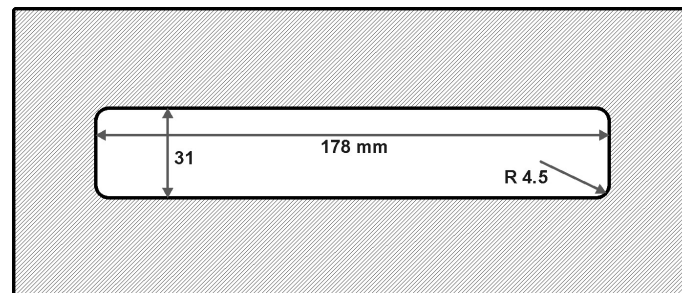
## 12. INSTALLATION AND MOUNTING

The **XW20LT** shall be mounted on vertical panel, in a 150x31 mm hole, and fixed using the special brackets supplied with the controllers. 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 the air circulate by the cooling holes.

### 12.1 CUT OUT FOR FRONT MOUNTING

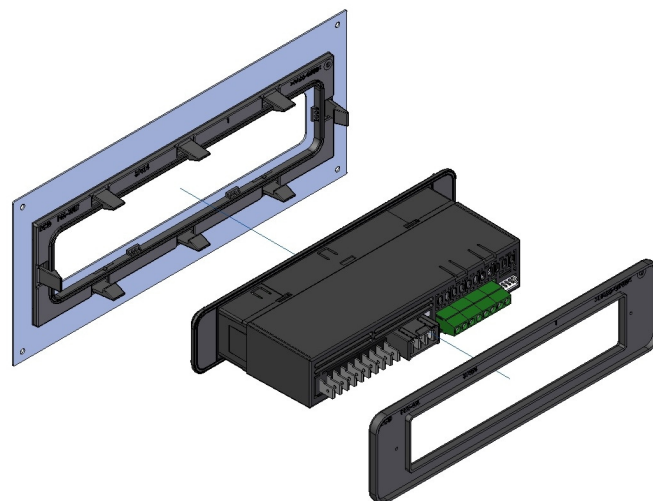


### 12.2 CUT OUT FOR BACK PANEL MOUNTING



### 12.3 PM-WLT: BACK PANEL MOUNTING SYSTEM

It is possible to use a back panel mount solution by using the new **PM-WLT** system.



## 13. ELECTRICAL CONNECTIONS

The instruments are provided with screw terminal block to connect cables with a cross section up to 2.5 mm² for the digital and analogue inputs. Relays and power supply have a Faston connection (6.3mm). Heat-resistant cables have to be used. 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.

**N.B. Maximum current allowed for all the loads is 20A.**

### 13.1 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.

## 14. HOW TO USE THE HOT KEY

### 14.1 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.

## 14.2 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 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.

## 15. ALARM SIGNALS

Message	Cause	Outputs
P1	Room probe failure	Compressor output acc. to par. <b>Con</b> and <b>CoF</b>
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 <b>AC2</b> parameter
LA2	Condenser low temperature	It depends on the <b>bLL</b> parameter
dA	Door open	Compressor and fans restarts
EA	External alarm	Output unchanged.
CA	Serious external alarm (i1F=bAL)	All outputs OFF.
CA	Pressure switch alarm (i1F=PAL)	All outputs OFF
rtC	Real time clock alarm	Alarm output ON; Other outputs unchanged; Defrosts according to par. <b>idF</b> Set real time clock has to be set.
rtF	Real time clock board failure	Alarm output ON; Other outputs unchanged; Defrosts according to par. <b>idF</b> . Contact the service.

## 15.1 SILENCING BUZZER / ALARM RELAY OUTPUT

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

## 15.2 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**, **LA**, **HA2** and **LA2** automatically stop as soon as the temperature returns to normal values.

Alarms **EA** and **CA** (with **i1F=bAL**) recover as soon as the digital input is disabled.

Alarm **CA** (with **i1F=PAL**) recovers only by **switching off and on** the instrument.

