IPC115D – IPC315D (V.2.5 – r5.8)

USER MANUAL

(Internal Use Only)

INDEX

1. IMPORTANT RECOMMENDATIONS

- The symbol alerts the user of non-insulated “dangerous voltage” within the product area that is sufficiently high to constitute a risk of electric shock to persons.

- The symbol alerts the user of important operating and maintenance (assistance) instructions found in the documentation attached to the device.

- The Manufacter cannot accept any liability for damages caused by modems that are not supported. Manufacter reserves the right to modify this manual without prior notice. The documentation can be downloaded from the Manufacter web site even prior to purchase.

- This manual forms part of the product and must always be kept near the device for easy and quick reference. The device cannot be used as a safety device. Verify the limits of application before using the device.

- Verify that the power supply voltage is correct before connecting the device. Do not expose it to water or humidity: use the controller only within the operating limits, avoiding sudden changes in temperature and high atmospheric humidity in order to prevent condensation from forming. Recommendation: disconnect all the electric connections before performing any maintenance. Insert the probe where it cannot be reached by the End User. The device must not be opened. Consider the maximum current that can be applied to each relay. Make sure that the wires for the probes, the loads and the electrical power supply are separated and sufficiently distant from each other, without crossing or intertwining with each other. In the case of applications in industrial environments, it may be useful to use the main filters (our mod. FT1) in parallel to the inductive loads.

- The customer shall bear full responsibility and risk for product configuration in order to achieve the results pertaining to installation and/or final equipment/system. Upon the customer's request and following a specific agreement, the Manufacter may be present during the start-up of the final machine/application, as a consultant, however, under no circumstances can the company be held responsible for the correct operation of the final equipment/system.

- Since the Manufacter products form part of a very high level of technology, a qualification/configuration/programming/commissioning stage is required to use them as best as possible. Otherwise, these products may malfunction and the Manufacter cannot be held responsible. The product must not be used in any way that differs from that stipulated in the documentation.

- The device must always be inserted inside an electrical panel that can only be accessed by authorised personnel. For safety purposes, the keyboard must be the only part that can be reached.

- The device must never be hand-held while being used.

It is good practice to bear the following in mind for all Manufacter products:

- Prevent the electronic circuits from getting wet as contact made with water, humidity or any other type of liquid can damage them. Comply with the temperature and humidity limits specified in the manual in order to store the product correctly.
- The device must not be installed in particularly hot environments as high temperatures can damage it (electronic circuits and/or plastic components forming part of the casing). Comply with the temperature and humidity limits specified in the manual in order to store the product correctly.
- Under no circumstances is the device to be opened - the user does not require the internal components. Please contact qualified service personnel for any assistance.
- Prevent the device from being dropped, knocked or shaken as either can cause irreparable damage.
- Do not clean the device with corrosive chemical products, solvents or aggressive detergents.
- The device must not be used in applications that differ from that specified in the following material.

- ***Separate the power of the device from the rest of the electrical devices connected inside the electrical panel. The secondary of the transformer must never be connected to the earth.***

- The Manufacter reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality."

1.1 PRODUCT DISPOSAL (WEEE)

With reference to Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 and to the relative national legislation, please note that:

- There lies the obligation not to dispose of electrical and electronic waste as municipal waste but to separate the waste.
- Public or private collection points must be used to dispose of the goods in accordance with local laws. Furthermore, at the end of the product's life, it is also possible to return this to the retailer when a new purchase is made.
- This equipment may contain hazardous substances. Improper use or incorrect disposal can have adverse effects on human health and the environment.
- The symbol shown on the product or the package indicates that the product has been placed on the market after 13 August 2005 and must be disposed of as separated waste.
- Should the product be disposed of incorrectly, sanctions may be applied as stipulated in applicable local regulations regarding waste disposal.

2. GENERALITIES

iProCHILL is a programmable controller for application on Air Conditioning units up to 4 circuits and 4 compressors per circuit.
It is possible to manage the following units:

- Air/air (for very simple unit)
- Air/water
- Water/water
- Condensing Units

All types with:

- Heating with gas reversibility
- Free cooling function
- Recovery function
- Domestic hot water function

3. AVAILABLE APPLICATION CONFIGURATIONS

The controller can manage various of equipments and functions, find the table below for possible combinations:

Application		Chiller water/ water	Chiller air/water	Heat pump	Domestic hot water	Free cooling	Heat recovery	Motor cond.unit
Type compres. to manage	Hermetic steps	√	√	√	√	√	√	√
	Screw steps	√	√	√	√	√	√	
	Screw Stepless	√	√	√	√	√	√	
	Inverter 0/10 volt	√	√	√	√	√	√	
	Inverter Refcomp	√	√	√	√	√	√	
Type of Thermo-regulation	Proportional Step	√	√	√	√	√	√	√
	Neutral zone	√	√	√	√	√	√	
	Step-less	√	√	√	√	√	√	
	Inverter	√	√	√	√	√	√	
Principal Functions	Anti-freeze	√	√	√	√	√	√	√
	Auxiliary relay	√	√	√	√	√	√	√
	Energy saving	√	√	√	√	√	√	√
	Dynamic setpoint	√	√	√	√	√	√	√
	Auxiliary heating	√	√	√	√	√	√	√
	Evaporator pump	√	√	√	√	√	√	√
	Condenser pump	√		√	√	√	√	
	Condensation fan		√	√	√	√	√	√
	Pump down	√	√	√	√	√	√	√
	Unloading	√	√	√	√	√	√	√
	Defrost			√	√			
	Anti-Legionella				√			
Family groups to consider		CF -CO- IO- RA- CA- AL- ES-SD- US -PA- PD -UN	CF -CO- IO- RA- CA- AL- ES-SD- US –PA- PD -UN - FA	CF -CO- IO- RA- CA- AL- ES-SD- US –PA- PD -UN – FA - DF	CF -CO- IO- RA- CA- AL- ES-SD-US –PA-PD - UN –FA – DF -FS	CF -CO- IO- RA- CA- AL- ES-SD- US –PA- PD -UN –FA –FC	CF -CO- IO- RA- CA- AL- ES-SD- US –PA- PD -UN – FA- AR	CF -CO- IO- RA- CA- AL- ES-SD- US –PA- PD -UN – FA

3.1 MAIN FUNCTIONS

Management of the cooling/heating unit with:
- Single-circuit up to four compressors
- Four circuits up to 16 compressors
- Screw compressors

Start-up of configurable compressors:
- Direct
- Part winding
- Star delta (not available)

Compressor management with inverter:
- *1 compressor per circuit*

Configurable soft start-ups:
- Start-up with unloading valve
- Idle running valve

Unloaders management:
- continuous working
- step working
- modulating working (screw compressors)

Compressors rotation and temperature control configurable from parameter:
- by fix sequence
- by FIFO sequence
- by balance
- by saturation

Step-less compressor management:
- with neutral-zone regulation

Compressors liquid injection function
- Control with dedicated PTC probe

Compressors discharge high temperature alarm function
- Control with dedicated PTC probe

Complete management of two water side pumping units:
- 2 pumps evaporator side
- 2 pumps condenser side

Customised default display of all variables
- Temperatures
- Pressures

Other displays available
- Status of the digital inputs
- Compressor running hours
- N° compressor start-ups
- Evaporator/condenser water pump running hours
- Time remaining before defrost
- Percentage of the proportional outputs
- Compressors discharge temperature

Reset alarms using customised password
- Historical alarms
- Compressor thermal overload alarms

Possibility of enabling/disabling the individual circuit
- Allows maintenance of the circuit
- Allows "partialised" working of the unit

Possibility of enabling/disabling the individual compressor
- Maintenance of the individual compressor
- Malfunction

Complete management of pump down function:
- With dedicated pressure switch
- Timed
- Via the low pressure switch
- Via the low pressure transducer

Circuit unloading function:
- From high evaporator inlet water temperature
- From low evaporator outlet water temperature
- From high condensing temperature/pressure
- From low evaporator pressure

Anti-freeze function:
- From low evaporator temperature
- From low condenser temperature
- From digital input as anti-freeze alarm
- Active with four heaters

Domestic hot water production function:
- From low temperature of domestic hot water control probe
- Take effects by compressors and heaters working with step regulation
- Manage domestic hot water pump and valves

Antilegionella function:
- From RTC time band setting
- Take effects by domestic hot water production

Solar panels water pump management:
- From high solar panel NTC temperature probe temperature
- Manage solar panel water pump and solar coil enabling/exclusion ON/OFF valve

Free-cooling function:
- From high system water inlet temperature and low external air temperature
- Manage Free-cooling ON/OFF valve and Free-cooling ON/OFF fan
- Mange modulating output free-cooling mixer valve and hot water three-way valve

Controlled loads maintenance signal function:
- Compressors
- Evaporator pumps
- Condenser pump

Circuit auxiliary relay function:
- Four completely configurable relay outputs, also released from normal working of the unit controlled, managed by means of NTC or PTC temperature probes or with 4÷20mA – 0.5 Volt pressure transducer

Weekly working in energy saving mode:
- Up to three daily time bands (devices with RTC option)
- From digital input

Weekly working with automatic switch on and switch off:
- Up to three daily time bands (devices with RTC option)

Dynamic set-point function:
- Managed by NTC or 4÷20mA input

Changeover function:
- Automatic changeover between cooling and heating by NTC input

Remote OFF function:
- From configurable digital input

Remote heating cooling function:
- From digital input with configurable logic

Supply fan hot start function:
- Air/air unit

Defrost management:

- In temperature in pressure or with both (combined control)
- Forced defrost for start-up with low external air temperatures
- From digital input or timed
- Manual using the relevant key
- By hot gas or fan only

Auxiliary heating function:

- With integration heaters

Four outputs for the proportional control of the condensing fan speeds via external module (inverter or single/three phase phase cut) with configurable signal:

- PWM
- 0÷10 Volt
- 4÷20 mA

Complete alarms management:

- With internal data logger alarms (up to 100 events)

Work as motor-condensing unit:

- Response to cooling/heating request from digital input
- Capacity controlled by digital input
- No temperature regulation

Expansion module:

- up to 4 IPROEX60D
- for each expansion module, including: 3 DI, 7 AI, 3 AO and 6 DO.

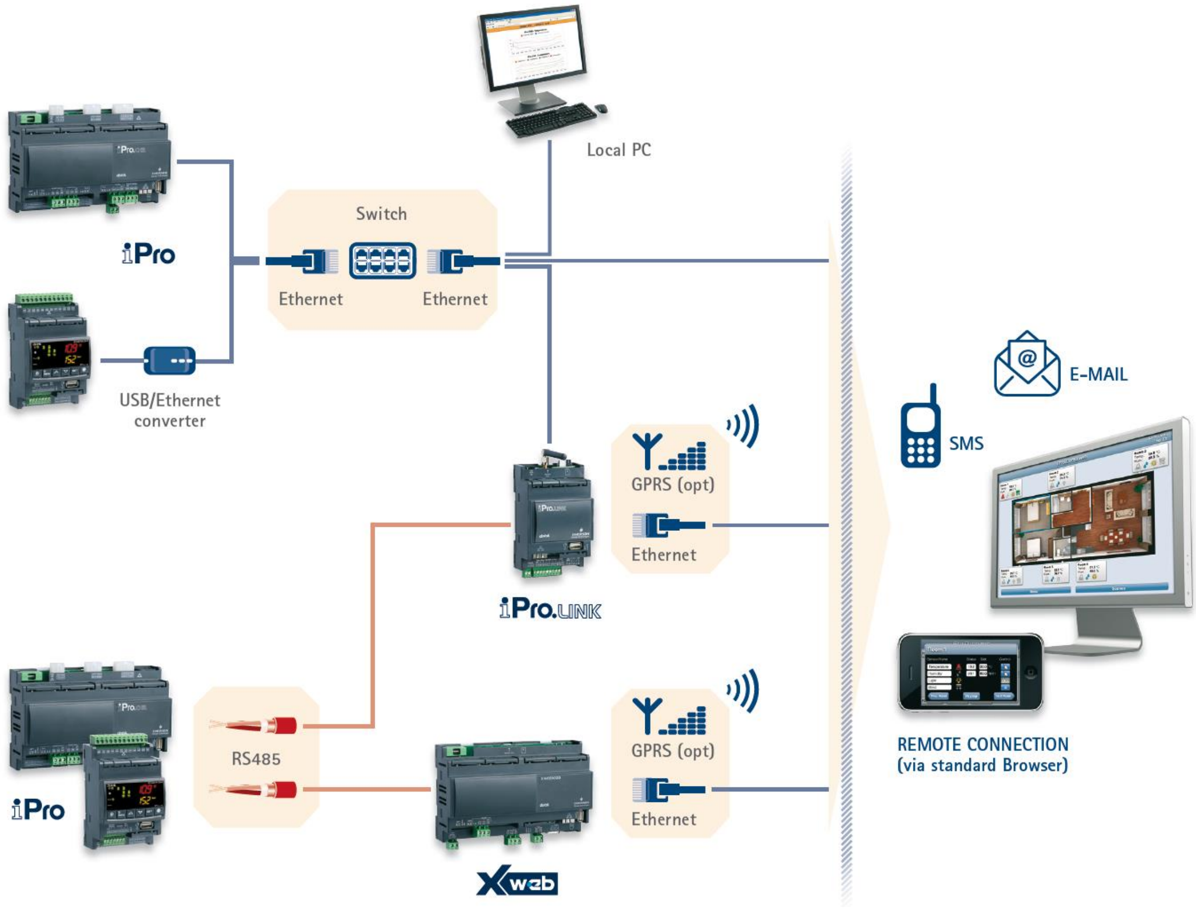
Electronic thermostatic valve driver:

- up to 4 XEV20D
- driving up to 8 electronic expansion valves
- each XEV20D includes 4 probes.

4. SUPERVISION FROM LOCAL AND REMOTE

Supervision/tele-assistance/remote monitoring for complete control and supervision from local and remote

- By means of network output with ModBus TCP / IP protocol (INTERNET / INTRANET)
- Directly by telephone line (MODEL WITH INTERNAL MODEM)
- Indirectly by means of GSM modem or XWEB serial modem (MODEL WITH RS232 OUTPUT PREPARATION)
- Via RS485 slave output with ModBus protocol to Manufacter XWEB300D / XWEB500D supervision systems
- Via RS485 with manufacter Cascade control management system.

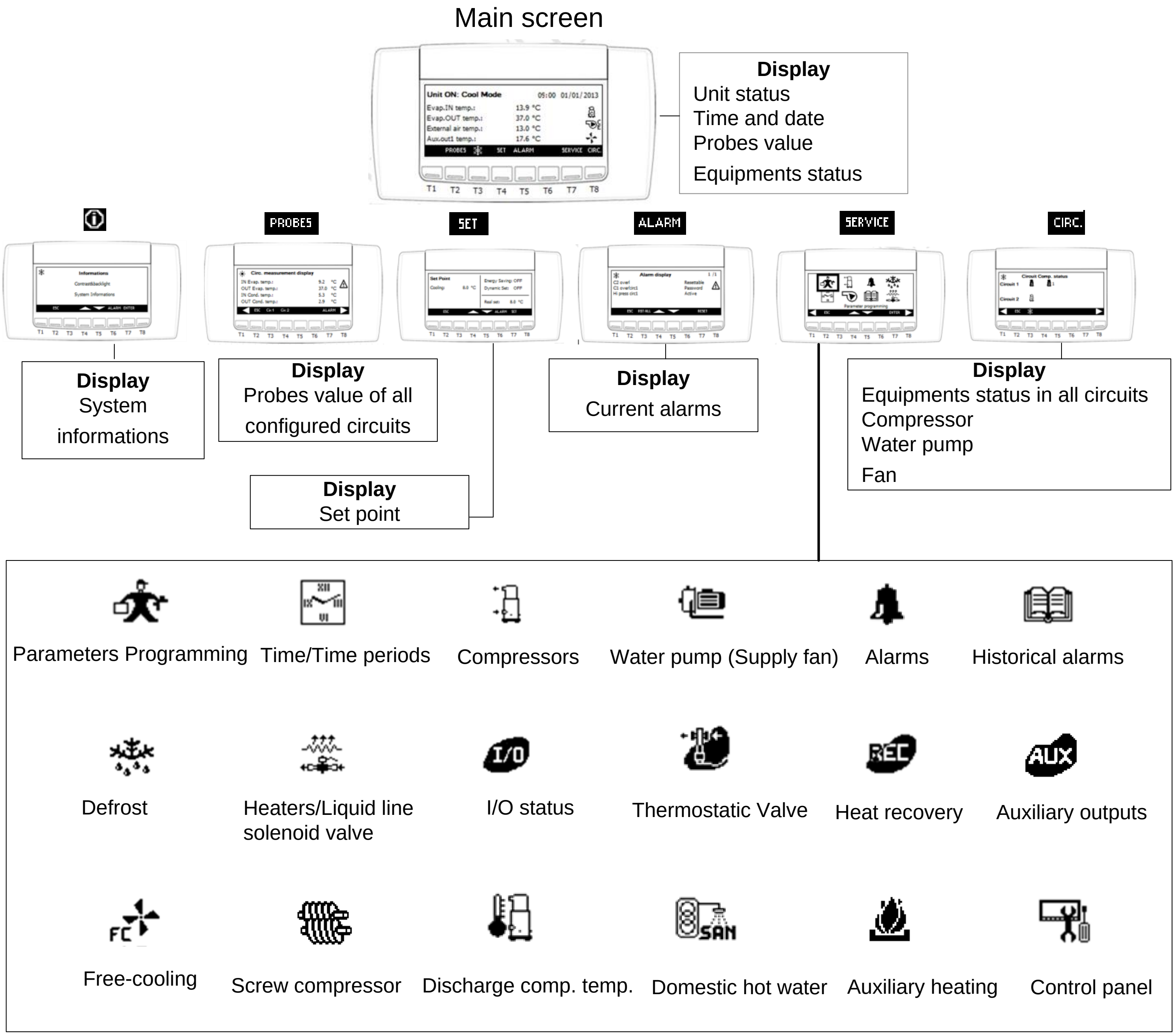


5. USER INTERFACE VISOGRAPH 1.0 AND VISOGRAPH 2.0

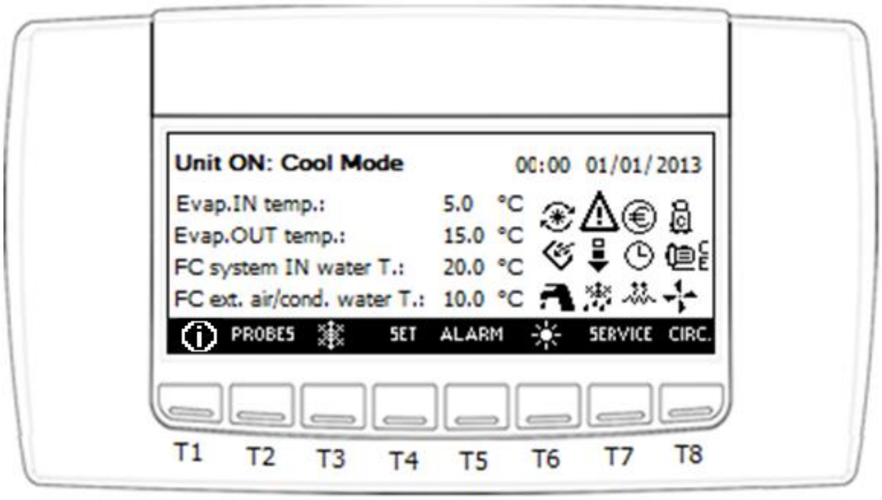
Using the VISOGRAPH LCD graphic keyboard, it is possible to monitor and modify the status of the unit. User can select UI type via configuring parameter DP12 in Wizmate with administrator authority. The options are: VISOGRAPH 1.0, VISOGRAPH 2.0 and VISOTOUCH.

VISOGRAPH 1.0 and VISOGRAPH 2.0 are different in hardware and firmware, but they are showing the same screens. The only difference is VISOGRAPH 2.0 can manage also two LEDs on the front panel in addition.

- Green LED: Always ON after power on.
- Red LED: ON when have alarm active or resettable.



The information that appears in the main screen is:

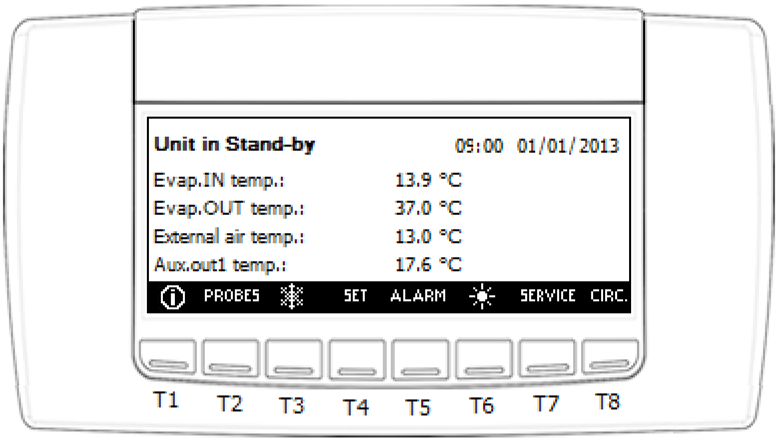


-  to indicate that at least one of the compressors is working.
-  to indicate that the evaporator pump  and/or the condenser pump  are working (the condenser pumps are present in the case of WATER-WATER configuration).
-  to indicate that the condenser fans are working
  (in the case of AIR-AIR or AIR-WATER unit configuration)

If the alarms occur or particular working modes sub-enter, the following icons will be shown on the main screens:

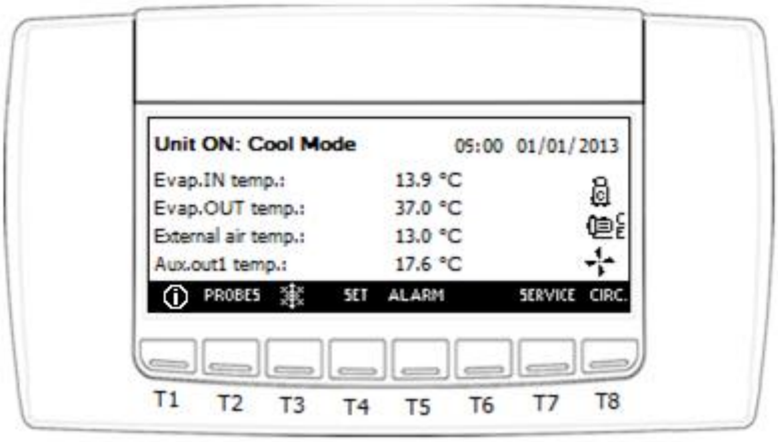
-  flashing to indicate that an alarm is active
-  to indicate that the UNLOADING mode is in progress
-  on to indicate that the defrost cycle is in progress, flashing during the count down
-  to indicate that the anti-freeze/support heaters are active
-  automatic switch-off and/or energy saving is enabled during the current day
-  to indicate that the unit is working within the energy saving period or that the dynamic set-point is active
-  to indicate that the domestic hot water production is active
-  to indicate that the auxiliary heating is active (it will display in the same place with domestic hot water production icon)

On unit power-on, the main screen will be the following (Displyed probes are selectable):



When the keyboard shows “Remote OFF”, “OFF through clock” or “Stand-by”, they all mean the unit is OFF now but with different causes.
When the keyboard shows “Unit ON: Cool Mode” or “Unit ON: Heat Mode”, they all mean the unit is ON now but in different working mode.

Below find a typical screen during working in chiller mode:



5.1 HOW TO SWITCH ON/OFF THE UNIT AND CHANGE CHILLER/HEAT PUMP WORK MODE FROM KEYBOARD

Firstly, we will talk about No Motor Condensing Unit. Set Par **CF04** = 0.

UNIT SWITCH-ON AND SWITCH-OFF CAN TAKE PLACE:

- From the keyboard
- From digital input configured as remote ON/OFF
- By time bands (see unit switch on/off by RTC)

5.1.1 Unit Switch-ON/OFF From The Keyboard

The unit can be configured as chiller only, heat pump only or as chiller with heat pump mode by par CF02.
For different type of units, the switch ON/OFF procedures are different.

CF 2	Selection of unit working 1 = chiller only 2 = heat pump only 3 = chiller with heat pump	1	3		

Note: If user wants change CF02 value, please switch off the unit to “Stand-by” status first. Otherwise, it may take no effect.
When only the heating is enabled, the ACF1 alarm is not generated if the reverse valves in the envisioned circuits are not configured.

SWITCH THE UNIT ON/OFF IN COOLING- HEATING MODE FROM THE KEYBOARD

The configuration should be:
CF04 = 0, (not Motor condensing unit)
CF02 = 3, (chiller with heat pump)
SP09 = 0, (from the keyboard)

In the beginning, the device is in stand-by mode, and the keys ❄ and ☀ are all visible. One is placed in key 3, another is placed in key 6, depends on Par SP08.
(The keyboard has eight keys in all. They are key 1, key 2, key 3…and key 8 from left to right.)

SP08 = 0: ❄ placed in key 3, ☀ placed in key 6.
SP08 = 1: ☀ placed in key 3, ❄ placed in key 6.

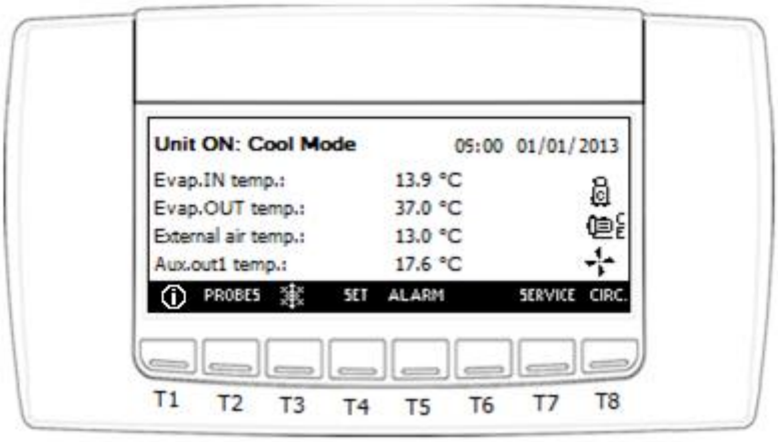
No matter how to place, key 3 is always used for cooling mode. Key 6 is always used for heating mode.

Suppose SP08 = 0, press key ❄ (key 3) can switch on the unit to work in cooling mode. At this moment ☀ is hidden.
Press the key ❄ again, the unit is switch OFF and return to status stand-by. The key ❄ and ☀ are all visible now. In this case, user can press key ☀ to switch to heating mode or press ❄ to restart the cooling mode.

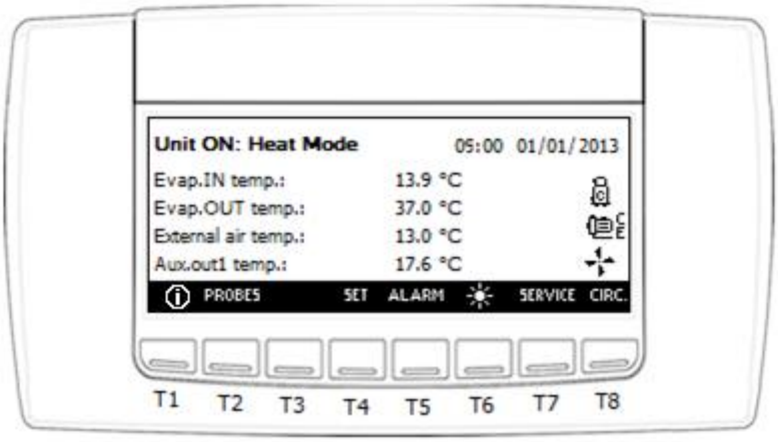
The device is in stand-by when both ❄ and ☀ keys are visible. The stand-by mode is obtained every time that the unit is off from cooling or heating working mode. Also in stand-by mode, the controller gives the possibility to:

- display the variables detected
- manage the alarm situations, displaying and signalling them.

When unit is ON in chiller mode, the status in the screen is “Cool Mode”:



When unit is ON in heat pump mode, the status in the screen is “Heat Mode”:



SWITCH THE UNIT ON/OFF IN COOLING MODE FROM THE KEYBOARD

The configuration should be:
CF04 = 0, (not Motor condensing unit)
CF02 = 1, (chiller only)
SP09 = 0, (from the keyboard)

In the keyboard, key 3 is always visible and key 6 is hidden. Key 3 will be shown as when SP08 = 0 and shown as when SP08 = 1.
Press key 3 can switch the device status between cooling mode and stand-by.

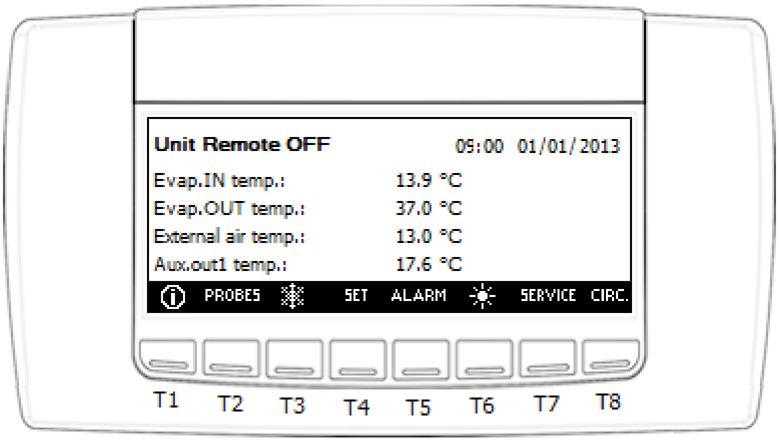
SWITCH THE UNIT ON/OFF IN HEATING MODE FROM THE KEYBOARD

The configuration should be:
CF04 = 0, (not Motor condensing unit)
CF02 = 2, (heat pump only)
SP09 = 0, (from the keyboard)

In the keyboard, key 6 is always visible and key 3 is hidden. Key 6 will be shown as when SP08 = 0 and shown as when SP08 = 1.
Press key 3 can switch the device status between heating mode and stand-by.

5.1.2 Unit Switch-ON/OFF From Digital Input

If the unit is switch off by remote digital input, the screen will be:



From digital input configured as **remote ON/OFF** (DI type =1). When deactivate, on the basis of the polarity selected, the input determines the OFF status

- It has priority with respect to the keyboard
- The unit can only be switched-on and off with input activated
- With input activated, the device goes back to the status previous to activation

5.1.3 Select The Working Mode: Chiller-Heat Pump

The parameter SP09 allows selecting and enabling the selection of the unit switch-on mode in the three working modes.

Par SP09 = 0

The switch-on selection of a unit configured for cooling and heating takes place from the keyboard.

AUTOMATIC WORKING SELECTION IN COOLING-HEATING MODE FROM DIGITAL INPUT

Par SP09 = 1

The switch-on selection of a unit configured for cooling and heating takes place from digital inputs configured as **Remote cooling/heating**(DI type=2). With digital input activated, cooling mode is selected, with digital input deactivated, heating mode is selected.

- The selection is enabled if a digital input is configured as cooling request or as heating request. If no digital input has been configured, the unit **REMAINS in stand - by**
- the cooling/heating selection from the keyboard is disabled. The unit can only be switched-on/off in the working status selected from the digital input
- CF02 is the precondition. If only CF02=3 the cooling/heating selection from digital input is available. Otherwise, the device working mode will be set by CF02.
- In the keyboard, keys for cooling/heating will be shown according to digital input status. E.g., digital input=cooling, key 3 is visible and key 6 is hidden. By pressing key 3, the unit can switch between cooling and stand-by.

AUTOMATIC WORKING SELECTION IN COOLING-HEATING MODE FROM ANALOGUE INPUT

Par SP09 = 2

Selection from analogue input (change over function) has priority with respect to the digital input. For temperature of the external air included in the SP11 differential, it is allowed to change the working mode from the keyboard.

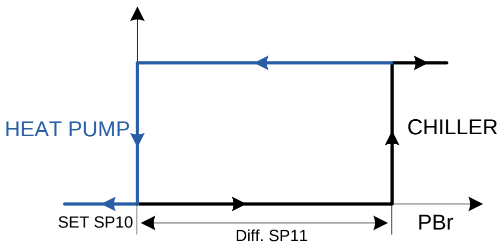
5.1.4 Change Over Function

SP10	Automatic chiller / heat pump mode changeover setting	-50.0 -58	110 230	°C °F	Dec int
SP11	Automatic chiller / heat pump mode changeover differential	0.1 1	25.0 45	°C °F	Dec int

The status change over can only take place if these necessary conditions are present at the same time, otherwise the unit **REMAINS in stand - by:**

1. CF02=3 (chiller with heat pump)
2. SP09=2 is an NTC probe configured as an **Dynamic/boiler function/change over set-point external air temperature NTC temperature probe**(AI type=35)
3. the regulation probe selected must not be in error conditions

AUTOMATIC CHANGE OVER REGULATOR GRAPHICS



Parameters that regulated the change over function
SP10 allows setting the change over set point. If the selection of the working mode from analogue input is enabled, it represents the temperature value detected by the regulation probe below which the device imposes the working in heating mode
SP11 allows setting the change over differential. If the selection of the working mode from analogue input is enabled, it represents the temperature differential on the basis of which the device imposes the working in cooling mode
For temperature of the external air included in the SP11 differential, it is allowed to change the working mode from the keyboard.

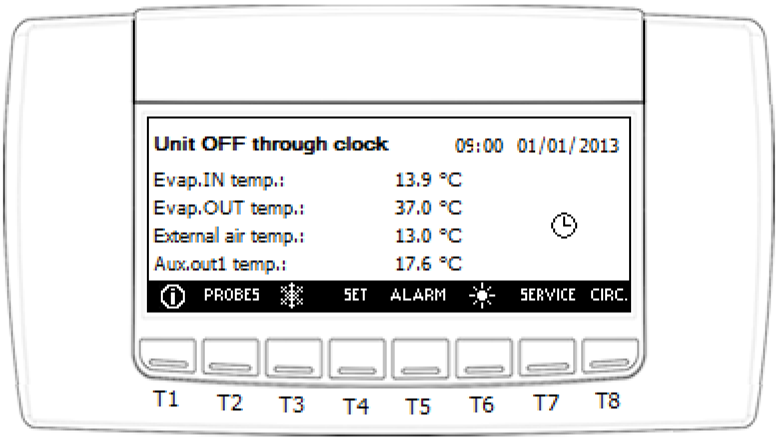
NTC external air temperature regulation NTC probe > SP10+ SP11, the unit is switched-on in cooling mode.
NTC external air temperature regulation NTC probe < SP10, the unit is switched-on in heating mode.

5.2 UNIT SWITH ON/OFF BY RTC

5.2.1 Working With Clock Disabling Digital Input

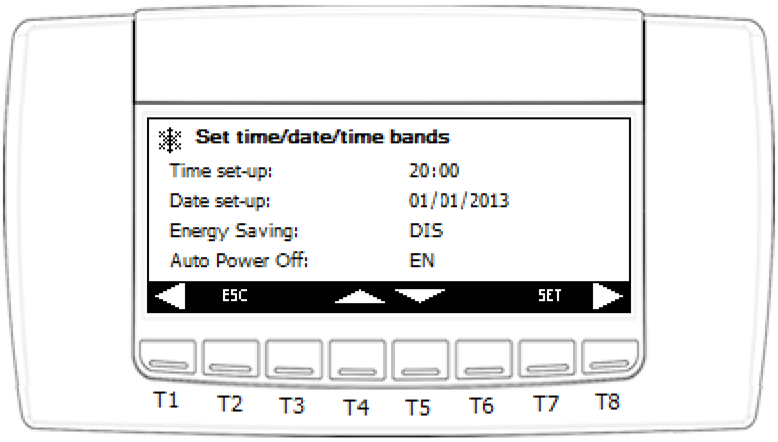
ES 1	Start of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 2	End of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 3	Start of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 4	End of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 5	Start of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES 6	End of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES18	Monday automatic shutdown time band	0	7		
ES19	Tuesday automatic shutdown time band	0	7		
ES20	Wednesday automatic shutdown time band	0	7		
ES21	Thursday automatic shutdown time band	0	7		
ES22	Friday automatic shutdown time band	0	7		
ES23	Saturday automatic shutdown time band	0	7		
ES24	Sunday automatic shutdown time band	0	7		

If the unit is switch off during switch-off time bands, the screen will be:

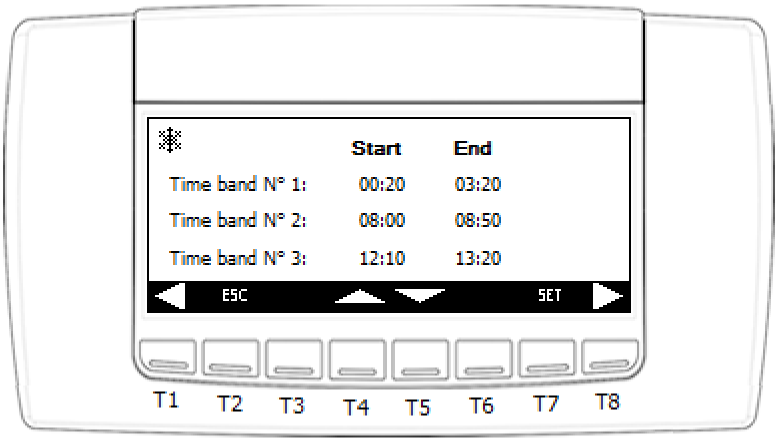


If a digital input is configured as **Digital input working in RTC automatic enabling (time band)/manual (keyboard) mode** (DI type=91) and is active, the working via the internal clock is disabled. Otherwise, if this digital input is not configured or configured but not active, enables the working via the internal clock.
The unit is forced to switch off within the time band.
Set the time band with Par ES01-ES06, and select weekly time band by Par ES18-ES24. If current time is inside the setting band, the unit will be shut off automatically, and the keyboard shows “Unit OFF through clock”.

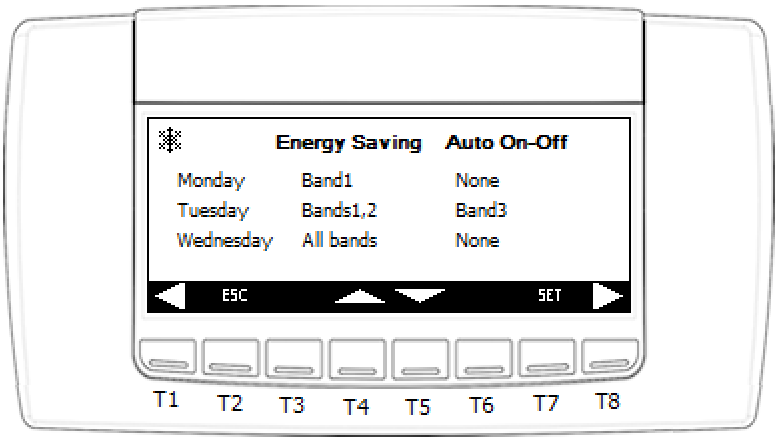
The RTC time band also can be configured from keyboard.
Enter into the **TIME/TIME PERIOD** screen from **SERVICE** menu.



Enable the **Auto Power Off** option, set **Time band N1/N3** in page 2.

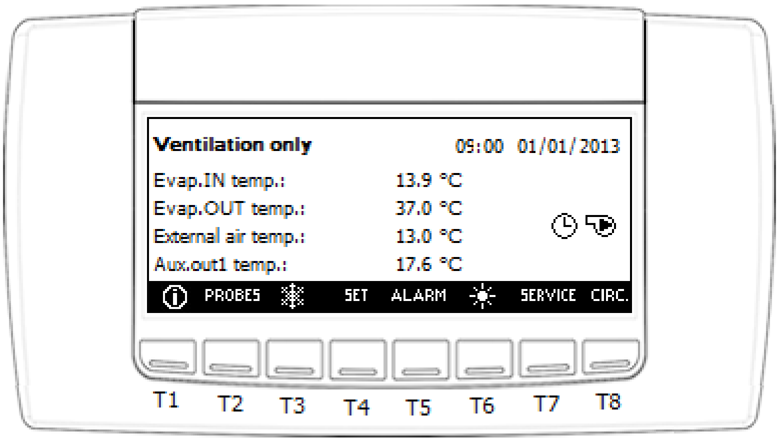


Select time band from **Monday** to **Sunday** in the next pages' last column **Auto On-Off**.



5.2.2 Working With "Ventilation Only" Digital Input (Air-Air Unit Only)

If the unit has been configured as AIR-AIR, during clock off, it is possible to decide whether to enable ventilation or not. When ventilation enabled, the screen will be:



This working mode is only enabled if the clock is present and enabled.
Set CF01=0, select air/air unit.
Set ES01-06, ES18-24 to enable the function automatic shutdown by RTC.
If a digital input is configured as **Digital input working with supply fan only** (DI type=92) and is active, when current time is inside the automatic shutdown time band, the unit will work in "Ventilation only" mode.
In "Ventilation only" mode, only relay configured as supply fan is enabled.
After current time goes out of the automatic shutdown time band, the unit will back to normal working mode.

