Digital controller for medium-low temperature refrigeration applications

XW30LT – XW30LRT

1. GENERAL WARNING

1.1 PLEASE READ BEFORE USING THIS MANUAL

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

1.2 ⚠ SAFETY PRECAUTIONS

- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation
- Warning: disconnect all electrical connections before any kind of maintenance.
- Fit the probe where it is not accessible by the End User. The instrument must not be opened.
- In case of failure or faulty operation send the instrument back to the distributor or to "Dixell S.p.A." (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 **XW30LT** and **XW30LRT**, format 38x185mm, are microprocessor based controllers, suitable for normal temperature applications on ventilated refrigerating units. They have 3 relay outputs to control compressor, fan, and light.
They 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. They are also provided with up to 3 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 digital inputs can operate as third temperature probe. The fourth probe is used to signal the condenser temperature alarm or to display a temperature. **NOTE:** the fourth probe is available only for XW30LT models.
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.
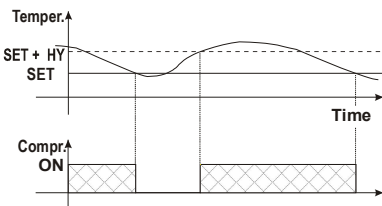
In case of fault in the thermostat probe the start and stop of the compressor are timed through parameters **Con** and **CoF**.

3.2 DEFROST

Defrost is performed through a simple stop of the compressor.
The defrost interval depends on the presence of the RTC (optional). If the RTC is present is controlled by means of parameter **EdF**:
- **EdF=in:** a defrost starts after elapsing the **idF** time (standard way for controller without RTC).
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 (**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;
- **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.

After defrost, there is a timed fan delay allowing for drip time, set by means of the **Fnd** parameter.
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**.

3.3.1 Forced activation of evaporator fans

This function, managed by the **FCt** parameter, is designed to avoid short cycles of evaporator fans, which could happen when the controller is switched on or after a defrost (when the room air warms the evaporator). If the temperature difference between the evaporator and the room probes is higher than the value set in the **FCt** parameter the fans are switched on. With **FCt=0** this function is disabled.

3.3.2 Fans cyclic activation with compressor off.

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

4. FRONT PANEL COMMANDS
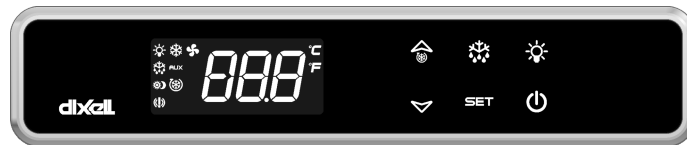
SET	To display target set point; in programming mode it selects a parameter or confirm an operation.
❄	**(DEF)** To start a manual defrost.
⌃	**(UP)** To see the max stored temperature; in programming mode it browses the parameter codes or increases the displayed value.
⌄	**(DOWN)** To see the min stored temperature; in programming mode it browses the parameter codes or decreases the displayed value.
⏻	**(OFF)** To switch the instrument off, if **onF=oFF**.
☀	**(LiG)** To switch the light, if **oA3=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
°C/°F	ON	Measurement unit
	Flashing	Programming phase

5. AUTOMATIC KEYBOARD LOCK

To avoid accidental modifications of the controller settings, **the XW30LT and XW30LRT keyboard will be locked automatically if no key will be touched for 60 seconds.** The controller 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

SET

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

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 wait 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 bothj **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.

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. **NOTE:** only for XW30LT model.
o4	**Fourth probe calibration:** (-12.0 to 12.0°C; -21 to 21°F) allows to adjust possible offset of the fourth probe. **NOTE:** only for XW30LT model.
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.
AC1	**2nd compressor delay at start up** (0÷255s) Used only with oA3 or oA4 = cP2 Time interval between the switching on of the first compressor and the second one. **NOTE:** only for XW30LT model.
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 **Con=0** compressor is always OFF.
CoF	**Compressor OFF time with faulty probe:** (0 to 255min) time during which the compressor is OFF in case of faulty thermostat probe. With **CoF=0** compressor is always active.