## 15.3 OTHER MESSAGES

<b>on</b>	Keyboard enabled after automatic lock.
<b>LOC</b>	Keyboard automatically locked
<b>Pon</b>	Keyboard unlocked.
<b>PoF</b>	Keyboard locked
<b>noP</b>	In programming mode: none parameter is present in Pr1 On the display or in dP2, dP3, dP4: the selected probe is nor enabled

## 16. TECHNICAL DATA

**Housing:** self extinguishing ABS

**Case:** facia 38x185 mm; depth 76mm

**Mounting:** panel mounting in a 150x31 mm panel cut-out with the 2 metal brackets supplied

**Protection:** IP20

**Frontal protection:** IP65

**Connections:** screw terminal block  $\leq 2.5 \text{ mm}^2$  heat-resistant wiring and 6.3mm Faston

**Power supply:** 230Vac or 110Vac or 24Vac  $\pm 10\%$

**Power absorption:** 5VA max

**Display:** 3 digits, white LED, 14.2 mm high

**Inputs:** Up to 4 NTC or PTC probes

**Digital inputs:** 2 free voltage

**Relay outputs:** **Total current on loads MAX. 20A**

**Compressor:** relay SPST 20(8) A, 250Vac

**Light:** relay SPST 8 or 16(3) A, 250Vac

**Other output:** buzzer

**Serial output:** TTL standard

**Communication protocol:** Modbus - RTU

**Data storing:** on the non-volatile memory (EEPROM)

**Internal clock back-up:** 24 hours (only for model with RTC)

**Kind of action:** 1B

**Pollution degree:** 2

**Software class:** A

**Rated impulsive voltage:** 2500V

**Over voltage Category:** II

**Operating temperature:** 0 to 60 °C (32 to 140°F)

**Storage temperature:** -30 to 85°C (-22 to 185°F)

**Relative humidity:** 20 to 85% (not condensing)

**Measuring and regulation range:**

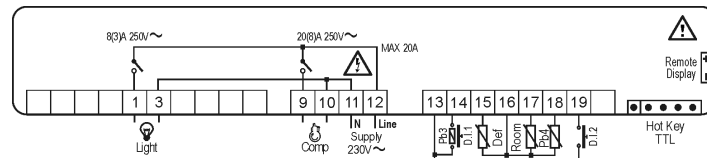
**NTC probe:** -40 to 110°C (-40 to 230°F)