WARNING: In ventilation only mode, the supply fan will forced to active if unit is on. When the unit is placed in remote off or stand-by, supply fan will switch off after the delay time set in par PA03.

5.2.3 Working With Unit In OFF From RTC If ON Is Forced From Key

ES25	Unit maximum working time in OFF from RTC if forced in ON from key	0	250	Min	10 Min

When the unit is OFF by RTC, user can use keyboard or digital input to force the unit ON. However, the ON time can't be longer than the time set by Par ES25. After ES25 time, the unit will be forced back to OFF status.
During ES25 time, user can manually switch OFF the unit by keyboard or digital input.

5.3 OPERATION IN CONDENSING UNIT WORKING MODE

If CF04 = 1, the unit will work as Motor-condensing unit.

CF 4	Motor-condensing unit 0 = no 1 = yes Temperature control, dynamic set point and energy saving functions are automatically disabled when CF04 = 1	0	1		

WARNING:
In condensing unit working mode the temperature control, dynamic set-point function and energy saving function are disabled automatically
In condensing unit working mode, the cooling/heating capacity is only controlled by digital input configured as **Capacity step x demand digital input** (x can be 1 to 16.DI type = 96-111).

5.3.1 Working With Digital Input Configuration As Temperature Control Request

Unit configured as motor-condensing CF04 = 1.
Configure DI as **Cooling/Heating demand digital input (condensing unit).** (DI type = 93)

- With DI contact NOT ACTIVE unit in **OFF**
- With DI contact ACTIVE unit in **cooling/heating**

With DI contact active, user can select the cooling or heating working mode by parameter CF02, SP09 and keyboard. The capacity steps will be called by DI configured as **Capacity step x demand digital input** (x can be 1 to 16.DI type = 96-111) if resources are available in the circuit.
With DI contact active, user can switch ON/OFF the unit by the keyboard. With DI contact not active, the unit will always OFF.

5.3.2 Working With Digital Input Configured As Cooling Request

Unit configured as motor-condensing CF04 = 1, CF02=1 or 3.
Configure DI as **Cooling demand digital input (condensing unit)** (DI type= 94)

- With DI contact NOT active unit is **OFF**
- With DI contact active unit is **ON** in chiller mode

With DI contact active, unit works in chiller mode. The capacity steps, if available, will be called by DI configured as **Capacity step x demand digital input** (x can be 1 to 16)**.**
With DI contact active, user can switch ON/OFF the unit by the keyboard. If the unit has been switched-off from the keyboard, user can re-start it by deactivated and re-activated the digital input.

5.3.3 Working With Digital Input Configured As Heating Request

Unit configured as motor-condensing CF04 = 1, CF02=2 or 3.
Configure DI as **Heating demand digital input (condensing unit)** (DI type= 95)

- With contact NOT active unit is **OFF**
- With contact active unit is **ON** in heat pump mode

With DI contact active, unit works in heat pump mode. The capacity steps, if available, will be called by DI configured as **Capacity step x demand digital input** (x can be 1 to 16)**.**
With DI contact active, user can switch ON/OFF the unit by the keyboard. If the unit has been switched-off from the keyboard, user can re-start it by deactivated and re-activated the digital input.

Working error
If two digital inputs are configured as cooling request and heating request with both inputs active at the same time, the unit will be positioned in OFF mode.

5.4 HOW TO MODIFY THE INFORMATION PRESENT IN THE MAIN SCREEN

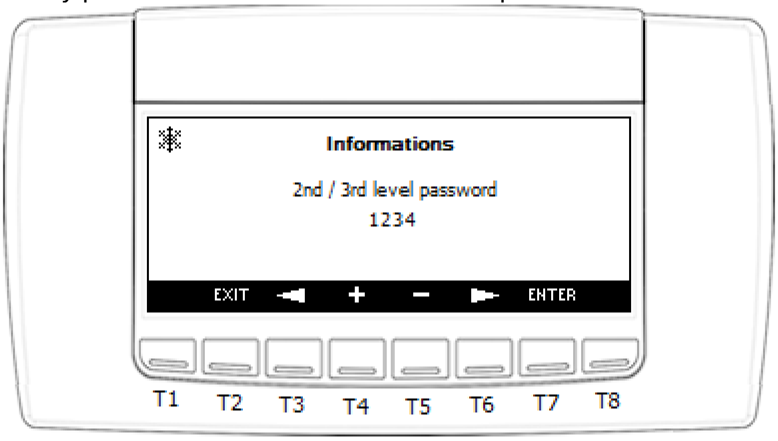
5.4.1 Select Probes For Display

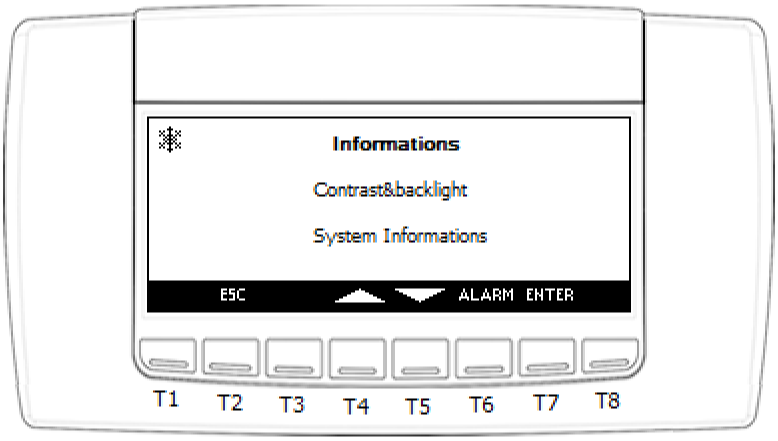
To select the probes to display on the keyboard, modify the parameters from DP01 to DP04 (see Programming parameters paragraph).

5.5 INFORMATION KEY IN MAIN SCREEN

Pressing the ⓘ key enter in the Informations screen.

This screen is protected by password. The 2nd level or 3rd level password are all available.

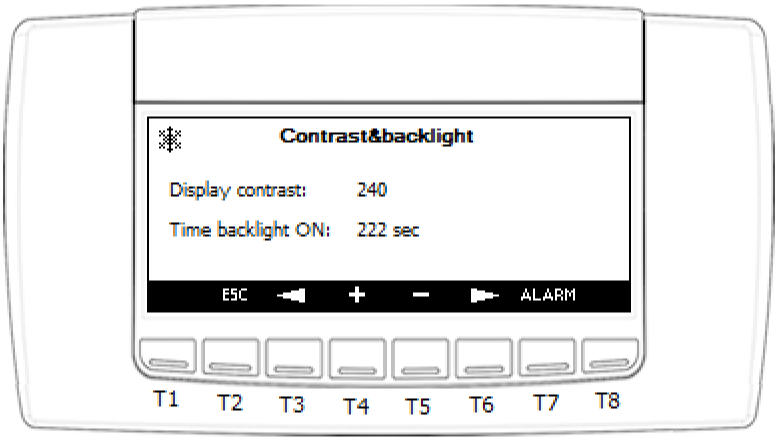




The possible options in this menu are:

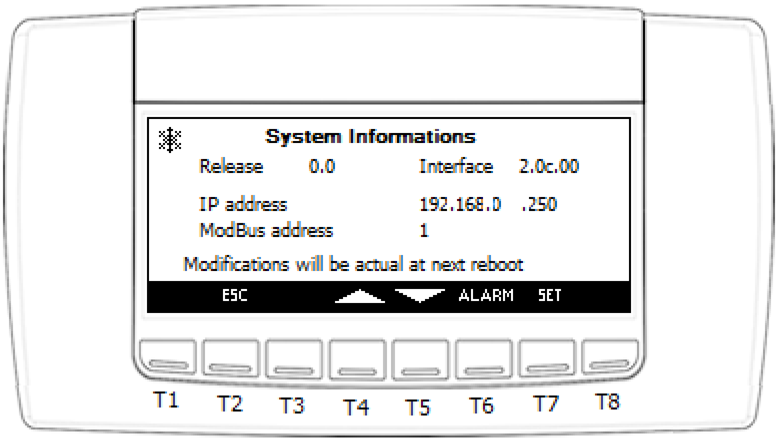
- Contrast & backlight:
  Contrast: regulation from 0 to 200
  Back light time ON: regulation from 0 to 200 seconds, or always on
- System Information: Release software, setting IP address and MODBus node.

- Contrast & backlight:



- System information:

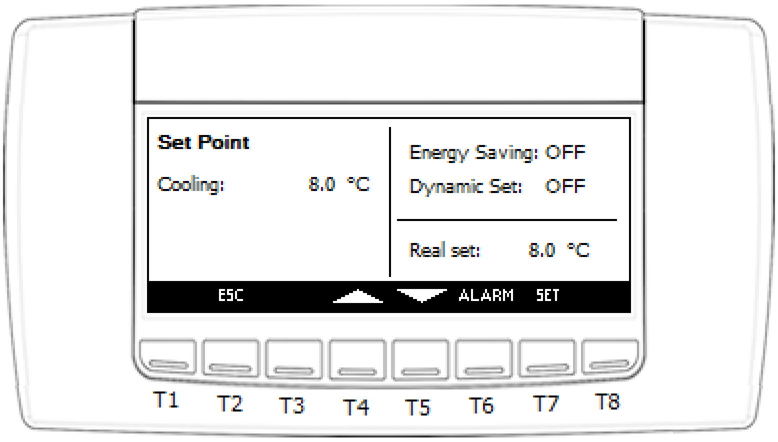
The IP address and ModBUS address are editable, but the modification will be actual at next reboot of the ipro.



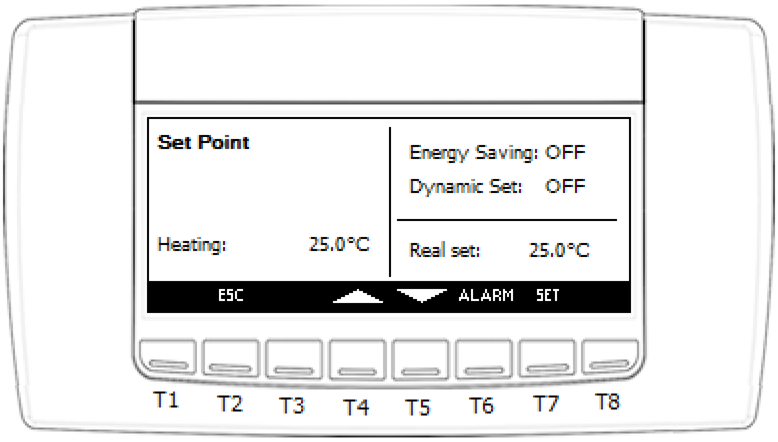
5.6 SET KEY IN MAIN SCREEN

To set the set-point of the cooling and/or heating from the main screen, press **SET**. In this way, enter the set-point screen.

Chiller mode:



Heat pump mode:

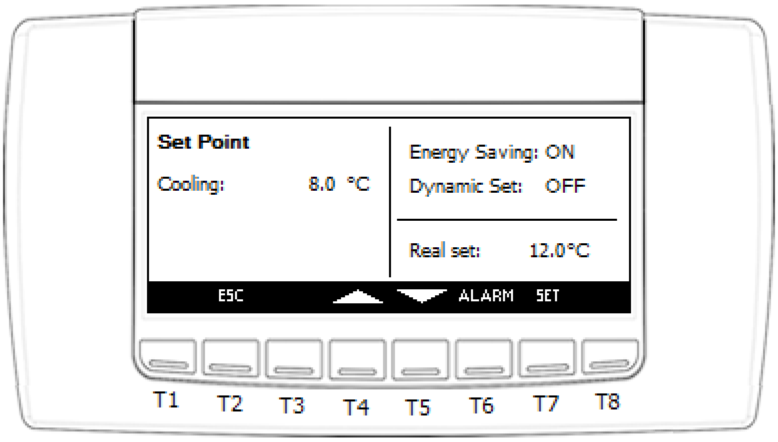


To modify the values, position the cursor on the element "Cooling" or "Heating" temperature and press the **SET** key:

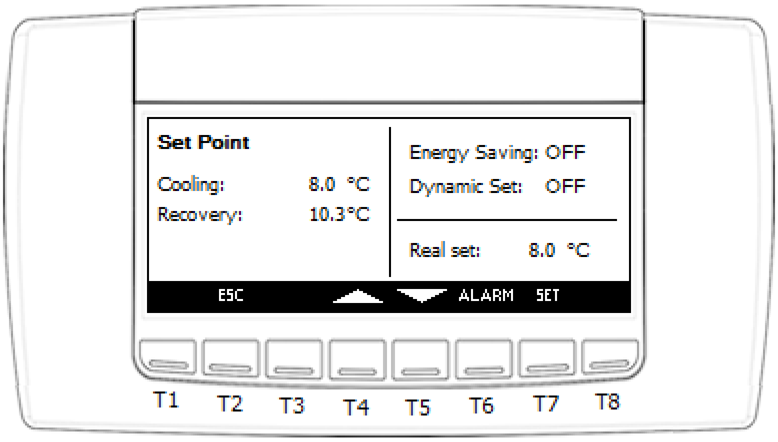
- The element starts to flash.
- Increase or decrease the value using the **UP** and **DOWN** keys.
- Confirm the modification by pressing the **SET** key again.

The cursor will automatically position itself on the next element, to modify it repeat the operation just described.

In this screen it is also possible to verify (but not modify) whether the energy saving mode and dynamic set are active. If they are active, the **real set** may different from the **Cooling** or **Heating** set.
Cooling (**Heating)** set is always the same as par ST01(ST04), the **real set** represent the set-point value including the energy saving delta or of the dynamic set, and it is read only (can't be modified).



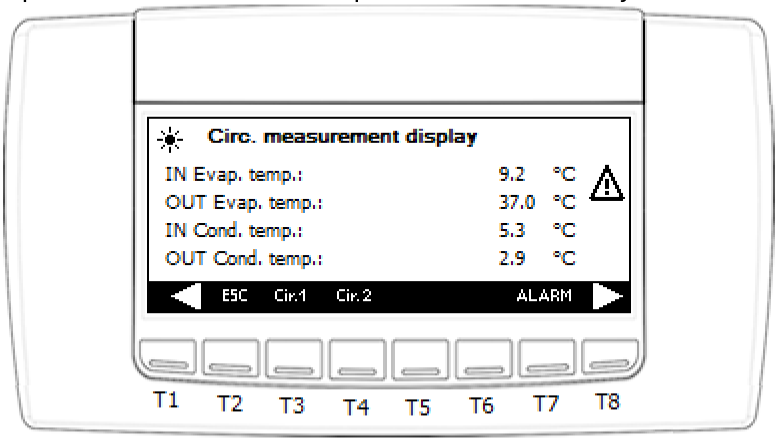
If heat recovery is enabled (RC01>0), the recovery set point will also shown in this screen.



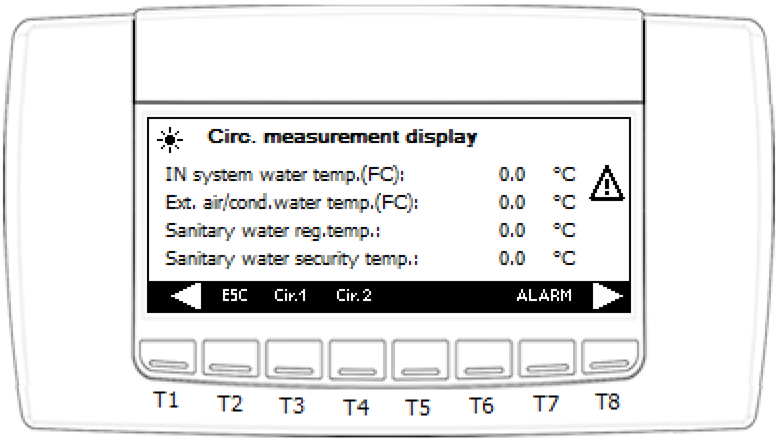
Press the **ESC** key several times to go back to the main screen.

5.7 PROBES KEY IN MAIN SCREEN

To see the configured probes value of the circuits, press the **PROBES** key in the main screen;

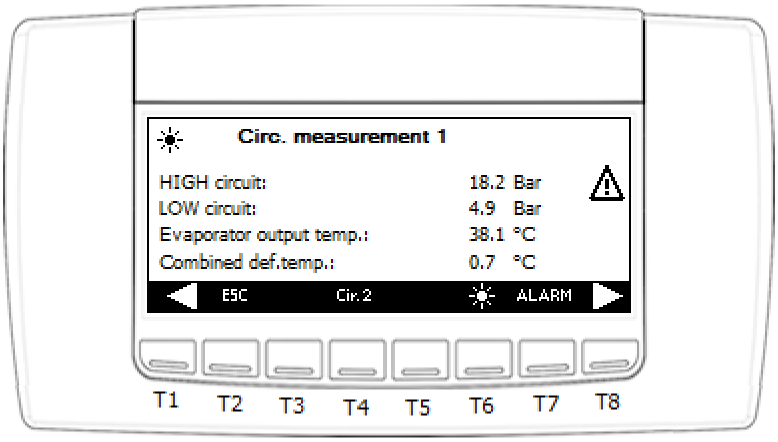


By pressing the  key, all of the relevant variables of the circuits can be seen.

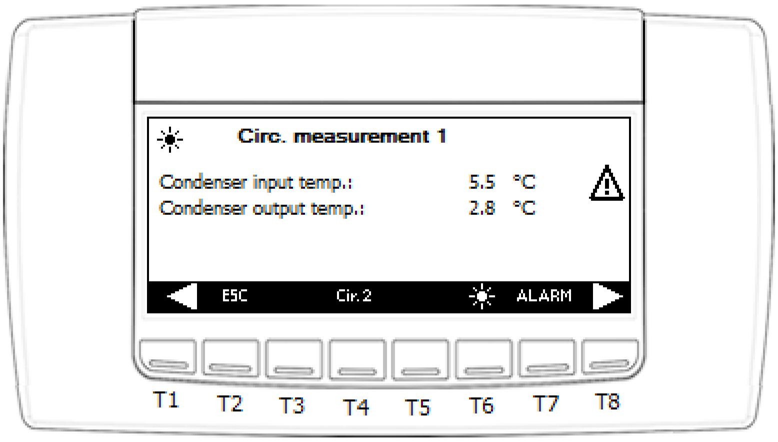


Warning: the probes displayed are only those configured.
In order to display the variables relative to the individual circuit, press the relative key. For example, if the variable of circuit 1 is to be displayed, press 

.



By pressing the  key, all of the other variables of the circuit selected can be seen.



Press the **ESC** key several times to go back to the main screen.

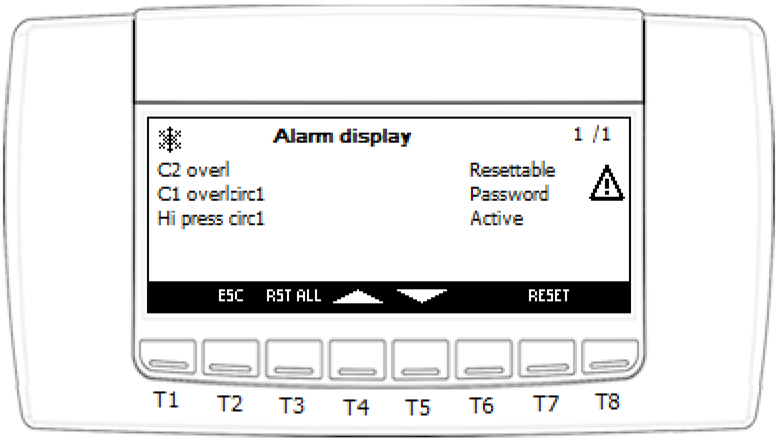
5.8 ALARM KEY IN MAIN SCREEN

When an alarm occurs, the display shows the flashing icon  and the buzzer starts to operate.
Press any key to silence the buzzer.

Moreover, the alarms key starts to flash alternately with the icons 

/ 

;
By pressing the key, pass to the alarms in progress screen:



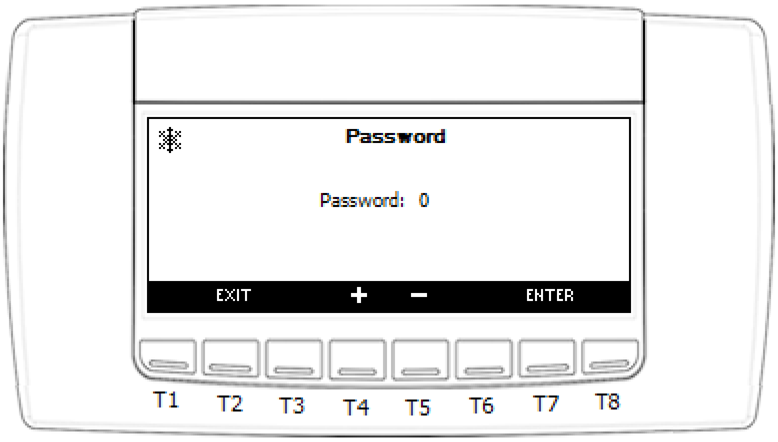
Three types of alarms can be present:

- Resettable → in this case, the alarm is not active and can be reset. Position the cursor on the alarm element and press **RESET**.
- Password → in this case, the alarm is not active, but a password is required to reset it.
- Active → the alarm is still in progress.

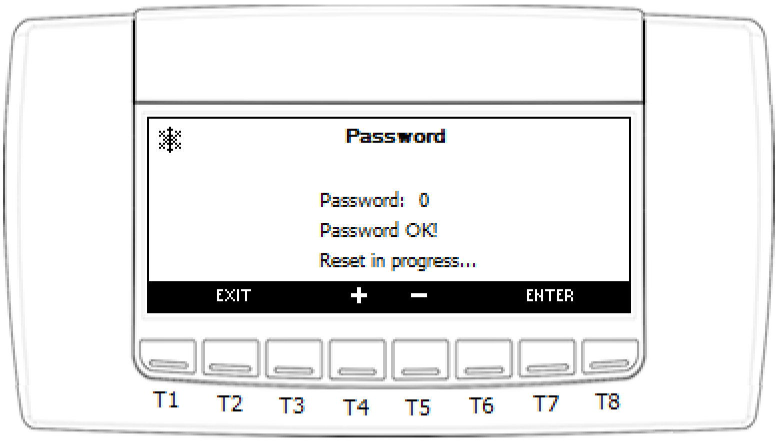
If there are several resettable alarms, instead of selecting them one by one, press **RST ALL** and they will all be reset together.

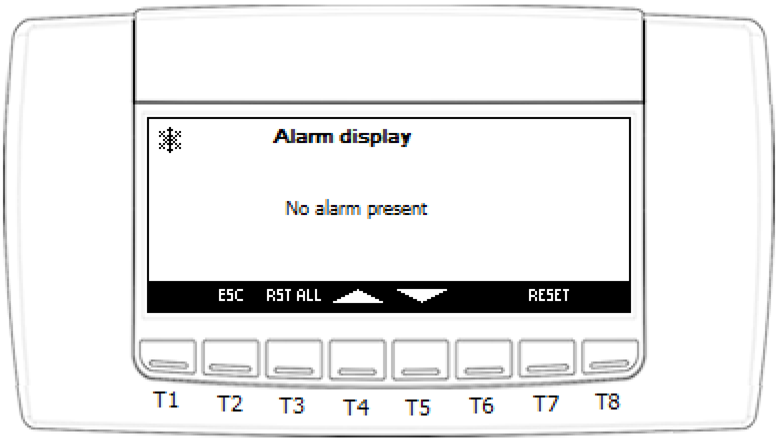
To reset an alarm that is protected by a password, operate as follows:

- Select the alarm marked by "Password".
- Press **RESET**.

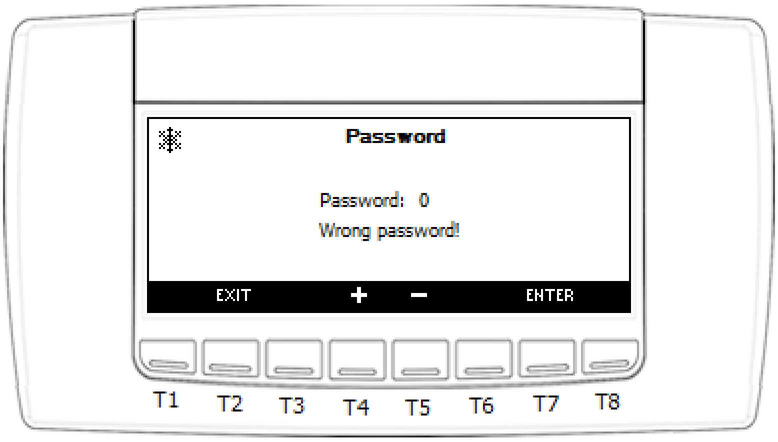


- Via keys  and  , set the password.
- Press **ENTER** to confirm.
- If the password is correct, the following message will be displayed:





- If the password introduced is incorrect, the following message will be displayed:

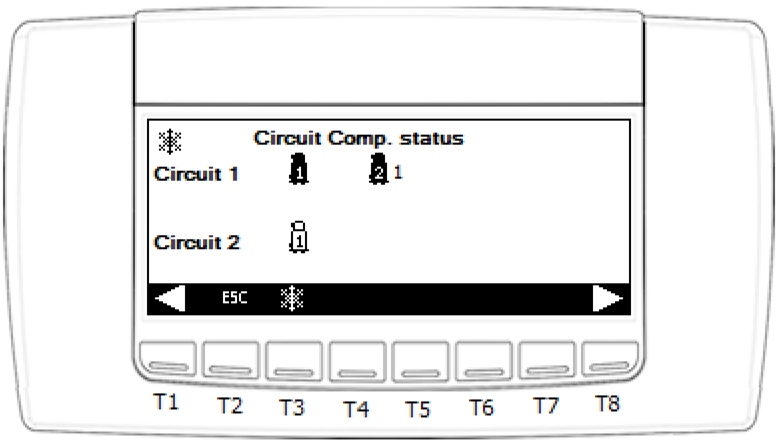


If the password is correct, after a few minutes you will go automatically back to the alarms screen.

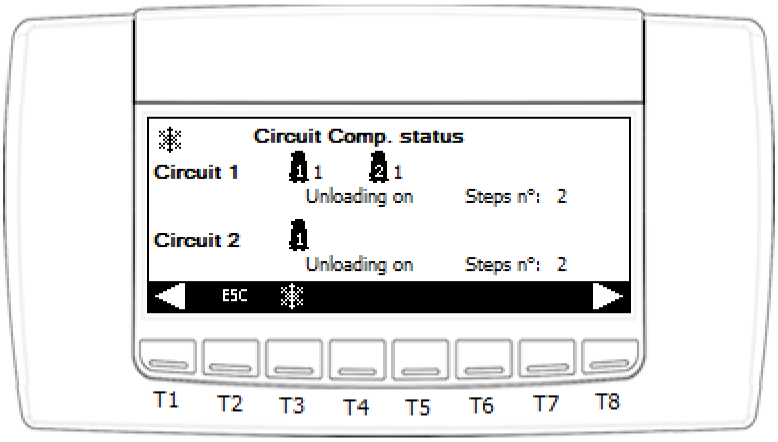
5.9 CIRC KEY IN MAIN SCREEN

Using the **CIRC** key in the main screen it is possible to monitor the situation of the unit. The information refers to:

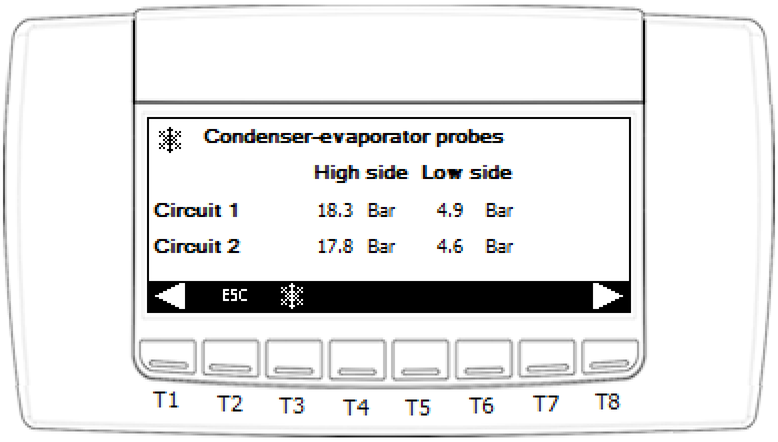
- Circuits compressors status; the screen shows the compressors present for each circuit and the activation status of the compressor (number of unloaders active). If the compressor has no number on the right, it means that it is at full power.
  In the screen below, circuit 1 has 2 compressors configured. Compressor 1 running at full power, compressor 2 running at 1st power step. circuit 2 has 1 compressors configured and it is not working now.



If unloading should be active, the maximum step number for unloading will be displayed.

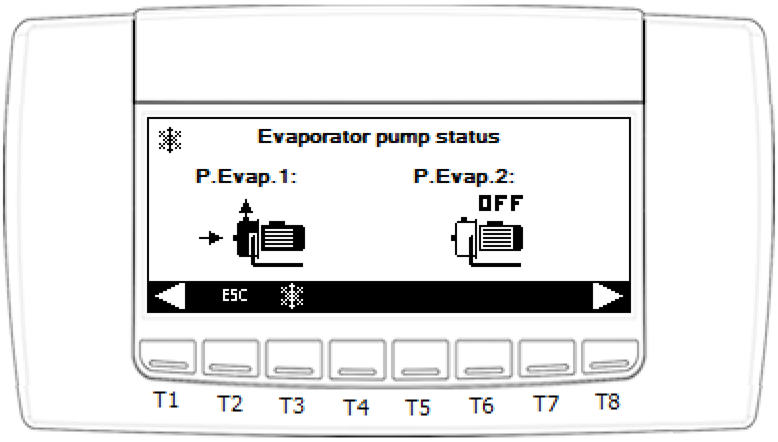


- Condensation-evaporation probes. The screen shows the condensation and evaporation pressures of every circuit present.

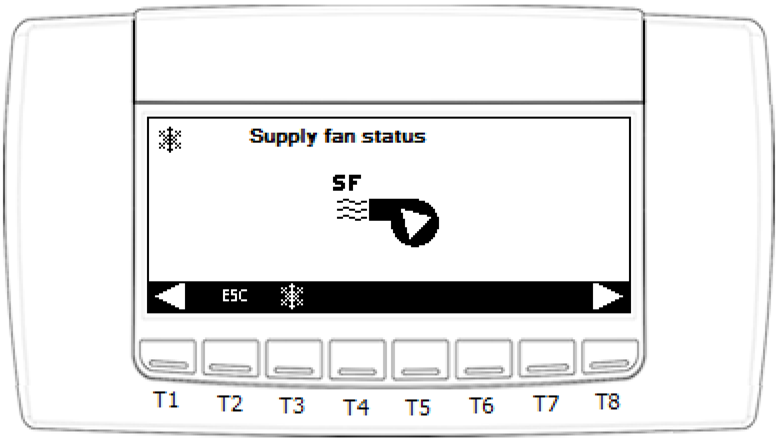


If the valuer of the parameter SP01 is equal to "0" or "2", the high side is represented with the temperatures.

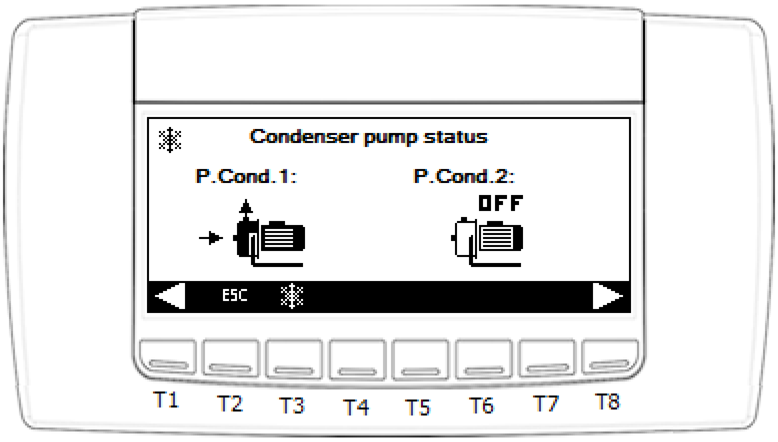
- Status of the evaporator pump (or evaporator pumps if the support is present)



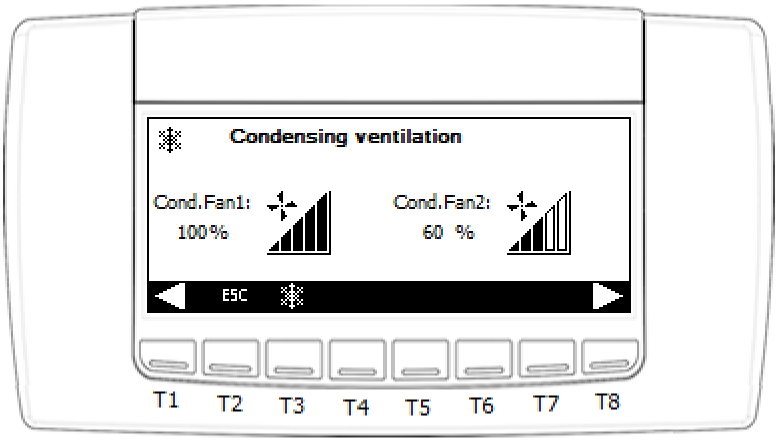
- Status of the supply fan

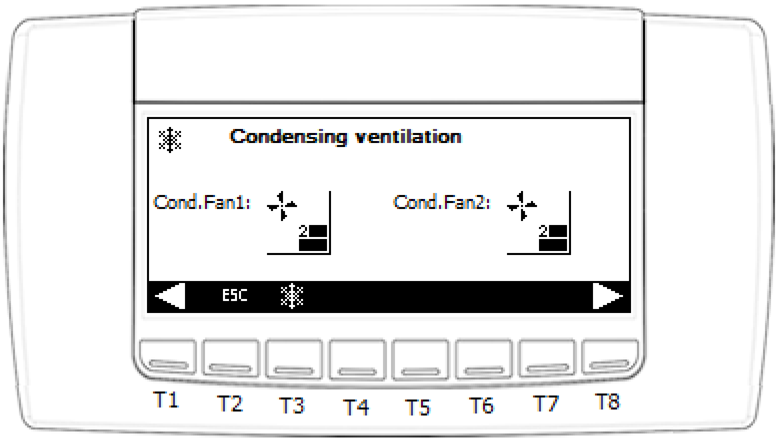


- Status of the condenser pump (or of the pumps if the WATER-WATER support is present)



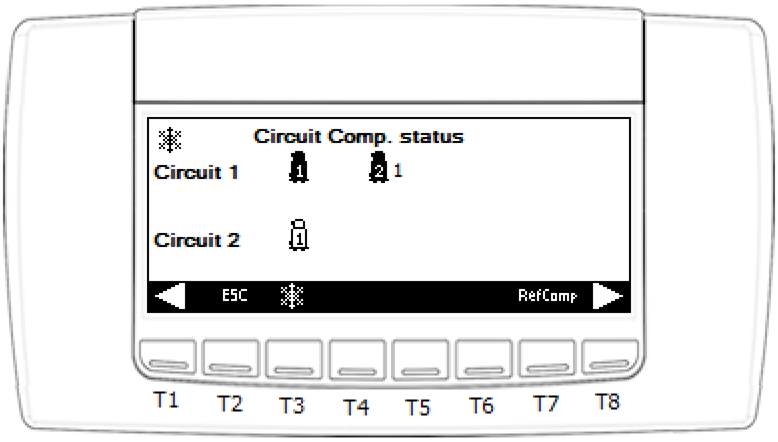
- Condensation fans (proportional or with steps - AIR-AIR or AIR-WATER)

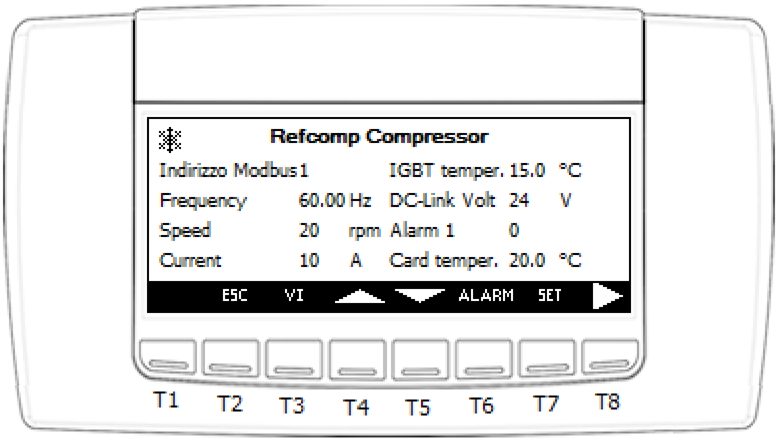




By pressing the  or  keys, pass from one screen to another.

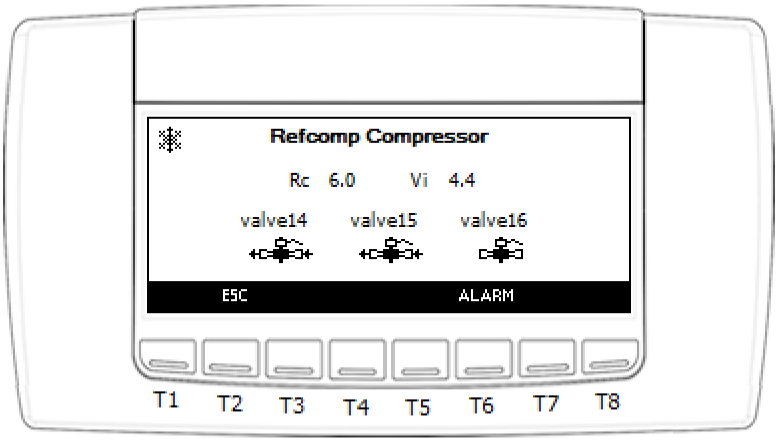
- Refcomp compressor information
  If Refcomp compressor is configured, press key **RefComp** to see relevant information.





In the screen above, the modbus address is editable.

- Refcomp compressor valve status
  Press key **VI** to see the valve status

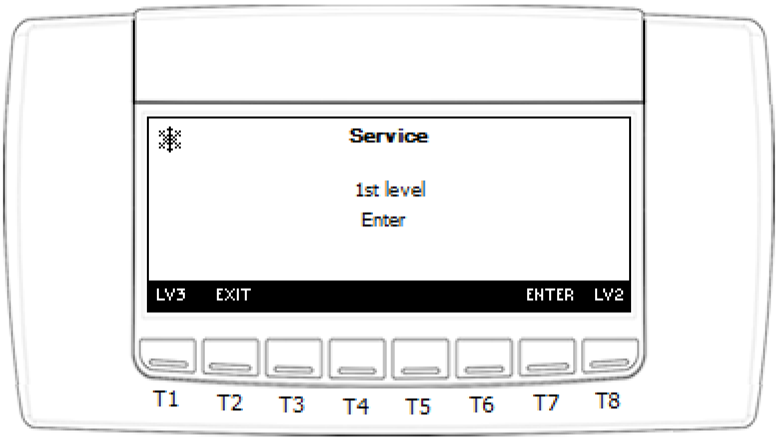


5.10 SERVICE KEY IN MAIN SCREEN

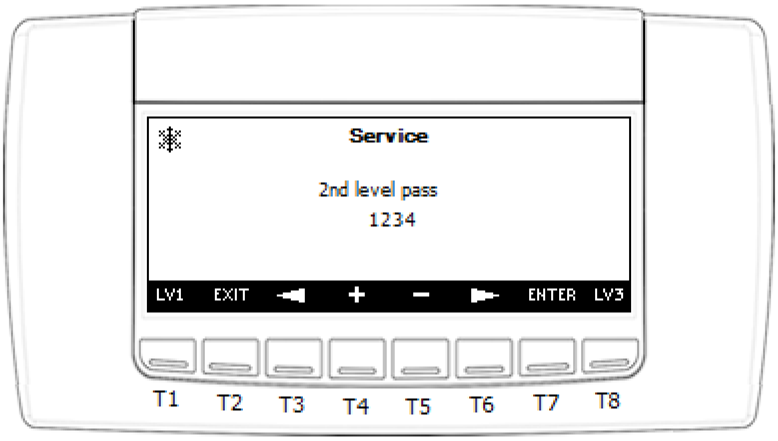
By pressing the SERVICE key, enter the configuration of:

- Parameters Programming
- Time/Time periods Programming
- Compressors
- Water pump (Supply fan)
- Alarms display
- Historical alarms
- Defrost
- Heaters/Liquid line solenoid valve
- I/O status (Inputs and Outputs)
- Thermostatic Valve
- Heat recovery function
- Auxiliary outputs
- Free-cooling
- Screw compressor
- Discharge compressor temperature
- Sanitary water (Domestic hot water)
- Auxiliary heating
- Control panel

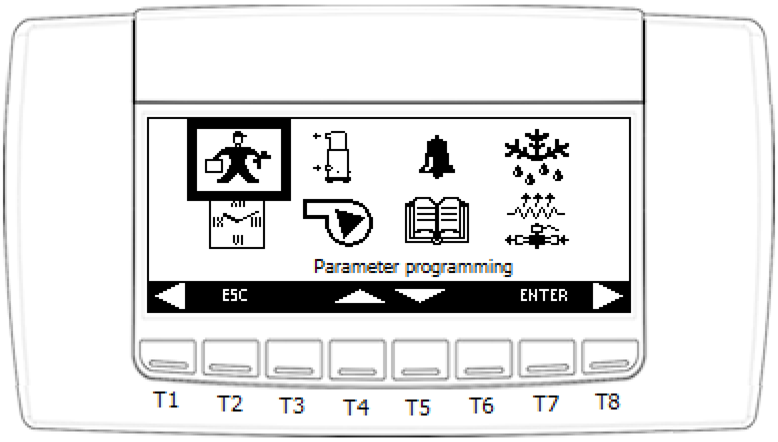
The SERVICE menu is protected by password in 3 levels.
For 1st level, no password needed. Press key ENTER can enter in SERVICE menu directly.