DISPLAY

CF	**Temperature measurement unit:** (°C; °F) **°C** = Celsius; **°F** = Fahrenheit. **WARNING:** When the measurement unit is changed the SET point and the values of the parameters **HY**, **LS**, **US**, **ot**, **ALU** and **ALL** have to be checked and modified (if necessary).
rES	**Resolution (for °C):** (in=1°C; dE=0.1°C) allows decimal point display.
Lod	**Instrument display:** (P1; P2, P3, P4, SET, dtr) it selects which probe is displayed by the instrument. **P1** = Thermostat probe; **P2** = Evaporator probe; **P3** = Third probe (only for model with this option enabled); **P4** = Fourth probe, **SET** = set point; **dtr** = percentage of visualization.
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

EdF	**Defrost mode (only for controller with RTC):** - **rtC: Real Time Clock mode**. Defrost time follows **Ld1 to Ld6** parameters on workdays and **Sd1 to Sd6** on holidays. - **in: interval mode**. The defrost starts when the time **idf** is expired.
dFP	**Probe selection for defrost termination:** (nP; P1; P2; P3; P4) **nP** = no probe; **P1** =thermostat probe; **P2** = evaporator probe; **P3** =configurable probe; **P4** = Probe on Hot Key plug.
dtE	**Defrost termination temperature:** (-55 to 50°C; -67 to 122°F) (enabled only when **EdF=Pb**) sets the temperature measured by the evaporator probe, which causes the end of defrost.
idF	**Interval between defrost cycles:** (0 to 120hours) determines the interval of time between two defrost cycles.
MdF	**(Maximum) length for defrost:** (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.

| dFd | **Temperature displayed during defrost:** (rt; it; SEt; dEF) **rt** = real temperature; **it** = temperature at defrost start; **SEt** = set point; **dEF** = "dEF" label. |
| dAd | **MAX display delay after defrost:** (0 to 255min) sets the maximum time between the end of defrost and the restarting of the real room temperature display. |

FANS

FnC	**Fans operating mode:** (C-n; o-n; C-Y; o-Y) **C-n** = runs with the compressor, OFF during defrost; **o-n** = continuous mode, OFF during defrost; **C-Y** = runs with the compressor, ON during defrost; **o-Y** = continuous mode, ON during defrost.
Fnd	**Fans delay after defrost:** (0 to 255min) interval between end of defrost and evaporator fans start.
FCt	**Temperature differential to avoid fan short cycles:** (0 to 59°C; 0 to 90°F) (N.B.: **FCt=0** means function disabled) if the difference of temperature between the evaporator and the room probes is higher than **FCt** value, the fans will be switched on.
FSt	**Fans stop temperature:** (-55 to 50°C; -67 to 122°F) setting of temperature, detected by evaporator probe, above which fans are always OFF.
Fon	**Fan ON time:** (0 to 15min) with **Fnc=C_n** or **C_Y**, (fan activated in parallel with compressor) it sets the evaporator fan ON cycling time when the compressor is off. With **Fon=0** and **FoF≠0** the fan are always off, with **Fon=0** and **FoF=0** the fan are always off.
FoF	**Fan OFF time:** (0 to 15min) With **FnC=C_n** or **C_Y**, (fan activated in parallel with compressor) it sets the evaporator fan off cycling time when the compressor is off. With **Fon=0** and **FoF≠0** the fan are always off, with **Fon=0** and **FoF=0** the fan are always off.
FAP	**Probe selection for fan management:** (nP; P1; P2; P3; P4) **nP** = no probe; **P1** =thermostat probe; **P2** = evaporator probe; **P3** =configurable probe; **P4** = 4th Probe.

AUXILIARY THERMOSTAT CONFIGURATION

ACH	**Kind of regulation for auxiliary relay:** (Ht; CL) **Ht** = heating; **CL** = cooling.
SAA	**Set Point for auxiliary relay:** (-55.0 to 150.0°C; -67 to 302°F) it defines the room temperature set point to switch auxiliary relay.
SHY	**Differential for auxiliary output:** (0.1 to 25.5°C; 1 to 45°F) intervention differential for auxiliary output set point. • **ACH=CL**, AUX Cut in is [**SAA+SHY**]; AUX Cut out is **SAA**. • **ACH=Ht**, AUX Cut in is [**SAA−SHY**]; AUX Cut out is **SAA**.
ArP	**Probe selection for auxiliary:** (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	**Auxiliary relay off during defrost:** (n; Y) **n** = the auxiliary relay operates during defrost. **Y** = the auxiliary relay is switched off during defrost.