**PTC probe:** -50 to 150°C (-58 to 302°F)

**Resolution:** 0.1°C or 1°C or 1°F (selectable)

**Accuracy (ambient temp. 25°C):**  $\pm 0.7^\circ\text{C} \pm 1 \text{ digit}$

## 17. CONNECTIONS



**Supply: 120Vac or 24Vac:** connect to terminals 11-12

**The X-REP output is optional**

**The light relay** can be also 16(5)A according to the model

## 18. DEFAULT SETTING VALUES

Label	Name	Range	°C/°F	Level
Set	Set point	LS to US	-5.0	---
rtC*	Real time clock menu	-	-	Pr1
Hy	Differential	[0.1 to 25.5°C] [1 to 45°F]	2.0	Pr1
LS	Minimum set point	[-55°C to SET] [-67°F to SET]	-50.0	Pr2
US	Maximum set point	[SET to 150°C] [SET to 302°F]	110	Pr2
ot	Thermostat probe calibration	[-12 to 12°C] [-21 to 21°F]	0.0	Pr1
P2P	Evaporator probe presence	n=not present; Y=present	Y	Pr1
oE	Evaporator probe calibration	[-12 to 12°C] [-21 to 21°F]	0.0	Pr2
P3P	Third probe presence	n=not present; Y=present	n	Pr2
o3	Third probe calibration	[-12 to 12°C] [-21 to 21°F]	0	Pr2
P4P	Fourth probe presence	n=not present; Y=present	n	Pr2
o4	Fourth probe calibration	[-12 to 12°C] [-21 to 21°F]	0	Pr2
odS	Outputs delay at start up	0 to 255 min	0	Pr2
AC	Anti-short cycle delay	0 to 50 min	1	Pr1
AC1	Second compressor start delay	0 to 255 sec	5	Pr2
rtr	P1-P2 percentage for regulation	0 to 100 (100=P1, 0=P2)	100	Pr2
CCt	Continuous cycle duration	0.0 to 24h00min	0.0	Pr2
CCS	Set point for continuous cycle	[-55.0 to 150.0°C] [-67 to 302°F]	-5	Pr2
Con	Compressor ON time with faulty probe	0 to 255 min	15	Pr2
CoF	Compressor OFF time with faulty probe	0 to 255 min	30	Pr2
CH	Type of regulation	CL; Ht	CL	Pr1
CF	Temperature measurement unit	°C to °F	°C	Pr2
rES	Resolution	in=integer; dE= dec.point	dE	Pr1
Lod	Probe displayed	P1; P2	P1	Pr2
rEd2	X-REP display	P1; P2; P3; P4; SET; dtr	P1	Pr2
dLy	Display temperature delay	0.0 to 20min00sec (10 sec)	0.0	Pr2
dtr	P1-P2 percentage for display	1 to 99	50	Pr2
dFP	Probe selection for defrost termination	nP; P1; P2; P3; P4	P2	Pr2
dtE	Defrost termination temperature	-50 to 50°C	8	Pr1
idF	Interval between defrost cycles	1 to 120 hours	6	Pr1
MdF	(Maximum) length for defrost	0 to 255 min	30	Pr1
dFd	Displaying during defrost	rt; it; SET; DEF	it	Pr2
dAd	MAX display delay after defrost	0 to 255 min	30	Pr2
ACH	Kind of action for auxiliary relay	CL; Ht	cL	Pr2
SAA	Set Point for auxiliary relay	[-55.0 to 150°C] [-67 to 302°F]	0.0	Pr2
SHy	Differential for auxiliary relay	[0.1 to 25.5°C] [1 to 45°F]	2.0	Pr2
ArP	Probe selection for auxiliary relay	nP; P1; P2; P3; P4	nP	Pr2
Sdd	Auxiliary relay operating during defrost	n(0); Y(1)	n	Pr2
ALP	Alarm probe selection	nP; P1; P2; P3; P4	P1	Pr2
ALC	Temperat. alarms configuration	rE= related to set; Ab = absolute	Ab	Pr2
ALU	MAXIMUM temperature alarm	[SET to 150.0°C] [SET to 302°F]	110.0	Pr1
ALL	Minimum temperature alarm	[-55.0°C to SET] [-67°F to SET]	-50.0	Pr1
AFH	Differential for temperat. alarm recovery	[0.1 to 25.5°C] [1 to 45°F]	2.0	Pr2
ALd	Temperature alarm delay	0 to 255 min	15	Pr2
dAo	Delay of temperature alarm at start up	0.0 to 23h50min	1.3	Pr2
AP2	Probe for temperat. alarm of condenser	nP; P1; P2; P3; P4	P4	Pr2
AL2	Condenser for low temperat. alarm	[-55 to 150°C] [-67 to 302°F]	-40	Pr2
AU2	Condenser for high temperat. alarm	[-55 to 150°C] [-67 to 302°F]	110	Pr2
AH2	Differ. for condenser temp. alar. recovery	[0.1°C to 25.5°C] [1°F to 45°F]	5	Pr2
Ad2	Condenser temperature alarm delay	0 to 254 min; 255=nU	15	Pr2
dA2	Delay of cond. temper. alarm at start up	0.0 to 23h50min	1.3	Pr2
bLL	Compr. off for condenser low temperature alarm	n(0); Y(1)	n	Pr2
AC2	Compr. off for condenser high temperature alarm	n(0); Y(1)	n	Pr2
tbA	Alarm relay disabling	n(0); Y(1)	y	Pr2