Press key LV2 or LV3 can switch to higher user level.
For 2nd and 3rd level, relevant password is required.


Service
2nd level pass
1234
LV1
EXIT
ENTER
LV3
T1
T2
T3
T4
T5
T6
T7
T8

5.10.1 Parameters Programming



By selecting this menu it is possible to modify the value of the parameters depending on the Password level. The parameters are divided per groups with the following meaning:

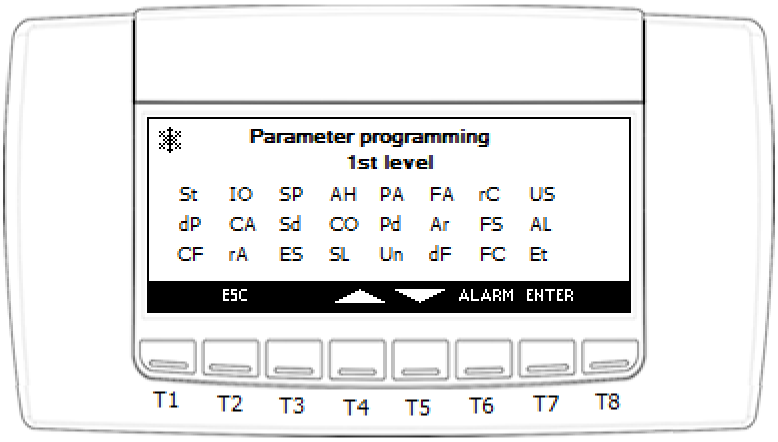
Label	Meaning
ST	Display temperature control parameters
DP	Display variables to be shown on the keyboard
CF	Display configuration parameters
SP	Display parameters for machine set up
Sd	Display dynamic set-point parameters
ES	Display energy saving and automatic timed switch-on/off parameters
AH	Display auxiliary heating parameters
CO	Display compressor parameters
SL	Display stepless compressor parameters
PA	Display evaporator/condenser water pump parameters
Pd	Display pump down function parameters
Un	Display unloading function parameters
FA	Display ventilation parameters
Ar	Display anti-freeze heaters parameters
dF	Display defrost parameters
rC	Display heat recovery parameters
FS	Display production of domestic hot water parameters
FC	Display free-cooling function parameters
US	Display auxiliary output parameters
AL	Display alarm parameters
Et	Display parameters for the management of the electronic expansion valve
IO	Display inputs/outputs configuration parameters
CA	Display analog input calibration parameters
RA	Display analog input range parameters

According to user level, different amount of parameters are visiable in the parameters programming screen.

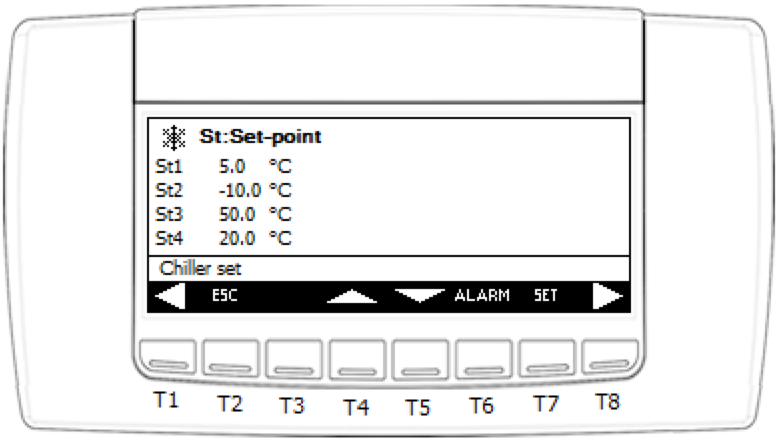
- If user entered into SERVICE menu with 1st level, he can enter to see parameters in Level 1(Pr1).
- If user entered into SERVICE menu with 2ndlevel, he can enter to see parameters in Level 1(Pr1) and Level 2(Pr2).
- If user entered into SERVICE menu with 3rd level, he can enter to see parameters in Level 1(Pr1), Level 2(Pr2) and Level 3(Pr3).

In the selected level screen, user only can see parameters with equal or lower protecting level.
For example: When enter into 2nd level parameters screen, only parameters with Pr1 or Pr2 are displayed. And user can change a parameter's protecting level to Pr1 or Pr2 in this screen.

Use the **UP** and **DOWN** cursors to select the family of parameters and press **ENTER**.



To modify a parameter, position the cursor on the value and use the **UP** and **DOWN** cursors and press **SET**:

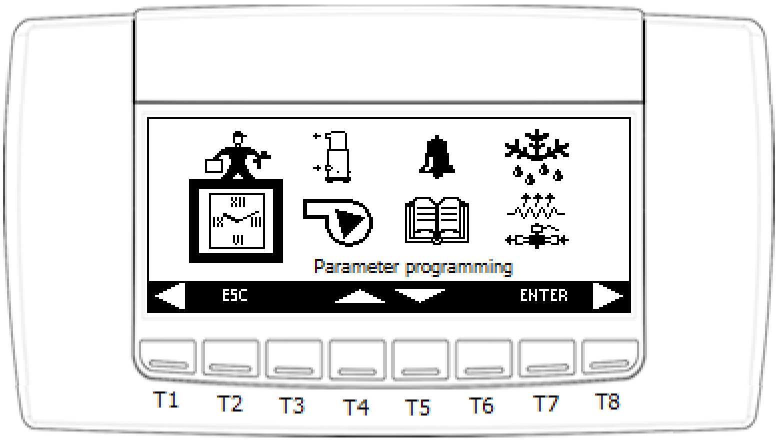


- The element starts to flash.
- Increase or decrease the value using the **UP** and **DOWN** keys.
- Confirm the modification by pressing the **SET** key again.

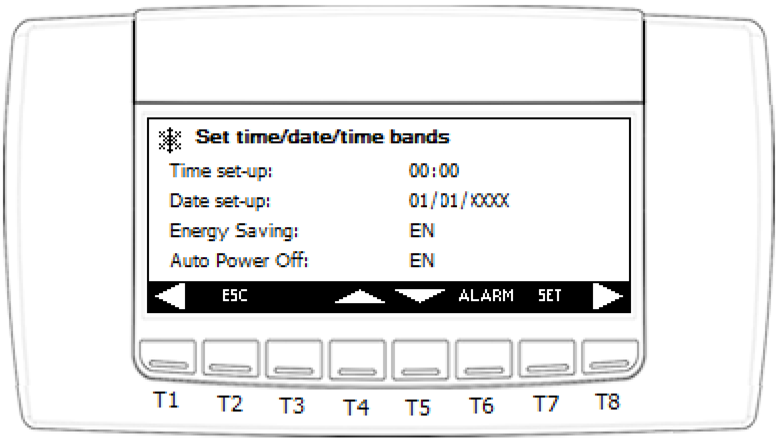
The cursor will automatically position itself on the next element, to modify it repeat the operation just described.
When cursor position in different parameters, the parameter's description will display in the bottom.
Press the **ESC** key several times to go back to the main screen.

Warning:
For parameter groups CF, IO, CA, and RA, they can be verified and changed only if the unit is switch-OFF (stand-by).

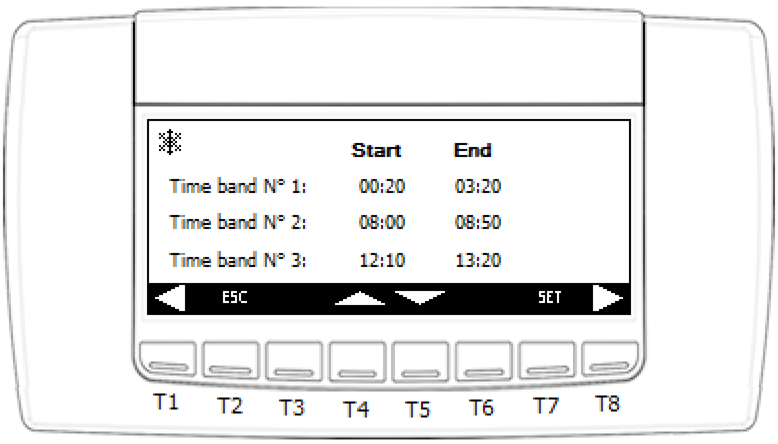
5.10.2 Time/Time Bands



We have already seen previously that this menu is used for the time and date set.
It is also possible to enable or disable the Energy Saving and/or automatic switch off of the time bands.



By pressing the  key, pass to the screen for the configuration of the three time bands.

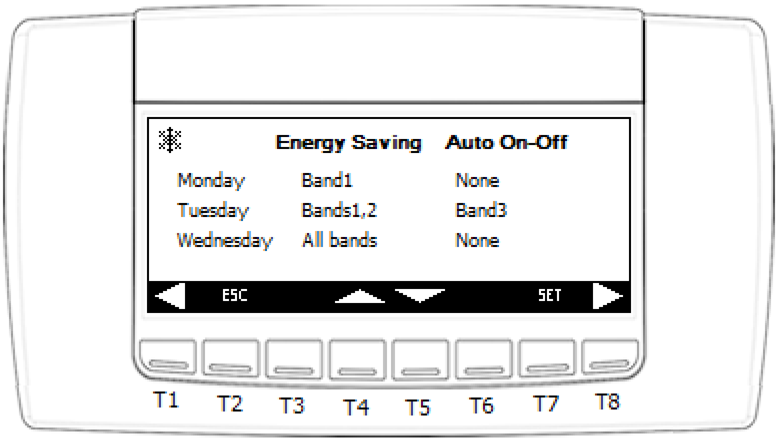


To modify the values, position the cursor on the element and press the **SET** key:

- The element starts to flash.
- Increase or decrease the value using the **UP** and **DOWN** keys.
- Confirm the modification by pressing the **SET** key again.

The cursor will automatically position itself on the next element, to modify it repeat the operation just described.

By pressing the  key again, pass to the screen for weekly programming of the time periods for the Energy saving and for automatic switch-off.

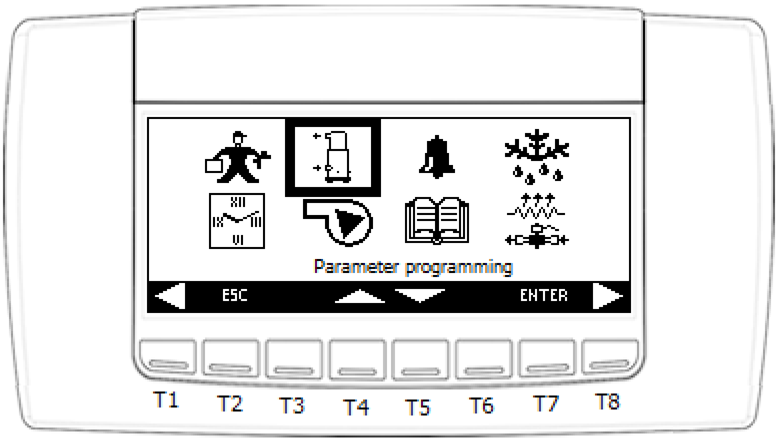


For every day of the week and for both functions, it is possible to manage:

- No time band
- Band 1
- Band 2
- Band 1 and 2
- Band 3
- Band 1 and 3
- Band 2 and 3
- All bands

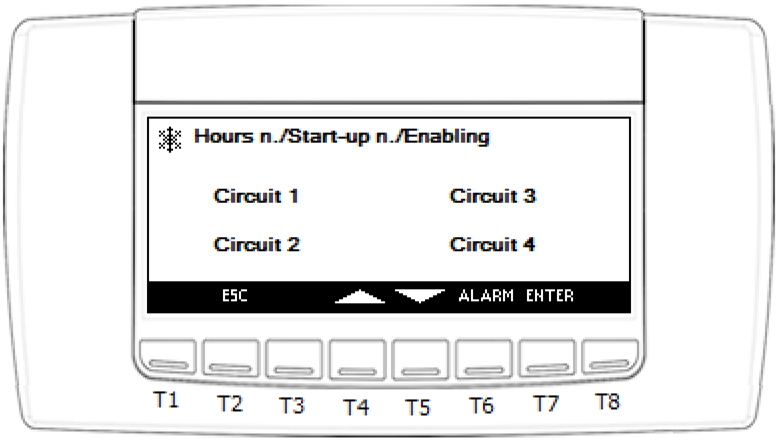
Warning: Automatic switch-off has priority with respect to Energy saving
Press the **ESC** key several times to go back to the main screen.

5.10.3 Compressors



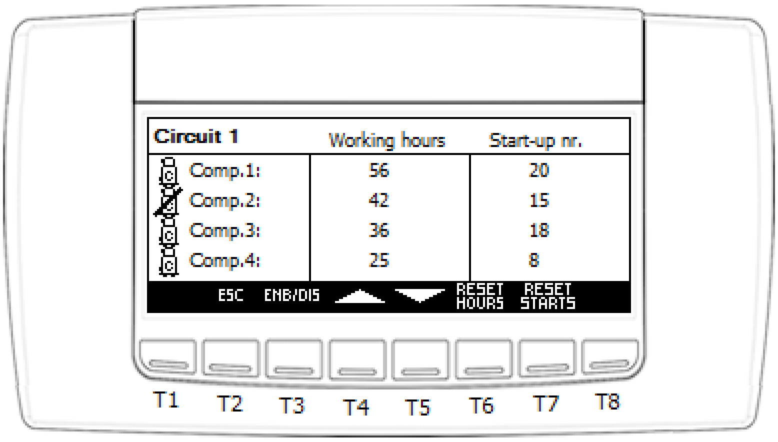
The following information is available for each circuit in this menu:

- Hours worked by each individual compressor
- Number of start-ups for each individual compressor



For each individual compressor it is possible:

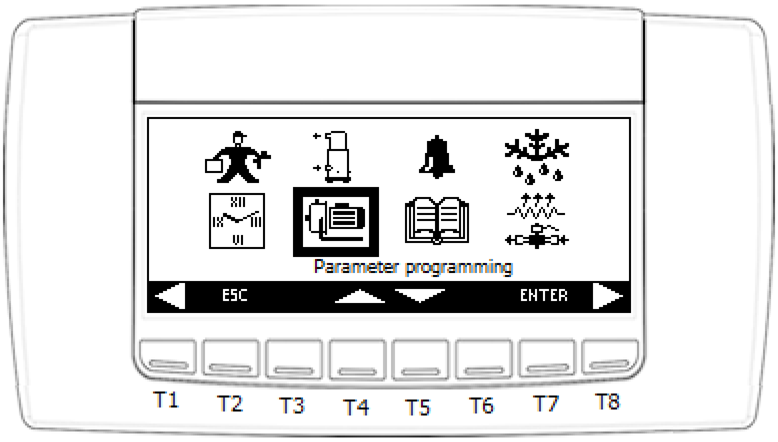
- To reset the working hours
- Reset the number of start-ups
- Disable compressor working (e.g. perform maintenance)



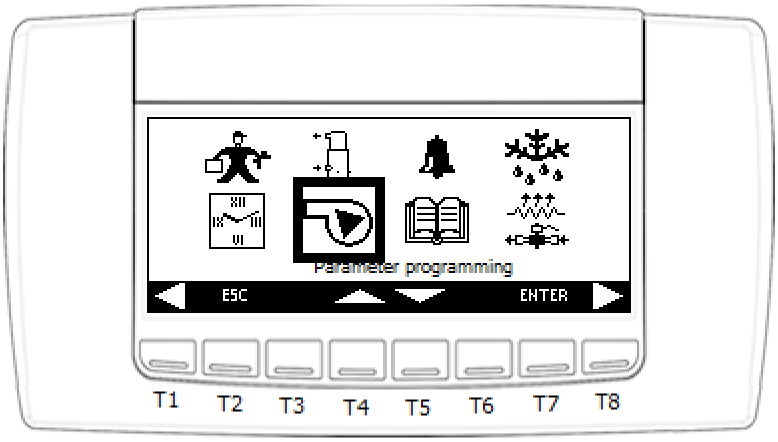
To reset the values, position the cursor on the element and press the **RESET HOURS** or **RESET STARTS** key. Password is request for reset operation (password is set by Par. AL31).
The cursor will automatically position itself on the next element, to modify it repeat the operation just described.
To enable or disable a compressor, position the cursor on the element and press the **ENB/DIS** key:

The cursor will automatically position itself on the next element, to modify it repeat the operation just described.

5.10.4 Water Pump



When CF01=0 (Air/air unit), instead of pump icon, the fan icon will display.

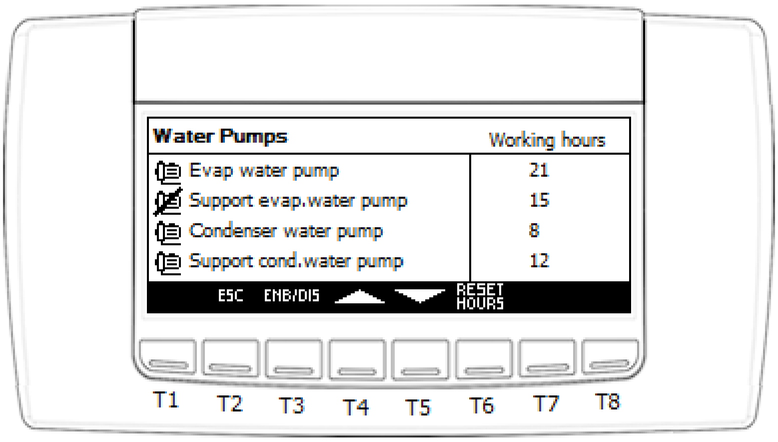


The following information is available in this menu:

- Hours worked by each individual pump (evaporator and condenser)

For each individual pump it is possible:

- To reset the working hours
- To disable the pump (e.g. perform maintenance)

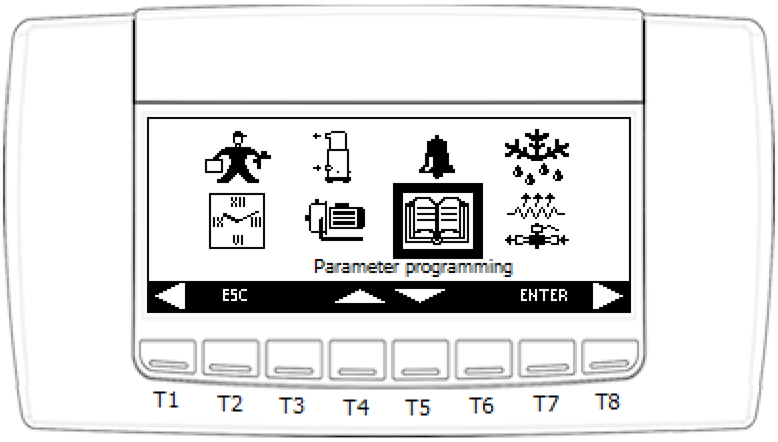


To reset working hours or disable/enable the pumps, follow the procedure described for the compressors. Password is request for reset operation (password is set by Par. AL31).

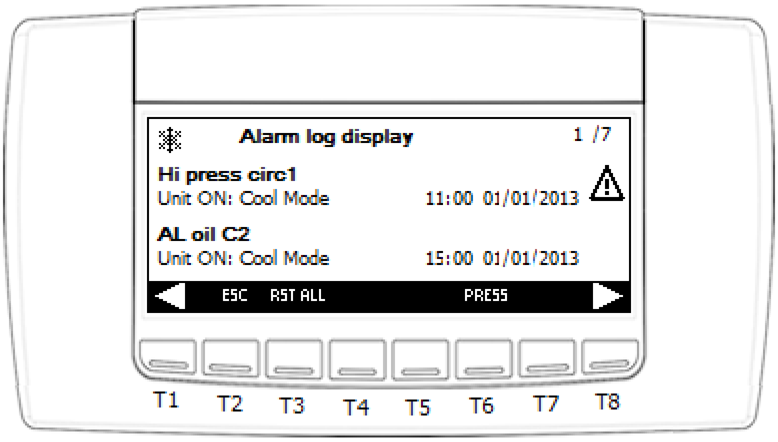
5.10.5 Alarms Display

This menu contains the same information as press key ALARM in the main screen.

5.10.6 Historical Alarms

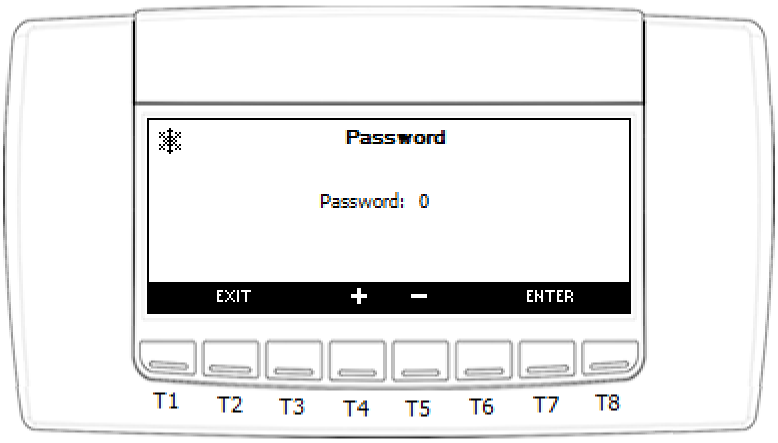


All alarms occurred are memorised in this screen.

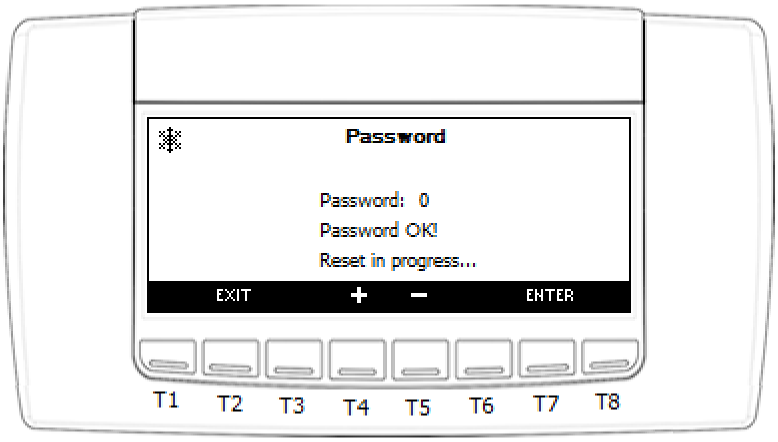


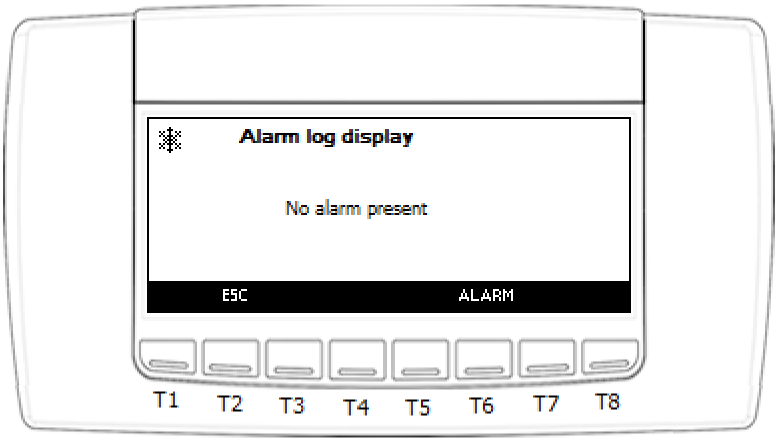
To reset the alarms log, operate as follows:

- Press the **RST ALL key,** holding it down for 3 seconds.

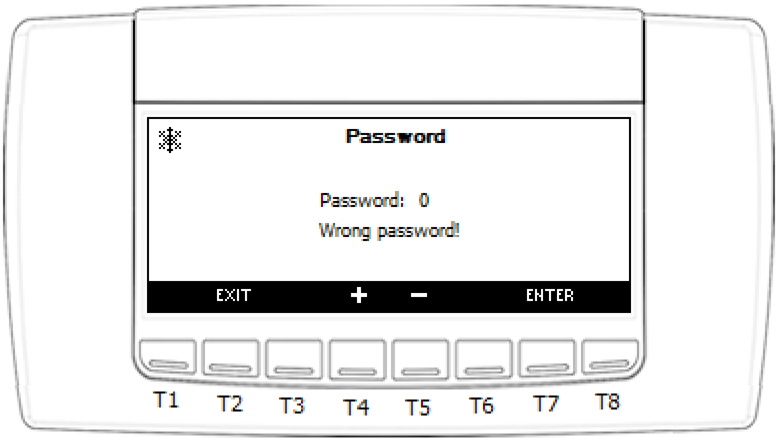


- Via keys  and  ,set the password.
- Press **ENTER** to confirm.
- If the password is correct, the following message will be displayed:



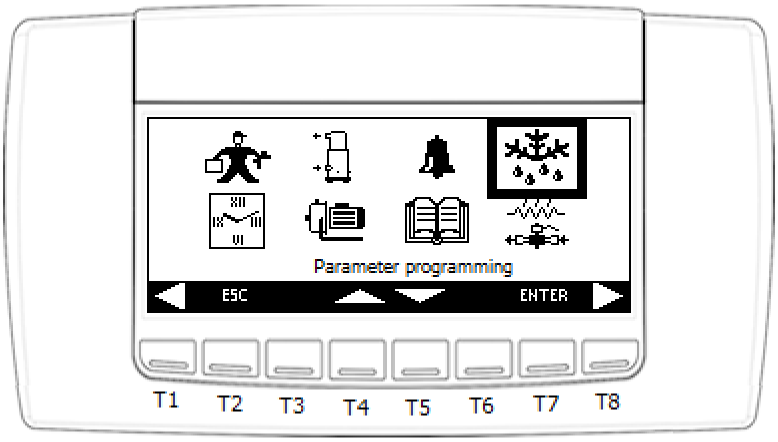


- If the password introduced is incorrect, the following message will be displayed:

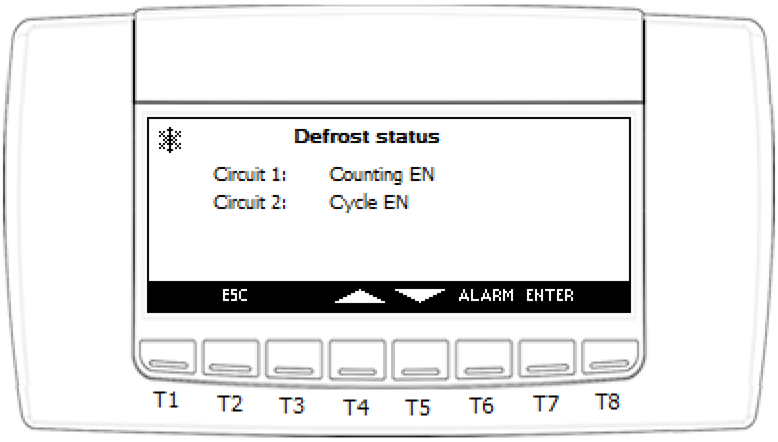


If the password is correct, after a few minutes you will go automatically back to the alarms screen.

5.10.7 Defrost



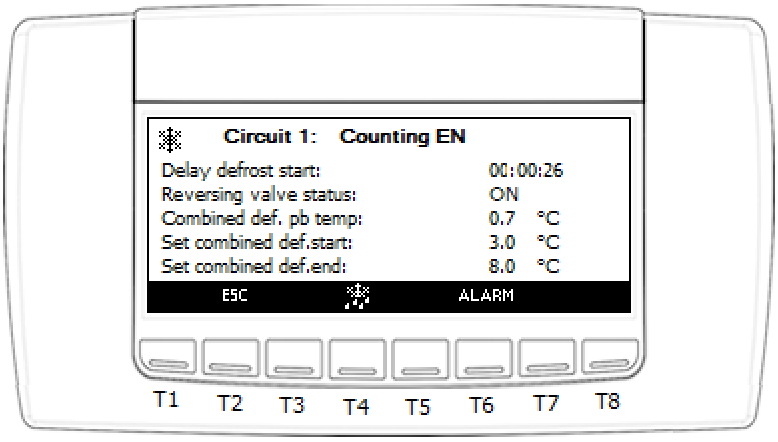
In this screen it is possible to check the status of the defrost cycle for every circuit present:



Circuit defrost status can be:

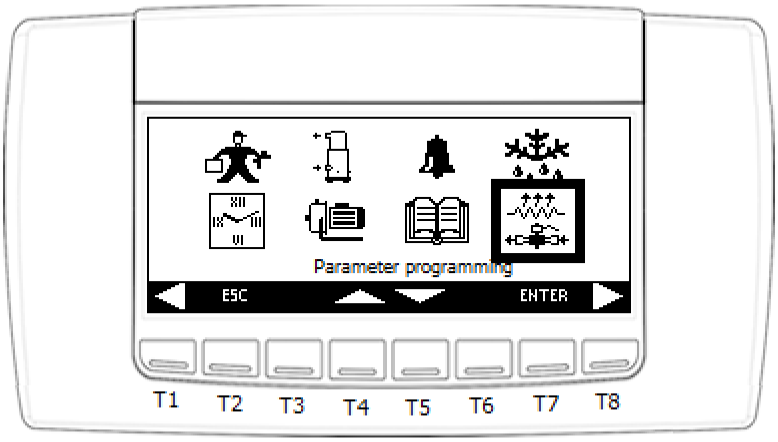
- Counting EN: In counting down, defrost will start soon
- Cycle EN: Defrost in progress
- Drip time EN: In dripping time
- Waiting: No defrost, normal working
- Condition not present: No necessary condition for defrost

By selecting the circuit affected and pressing **ENTER**, pass to the following screen.

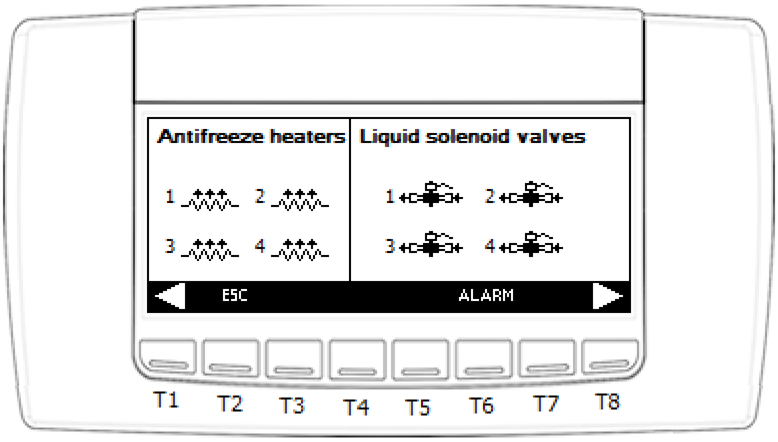


Press the  key for 5 seconds allows forcing start of the defrost cycle.

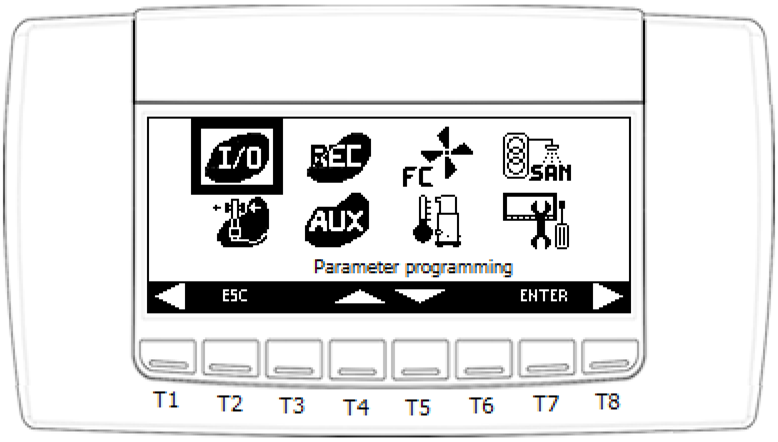
5.10.8 Heaters/Liquid Line Solenoid Valve



This menu allows to display the active and/or deactivated heaters and any active and/or deactivated liquid line solenoid valves (only the resources configured are displayed).

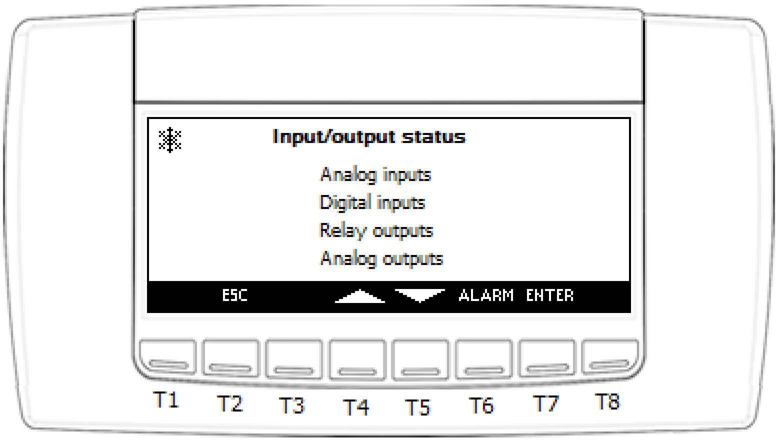


5.10.9 I/O Status



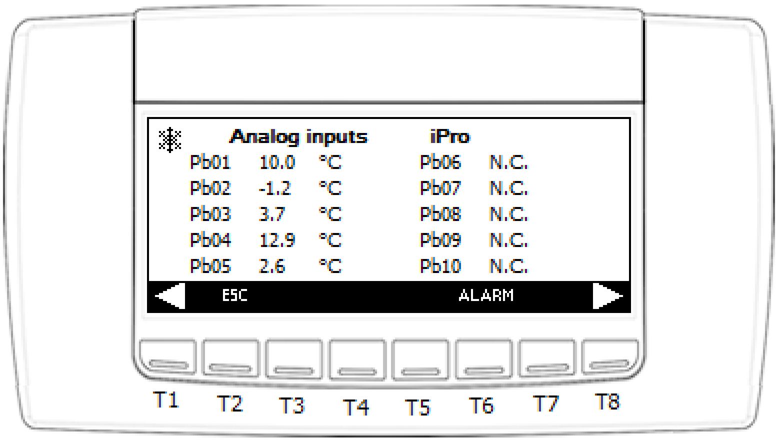
This menu allows to display the status of all inputs and outputs that have been defined.

The I/O units have been divided by groups, as in the screen below:

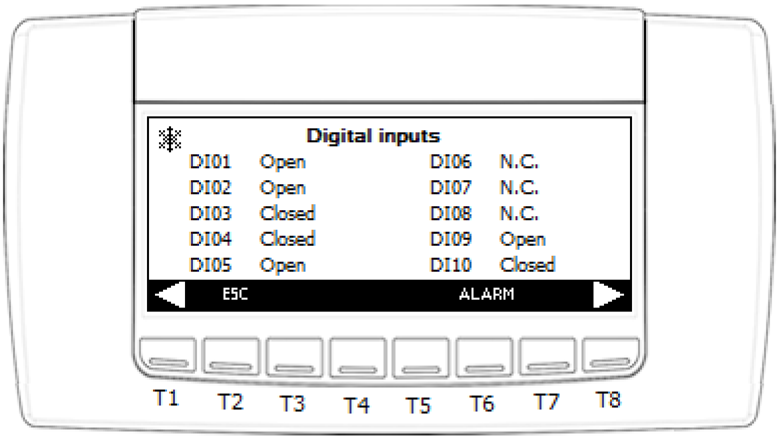


By pressing the **ENTER** key, it is possible to enter every I/O unit.

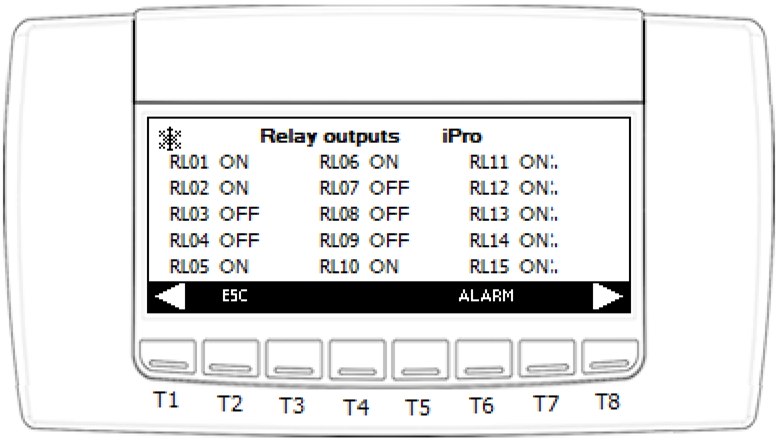
Analog inputs:



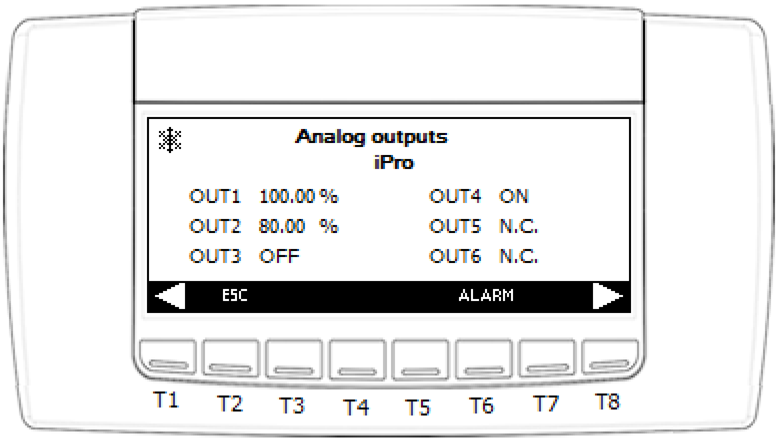
Digital inputs:



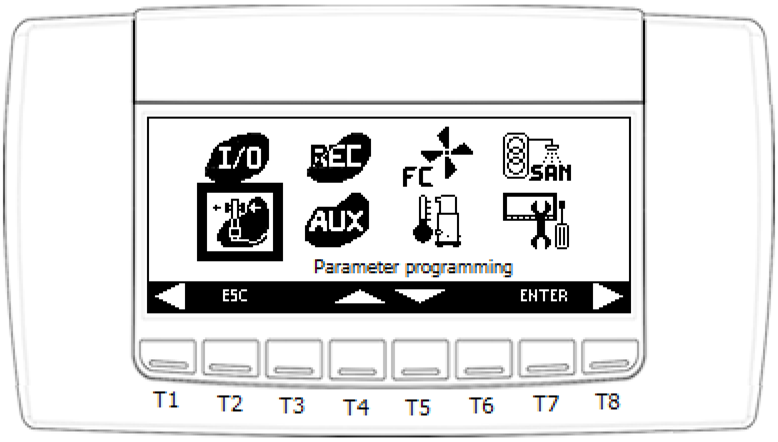
Relay outputs:



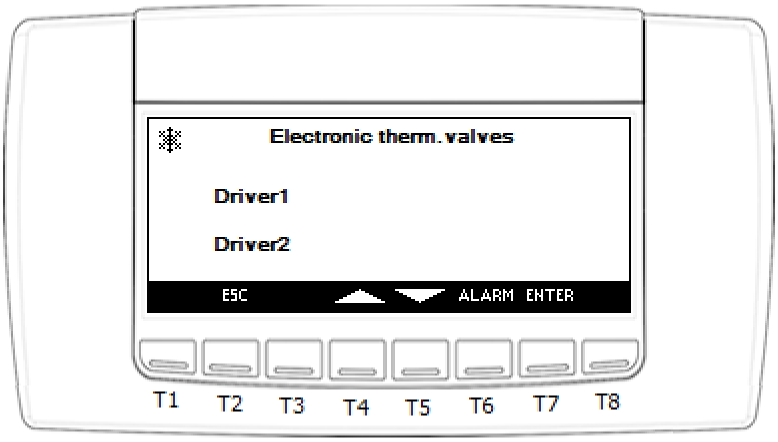
Analog outputs:

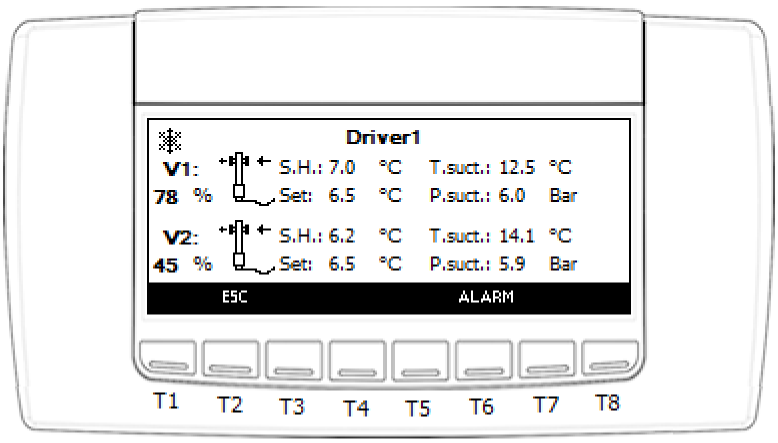


5.10.10 Thermostatic



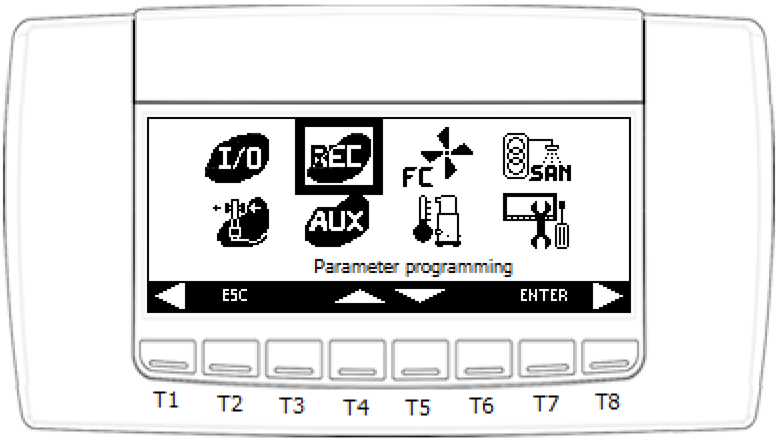
In this menu it is possible to check the working status of the valve and/or electronic thermostatic valves for every circuit defined.