ALARMS

ALP	**Probe selection for alarm:** (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	**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:** • If **ALC=Ab**: [ALL to 150.0°C or ALL to 302°F] • If **ALC=rE**: [0.0 to 50.0°C or 0 to 90°F] when this temperature is reached the alarm is enabled, after the **ALd** delay time.
ALL	**Minimum temperature alarm:** • If **ALC=Ab**: [-55°C to ALU; -67 to ALU] • If **ALC=rE**: [0.0 to 50.0°C or 0 to 90°F] when this temperature is reached the alarm is enabled, after the **ALd** delay time.
AFH	**Differential for temperature alarm recovery:** (0.1 to 25.5°C; 1 to 45°F) intervention differential for recovery of temperature alarm.
ALd	**Temperature alarm delay:** (0 to 255 min) time interval between the detection of an alarm condition and alarm signalling.
dAo	**Exclusion of temperature alarm at start-up:** (0.0 to 24h00min, res. 10min) time interval between the detection of the temperature alarm condition after instrument power on and alarm signalling.

CONDENSER TEMPERATURE ALARM

AP2	**Probe selection for temperature alarm of condenser:** (nP; P1; P2; P3; P4) **nP** = no probe; **P1** = thermostat probe; **P2** = evaporator probe; **P3** = configurable probe; **P4** = Probe on Hot Key plug.
AL2	**Low temperature alarm of condenser:** (-55 to 150°C; -67 to 302°F) when this temperature is reached the LA2 alarm is signalled, possibly after the Ad2 delay.
Au2	**High temperature alarm of condenser:** (-55 to 150°C; -67 to 302°F) when this temperature is reached the HA2 alarm is signalled, possibly after the Ad2 delay.
AH2	**Differential for temperature condenser alarm recovery:** 0.1 to 25.5°C; 1 to 45°F.
Ad2	**Condenser temperature alarm delay:** (0 to 255 min) time interval between the detection of the condenser alarm condition and alarm signalling.
dA2	**Condenser temperature alarm exclusion at start up:** 0.0 to 24h00min, res. 10min.
bLL	**Compressor off with low temperature alarm of condenser:** (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	**Compressor off with high temperature alarm of condenser:** (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.

OUTPUT RELAY

| tbA | **Alarm relay silencing (with oAx =ALr):** (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. |

| oA1 | **Third relay configuration (XW30LT: terminals 1-3, XW30LRT: terminals 5-6):** (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 | **Alarm relay polarity:** (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	**First digital input polarity:** (oP; CL) **oP** = the digital input is activated by opening the contact; **CL** = the digital input is activated by closing the contact.
i1F	**First digital input configuration:** (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	**Digital input 1 alarm delay:** (0 to 255 min) delay between the detection of the external alarm condition and its signalling. When **i1F= PAL**, it is the interval of time to calculate the number of pressure switch activation.
i2P	**Second digital input polarity:** (oP; CL) **oP** = the digital input is activated by opening the contact; **CL** = the digital input is activated by closing the contact.
i2F	**Second digital input configuration:** (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.
doA	**Door open alarm delay:** 0 to 255 min.
d2d	**Digital input 2 alarm delay:** (0 to 255 min) delay between the detection of the external alarm condition and its signalling. When **i2F= PAL**, it is the interval of time to calculate the number of pressure switch activation.
nPS	**Number of pressure switch activation:** (0 to 15) Number of activation, during the **did** or **d2d** interval, before signalling an alarm event (**i1F, i2F=PAL**). If the **nPS** activation during **did** or **d2d** time is reached, switch off and on the instrument to restart normal regulation.
odC	**Compressor status when open door:** (no; FAn; CPr;F_C;) **no** = normal; **FAn** = normal; **CPr** = compressor OFF, **F_C** = compressor OFF.
rrd	**Outputs restart after door open alarm:** (n; Y) **n** = outputs follow the **odC** parameter. **Y** = outputs restart with a door open alarm.
HES	**Delta temperature during an Energy Saving cycle:** (-30.0 to 30.0°C; -54 to 54°F) it sets the increasing value of the set point [**SET+HES**] during the Energy Saving cycle.