Label	Name	Range	°C/°F	Level
oA3	Third relay configuration	ALr = alarm; dEF = do not select it; Lig =Light; AUS =AUX; onF=always on; Fan= do not select it; db = neutral zone; cP2 = second compressor; dF2 = do not select it; HES = night blind	Lig	Pr2
AoP	Alarm relay polarity (oAx=ALr)	oP; cL	cL	Pr2
i1P	Digital input polarity	oP=opening; CL=closing	cL	Pr1
i1F	Digital input 1 configuration	EAL, bAL, PAL, dor; dEF; Htr, AUS	dor	Pr1
did	Digital input alarm delay	0 to 255 min	15	Pr1
i2P	Digital input polarity	oP=opening; CL=closing	cL	Pr2
i2F	Digital input configuration	EAL, bAL, PAL, dor; dEF; Htr, AUS	EAL	Pr2
d2d	Digital input alarm delay	0 to 255 min	5	Pr2
nPS	Number of activation of pressure switch	0 to 15	15	Pr2
odC	Compress and fan status when open door	no; Fan; CP; F_C	F-c	Pr2
rrd	Regulation restart with door open alarm	n(0); Y(1)	y	Pr2
HES	Differential for Energy Saving	[-30 to 30°C] [-54 to 54°F]	0	Pr2
Hur*	Current hour	0 to 23	-	rtc
Min*	Current minute	0 to 59	-	rtc
dAY*	Current day	Sun to SAT	-	rtc
Hd1*	First weekly holiday	Sun to SAT; nu	nu	rtc
Hd2*	Second weekly holiday	Sun to SAT; nu	nu	rtc
ILE*	Energy Saving cycle start during workdays	0.0 to 23h50min	0	rtc
dLE*	Energy Saving cycle length during workdays	0.0 to 24h00min	0	rtc
ISE*	Energy Saving cycle start on holidays	0.0 to 23h50min	0	rtc
dSE*	Energy Saving cycle length on holidays	0.0 to 24h00min	0	rtc
Ld1*	1 <sup>st</sup> workdays defrost start	0.0 to 23h50min; nu	6.0	rtc
Ld2*	2 <sup>nd</sup> workdays defrost start	0.0 to 23h50min; nu	13.0	rtc
Ld3*	3 <sup>rd</sup> workdays defrost start	0.0 to 23h50min; nu	21.0	rtc
Ld4*	4 <sup>th</sup> workdays defrost start	0.0 to 23h50min; nu	0.0	rtc
Ld5*	5 <sup>th</sup> workdays defrost start	0.0 to 23h50min; nu	0.0	rtc
Ld6*	6 <sup>th</sup> workdays defrost start	0.0 to 23h50min; nu	0.0	rtc
Sd1*	1 <sup>st</sup> holiday defrost start	0.0 to 23h50min; nu	6.0	rtc
Sd2*	2 <sup>nd</sup> holiday defrost start	0.0 to 23h50min; nu	13.0	rtc
Sd3*	3 <sup>rd</sup> holiday defrost start	0.0 to 23h50min; nu	21.0	rtc
Sd4*	4 <sup>th</sup> holiday defrost start	0.0 to 23h50min; nu	0.0	rtc
Sd5*	5 <sup>th</sup> holiday defrost start	0.0 to 23h50min; nu	0.0	rtc
Sd6*	6 <sup>th</sup> holiday defrost start	0.0 to 23h50min; nu	0.0	rtc
LoC	Keyboard lock timer	nu; 10 to 255 sec	60	Pr2
Adr	Serial address	1 to 247	1	Pr2
PbC	Kind of probe	PtC; ntC	ntc	Pr2
onF	on/off key enabling	nu, oFF; ES	oFF	Pr2
dP1	Room probe display	Read Only	-	Pr2
dP2	Evaporator probe display	Read Only	-	Pr2
dP3	Third probe display	Read Only	-	Pr2
dP4	Fourth probe display	Read Only	-	Pr2
rSE	Real set	actual set	-	Pr2
rEL	Software release	Read Only	6.9	Pr2
Ptb	Map code	Read Only	-	Pr2

\* Only for model with real time clock

<sup>2</sup> Only for XW20LT with X-REP output