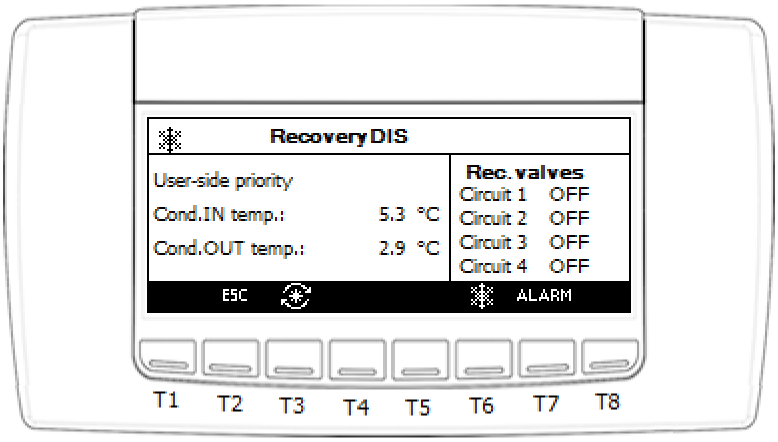


Press the **ESC** key to go back to the main screen.

5.10.11 Heat Recovery



Using this menu it is possible to verify the recovery working status.



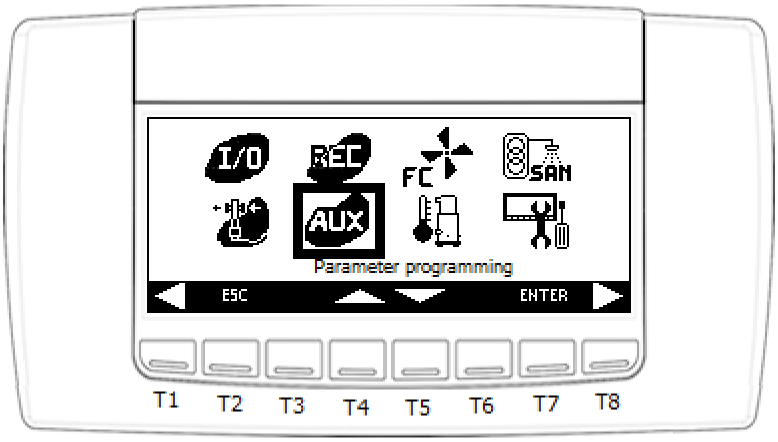
Press the  key for 1 second enables the recovery working.

The following information may be available in this screen:

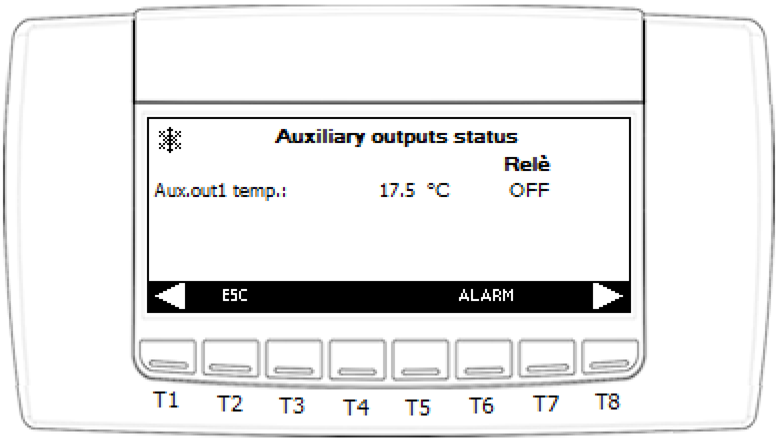
- Status of the recovery function:
  - Disabled
  - Disabled from key
  - Enabled
  - Active
- Type of priority:
  - User side
  - Recovery side

Press the **ESC** key to go back to the main screen.

5.10.12 Auxiliary Outputs

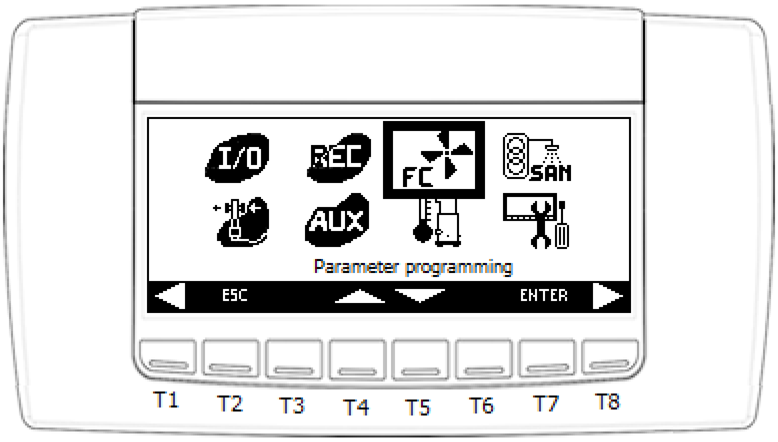


Using this menu it is possible to display the status of the auxiliary outputs (if present).

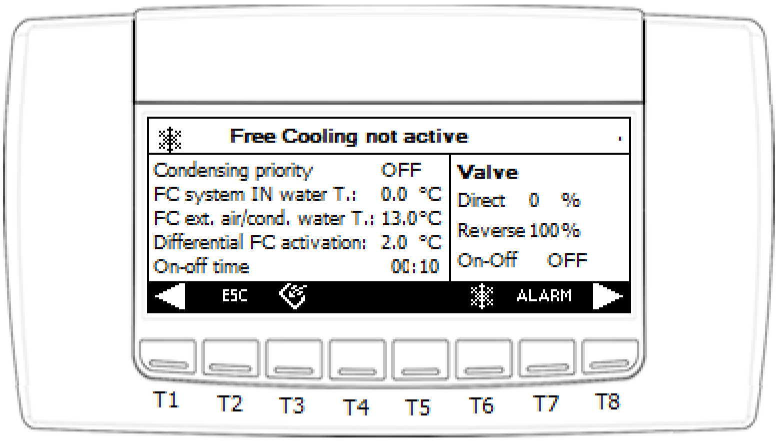


Press the **ESC** key to go back to the main screen.

5.10.13 Free-Cooling



Using this menu it is possible to verify the free cooling working status.
If FC01 $\neq$ 4, this following screen will display:

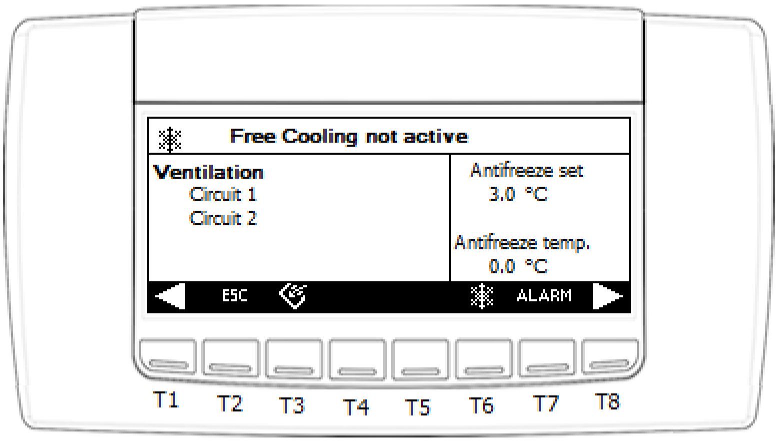


Press the  key for 1 second can enable the free cooling working.

The following information may be available in this screen:

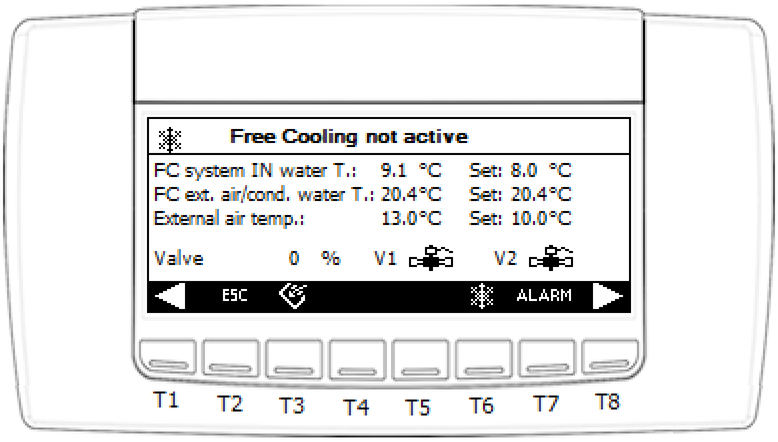
- Status of the free cooling function:
  - Not active
  - Disabled from key
  - Disabled from anti-freeze
  - OFF
  - ON
- Type of priority:
  - Condensation
  - Free-cooling
  - External ventilation

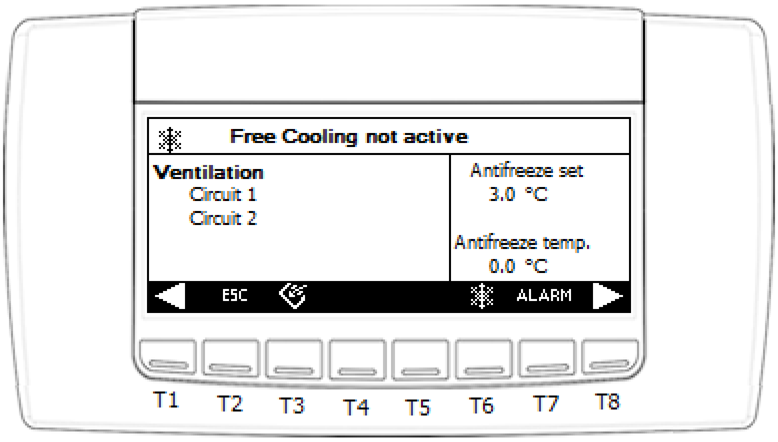
By pressing the  key, pass to the next screen where the following information is available (only if CF01 $\neq 0$):

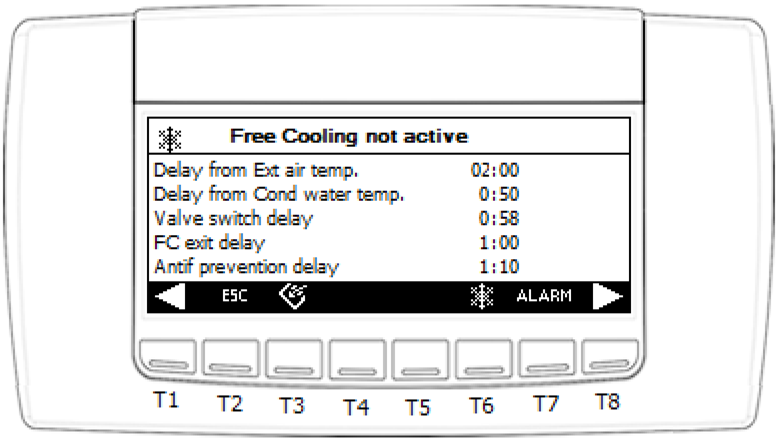


Press the **ESC** key to go back to the main screen.

If FC01 = 4, the following 3 screens will display. Press key  and  can switch between screens:







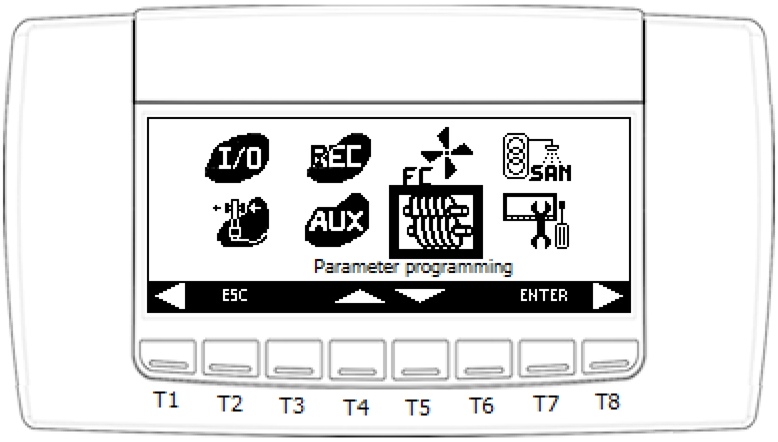
Delay in free-cooling:

- Delay from Ext. air temp.: Count down from parameter FC03
- Delay from Cond water temp.: Count down from parameter FC19
- Valve switch delay: Count down from parameter FC20
- FC exit delay: Count down from parameter FC23
- Antif prevention delay: Count down from parameter FC24

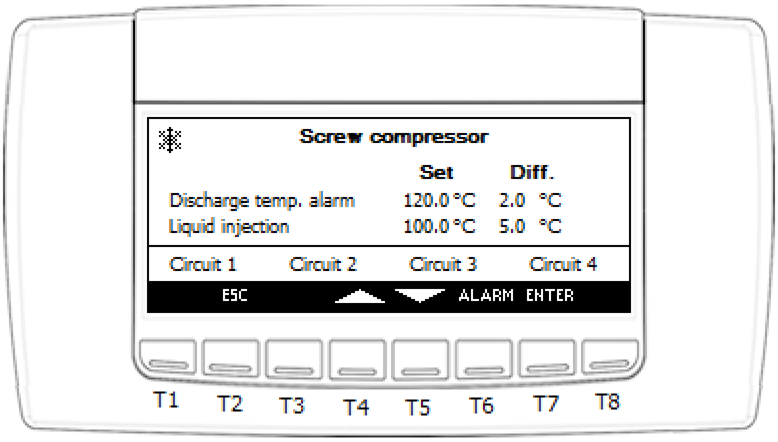
Press the **ESC** key to go back to the main screen.

5.10.14 Screw Compressor

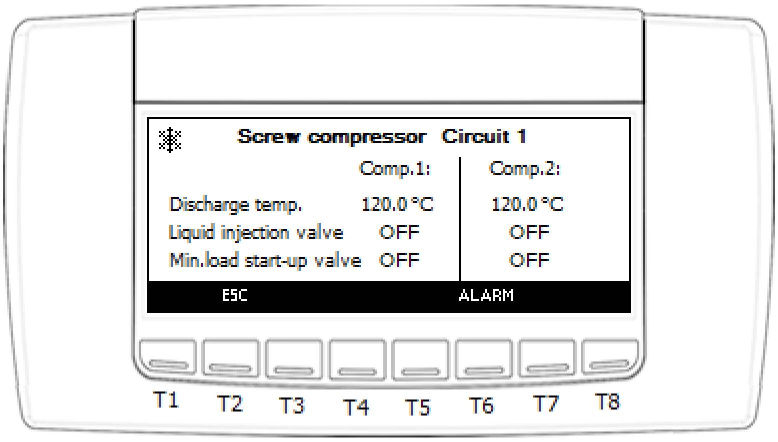
If CO09 = 2/3, screw compressor is used. The icon is shown as picture below.



This menu can be used to monitor the working status of the screw compressor in the various circuits.

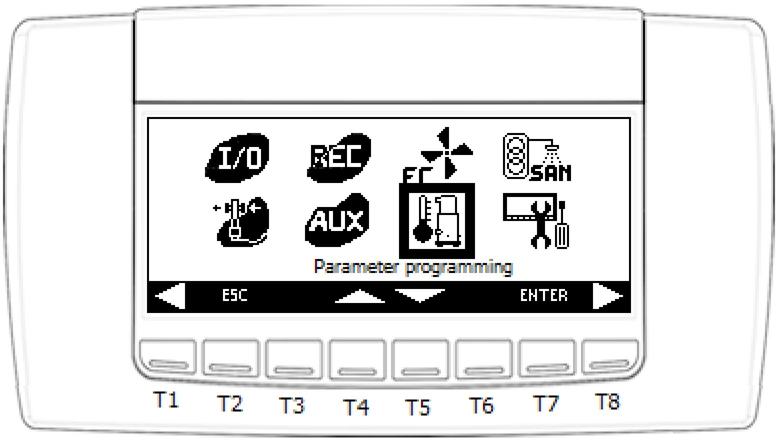


By selecting the desired circuit and pressing **ENTER**, the following information can be displayed:

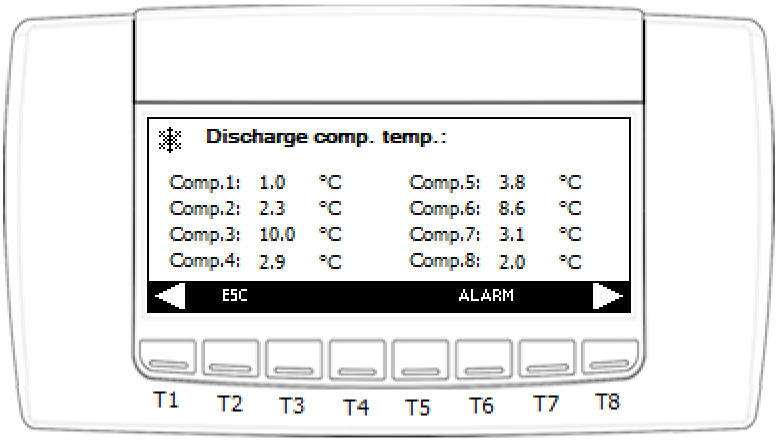


5.10.15 Discharge Compressor Temperature

If CO09 = 0/1, discharge compressor icon is shown as picture below.

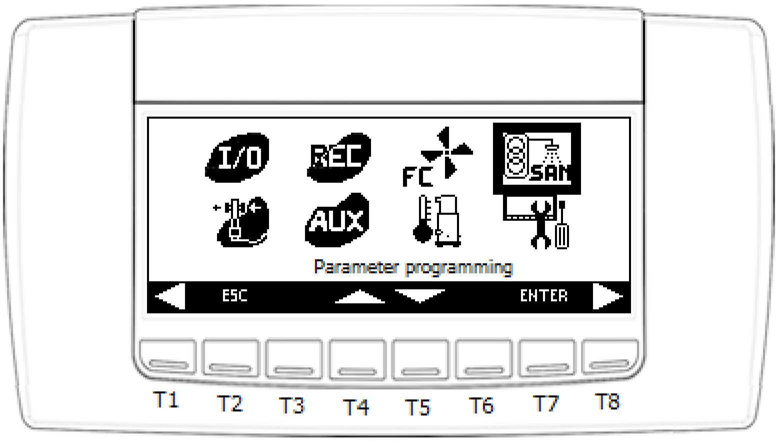


In this screen, if the probe: **compressor 1…16 PTC discharge temperature probe** (AI type=1 to 16) is configured, its value will be displayed.



5.10.16 Domestic Hot Water (Sanitary Water)

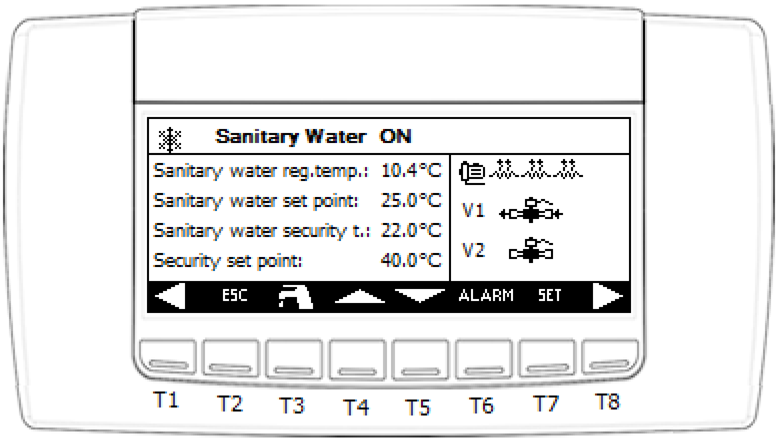
If AH01 = 0 (Auxiliary heating is disabled), the icon for domestic hot water is shown as picture below.



In sanitary water screen, relevant probes value and output status will display.
The sanitary water set point is editable.
Press key for 1 second can enable/disable the sanitary water function.

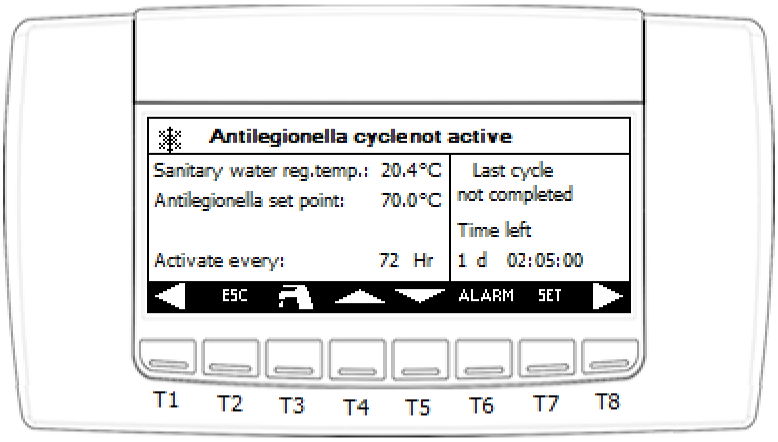
The sanitary water function status can be:

- DIS disabled by parameter setting
- Dis by key disabled by keyboard
- Not requested not needed
- Doing dF defrost in progress
- Changing state requested but not start yet, in inversion valve changing phase.
- ON activated



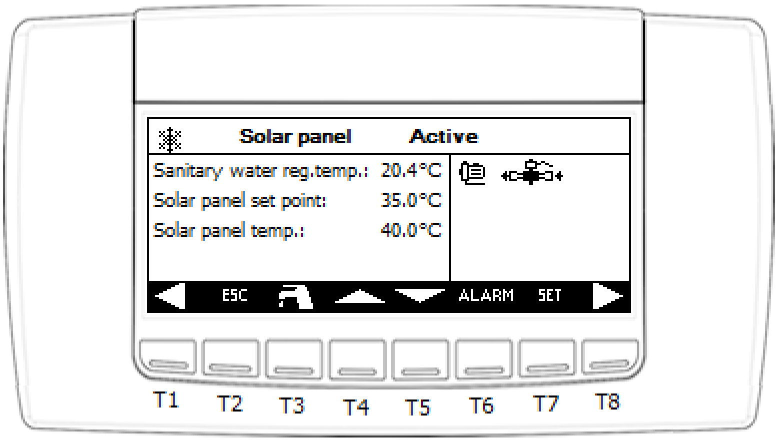
In Antilegionella cycle screen, relevant probes value, status and count down time will display.
The Antilegionella set point and the activate time is editable.
The antilegionella function status can be:

- DIS disabled by parameter setting
- Not active deactive
- Running active



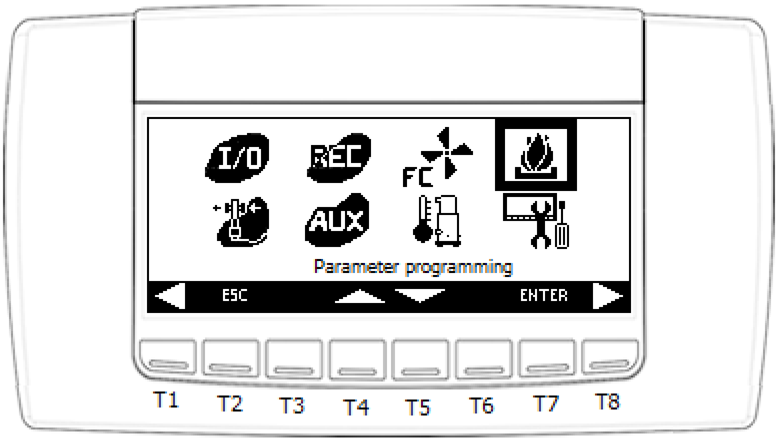
In Solar panel screen, relevant probes value and output status will display.
The Solar panel set point is editable.
The solar panel working status can be:

- Not active
- Active

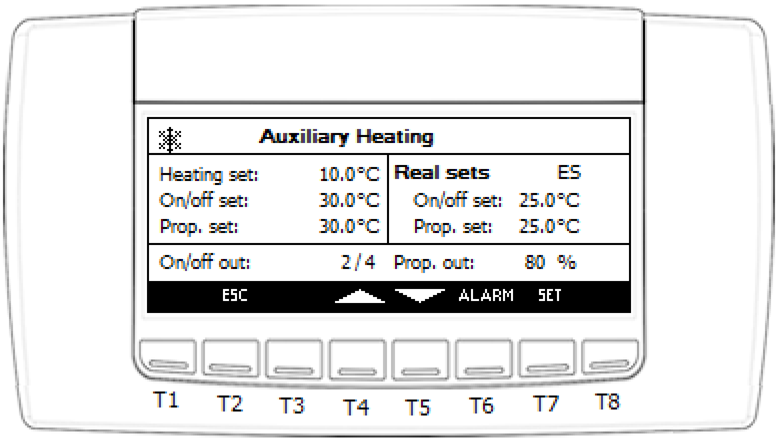


5.10.17 Auxiliary Heating

If AH01 > 0 (Auxiliary heating is enabled), the icon for auxiliary heating is shown as picture below.

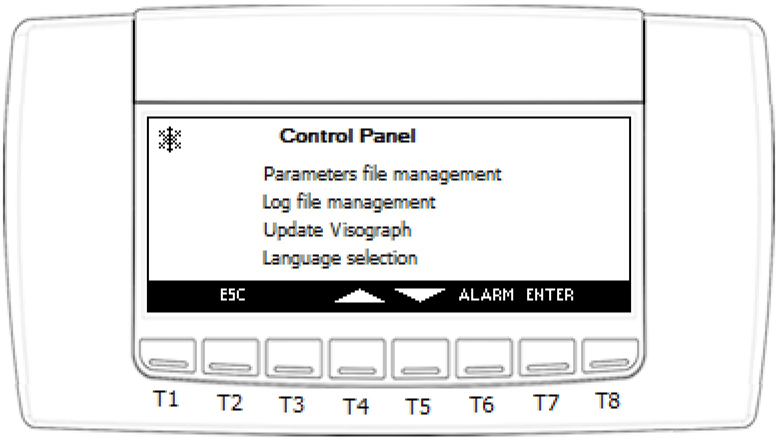


In auxiliary heating screen, set points and output status are displayed.

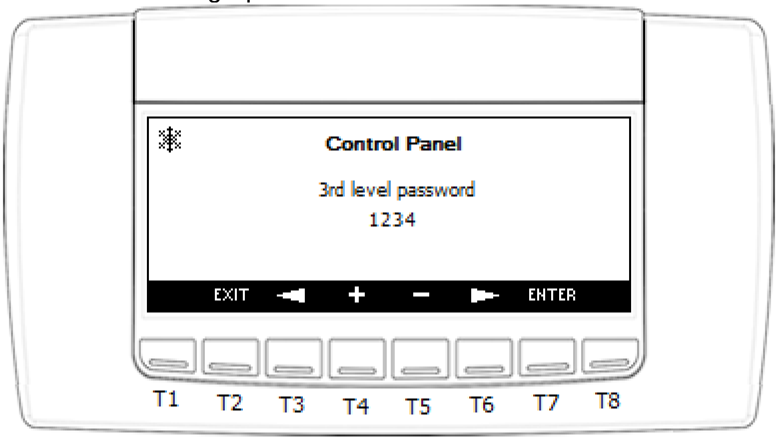


5.10.18 Control Panel

Your own LCD keyboard can be customised in this menu.



If user entered into SERVICE menu with 1st level or 2nd level, he needs to input the 3rd level password to enter in the control panel screen. See graph below:



On the contrary, if user entered into SERVICE menu with 3rd level, no password is needed for control paned menu anymore.

The possible options in this menu are:

- Parameters file management: Load last saved parameters or load default parameters.
- Log file management:
  Export log files to USB disk.

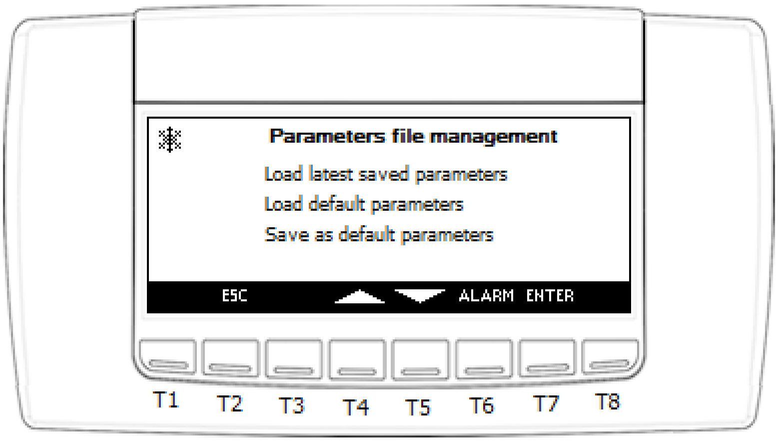
- Language selection: Italian → English → Italian
- Update Visograph

- Parameters file management:

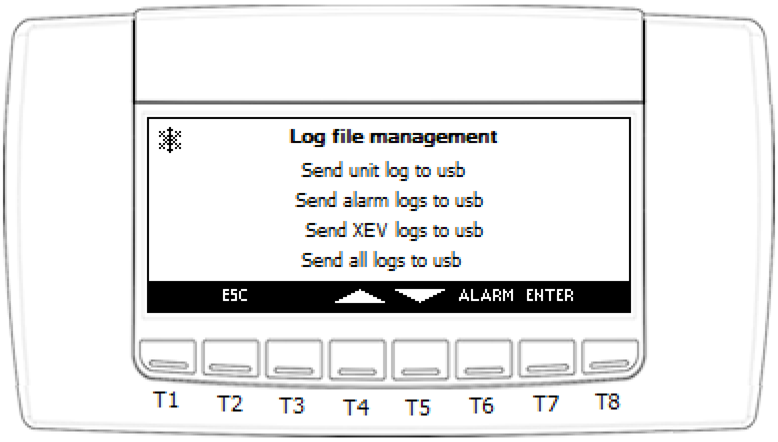
  Position the cursor on the element with UP and DOWN key, press ENTER, the parameters value will be loaded from configuration file.

  There are 2 files available, one for latest saved parameters and another for default parameters.

  The 3rd line “Save as default parameters” means copy latest saved parameters to default parameters configuration file.



- Log file management:



Plug the USB disk in iPro,send command from this screen, the log file will be export to the USB disk.

The log file path is: USB ROOT:\ipro\IP address of the ipro

One example for unit log: F:\ipro\10.161.92.79\log\Unit_20130221.txt

Unit log file (Record every 100 PLC cycles):

```
Counter,Date,Status,Set,Regulation probe,steps required,steps provided,unloading,water pumps,average cycle time,overcycles
130117101213,HP,100,-61,3,3,FALSE,FALSE,99,42,
130117101226,HP,100,-61,3,3,FALSE,FALSE,100,37,
130117101238,HP,100,-61,3,3,FALSE,FALSE,94,38,
130117101251,HP,100,-61,3,3,FALSE,FALSE,94,36,
```

Alarms log file (including alarms_a, alarms_b, alarms_c):

- alarms_a = unit alarm
- alarms_b = circuit alarm
- alarms_c = compressor alarm

alarms_a log file:

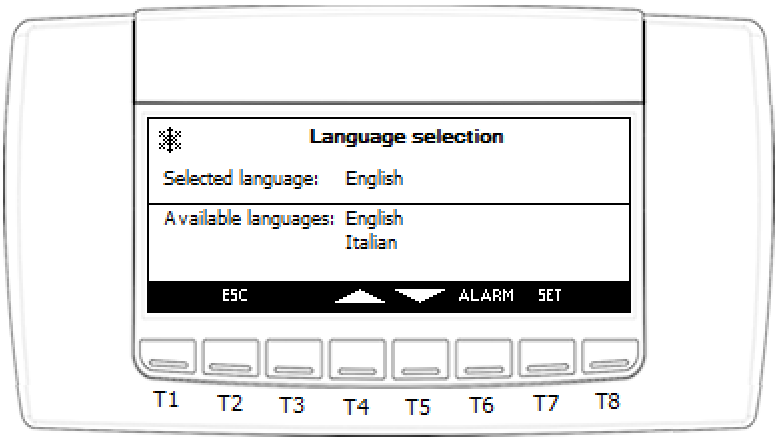
```
Counter,Date,Alarm description,Alarm status,Events in last hour
121115150206,AEM3-IPEX 3 not connected,START,18
121115150206,AEM4-IPEX 4 not connected,START,18
121115150307,AP22-Failure on probe 5 exp. 2,START,19
121115150307,AP5 -Failure on probe 5,START,19
```

Xev log file (including xev11, xev12, xev21, xev22):

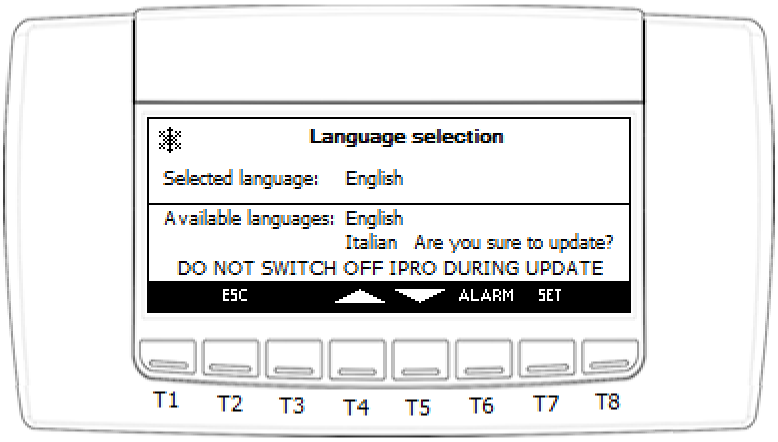
Record every 10 seconds if XEV20D is available.

```
Counter,Date,Suction pressure,Saturation temperature,Suction temperature,Superheating,Steps
130130121005,60,45,125,70,500
130130121015,59,44,121,68,496
130130121025,57,45,123,63,492
130130121035,56,44,122,61,488
```

- Language selection:

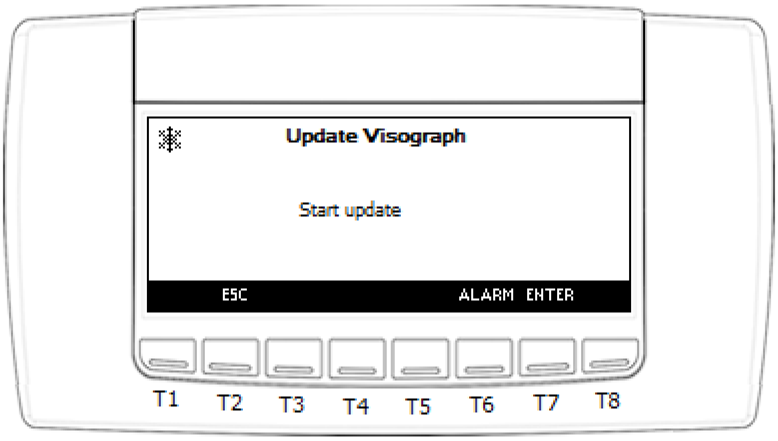


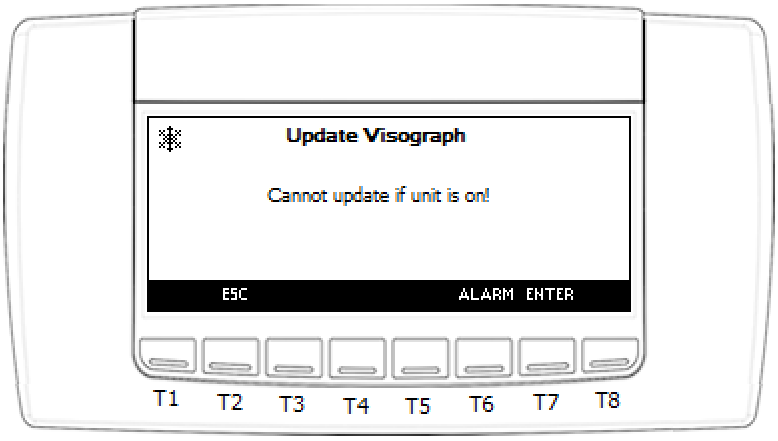
Use key UP and DOWN to select the language. If new language is selected, the warning will show as below. Press key SET to start language update. Please don’t switch off the ipro during updating.



- Update Visograph:

  Press key ENTER, Visograph application will be updated. If the unit is ON now, the updating is not allowed.