CURRENT TIME AND WEEKLY HOLIDAYS (ONLY FOR MODELS WITH RTC)

Hur	**Current hour:** 0 to 23h.
Min	**Current minute:** 0 to 59min.
dAY	**Current day:** Sun to SAt.
Hd1	**First weekly holiday:** (Sun to nu) set the first day of the week which follows the holiday times.
Hd2	**Second weekly holiday:** (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	**Energy Saving cycle start during workdays:** (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	**Energy Saving cycle length during workdays:** (0 to 24h00min) sets the duration of the Energy Saving cycle on workdays.
ISE	**Energy Saving cycle start on holidays:** 0 to 23h50min.
dSE	**Energy Saving cycle length on holidays:** 0 to 24h00min.

TO SET DEFROST TIMES (ONLY FOR MODELS WITH RTC)

| Ld1...Ld6 | **Workday defrost start:** (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 | **Holiday defrost start:** (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	**Lock keyboard timer:** nu(9) = keyboard never blocked, or 10 to 255 sec
Adr	**Serial address:** (1 to 247) identifies the instrument address when connected to a ModBUS compatible monitoring system.
PbC	**Type of probe:** (PtC; ntC) it allows to set the kind of probe used by the instrument: - **PtC** = PTC probe; - **ntC** = NTC probe.
onF	**On/Off key enabling:** (nU; oFF; ES) **nU** = disabled; **oFF** = enabled; **ES** = not set it.
dP1	Thermostat probe display.
dP2	Evaporator probe display.
dP3	Third probe display.
dP4	Fourth probe display (only for XW30LT model).
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 (XW30LT: terminals 13-14; XW30LRT: terminals 14-15) 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 de-activated.

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 de-activated.

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; **CPr:** 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 ON OFF FUNCTION (i1F or i2F = onF)

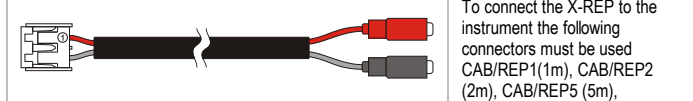To switch the controller on and off.

9.10 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 XW30LT 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
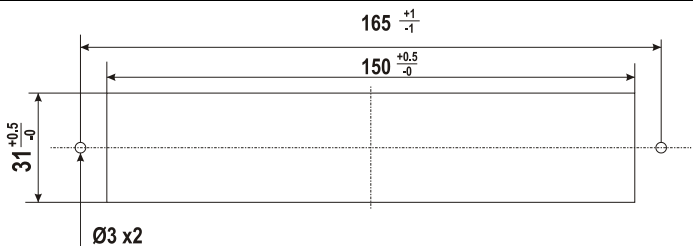
13. ELECTRICAL CONNECTIONS

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 a by a flashing "**End**" label.
4. After 10 seconds the instrument will restart working with the new parameters.
5. Remove the "**HOT-KEY**".

NOTE: the message "**Err**" is displayed for failed programming. In this case turn the unit off and then on if you want to restart the download again or remove the "**HOT-KEY**" to abort the operation.

15. ALARM SIGNALS

Message	Cause	Outputs
P1	Room probe failure	Compressor output acc. to par. **Con** and **CoF**
P2	Evaporator probe failure	Defrost end is timed
P3	Third probe failure	Outputs unchanged
P4	Fourth probe failure	Outputs unchanged
HA	Maximum temperature alarm	Outputs unchanged.
LA	Minimum temperature alarm	Outputs unchanged.
HA2	Condenser high temperature	It depends on the **AC2** parameter
LA2	Condenser low temperature	It depends on the **bLL** 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. **idF** Set real time clock has to be set.
rtF	Real time clock board failure	Alarm output ON; Other outputs unchanged; Defrosts according to par. **idF**. Contact the service.