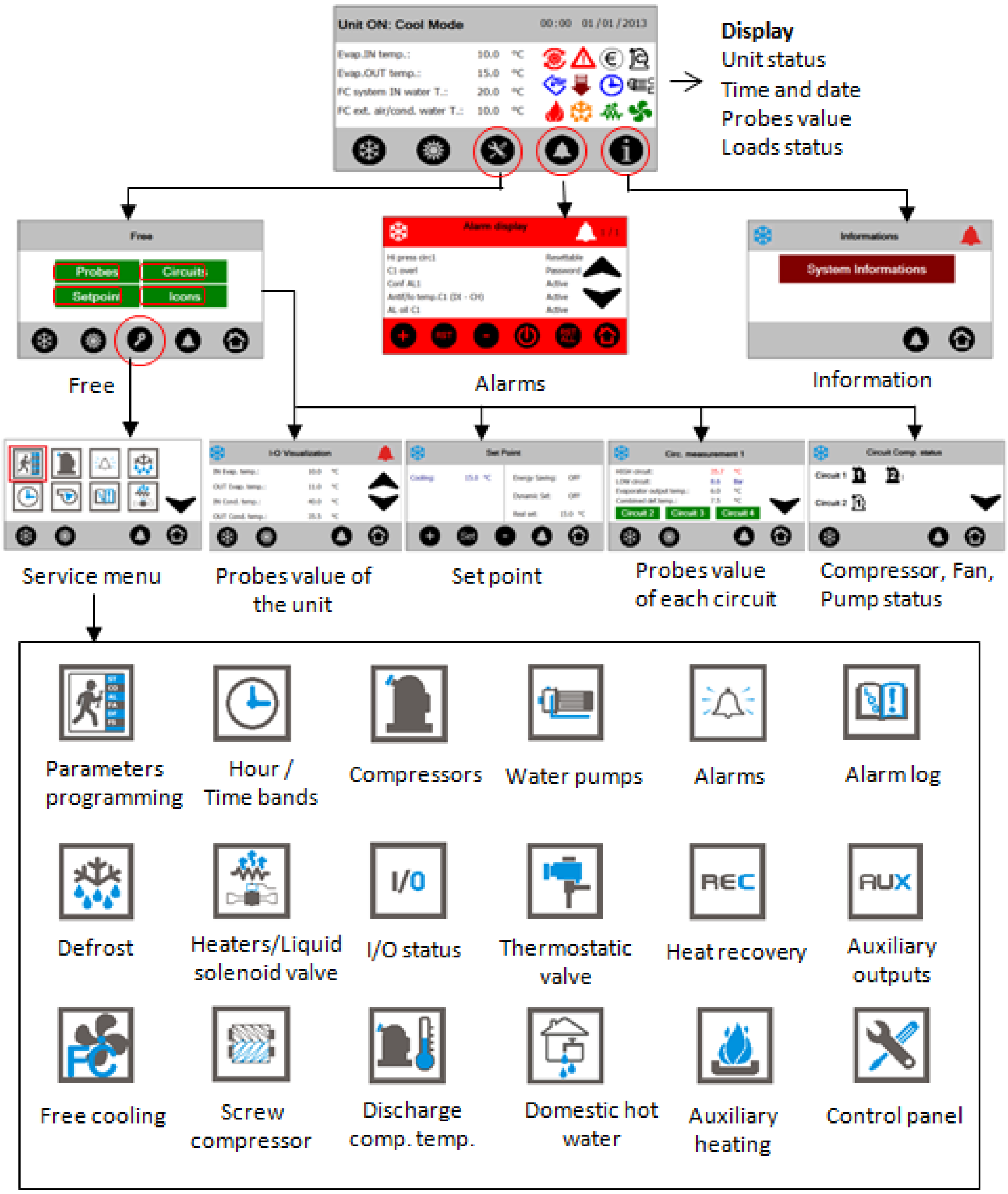

Update Visograph
Start update
ESC
ALARM ENTER
T1
T2
T3
T4
T5
T6
T7
T8


Update Visograph
Cannot update if unit is on!
ESC
ALARM ENTER
T1
T2
T3
T4
T5
T6
T7
T8

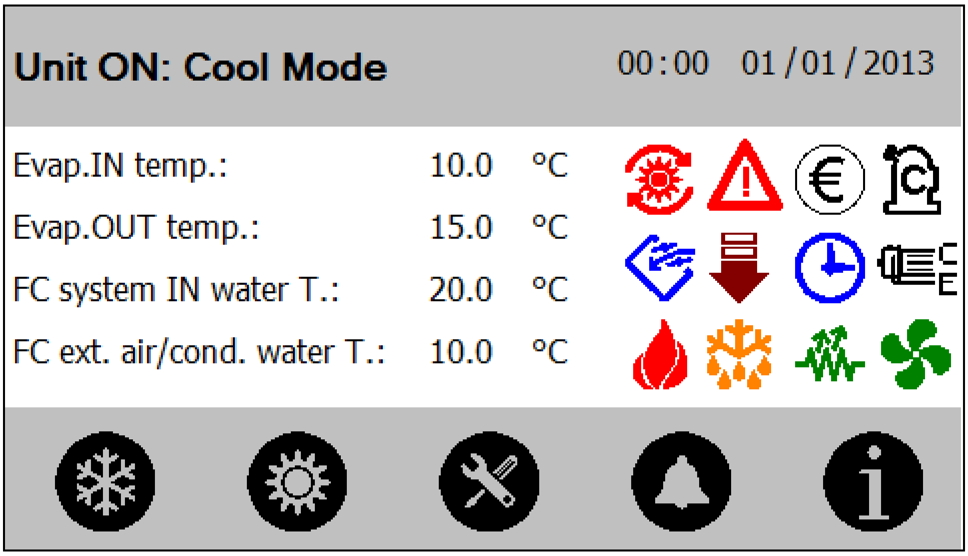
6. USER INTERFACE VISOTOUCH

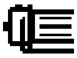
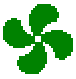
Configure parameter DP12=2 from Wizmate can select VISOTOUCH as the user interface.
VISOTOUCH shows similar screens as VISOGRAPH 1.0, and it manages two LEDs on the front panel in addition.

- Green LED: Always ON after power on.
- Red LED: ON when have alarm active or resettable.

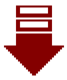
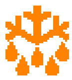
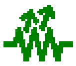
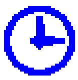
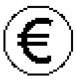
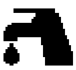


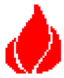
The information that appears in the main screen is:



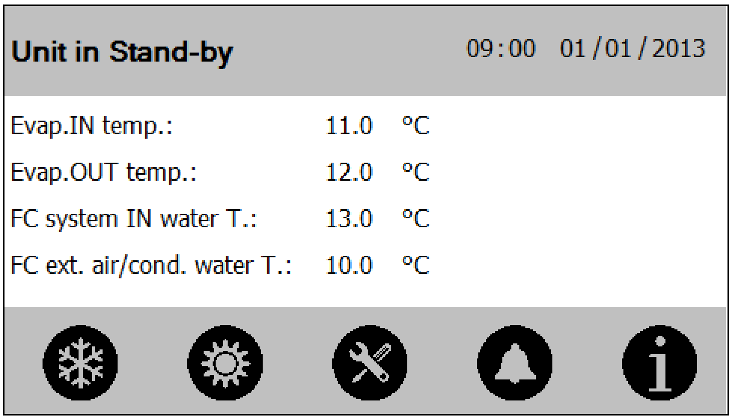
-  to indicate that at least one of the compressors is working.
-  to indicate that the evaporator pump E and/or the condenser pump C are working (the condenser pumps are present in the case of WATER-WATER configuration).
-  to indicate that the condenser fans are working (in the case of AIR-AIR or AIR-WATER unit configuration)

If the alarms occur or particular working modes sub-enter, the following icons will be shown on the main screens:

-  flashing to indicate that an alarm is active
-  to indicate that the UNLOADING mode is in progress
-  on to indicate that the defrost cycle is in progress, flashing during the count down
-  to indicate that the anti-freeze/support heaters are active
-  automatic switch-off and/or energy saving is enabled during the current day
-  to indicate that the unit is working within the energy saving period or that the dynamic set-point is active
-  to indicate that the domestic hot water production is active

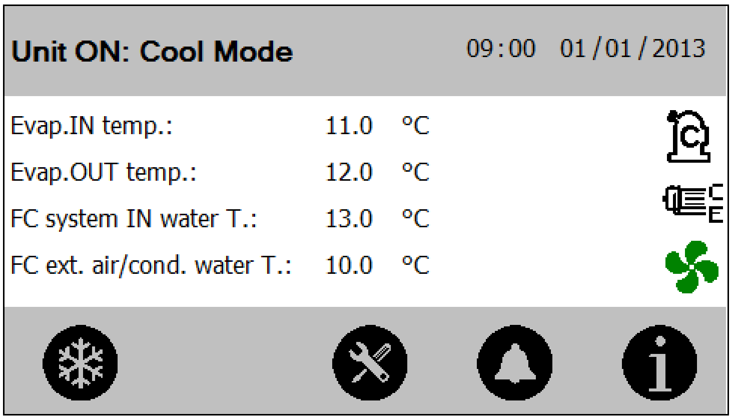
-  to indicate that the auxiliary heating is active (it will display in the same place with domestic hot water production icon)

After iPro power-on, the main screen will be the following (Displyed probes are selectable by DP parameters):



When the keyboard shows “Remote OFF”, “OFF through clock” or “Stand-by”, they all mean the unit is OFF now but with different causes.
When the keyboard shows “Unit ON: Cool Mode” or “Unit ON: Heat Mode”, they all mean the unit is ON now but in different working mode.

Below find a typical screen during working in chiller mode:



6.1 HOW TO SWITCH ON/OFF THE UNIT AND CHANGE CHILLER/HEAT PUMP WORK MODE FROM VISOTOUCH

Firstly, we will talk about No Motor Condensing Unit. Set Par **CF04** = 0.

UNIT SWITCH-ON AND SWITCH-OFF CAN TAKE PLACE:

- From the keyboard
- From digital input configured as remote ON/OFF
- By time bands (see unit switch on/off by RTC)

6.1.1 Unit Switch-ON/OFF From The Visotouch

The unit can be configured as chiller only, heat pump only or as chiller with heat pump mode by par CF02. For different type of units, the switch ON/OFF procedures are different.

CF 2	Selection of unit working 1 = chiller only 2 = heat pump only 3 = chiller with heat pump	1	3		

Note: If user wants change CF02 value, please switch off the unit to "Stand-by" status first. Otherwise, it may take no effect.
When only the heating is enabled, the ACF1 alarm is not generated if the reverse valves in the envisioned circuits are not configured.

SWITCH THE UNIT ON/OFF IN COOLING- HEATING MODE FROM THE VISOTOUCH

The configuration should be:
CF04 = 0, (not Motor condensing unit)
CF02 = 3, (chiller with heat pump)
SP09 = 0, (from the keyboard)

In the beginning, the device is in stand-by mode, and the buttons  and  are all visible. These two buttons' position depends on Par SP08.

SP08 = 0:  is placed in left,  is placed in right.
SP08 = 1:  is placed in left,  is placed in right.

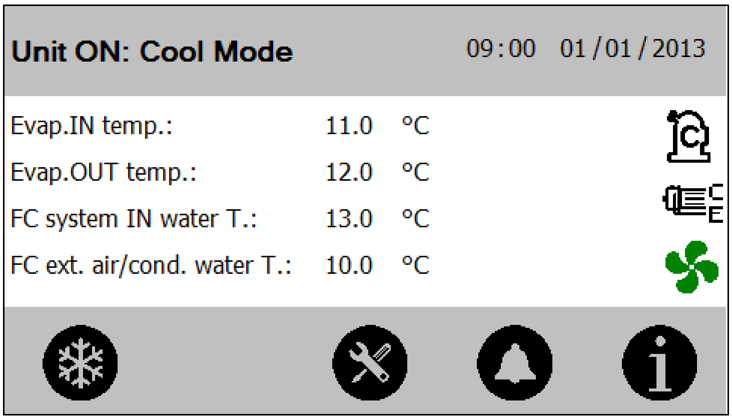
No matter how to place, the left button is always used for cooling mode. The right button is always used for heating mode.

Suppose SP08 = 0, press button  for 1 second can switch on the unit to work in cooling mode. At this moment  is hidden.
Press the button  again, the unit is switch OFF and return to status stand-by. The button  and  are all visible now. In this case, user can press button  to switch to heating mode or press  to restart the cooling mode.

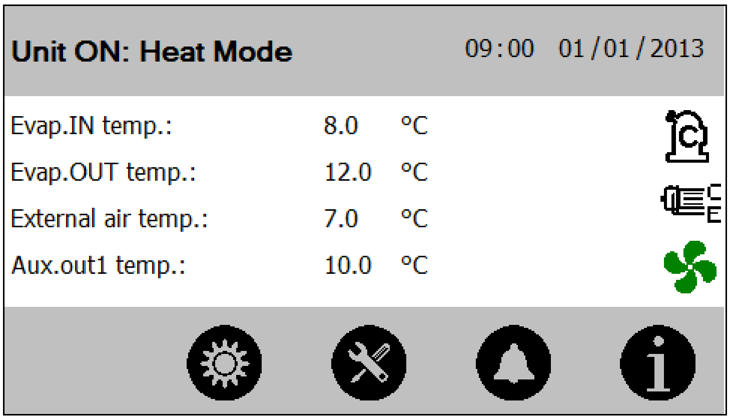
The device is in stand-by when both  and  buttons are visible. The stand-by mode is obtained every time that the unit is off from cooling or heating working mode. Also in stand-by mode, the controller gives the possibility to:

- display the variables detected
- manage the alarm situations, displaying and signalling them.

When unit is ON in chiller mode, the status in the screen is "Cool Mode":



When unit is ON in heat pump mode, the status in the screen is “Heat Mode”:



SWITCH THE UNIT ON/OFF IN COOLING MODE FROM THE VISOTOUCH

The configuration should be:
CF04 = 0, (not Motor condensing unit)
CF02 = 1, (chiller only)
SP09 = 0, (from the keyboard)

In the Visotouch, the left button is always visible and the right button is hidden. The left button will be shown as when SP08 = 0 and shown as when SP08 = 1.
Press this button for 1 second can switch the device status between cooling mode and stand-by.

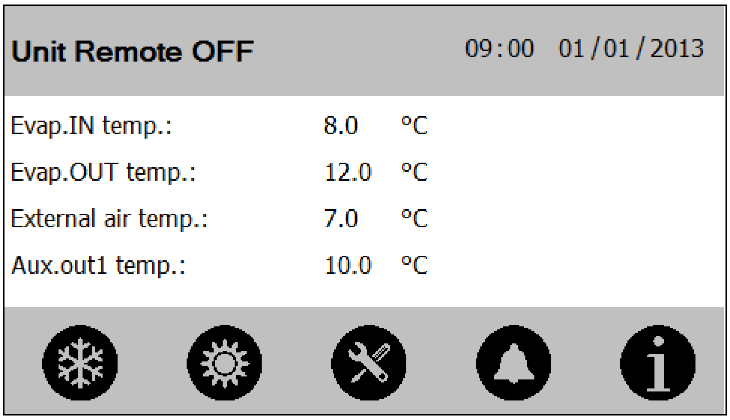
SWITCH THE UNIT ON/OFF IN HEATING MODE FROM THE VISOTOUCH

The configuration should be:
CF04 = 0, (not Motor condensing unit)
CF02 = 2, (heat pump only)
SP09 = 0, (from the keyboard)

In the Visotouch, the right button is always visible and the left button is hidden. The right button will be shown as when SP08 = 0 and shown as when SP08 = 1.
Press this button for 1 second can switch the device status between heating mode and stand-by.

6.1.2 Unit Switch-ON/OFF From Digital Input

If the unit is switch off by remote digital input, the screen will be:



From digital input configured as **remote ON/OFF** (DI type =1). When deactivate, on the basis of the polarity selected, the input determines the OFF status

- It has priority with respect to the keyboard
- The unit can only be switched-on and off with input activated
- With input activated, the device goes back to the status previous to activation

6.1.3 Select The Working Mode: Chiller-Heat Pump

The parameter SP09 allows selecting and enabling the selection of the unit switch-on mode in the three working modes.

Par SP09 = 0

The switch-on selection of a unit configured for cooling and heating takes place from the Visotouch.

AUTOMATIC WORKING SELECTION IN COOLING-HEATING MODE FROM DIGITAL INPUT

Par SP09 = 1

The switch-on selection of a unit configured for cooling and heating takes place from digital inputs configured as **Remote cooling/heating**(DI type=2). With digital input activated, cooling mode is selected, with digital input deactivated, heating mode is selected.

- The selection is enabled if a digital input is configured as cooling request or as heating request. If no digital input has been configured, the unit **REMAINS in stand - by**
- the cooling/heating selection from the keyboard is disabled. The unit can only be switched-on/off in the working status selected from the digital input
- CF02 is the precondition. If only CF02=3 the cooling/heating selection from digital input is available. Otherwise, the device working mode will be set by CF02.
- In the Visotouch, buttons for cooling/heating will be shown according to digital input status. E.g., digital input=cooling, is visible and is hidden. By pressing , the unit can switch between cooling and stand-by.

AUTOMATIC WORKING SELECTION IN COOLING-HEATING MODE FROM ANALOGUE INPUT

Par SP09 = 2

Selection from analogue input (change over function) has priority with respect to the digital input. For temperature of the external air included in the SP11 differential, it is allowed to change the working mode from the keyboard.

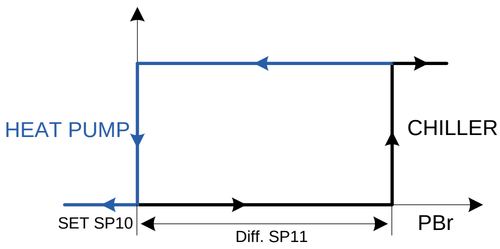
6.1.4 Change Over Function

SP10	Automatic chiller / heat pump mode changeover setting	-50.0 -58	110 230	°C °F	Dec int
SP11	Automatic chiller / heat pump mode changeover differential	0.1 1	25.0 45	°C °F	Dec int

The status change over can only take place if these necessary conditions are present at the same time, otherwise the unit **REMAINS in stand - by:**

4. CF02=3 (chiller with heat pump)
5. SP09=2 is an NTC probe configured as an **Dynamic/boiler function/change over set-point external air temperature NTC temperature probe**(AI type=35)
6. the regulation probe selected must not be in error conditions

AUTOMATIC CHANGE OVER REGULATOR GRAPHICS



Parameters that regulated the change over function
SP10 allows setting the change over set point. If the selection of the working mode from analogue input is enabled, it represents the temperature value detected by the regulation probe below which the device imposes the working in heating mode
SP11 allows setting the change over differential. If the selection of the working mode from analogue input is enabled, it represents the temperature differential on the basis of which the device imposes the working in cooling mode
For temperature of the external air included in the SP11 differential, it is allowed to change the working mode from the keyboard.

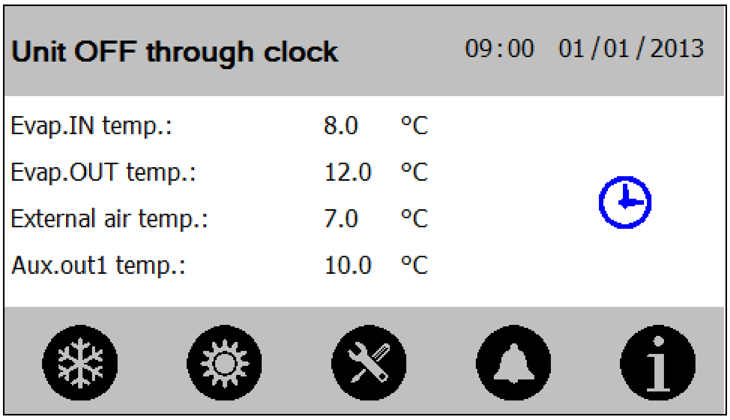
NTC external air temperature regulation NTC probe > SP10+ SP11, the unit is switched-on in cooling mode.
NTC external air temperature regulation NTC probe < SP10, the unit is switched-on in heating mode.

6.2 UNIT SWITH ON/OFF BY RTC

6.2.1 Working With Clock Disabling Digital Input

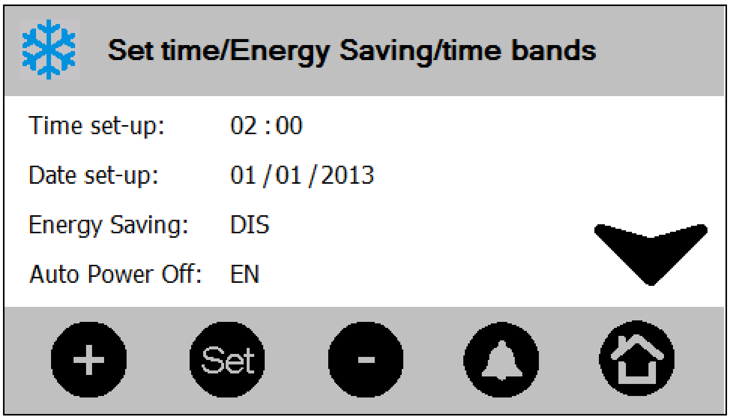
ES 1	Start of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 2	End of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 3	Start of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 4	End of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 5	Start of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES 6	End of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES18	Monday automatic shutdown time band	0	7		
ES19	Tuesday automatic shutdown time band	0	7		
ES20	Wednesday automatic shutdown time band	0	7		
ES21	Thursday automatic shutdown time band	0	7		
ES22	Friday automatic shutdown time band	0	7		
ES23	Saturday automatic shutdown time band	0	7		
ES24	Sunday automatic shutdown time band	0	7		

If the unit is switch off during switch-off time bands, the screen will be:

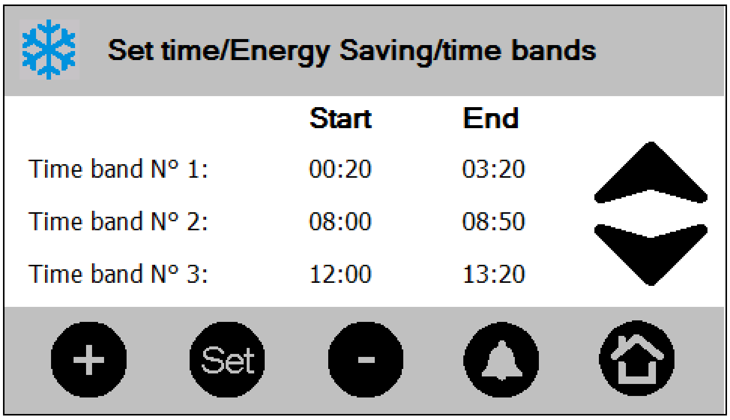


If a digital input is configured as **Digital input working in RTC automatic enabling (time band)/manual (keyboard) mode** (DI type=91) and is active, the working via the internal clock is disabled. Otherwise, if this digital input is not configured or configured but not active, enables the working via the internal clock.
The unit is forced to switch off within the time band.
Set the time band with Par ES01-ES06, and select weekly time band by Par ES18-ES24. If current time is inside the setting band, the unit will be shut off automatically, and the Visotouch shows “Unit OFF through clock”.

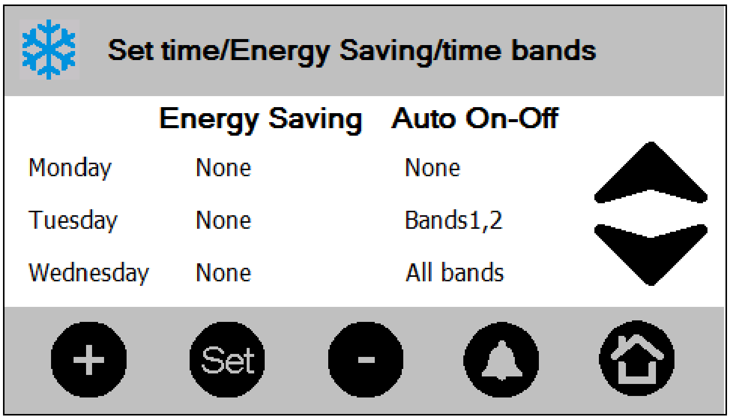
The RTC time band also can be configured from Visotouch.
Enter into the **Set time/date/time bands** screen from **SERVICE** menu.



Enable the **Auto Power Off** option, set **Time band N1/N3** in page 2.

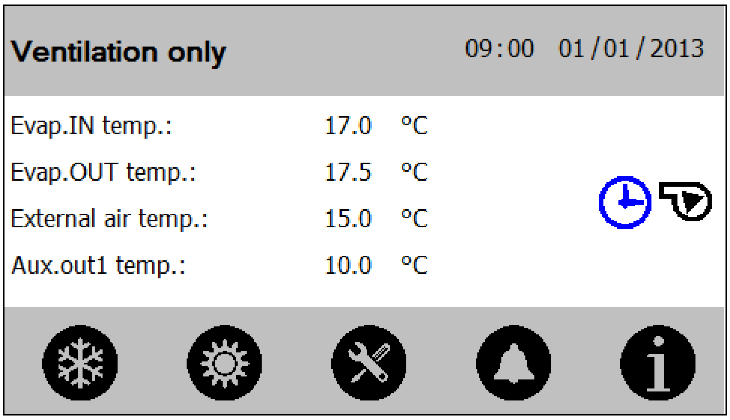


Select time band from **Monday** to **Sunday** in the next pages' last column **Auto On-Off**.



6.2.2 Working With “Ventilation Only” Digital Input (Air-Air Unit Only)

If the unit has been configured as AIR-AIR, during clock off, it is possible to decide whether to enable ventilation or not. When ventilation enabled, the screen will be:



This working mode is only enabled if the clock is present and enabled.
Set CF01=0, select air/air unit.
Set ES01-06, ES18-24 to enable the function automatic shutdown by RTC.
If a digital input is configured as **Digital input working with supply fan only** (DI type=92) and is active, when current time is inside the automatic shutdown time band, the unit will work in “Ventilation only” mode.
In “Ventilation only” mode, only relay configured as supply fan is enabled.
After current time goes out of the automatic shutdown time band, the unit will back to normal working mode.

WARNING: In ventilation only mode, the supply fan will forced to active if unit is on. When the unit is placed in remote off or stand-by, supply fan will switch off after the delay time set in par PA03.

6.2.3 Working With Unit In OFF From RTC If ON Is Forced From Visotouch

ES25	Unit maximum working time in OFF from RTC if forced in ON from key	0	250	Min	10 Min

When the unit is OFF by RTC, user can use Visotouch or digital input to force the unit ON. However, the ON time can’t be longer than the time set by Par ES25. After ES25 time, the unit will be forced back to OFF status.
During ES25 time, user can manually switch OFF the unit by Visotouch or digital input.

6.3 OPERATION IN CONDENSING UNIT WORKING MODE

If CF04 = 1, the unit will work as Motor-condensing unit.

CF 4	Motor-condensing unit 0 = no 1 = yes Temperature control, dynamic set point and energy saving functions are automatically disabled when CF04 = 1	0	1		

WARNING:
In condensing unit working mode the temperature control, dynamic set-point function and energy saving function are disabled automatically
In condensing unit working mode, the cooling/heating capacity is only controlled by digital input configured as **Capacity step x demand digital input** (x can be 1 to 16.DI type = 96-111).

6.3.1 Working With Digital Input Configuration As Temperature Control Request

Unit configured as motor-condensing CF04 = 1.
Configure DI as **Cooling/Heating demand digital input (condensing unit).** (DI type = 93)

- With DI contact NOT ACTIVE unit in **OFF**
- With DI contact ACTIVE unit in **cooling/heating**

With DI contact active, user can select the cooling or heating working mode by parameter CF02, SP09 and keyboard. The capacity steps will be called by DI configured as **Capacity step x demand digital input** (x can be 1 to 16.DI type = 96-111) if resources are available in the circuit.
With DI contact active, user can switch ON/OFF the unit by the keyboard. With DI contact not active, the unit will always OFF.

6.3.2 Working With Digital Input Configured As Cooling Request

Unit configured as motor-condensing CF04 = 1, CF02=1 or 3.
Configure DI as **Cooling demand digital input (condensing unit)** (DI type= 94)

- With DI contact NOT active unit is **OFF**
- With DI contact active unit is **ON** in chiller mode

With DI contact active, unit works in chiller mode. The capacity steps, if available, will be called by DI configured as **Capacity step x demand digital input** (x can be 1 to 16)**.**
With DI contact active, user can switch ON/OFF the unit by the keyboard. If the unit has been switched-off from the Visotouch, user can re-start it by deactivate and re-activate the digital input.

6.3.3 Working With Digital Input Configured As Heating Request

Unit configured as motor-condensing CF04 = 1, CF02=2 or 3.
Configure DI as **Heating demand digital input (condensing unit)** (DI type= 95)

- With contact NOT active unit is **OFF**
- With contact active unit is **ON** in heat pump mode

With DI contact active, unit works in heat pump mode. The capacity steps, if available, will be called by DI configured as **Capacity step x demand digital input** (x can be 1 to 16)**.**
With DI contact active, user can switch ON/OFF the unit by the keyboard. If the unit has been switched-off from the Visotouch, user can re-start it by deactivate and re-activate the digital input.

Working error
If two digital inputs are configured as cooling request and heating request with both inputs active at the same time, the unit will be positioned in OFF mode.

6.4 HOW TO MODIFY THE INFORMATION PRESENT IN THE MAIN SCREEN

6.4.1 Select Probes For Display

To select the probes to display on the Visotouch, modify the parameters from DP01 to DP04 (see Programming parameters chapters).

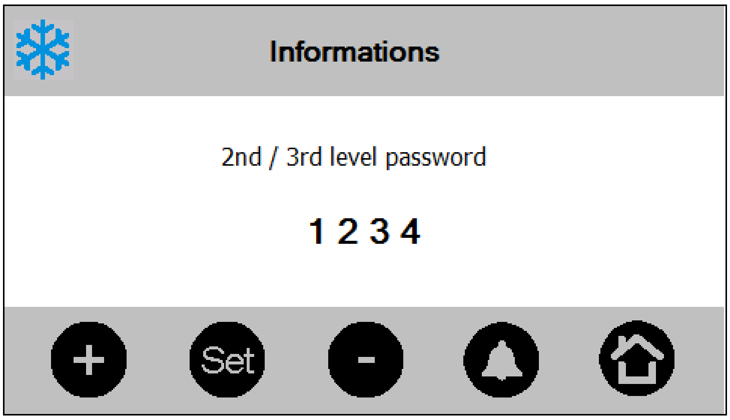
6.5 INFORMATION BUTTON IN MAIN SCREEN

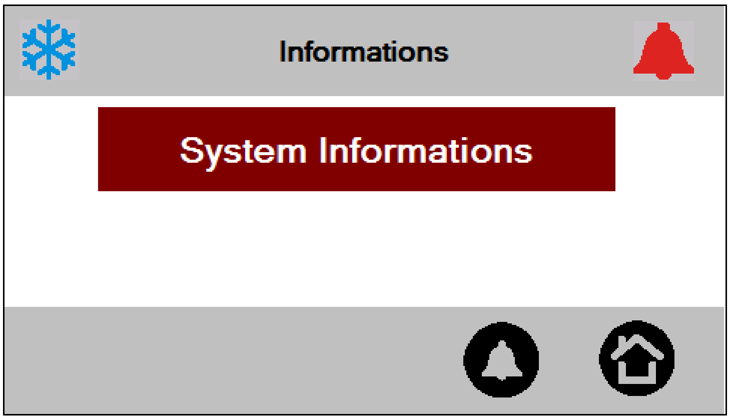
Press the button can enter in the Informations screen. In order to go back to previous screen, press the button.

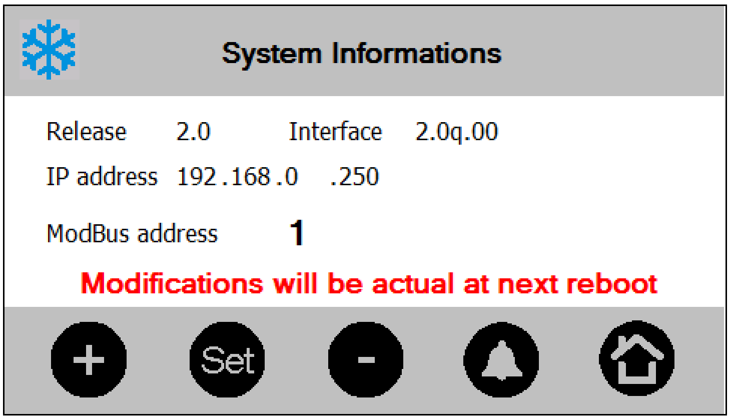
This screen is protected by password. The 2nd level or 3rd level password are all available.

- System information:

The IP address and ModBUS address are editable, but the modification will be actual at next reboot of the ipro.



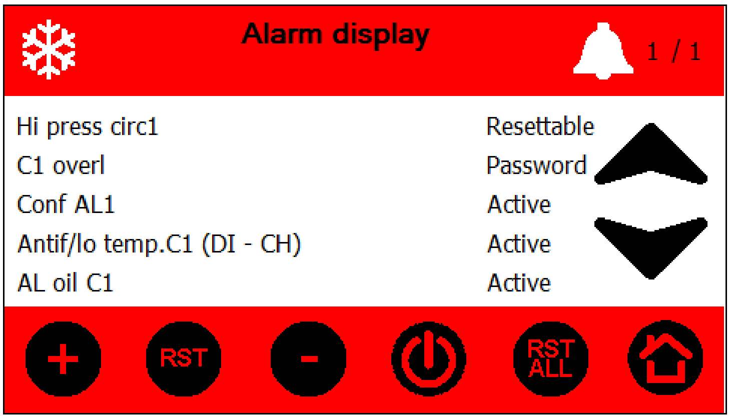




6.6 ALARM BUTTON IN MAIN SCREEN

When an alarm occurs, the screen shows the flashing icon , the red LED switch ON and the buzzer starts to operate. Press anywhere on the screen can silence the buzzer.

Push button can enter in the Alarm display screen. In order to go back to previous screen, please press the button.



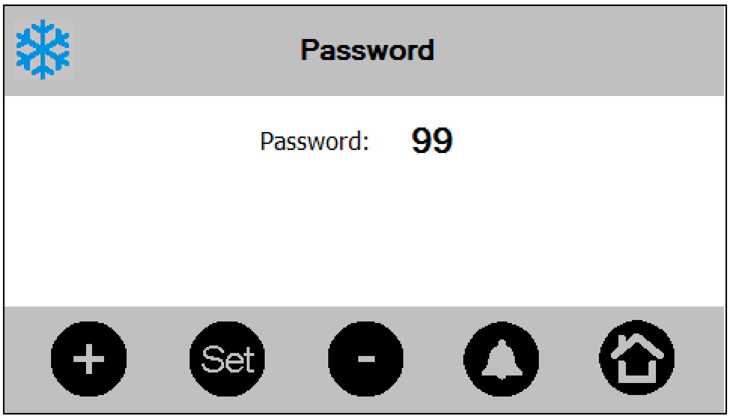
Three types of alarms can be present:

- Resettable → in this case, the alarm is not active and can be reset. Position the cursor on the alarm element and press .
- Password → in this case, the alarm is not active, but a password is required to reset it.
- Active → the alarm is still in progress.

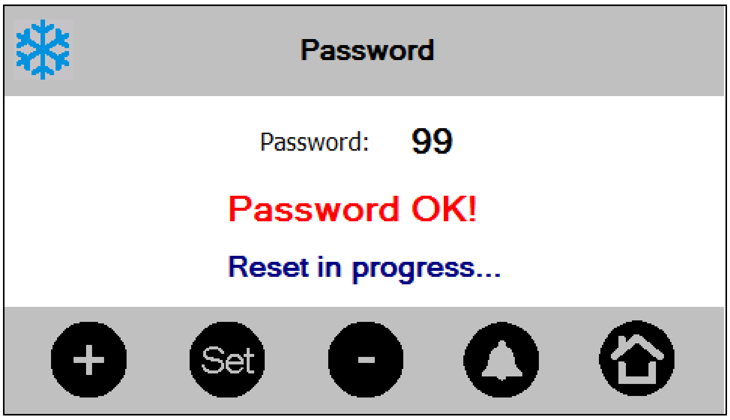
If there are several resettable alarms, instead of selecting them one by one, press and they will all reset together.

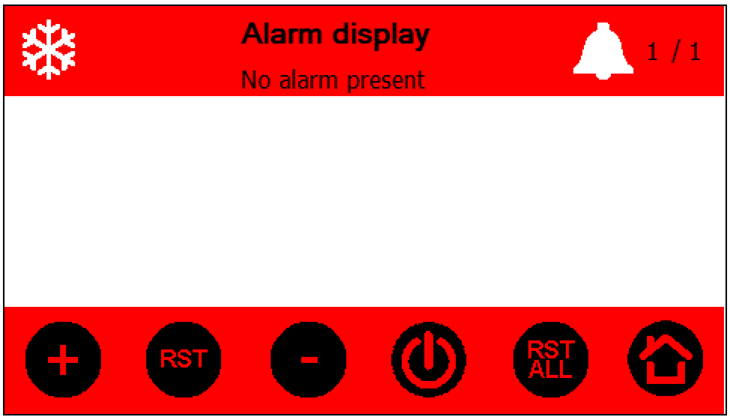
To reset an alarm that is protected by a password, operate as follows:

- Select the alarm marked by "Password".
- Press .

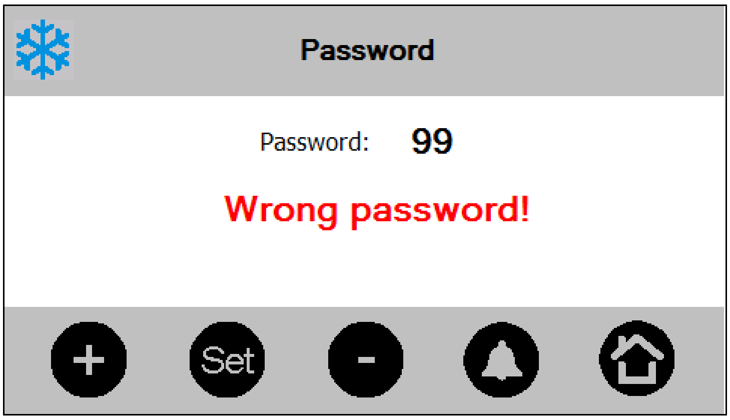


- Via buttons and , set the password.
- Press to confirm.
- If the password is correct, the following message will display:





- If the password introduced is incorrect, the following message will display:

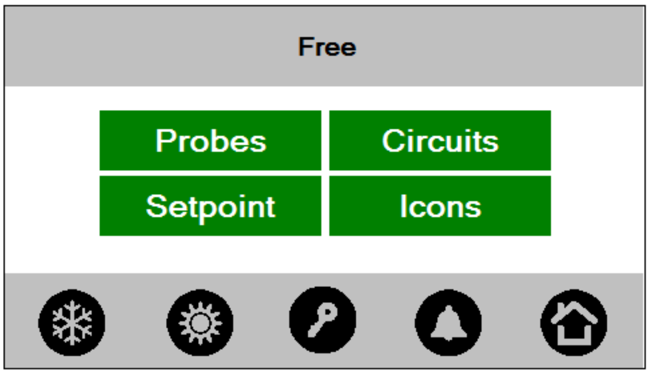


If the password is correct, after a few seconds you will go automatically back to the alarms screen.

6.7 FREE BUTTON IN MAIN SCREEN

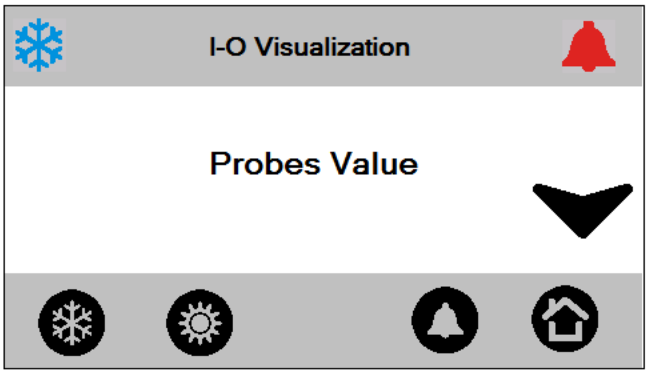
Press button  can enter in the Free screen. It has 4 sub menus.

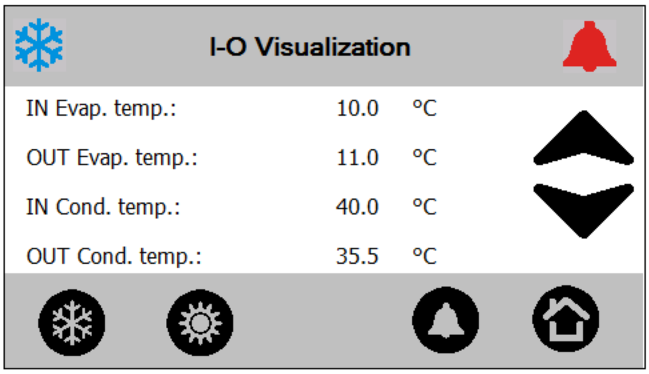
- **Probes:** Show the global probes' value. They are not dedicated to any circuit.
- **Setpoint:** Show the configured setpoint value and the real setpoint value in use considering energy saving and dynamic setpoint.
- **Circuits:** Show the probes' value belong to each circuit.
- **Icons:** Show the loads' status of all configured circuits (including compressors, pumps, and fans).



6.7.1 Probes Submenu

Press  button in Free screen can enter in the Probes screen.
By pressing the  and  buttons, all the relevant probes can be seen.



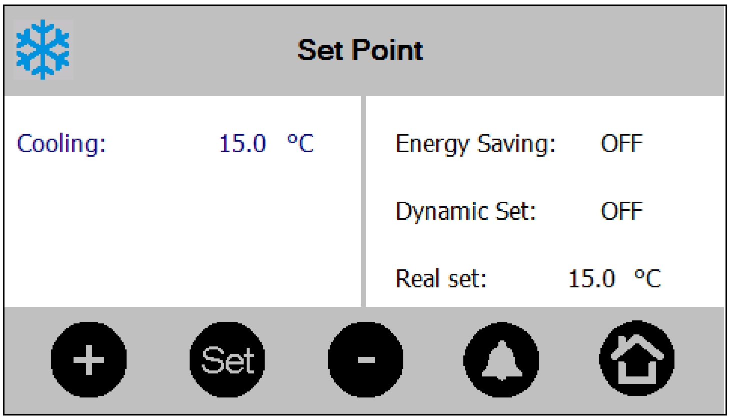


Press the  button several times to go back to the main screen.

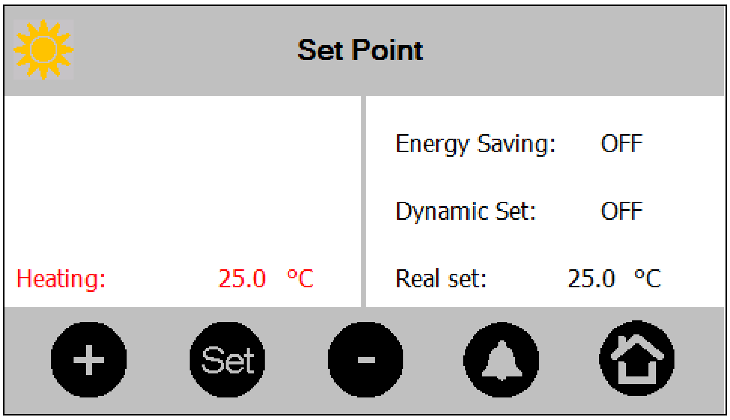
6.7.2 Setpoint Submenu

To set the setpoint of the cooling and/or heating, press **Setpoint** button and enter the set-point screen.

Chiller mode:



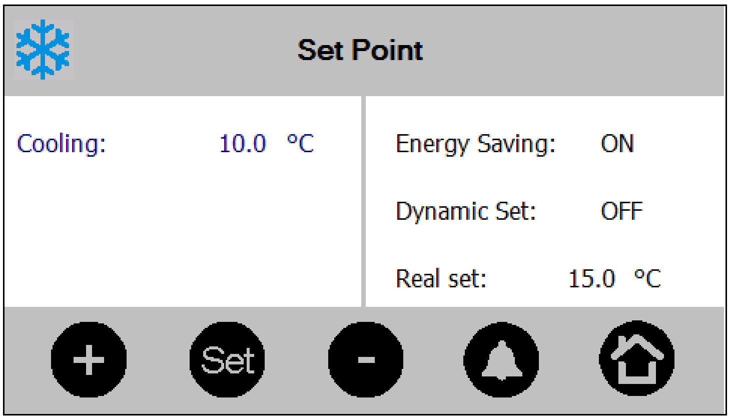
Heat pump mode:



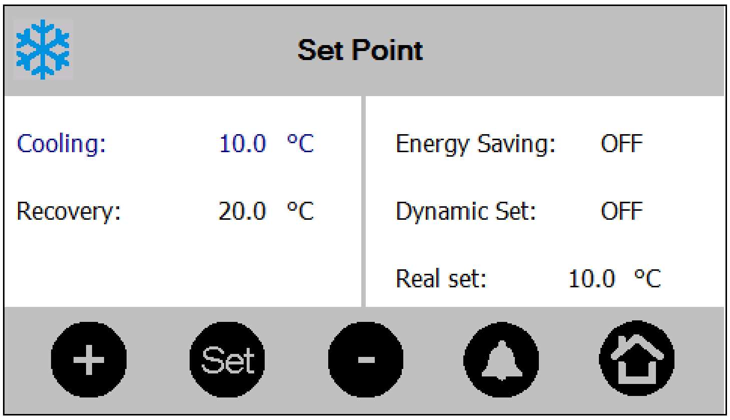
To modify the setpoint, click the element “Cooling” or “Heating” setpoint then press the Set button:

- The element starts to flash.
- Increase or decrease the value using the + and - buttons.
- Confirm the modification by pressing the Set button again.

In this screen it is also possible to verify (but not modify) whether the energy saving mode and dynamic set are active. If they are active, the **Real set** may different from the **Cooling** or **Heating** set.
Cooling (**Heating)** set is always the same as par ST01(ST04), the **real set** represent the set-point value including the energy saving delta or of the dynamic set, and it is read only (can’t be modified).



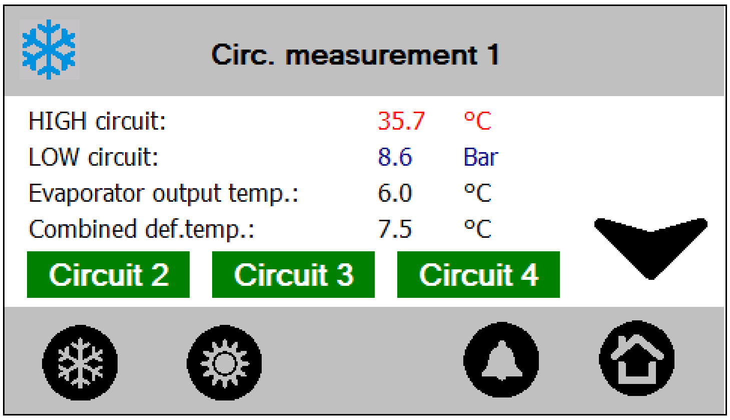
If heat recovery is enabled (RC01>0), the recovery set point will also be shown in this screen.



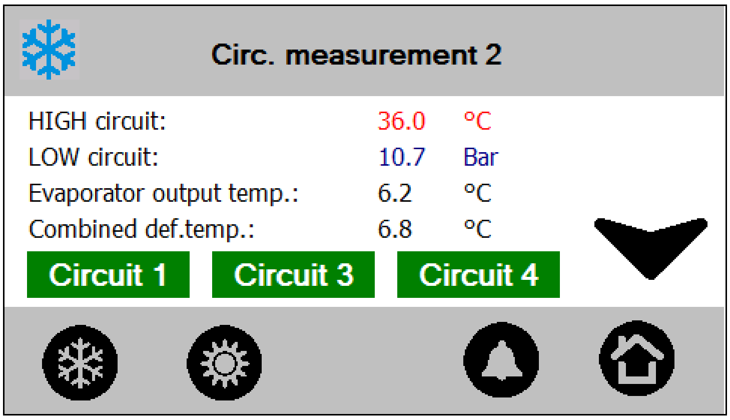
Press the  button can exit current screen.

6.7.3 Circuits Submenu

Press the Circuits button in the Free screen can show probes' value of each circuit.



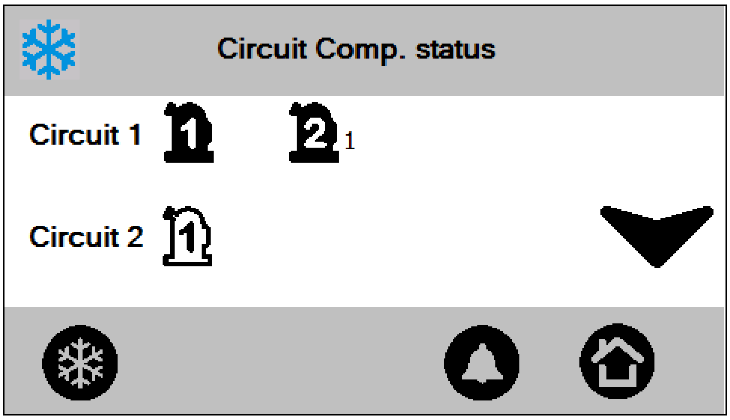
If multi circuits are configured, press Circuit 2 Circuit 3 Circuit 4 buttons can switch the display between different circuits.



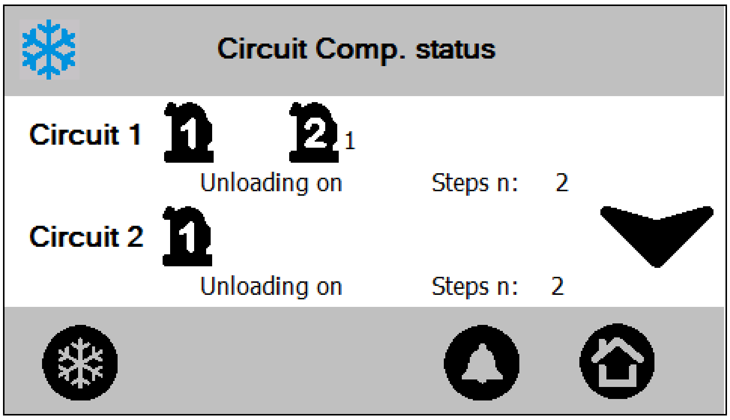
6.7.4 Icons Submenu

Press the Icons button in the Free screen is possible to monitor the loads' status of the unit. The information refers to:

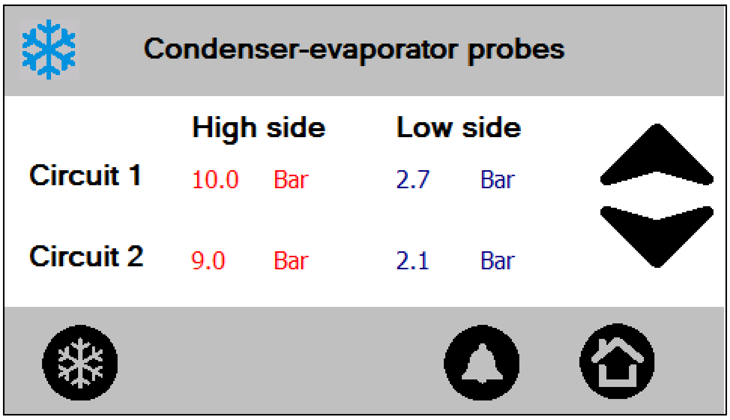
- Circuits compressors status; the screen shows the compressors present for each circuit and the activation status of the compressor (number of unloaders active). If the compressor has no number on the right, it means that it is at full power.
  In the screen below, circuit 1 has 2 compressors configured. Compressor 1 running at full power, compressor 2 running at 1st power step. circuit 2 has 1 compressors configured and it is not working now.



If unloading is active, the maximum step number for unloading will be displayed.

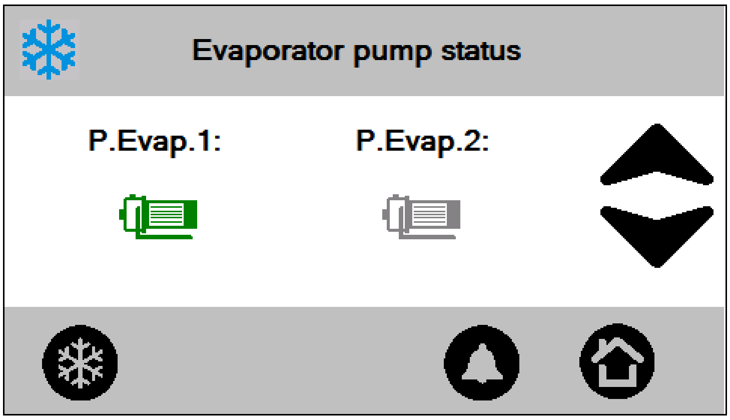


- Condensation-evaporation probes. The screen shows the condensation and evaporation pressures of every circuit present.

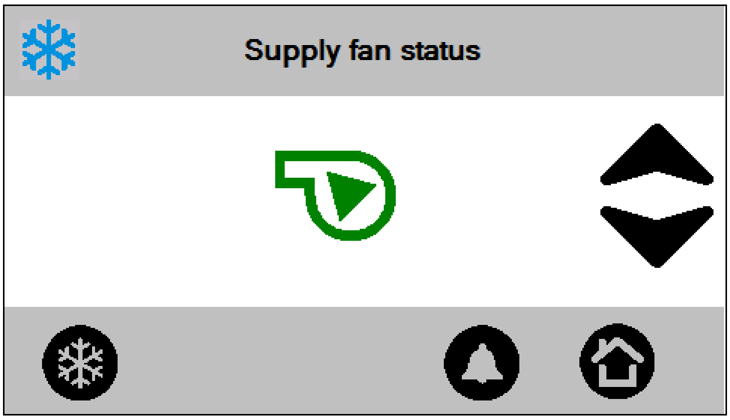


If the valuer of the parameter SP01 is equal to "0" or "2", the high side is represented with the temperatures.

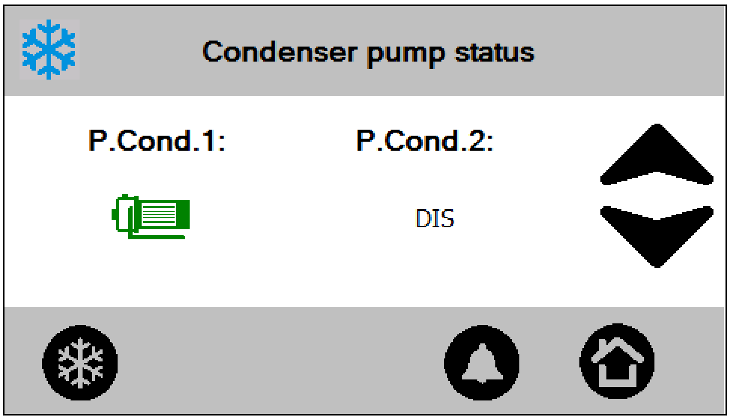
- Status of the evaporator pump (or evaporator pumps if the support is present)



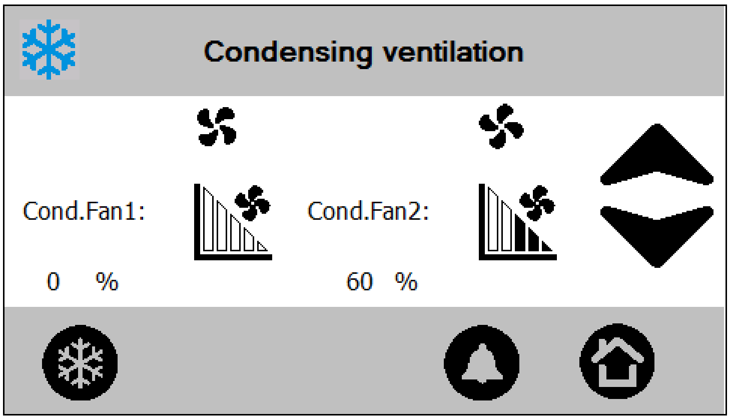
- Status of the supply fan

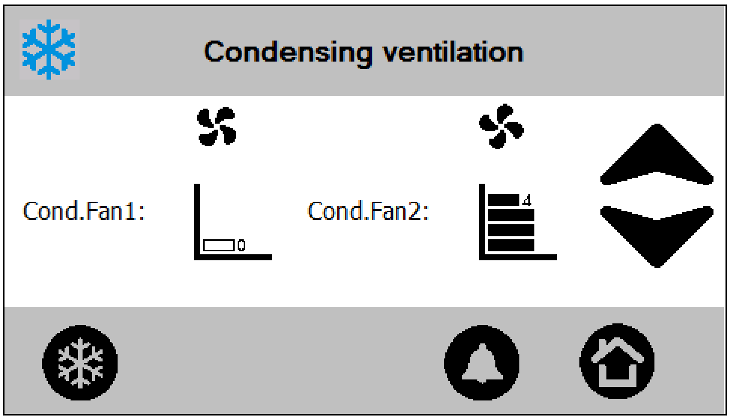


- Status of the condenser pump (or of the pumps if the WATER-WATER support is present)



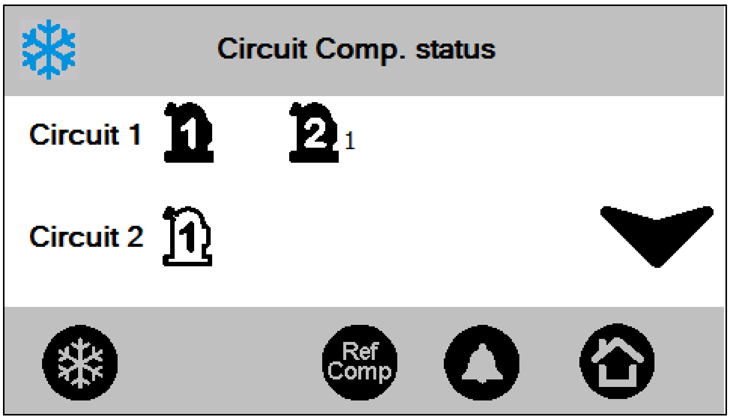
- Condensation fans (proportional or with steps - AIR-AIR or AIR-WATER)

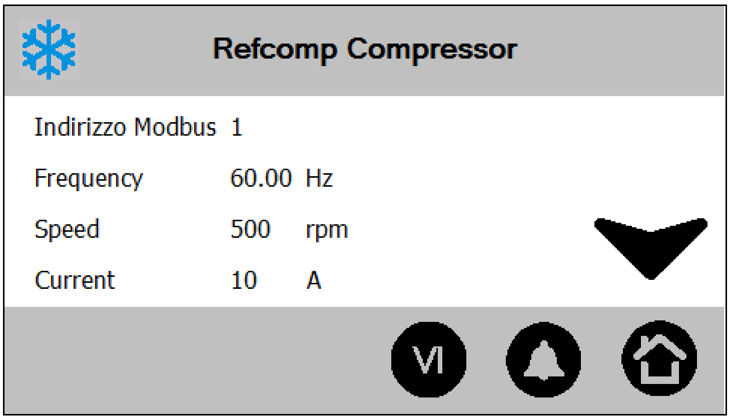


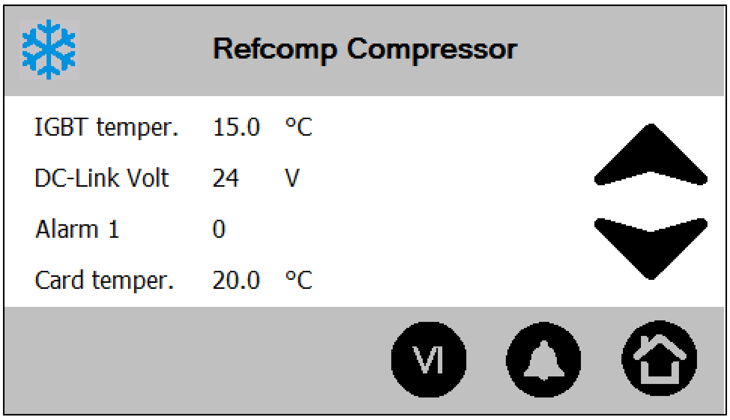


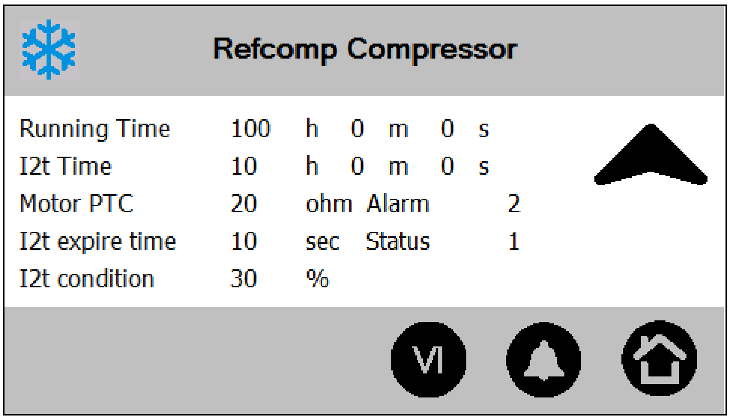
By pressing the  or  buttons, can pass from one screen to another.

- Refcomp compressor information
  If Refcomp compressor is configured, press key **RefComp** to see relevant information.





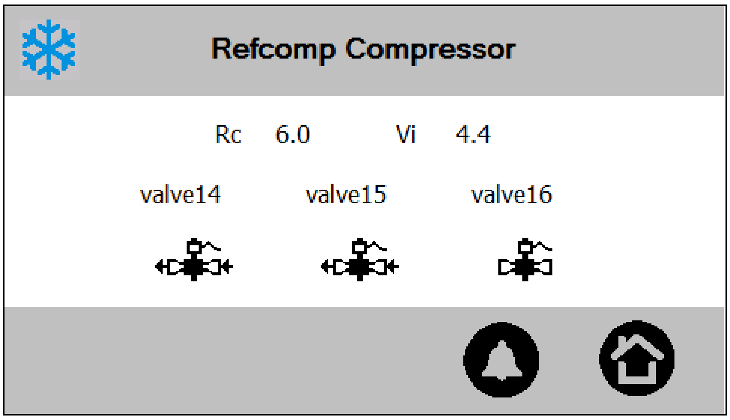




In the screen above, the modbus address is editable.

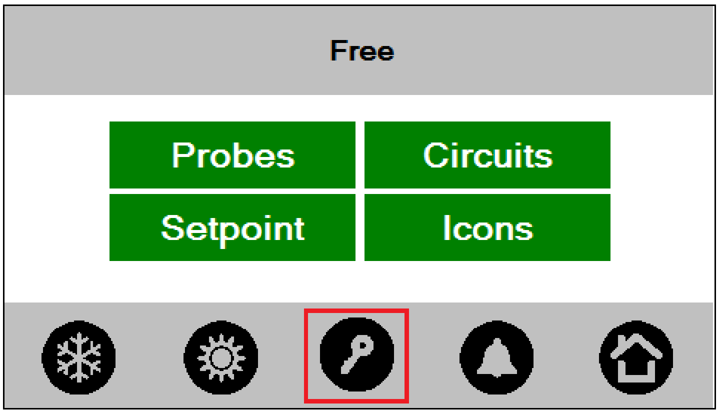
- Refcomp compressor valve status

  Press VI button to see the valve status



6.8 SERVICE MENU

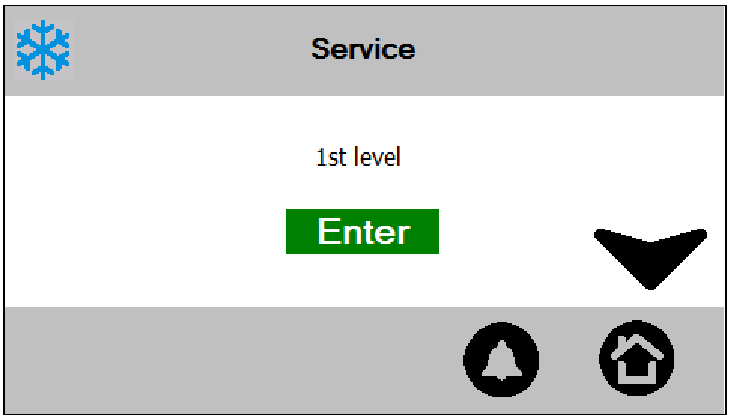
In screen Free, press the  button on the bottom can enter in the SERVICE menu.



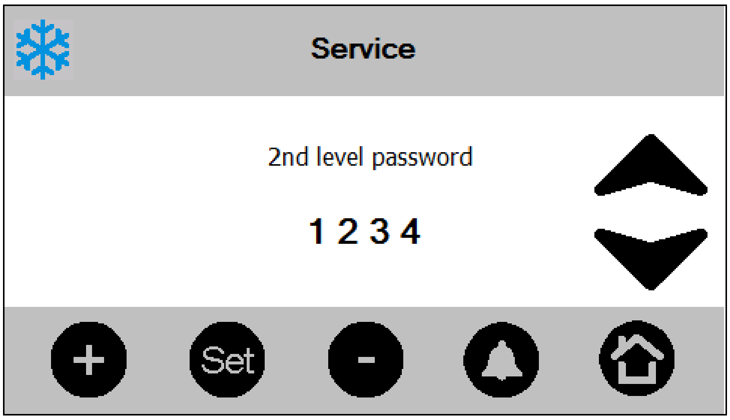
In SERVICE menu is possible to configure:

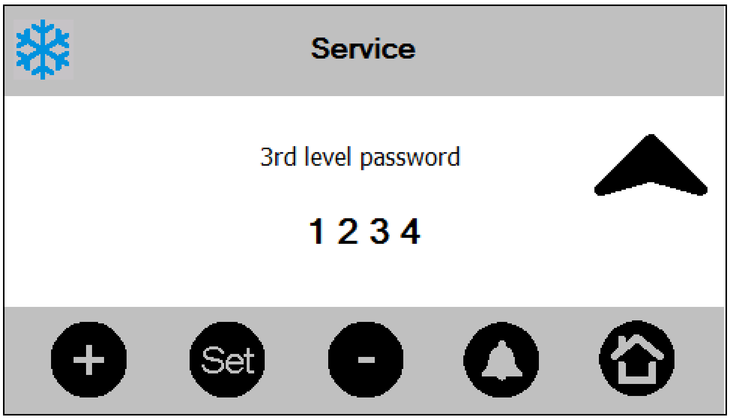
- Parameters Programming
- Time/Time periods Programming
- Compressors
- Water pump (Supply fan)
- Alarms display
- Historical alarms
- Defrost
- Heaters/Liquid line solenoid valve
- I/O status (Inputs and Outputs)
- Thermostatic Valve
- Heat recovery function
- Auxiliary outputs
- Free-cooling
- Screw compressor
- Discharge compressor temperature
- Sanitary water (Domestic hot water)
- Auxiliary heating
- Control panel

The SERVICE menu is protected by password in 3 levels.
For 1st level, no password needed. Press key ENTER can enter in SERVICE menu directly.

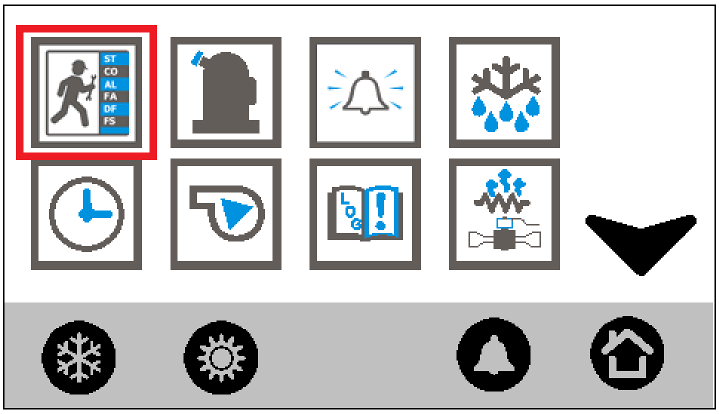


Press button can switch to higher user level.
For 2nd and 3rd level, relevant password is required.





6.8.1 Parameters Programming



By selecting this menu it is possible to modify the value of the parameters depending on the password level. The parameters are divided per groups with the following meaning:

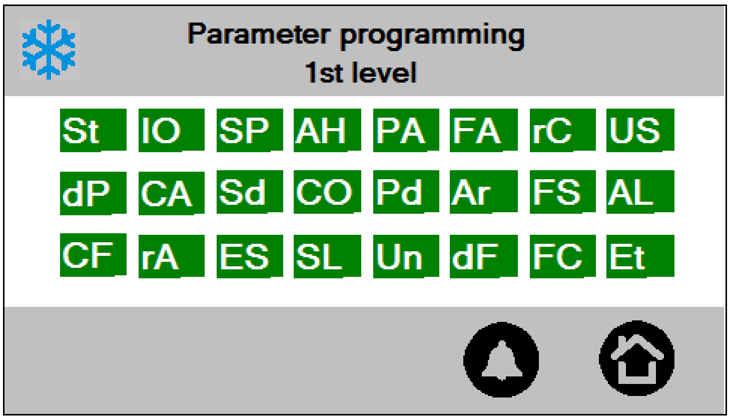
Label	Meaning
ST	Display temperature control parameters
DP	Display variables to be shown on the keyboard
CF	Display configuration parameters
SP	Display parameters for machine set up
Sd	Display dynamic set-point parameters
ES	Display energy saving and automatic timed switch-on/off parameters
AH	Display auxiliary heating parameters
CO	Display compressor parameters
SL	Display stepless compressor parameters
PA	Display evaporator/condenser water pump parameters
Pd	Display pump down function parameters
Un	Display unloading function parameters
FA	Display ventilation parameters
Ar	Display anti-freeze heaters parameters
dF	Display defrost parameters
rC	Display heat recovery parameters
FS	Display production of domestic hot water parameters
FC	Display free-cooling function parameters
US	Display auxiliary output parameters
AL	Display alarm parameters
Et	Display parameters for the management of the electronic expansion valve
IO	Display inputs/outputs configuration parameters
CA	Display analog input calibration parameters
RA	Display analog input range parameters

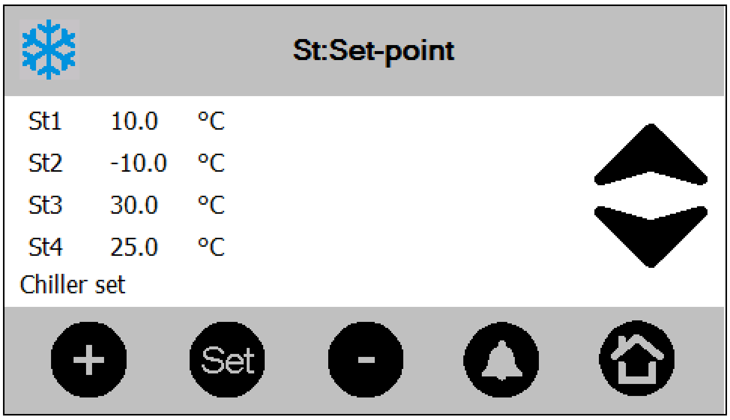
According to user level, different amount of parameters are visiable in the parameters programming screen.

- If user entered into SERVICE menu with 1st level, he can enter to see parameters in Level 1(Pr1).
- If user entered into SERVICE menu with 2ndlevel, he can enter to see parameters in Level 1(Pr1) and Level 2(Pr2).
- If user entered into SERVICE menu with 3rd level, he can enter to see parameters in Level 1(Pr1), Level 2(Pr2) and Level 3(Pr3).

In the selected level screen, user only can see parameters with equal or lower protecting level.
For example: When enter into 2nd level parameters screen, only parameters with Pr1 or Pr2 are displayed. And user can change a parameter's protecting level to Pr1 or Pr2 in this screen.

Click on the family name label can open this parameter family.





To modify a parameter, click on the value:

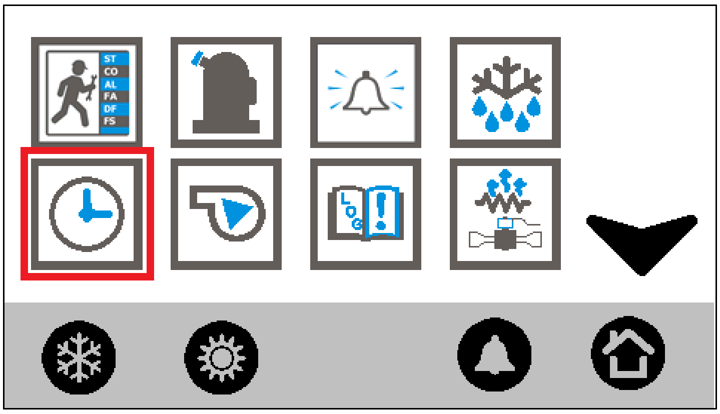
- Press the Set button.
- Increase or decrease the value using the + and - buttons.
- Confirm the modification by pressing the Set button again.

+ and - buttons also can be used to move the cursor. When cursor points to different parameters, the parameter's description will display in the bottom.

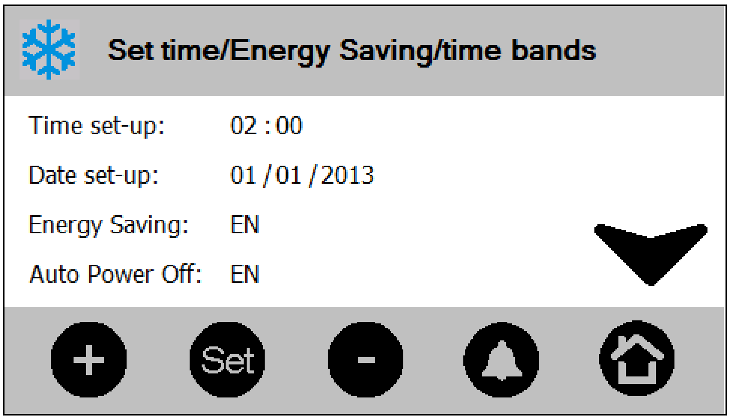
Press the button can exit current screen.

Warning:
For parameter groups CF, IO, CA, and RA, they can be verified and changed only if the unit is switch-OFF (stand-by).

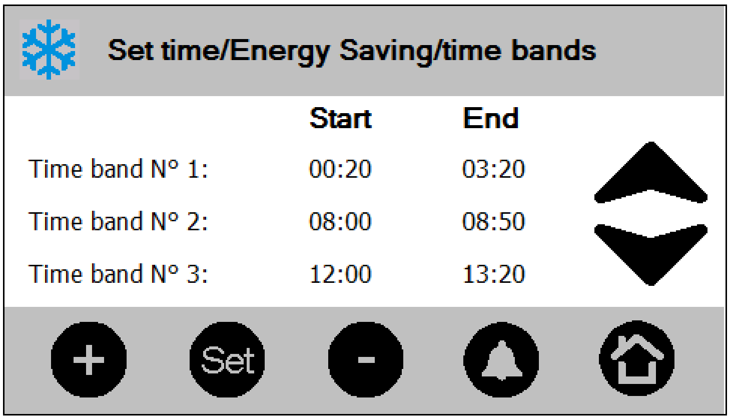
6.8.2 Time/Time Bands



As mentioned in previous chapter, this menu is used for the time and date set.
It is also possible to enable or disable the Energy Saving and/or automatic switch on/off the time bands.



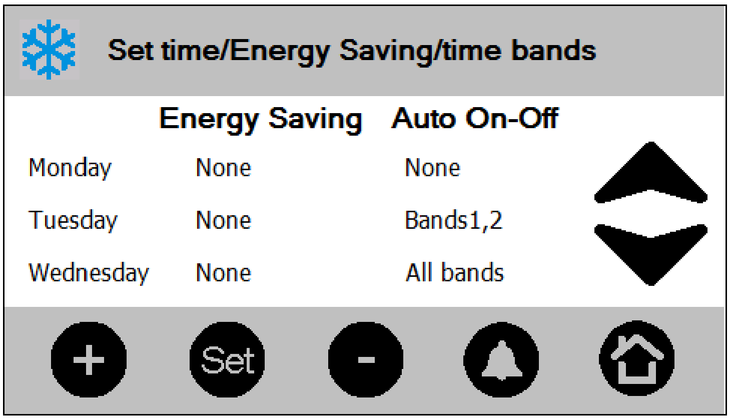
By pressing the  button, pass to the screen for the configuration of the three time bands.



To modify the time bands, click on the time:

- Press the  button.
- Increase or decrease the value using the  and  buttons.
- Confirm the modification by pressing the  button again.

By pressing the  button again, pass to the screen for weekly programming of the time periods for the Energy saving and for automatic switch-off.



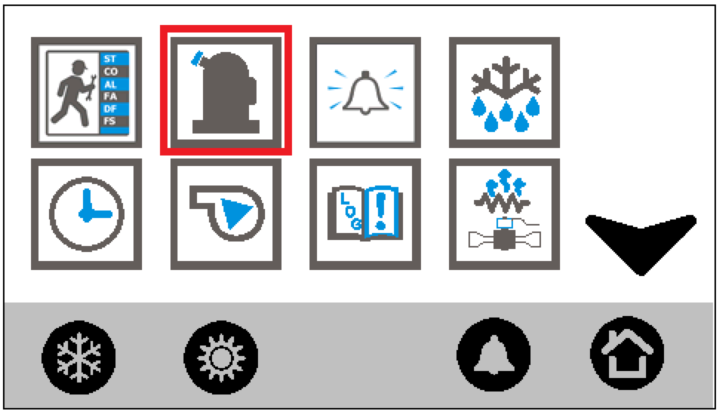
For every day of the week and for both functions(Energy saving and Auto On-Off), it is possible to manage:

- No time band
- Band 1
- Band 2
- Band 1 and 2
- Band 3
- Band 1 and 3
- Band 2 and 3
- All bands

Warning: Automatic switch-off has priority with respect to Energy saving

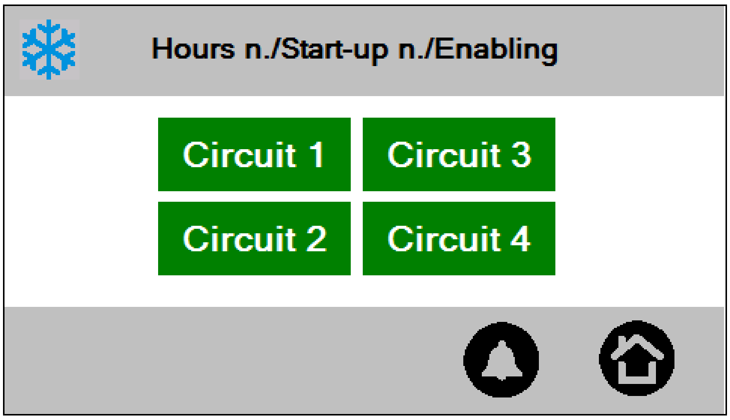
Press the  button can exit current screen.

6.8.3 Compressors



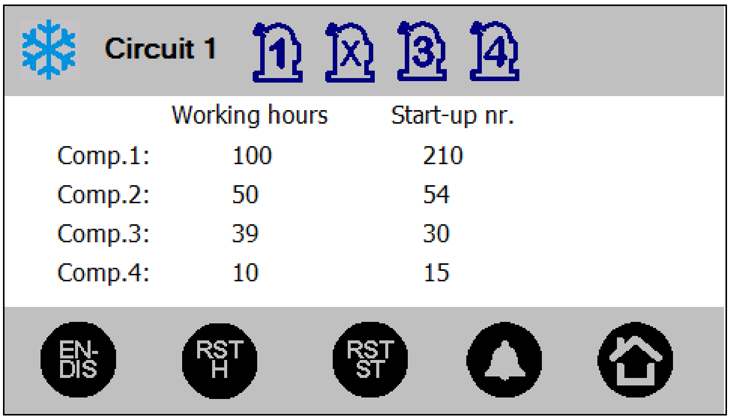
The following information is available for each circuit in this menu:

- Hours worked by each individual compressor
- Number of start-ups for each individual compressor



For each individual compressor it is possible:

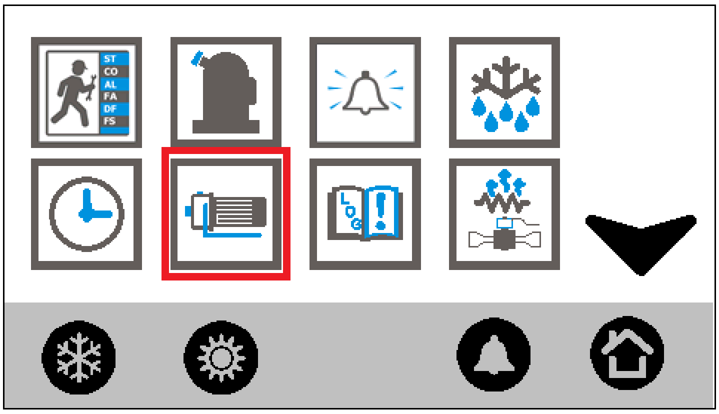
- To reset the working hours
- Reset the number of start-ups
- Disable compressor working (e.g. inorder to perform maintenance)



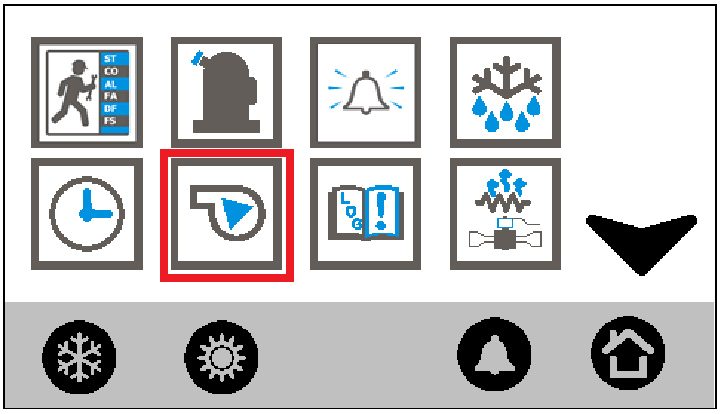
To reset the values, click on the compressor name label, and press the  or  button. And the password is request for reset operation (password is set by Par. AL31).

To enable or disable a compressor, click on the compressor name label, and then press the  button.

6.8.4 Water Pump



When CF01=0 (Air/air unit), instead of pump icon, the fan icon will display in the same position.

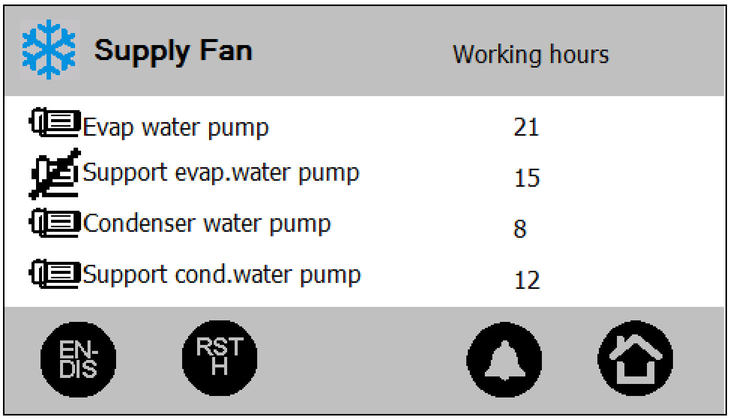


The following information is available in this menu:

- Hours worked by each individual pump (evaporator and condenser)

For each individual pump it is possible:

- To reset the working hours
- To disable the pump (e.g. to perform maintenance)

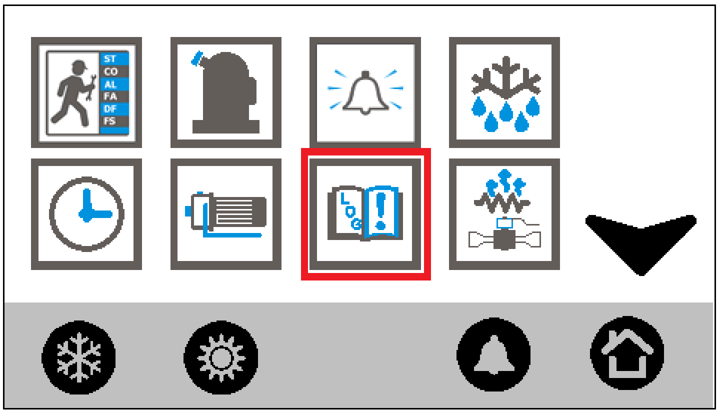


To reset working hours or disable/enable the pumps, follow the procedure described for the compressors. Password is request for reset operation (password is set by Par. AL31).