15.1 SILENCING BUZZER / ALARM RELAY OUTPUT

- **tbA=Y:** the buzzer and the relay are is 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

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

16. TECHNICAL DATA

Housing: self extinguishing ABS
Case: facia 38x185 mm; depth [XW30LT: 76mm], [XW30LRT: 40mm]
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 ≤ 2.5 mm² heat-resistant wiring and 6.3mm Faston
Power supply: 230Vac or. 110Vac or 24Vac ± 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 for XW30LT models: _Total current on loads MAX. 20A_
Compressor: relay SPST 20(8) A, 250Vac
Light: relay SPST 8 or 16(3) A, 250Vac
Fans: relay SPST 8(3) A, 250Vac
Defrost: relay SPST 8(3) A, 250Vac
Relay outputs for XW30LRT models: _Total current on loads MAX. 16A_
Compressor: relay SPST 20(8)A, 250Vac
Fans: relay SPST 5A, 250Vac
Light: relay SPST 8(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:
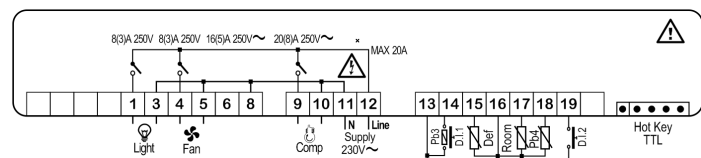   NTC probe: -40 to 110°C (-40 to 230°F)
   PTC probe: -50 to 150°C (-58 to 302°F)
Resolution: 0.1°C or 1°C or 1°F (selectable)
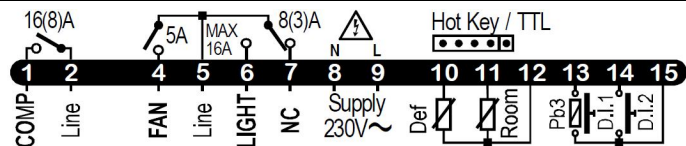**Accuracy (ambient temp. 25°C):** ±0.7°C ±1 digit

17. CONNECTIONS

17.1 XW30LT

Supply: 120Vac or 24Vac: connect to terminals 11-12
The light relay can be also 16(5)A according to the model

17.2 XW30LRT

Model at 120Vac: connect to terminals 8-9

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 (only for XW30LT)	n=not present; Y=present	n	Pr2
o4	Fourth probe calibration (only for XW30LT)	[-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
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
dLy	Display temperature delay	0.0 to 20min00sec (10 sec)	0.0	Pr2
dtr	P1-P2 percentage for display	1 to 99	50	Pr2
EdF*	Kind of interval for defrost	rtC; in	in	Pr2
dFP	Probe selection for defrost termination	nP; P1; P2; P3; P4	P2	Pr2

Label	Name	Range	°C/°F	Level
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
Fnc	Fan operating mode	C-n; o-n; C-y; o-Y	o-y	Pr1
Fnd	Fan delay after defrost	0 to 255 min	0	Pr1
FCt	Differential of temperature for forced activation of fans	0 yo 50°C	0	Pr2
FSt	Fan stop temperature	[-50 to 50°C] [-55 to 122°F]	40	Pr1
Fon	Fan on time with compressor off	0 to 15 min	0	Pr2
FoF	Fan off time with compressor off	0 to 15 min	0	Pr2
FAP	Probe selection for fan management	nP; P1; P2; P3; P4	P2	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	nP	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
oA1	Light 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 (oA1=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; CPr; 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*	1st workdays defrost start	0.0 to 23h50min; nu	6.0	rtc
Ld2*	2nd workdays defrost start	0.0 to 23h50min; nu	13.0	rtc
Ld3*	3rd workdays defrost start	0.0 to 23h50min; nu	21.0	rtc
Ld4*	4th workdays defrost start	0.0 to 23h50min; nu	0.0	rtc
Ld5*	5th workdays defrost start	0.0 to 23h50min; nu	0.0	rtc
Ld6*	6th workdays defrost start	0.0 to 23h50min; nu	0.0	rtc
Sd1*	1st holiday defrost start	0.0 to 23h50min; nu	6.0	rtc
Sd2*	2nd holiday defrost start	0.0 to 23h50min; nu	13.0	rtc
Sd3*	3rd holiday defrost start	0.0 to 23h50min; nu	21.0	rtc
Sd4*	4th holiday defrost start	0.0 to 23h50min; nu	0.0	rtc
Sd5*	5th holiday defrost start	0.0 to 23h50min; nu	0.0	rtc
Sd6*	6th holiday defrost start	0.0 to 23h50min; nu	0.0	rtc

Label	Name	Range	°C/°F	Level
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