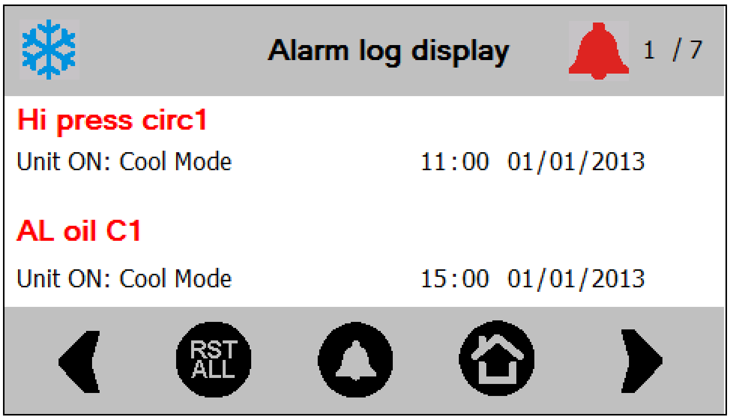
6.8.5 Alarms Display

This menu contains the same information as press the  button in the main screen. See previous chapters for your reference.

6.8.6 Historical Alarms

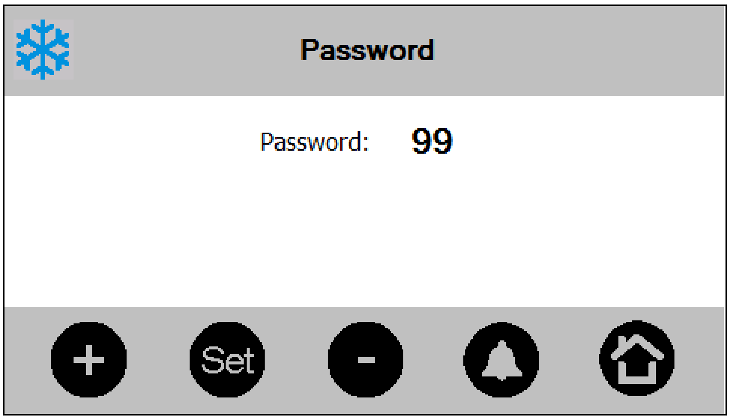


All alarms occurred are memorised in this screen.

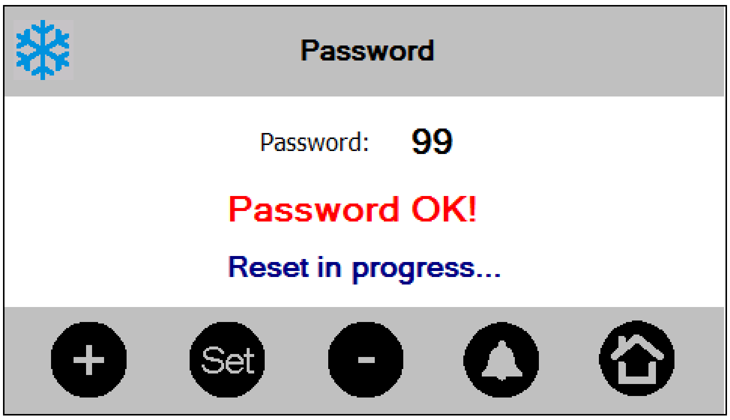


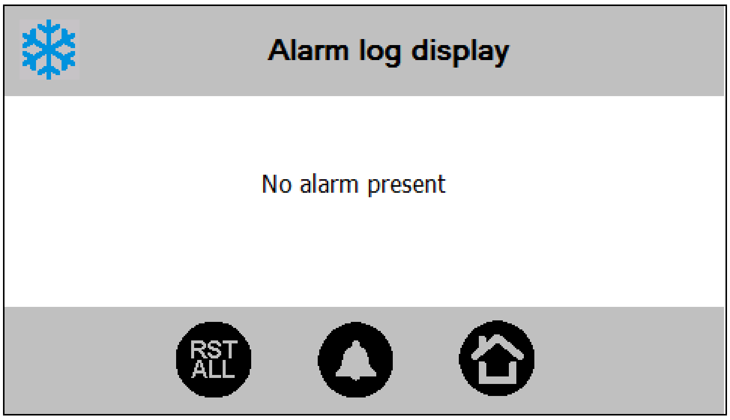
To reset the alarms log, operate as follows:

- Press the RST ALL button for 3 seconds.

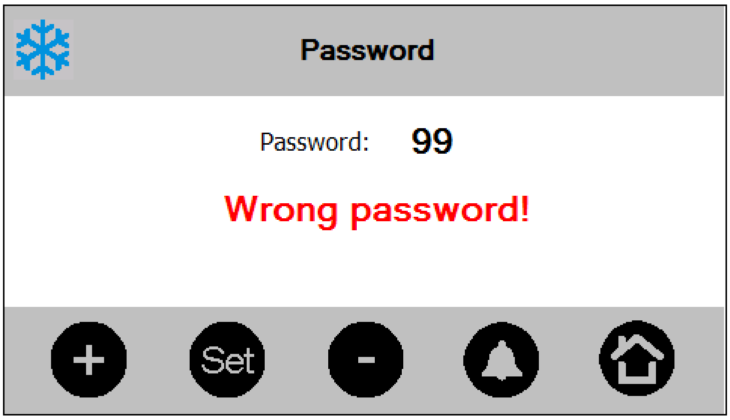


- Via buttons + and -, set the password.
- Press Set to confirm.
- If the password is correct, the following message will display:



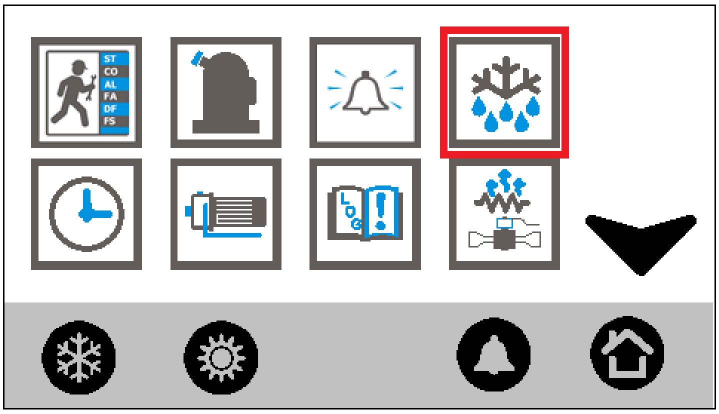


- If the password introduced is incorrect, the following message will display:

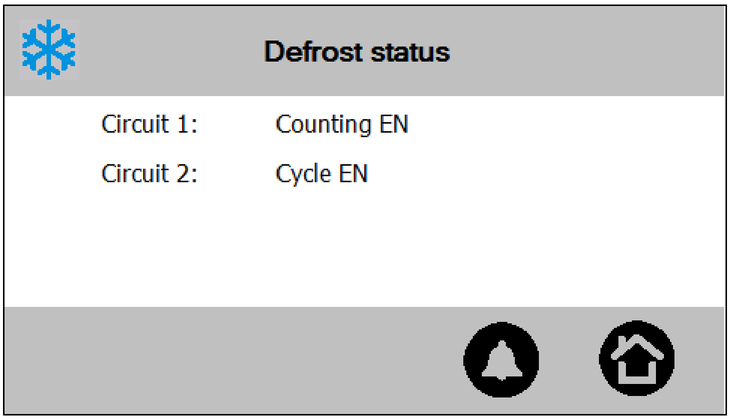


If the password is correct, after a few seconds you will go back automatically to the Alarm log screen.

6.8.7 Defrost



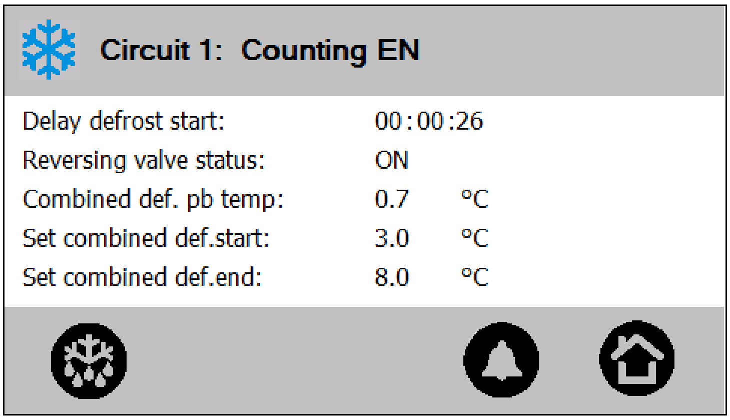
In this screen it is possible to check the status of the defrost cycle for every circuit present:



Circuit defrost status can be:

- Counting EN: In counting down, defrost will start soon
- Cycle EN: Defrost in progress
- Drip time EN: In dripping time
- Waiting: No defrost, normal working
- Condition not present: No necessary condition for defrost

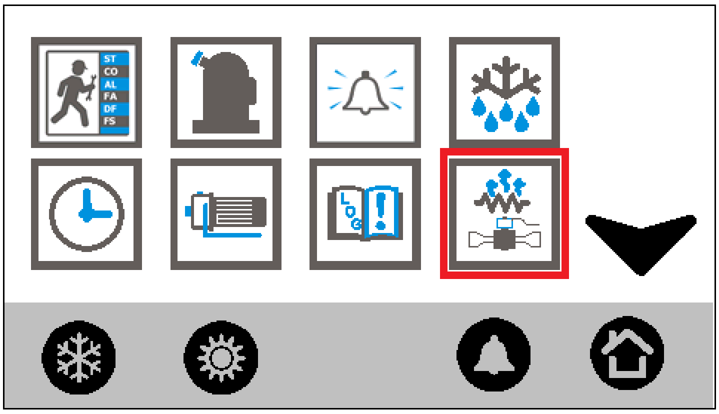
Click on the circuit label can pass to the following screen.



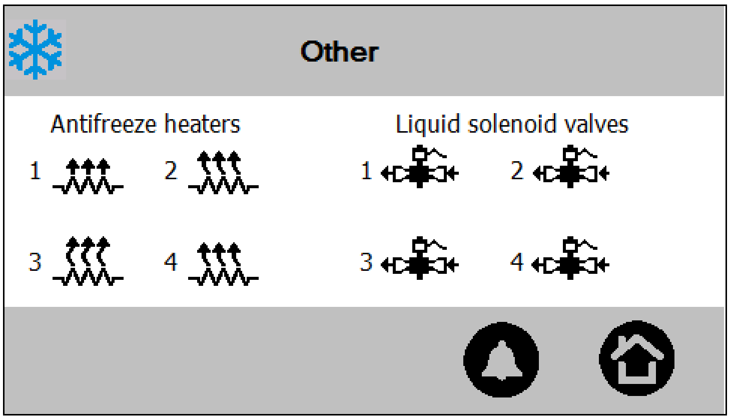
Press the button for 5 seconds allows forcing start of the defrost cycle.

Press the button can exit current screen.

6.8.8 Heaters/Liquid Line Solenoid Valve

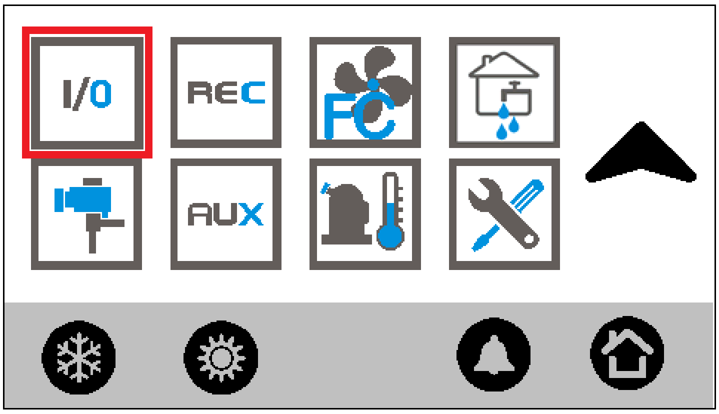


This menu allows to display the active and/or deactivated heaters and any active and/or deactivated liquid line solenoid valves (only the resources configured are displayed).



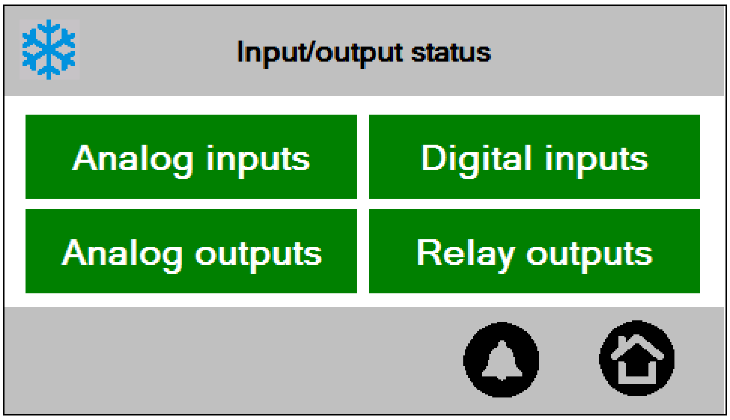
Press the  button can exit current screen.

6.8.9 I/O Status



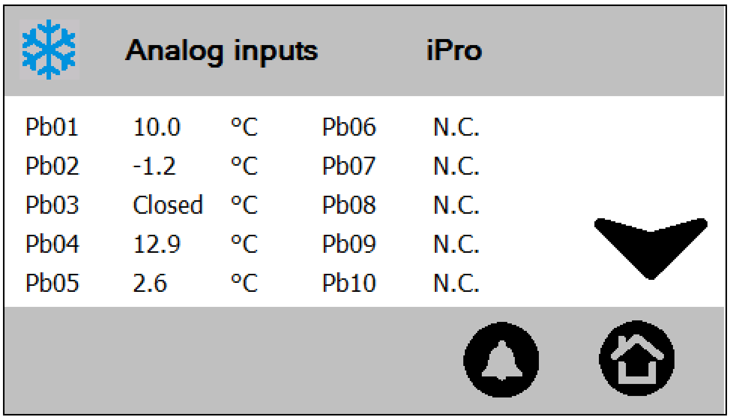
This menu allows to display the status of all inputs and outputs that have been defined.

The I/O units have been divided by groups, as in the screen below:

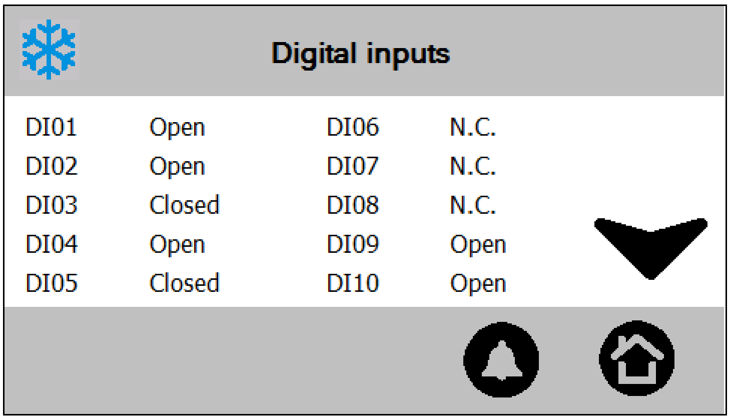


Click on the Analog inputs/Digital inputs/Analog outputs/Relay outputs button, it is possible to enter in the corresponding I/O screen.

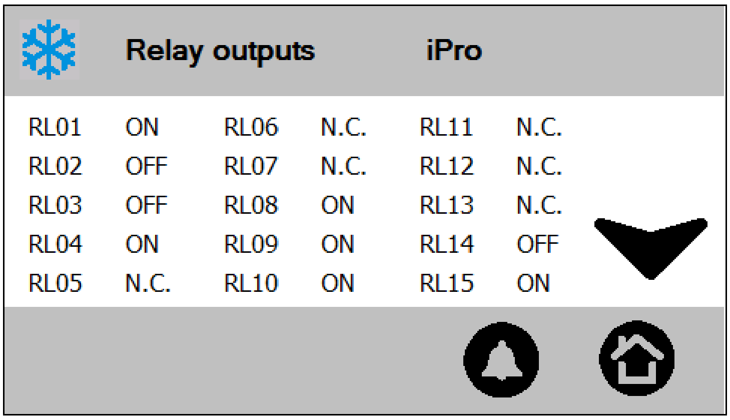
Analog inputs:



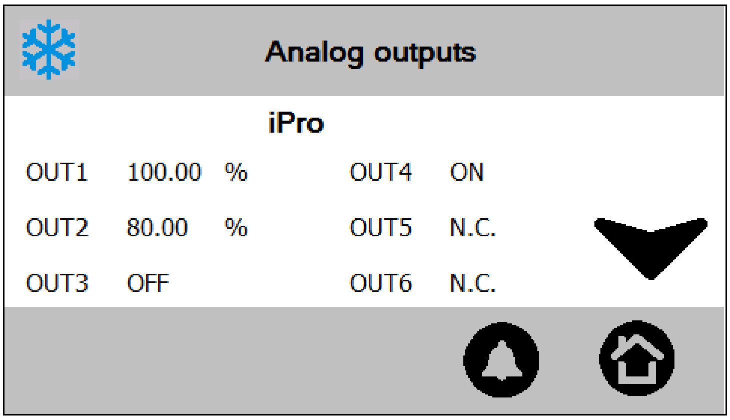
Digital inputs:



Relay outputs:

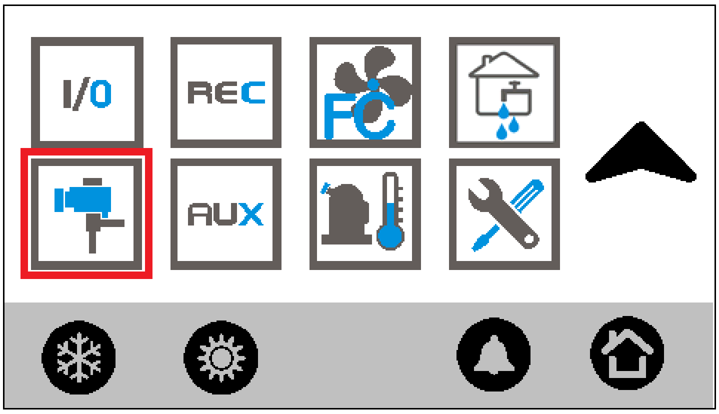


Analog outputs:

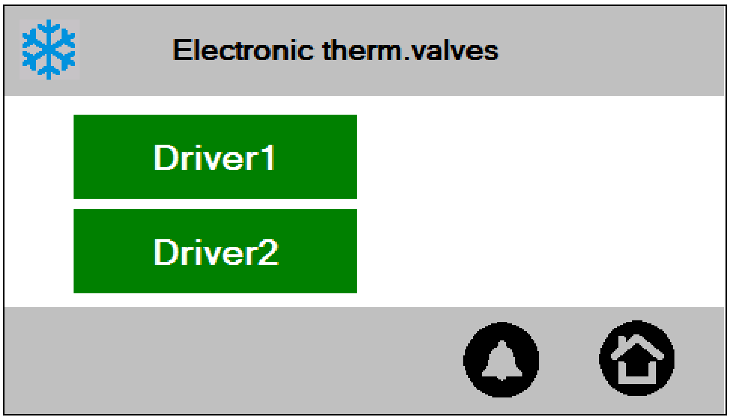


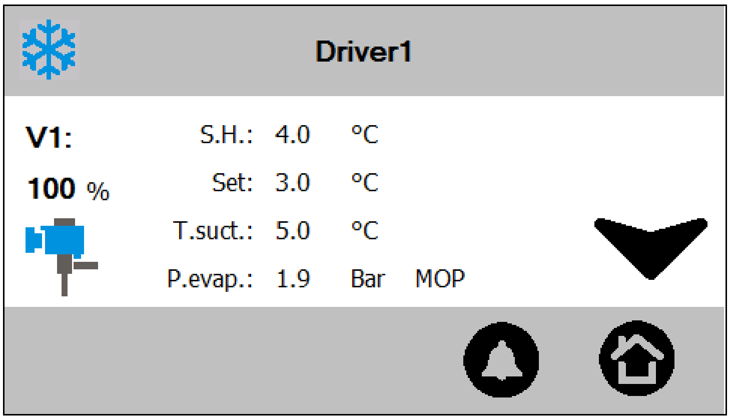
Press the button can exit current screen.

6.8.10 Thermostatic



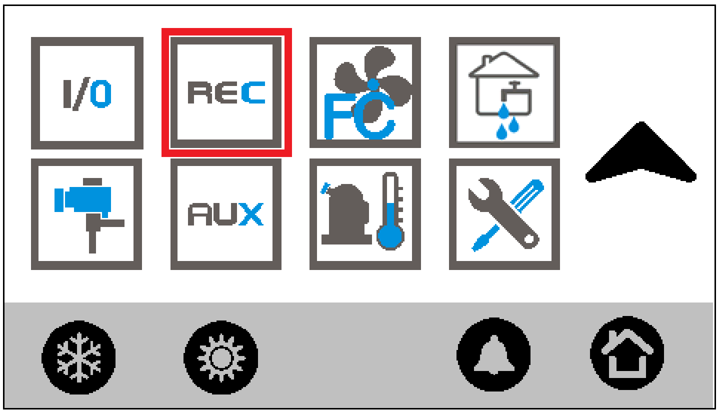
In this menu it is possible to check the working status of the valve and/or electronic thermostatic valves for every circuit defined.



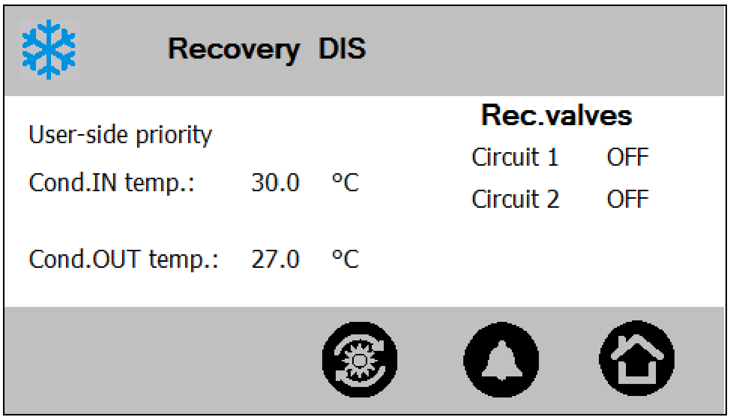


Press the button can exit current screen.

6.8.11 Heat Recovery



Using this menu it is possible to verify the recovery working status.



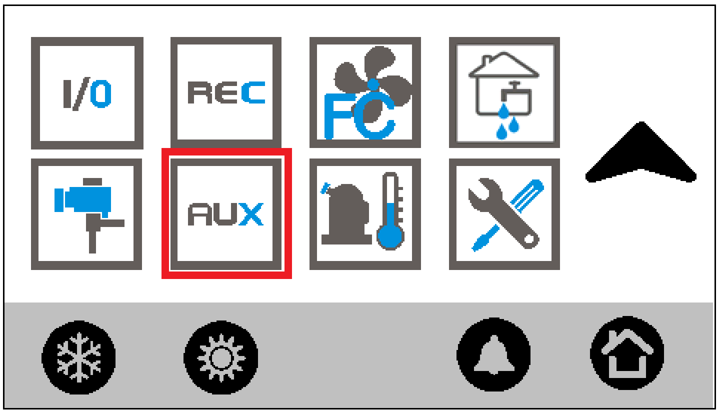
Press the  button for 1 second enables the recovery working.

The following information can be available in this screen:

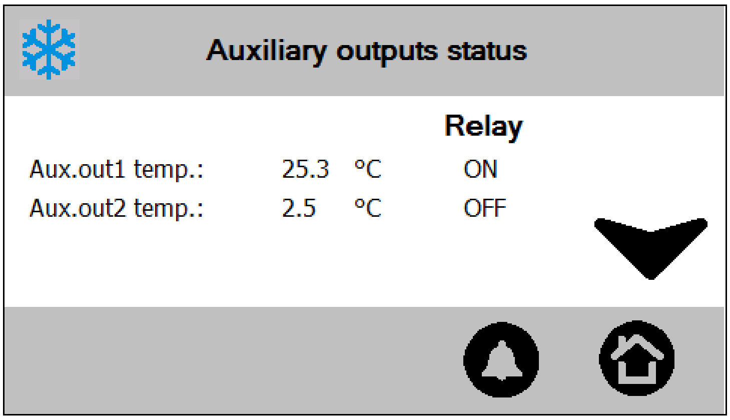
- Status of the recovery function:
  - Disabled
  - Disabled from key
  - Enabled
  - Active
- Type of priority:
  - User side
  - Recovery side

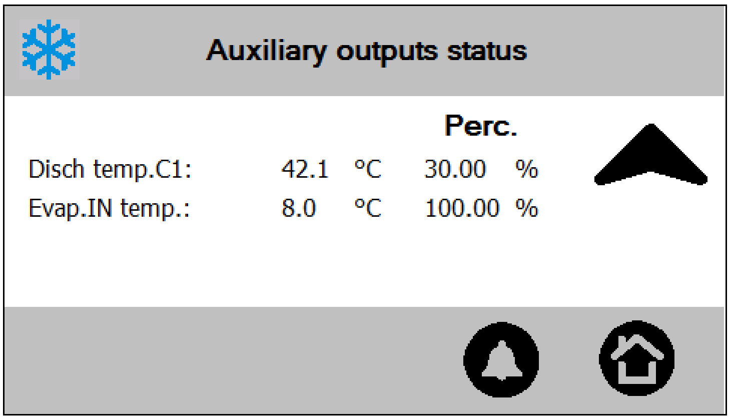
Press the  button can exit current screen.

6.8.12 Auxiliary Outputs



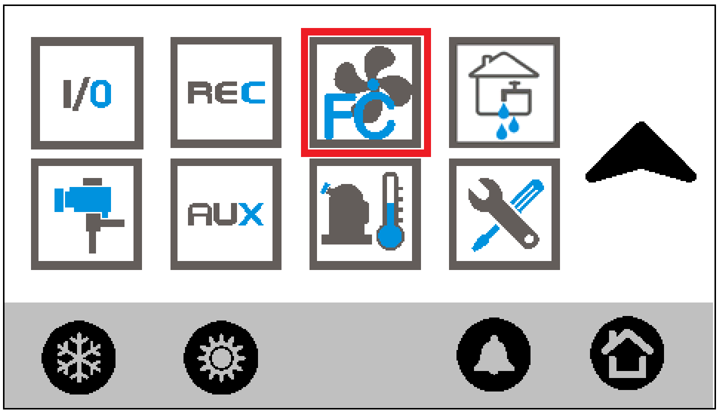
Using this menu it is possible to display the status of the auxiliary outputs (if present).



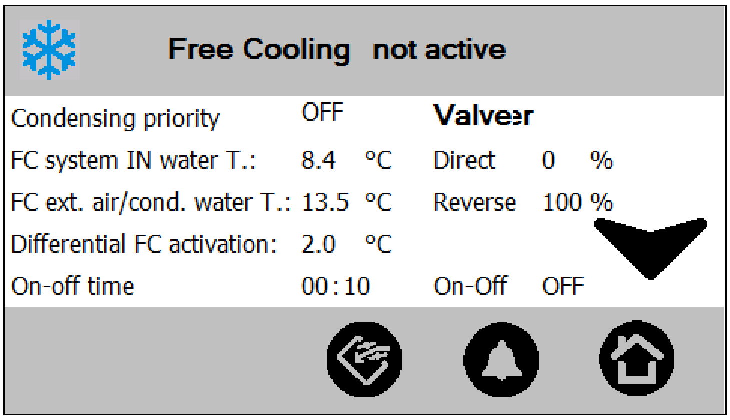


Press the button can exit current screen.

6.8.13 Free-Cooling



In this menu it is possible to verify the free cooling working status.
If FC01 $\neq$ 4, this following screen will display:

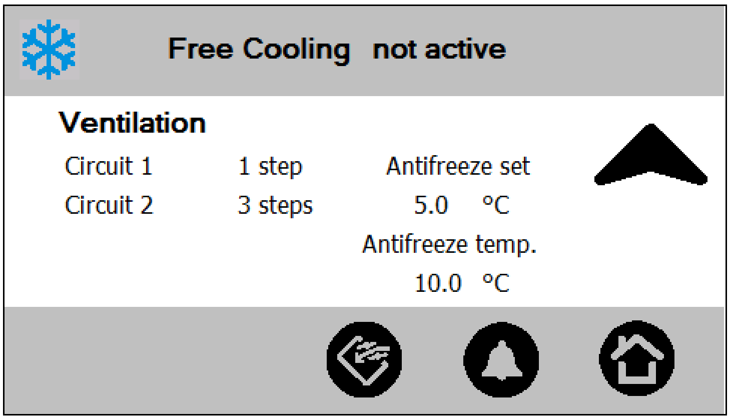


Press the button for 1 second can enable the free cooling working.

The following information can be available in this screen:

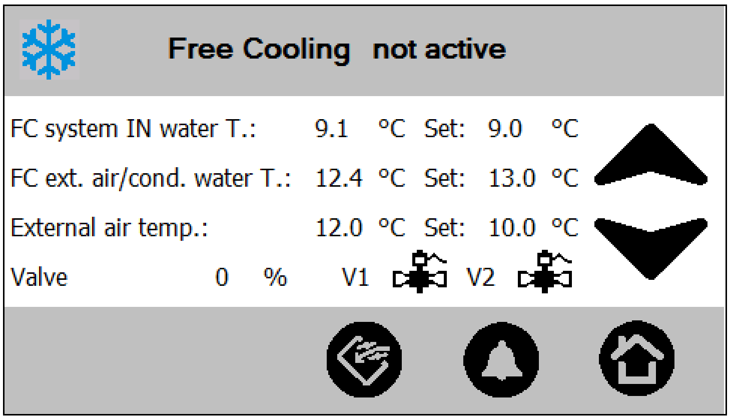
- Status of the free cooling function:
  - Not active
  - Disabled from key
  - Disabled from anti-freeze
  - OFF
  - ON
- Type of priority:
  - Condensation
  - Free-cooling
  - External ventilation

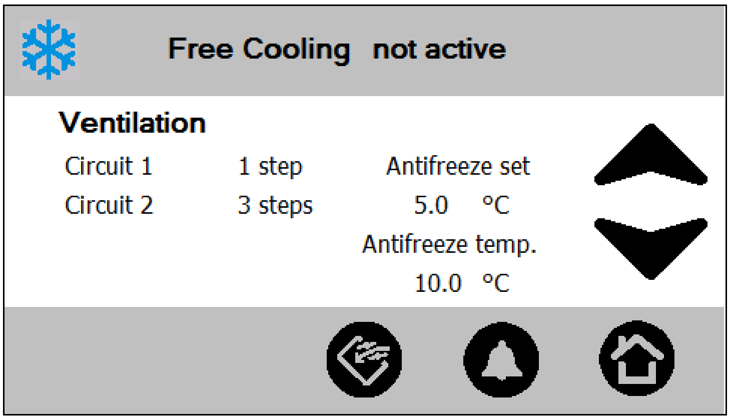
By pressing the button can pass to the next screen where the following information is available (only if CF01≠0):

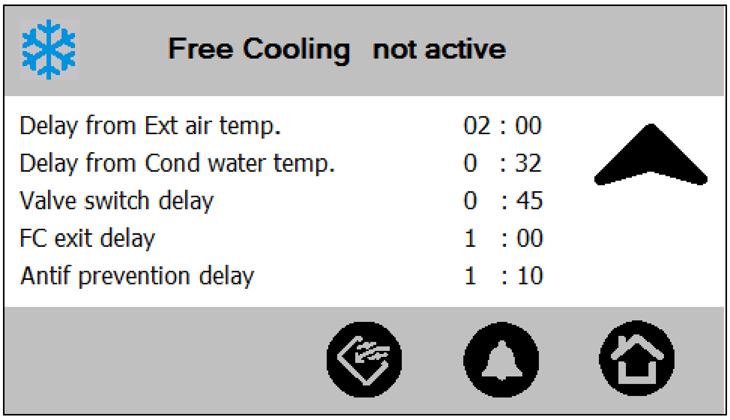


Press the button can exit the current screen.

If FC01 = 4, the following 3 screens will display. Press and buttons can switch between the following screens:







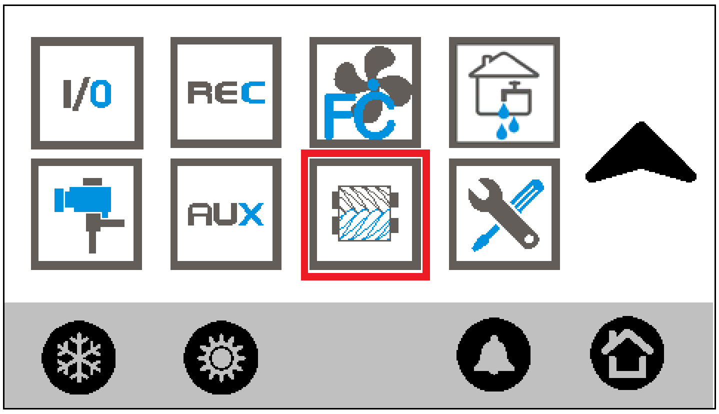
Delay in free-cooling:

- Delay from Ext. air temp.: Count down from parameter FC03
- Delay from Cond water temp.: Count down from parameter FC19
- Valve switch delay: Count down from parameter FC20
- FC exit delay: Count down from parameter FC23
- Antif prevention delay: Count down from parameter FC24

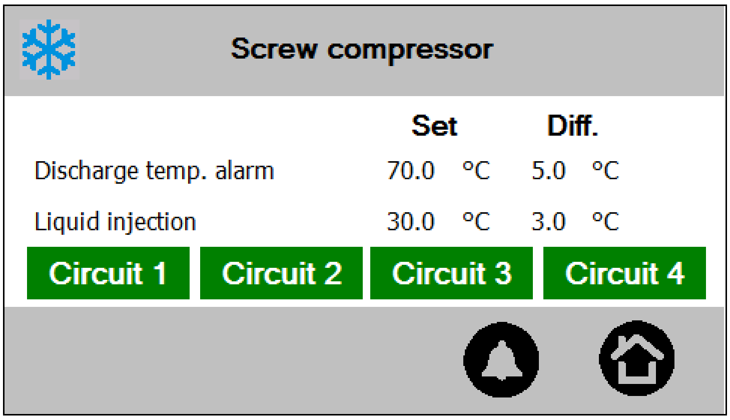
Press the  button can exit current screen.

6.8.14 Screw Compressor

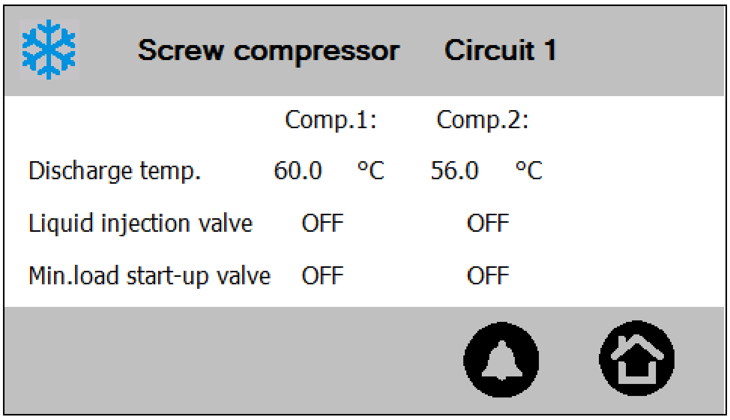
If CO09 = 2/3, screw compressor is used. The icon is shown as picture below.



This menu can be used to monitor the working status of the screw compressor in each circuit.



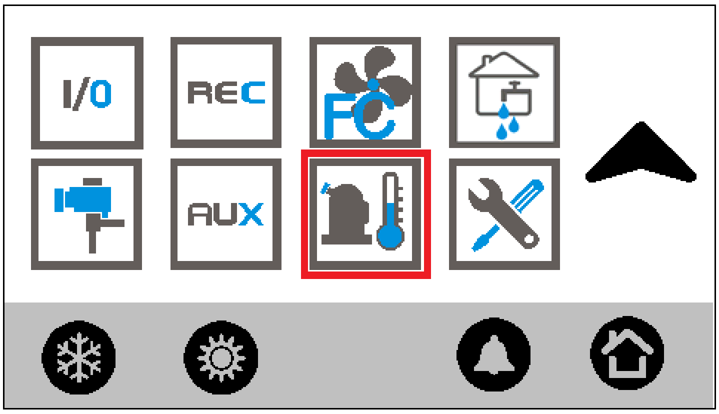
By selecting the desired circuit and click on its label, the following information can be displayed:



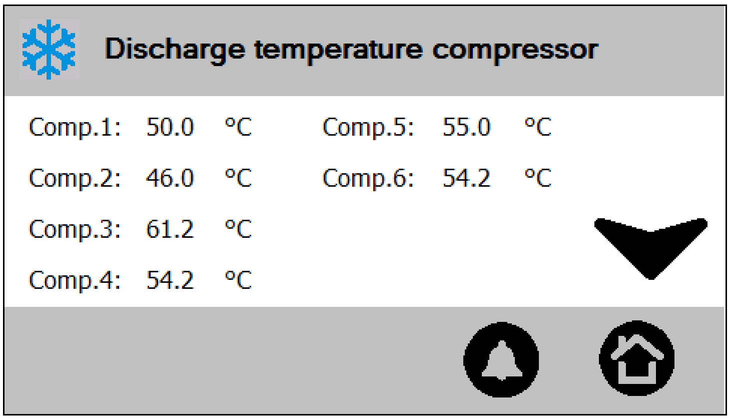
Press the button can exit current screen.

6.8.15 Discharge Compressor Temperature

If CO09 = 0/1, discharge compressor icon is shown as picture below.



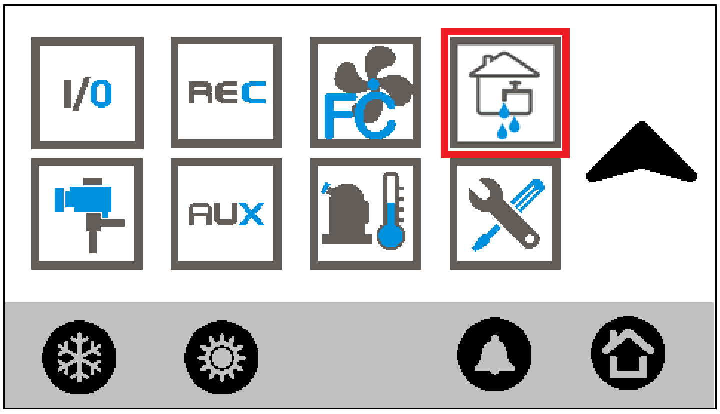
In this screen, if the probe: **compressor 1…16 PTC discharge temperature probe** (AI type=1 to 16) is configured, its value will be displayed.



Press the  button can exit current screen.

6.8.16 Domestic Hot Water (Sanitary Water)

If AH01 = 0 (Auxiliary heating is disabled), the icon for domestic hot water is shown as picture below.



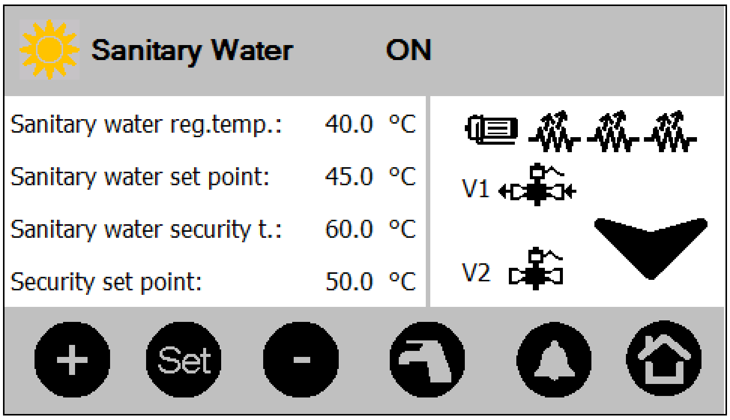
In sanitary water screen, relevant probes value and output status will display.

The sanitary water set point is editable.

Press button for 1 second can enable/disable the sanitary water function.

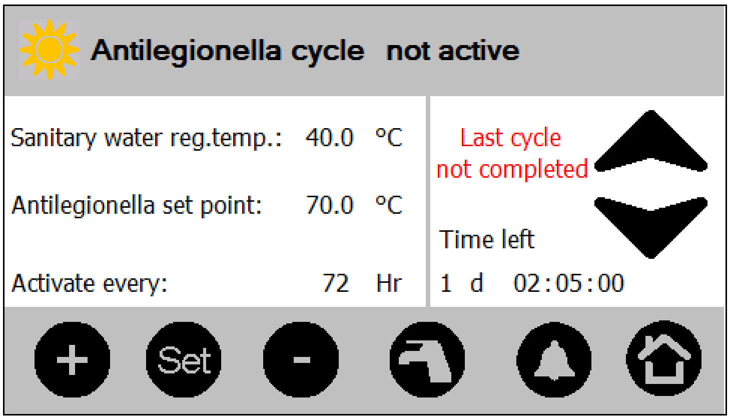
The sanitary water function status can be:

- DIS disabled by parameter setting
- Dis by key disabled by keyboard
- Not requested not needed
- Doing dF defrost in progress
- Changing state requested but not start yet, in inversion valve changing phase.
- ON activated



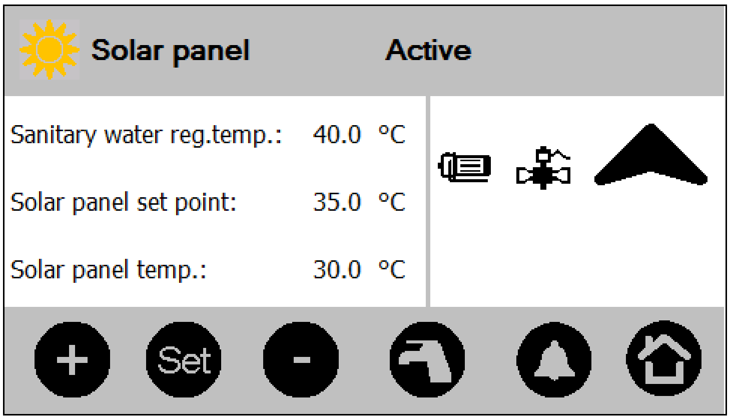
In Antilegionella cycle screen, relevant probes value, status and count down time will display.
The Antilegionella set point and the activate time is editable.
The antilegionella function status can be:

- DIS disabled by parameter setting
- Not active deactive
- Running active



In Solar panel screen, relevant probes value and output status will display.
The Solar panel set point is editable.
The solar panel working status can be:

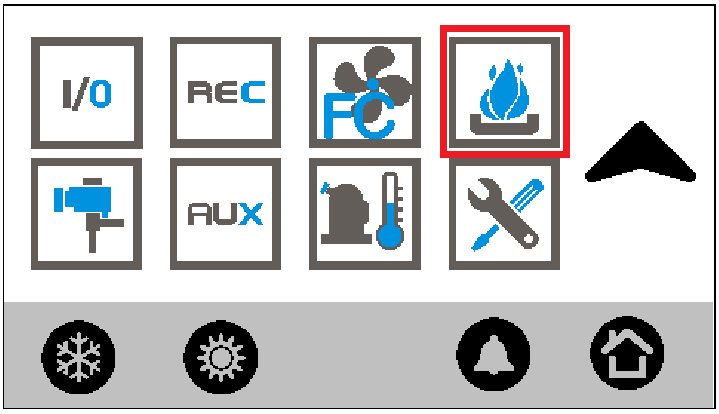
- Not active
- Active



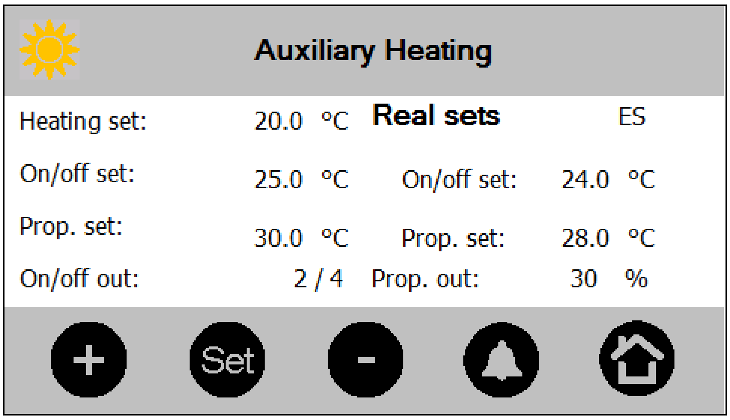
Press the  button can exit current screen.

6.8.17 Auxiliary Heating

If AH01 > 0 (Auxiliary heating is enabled), the icon for auxiliary heating is shown as picture below.

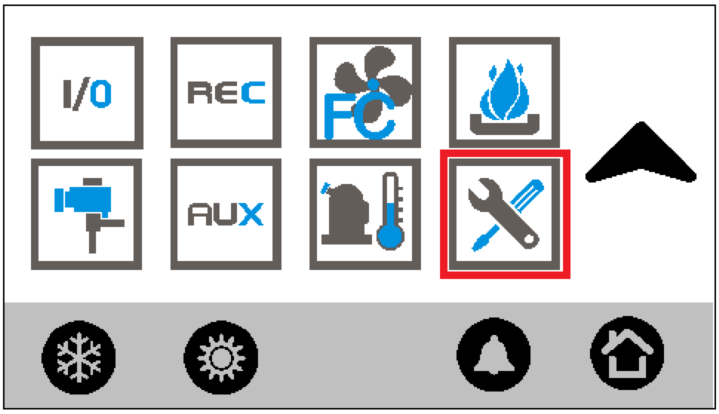


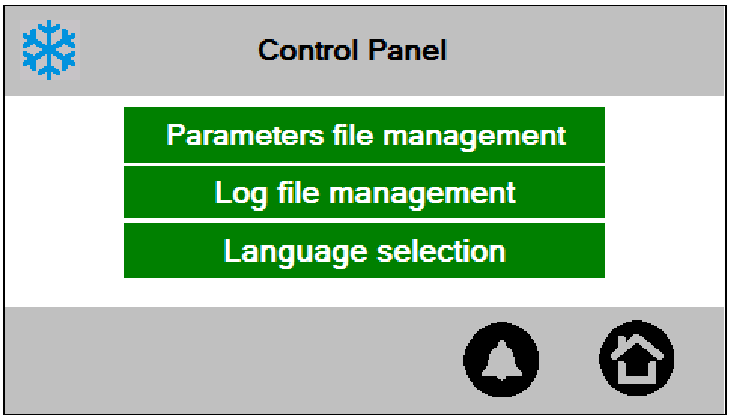
In auxiliary heating screen, set points and output status are displayed.



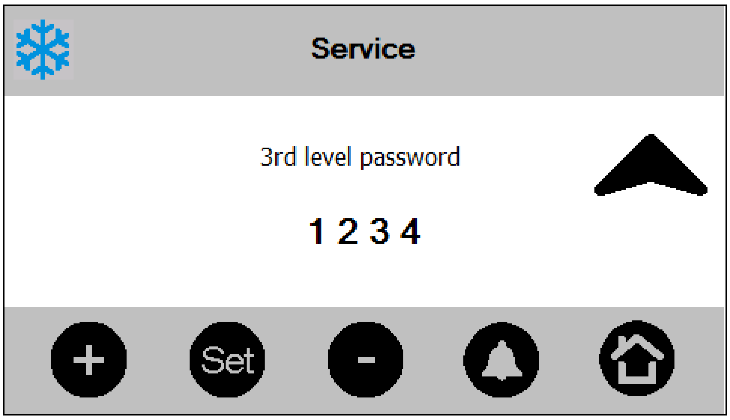
Press the  button can exit current screen.

6.8.18 Control Panel





If user entered into SERVICE menu with 1st level or 2nd level, he needs to input the 3rd level password to enter in the control panel screen. See graph below:



On the contrary, if user entered into SERVICE menu with 3rd level, no password is needed for control paned menu anymore.

The possible options in this menu are:

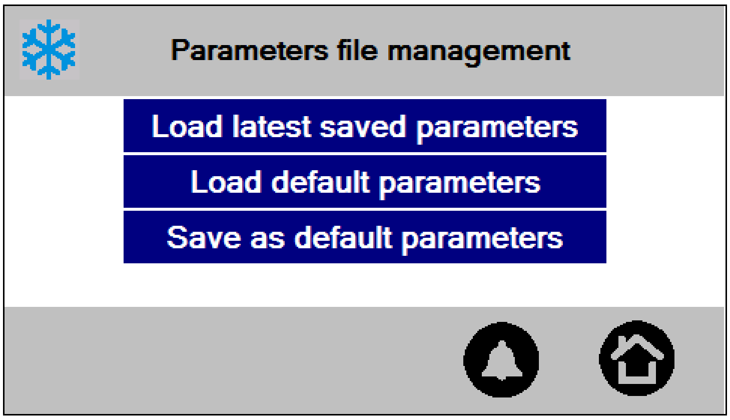
- Parameters file management: Load last saved parameters or load default parameters.
- Log file management:
  Export log files to USB disk.
- Language selection: Italian → English → Italian

- Parameters file management:

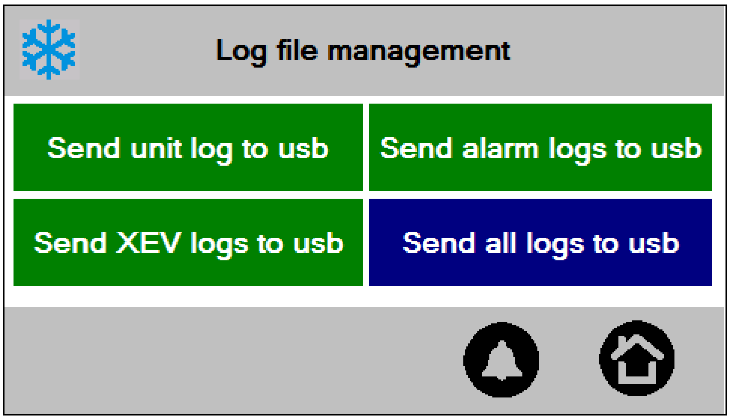
  Position the cursor on the element with UP and DOWN key, press ENTER, the parameters value will be loaded from configuration file.

There are 2 files available, one for latest saved parameters and another for default parameters.

The 3rd line “Save as default parameters” means copy latest saved parameters to default parameters configuration file.



- Log file management:



Plug the USB disk in iPro,send command from this screen, the log file will be export to the USB disk.

The log file path is: USB ROOT:\ipro\IP address of the ipro

One example for unit log: F:\ipro\10.161.92.79\log\Unit_20130221.txt

Unit log file (Record every 100 PLC cycles):

```
Counter,Date,Status,Set,Regulation probe,steps required,steps provided,unloading,water pumps,average cycle time,overcycles
130117101213,HP,100,-61,3,3,FALSE,FALSE,99,42,
130117101226,HP,100,-61,3,3,FALSE,FALSE,100,37,
130117101238,HP,100,-61,3,3,FALSE,FALSE,94,38,
130117101251,HP,100,-61,3,3,FALSE,FALSE,94,36,
```

Alarms log file (including alarms_a, alarms_b, alarms_c):

- alarms_a = unit alarm
- alarms_b = circuit alarm
- alarms_c = compressor alarm

alarms_a log file:

```
Counter,Date,Alarm description,Alarm status,Events in last hour
121115150206,AEM3-IPEX 3 not connected,START,18
121115150206,AEM4-IPEX 4 not connected,START,18
121115150307,AP22-Failure on probe 5 exp. 2,START,19
121115150307,AP5 -Failure on probe 5,START,19
```

Xev log file (including xev11, xev12, xev21, xev22):

Record every 10 seconds if XEV20D is available.

```
Counter,Date,Suction pressure,Saturation temperature,Suction temperature,Superheating,Steps
130130121005,60,45,125,70,500
130130121015,59,44,121,68,496
130130121025,57,45,123,63,492
130130121035,56,44,122,61,488
```

- Language selection:

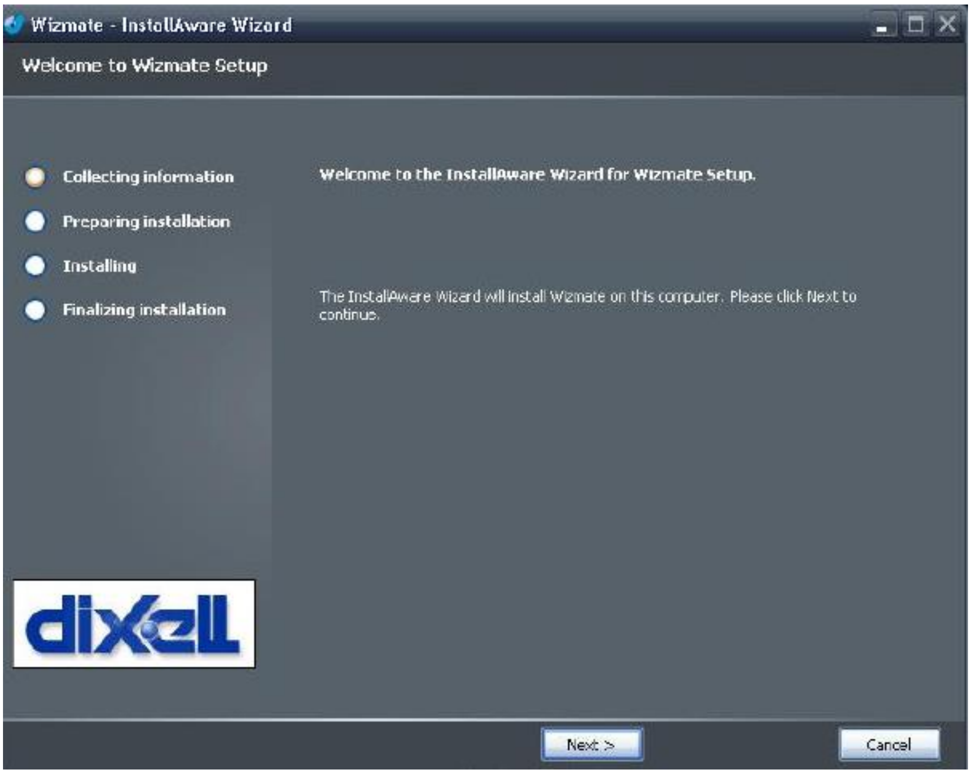
Press the button can exit current screen.

7. USE WIZMATE TO CONFIGURE PARAMETERS

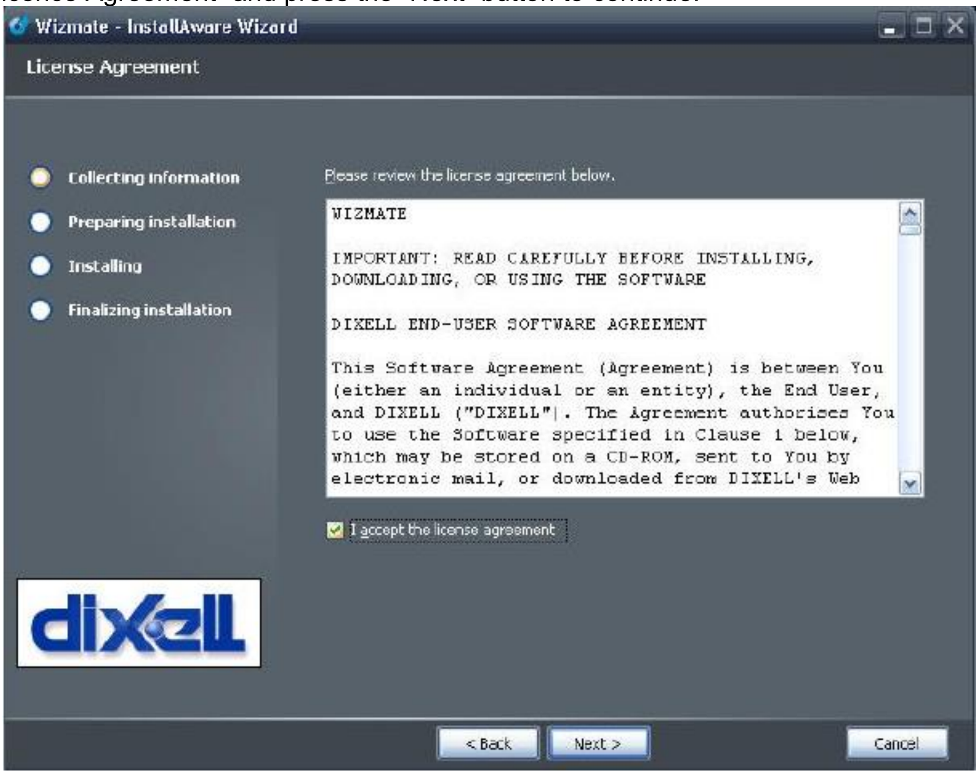
Wizmate software allows the managing of the parameter map of Manufacter controllers.

7.1 HOW TO INSTALL WIZMATE

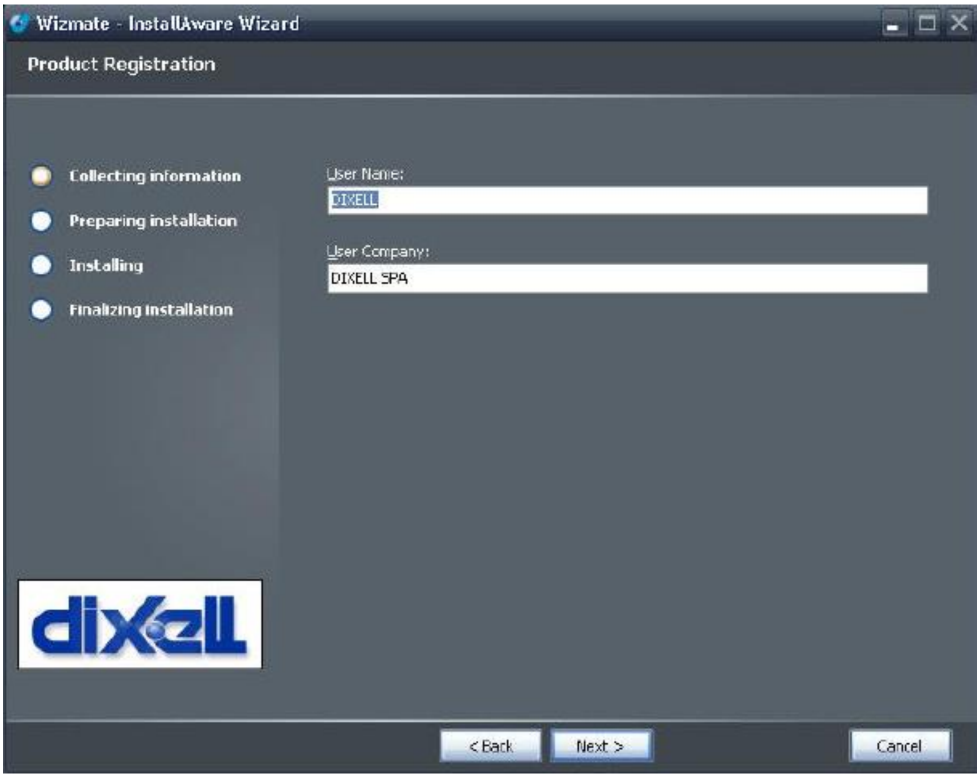
Inserter the CD in the CD drive and click the “Wizmate.exe” file to start the guided process. press the “Next” button:



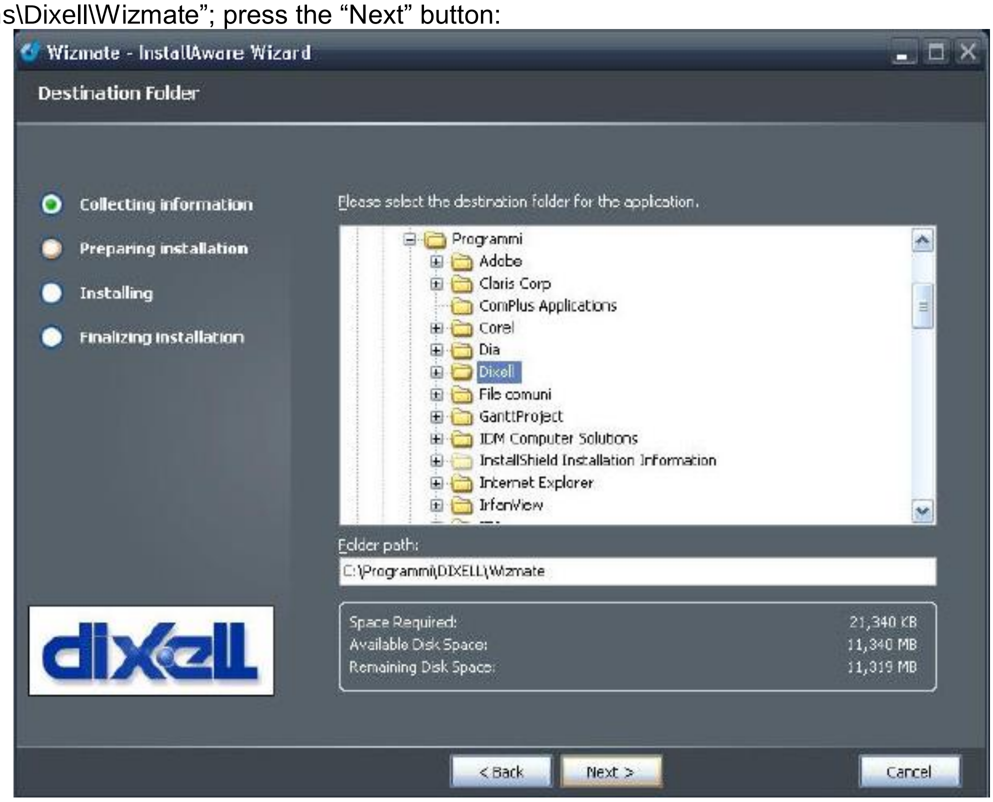
Accept the “Licence Agreement” and press the “Next” button to continue:



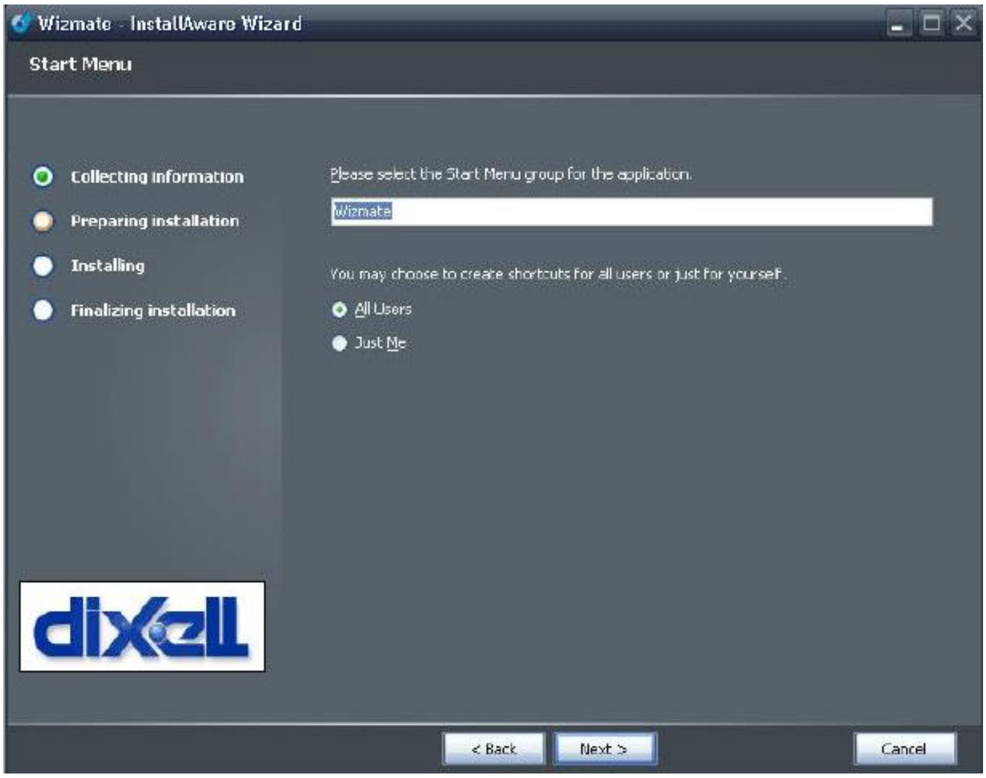
Enter “User name” and “Company name”, then press the “Next” button to continue:



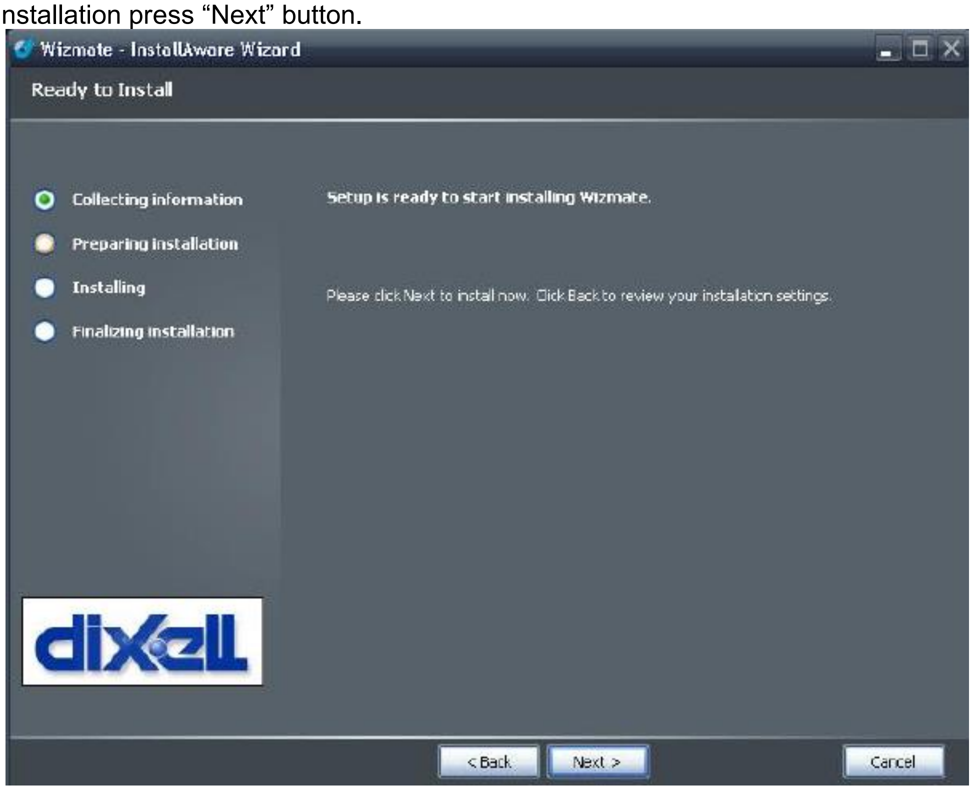
Select the path where you want to install the Wizmate; default path is "C:\Programs\Dixell\Wizmate"; press the "Next" button:



Press the "Next" button:



To finish the installation press “Next” button.



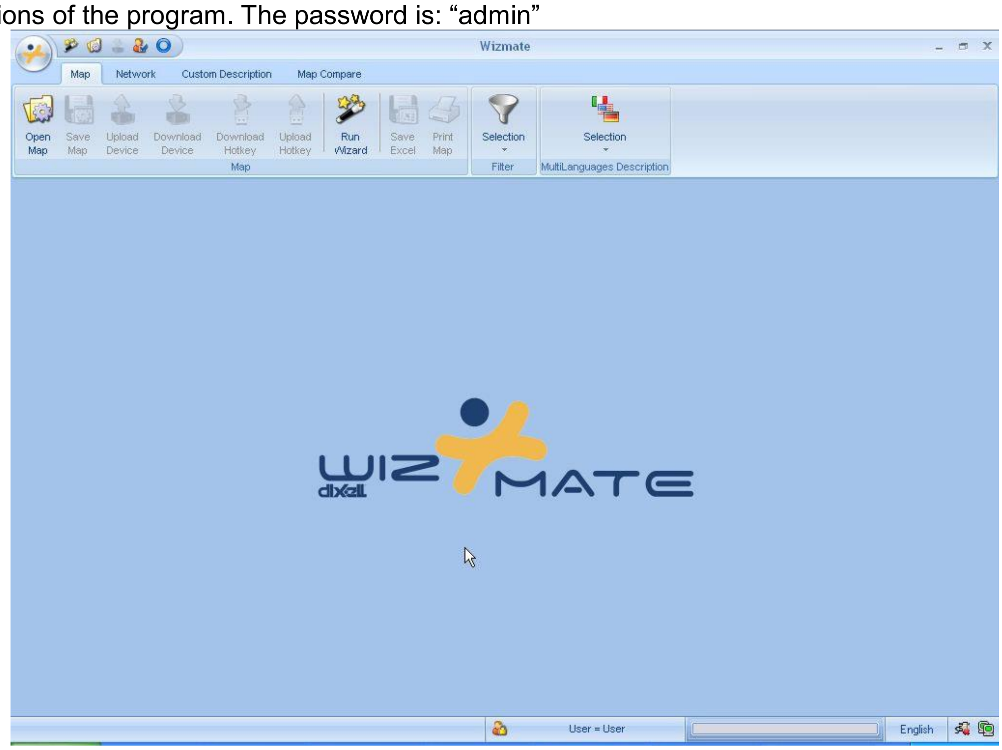
To exit the installation press “Finish” button.

7.2 LOGIN WIZMATE

After having installed Wizmate, two users are managed:

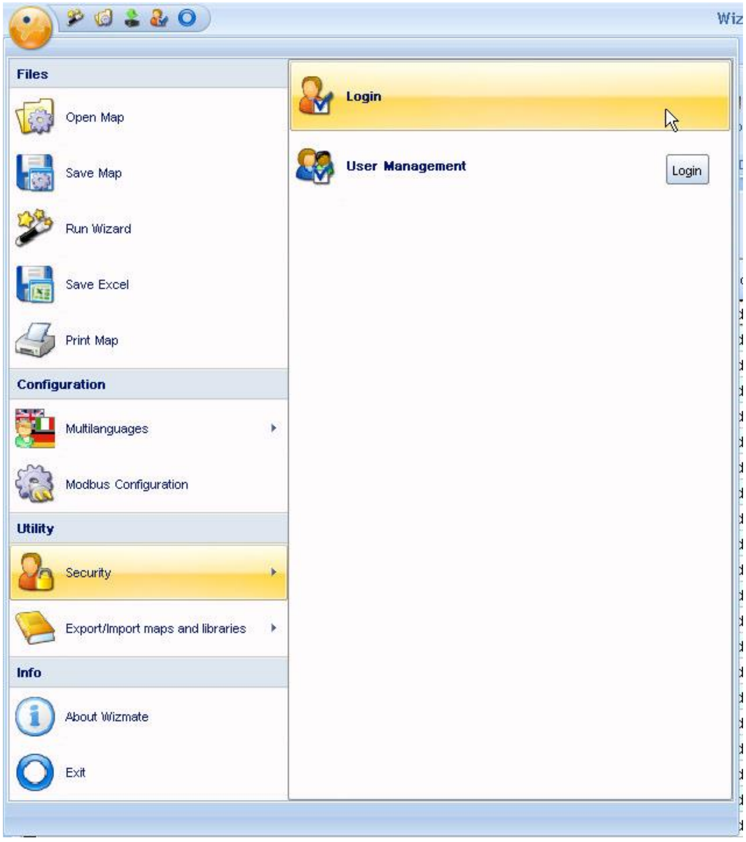
• User: can see only a small number of parameters (only Pr1 level of visibility); he cannot use all functions of the program (is not possible to create wizard and to create new users). The password is: “user”

• Administrator: can see all the parameters (Pr1, Pr2 and Pr3 level of visibility); the “Administrator” can use all the functions of the program. The password is: “admin”



To access the program as “Administrator”, press the “Login” button:

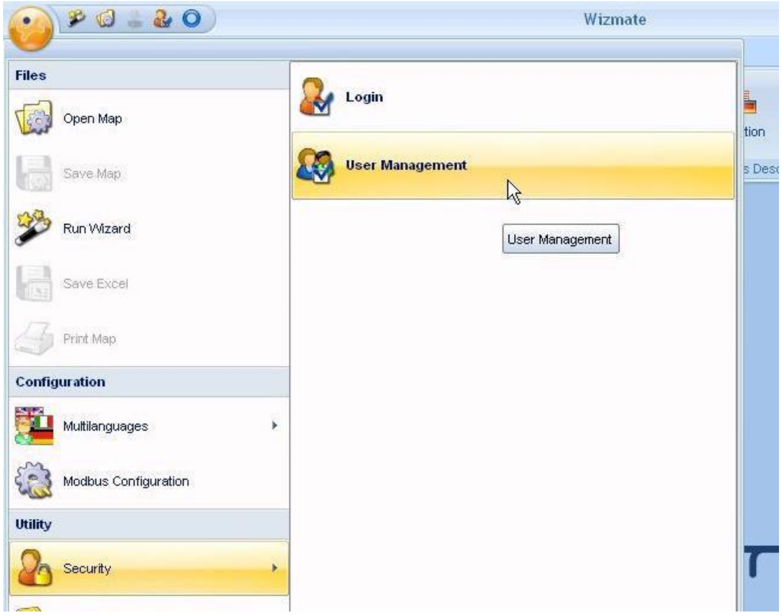
or using the configuration menu (press the button) and select “Security” menu:



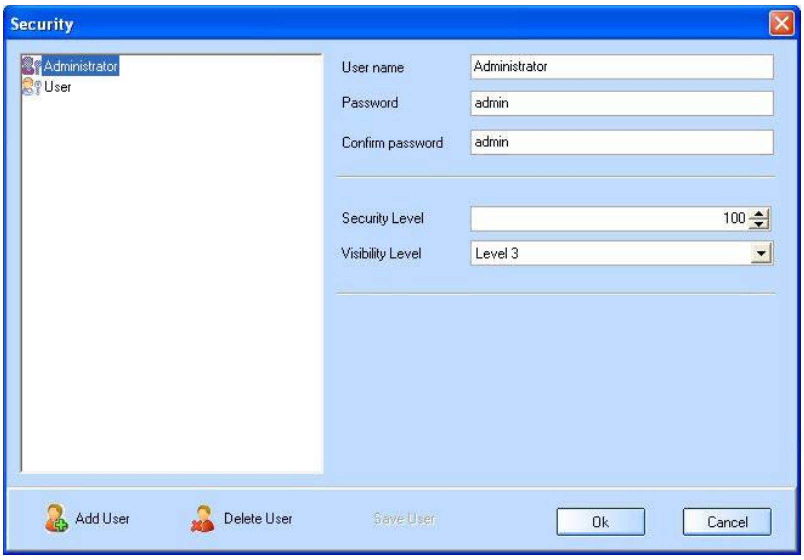
Enter the user name “Administrator” and password “admin”, then press “Login” button.

How to create a new user:
Only the “Administrator” user can create a new user.

Press  button, select “Security” and then “User management”:



From the configuration menu, click “Security” _ “User Management” to display the following window:



A new user can be entered clicking “Add user”:
• enter the user name
• enter the password
• confirm the password
• enter the security level:
  - level 5= “user” level (it is not possible to generate wizard);
  - level 100= “administrator” right (it is possible to generate wizard)
• enter the maximum level of visibility of the parameters
• to confirm, click the “Ok” button

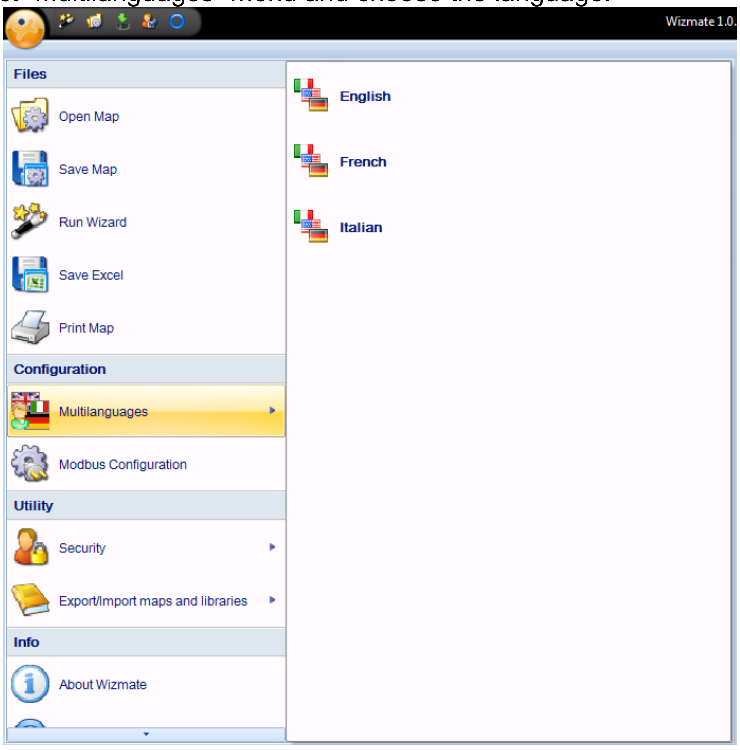
7.3 WIZMATE CONFIGURATION

7.3.1 Configuration Menu

It is used to configure the language, the communication port (COM), etc.

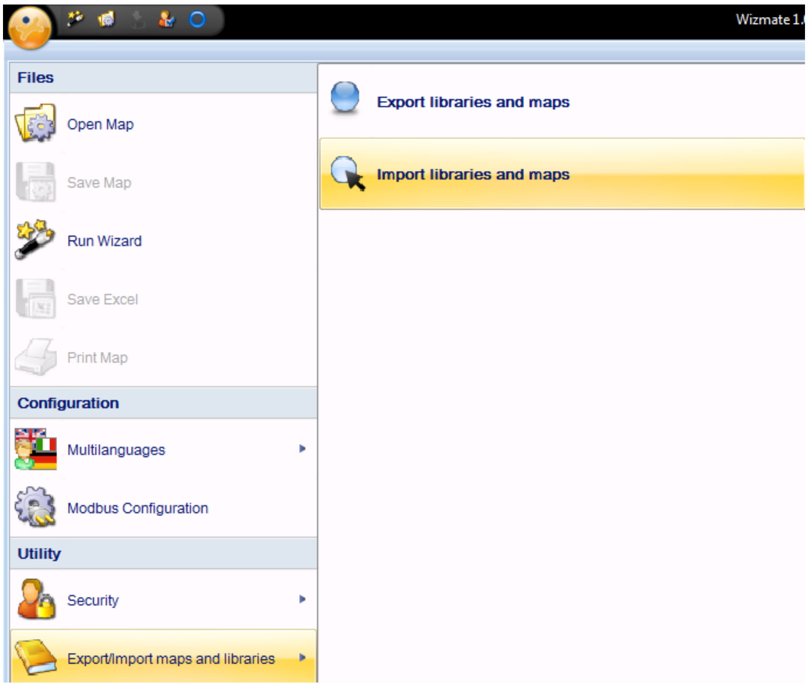
7.3.2 Language Configuration

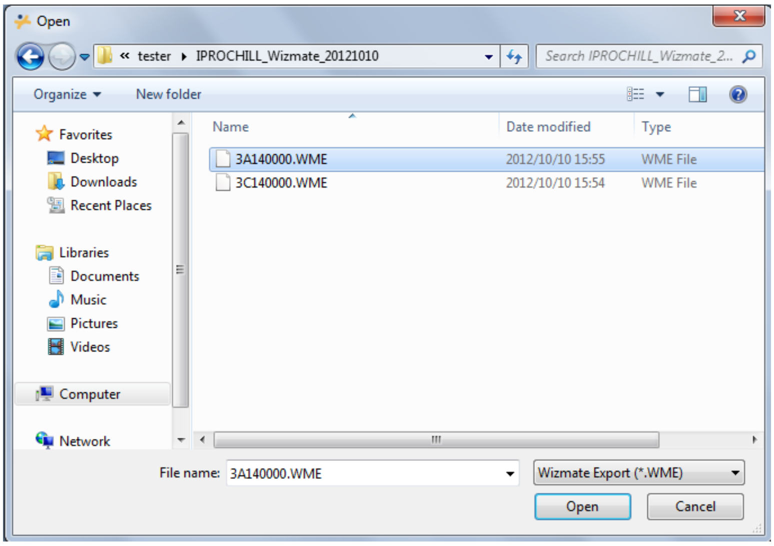
Press button, select “Multilanguages” menu and choose the language:



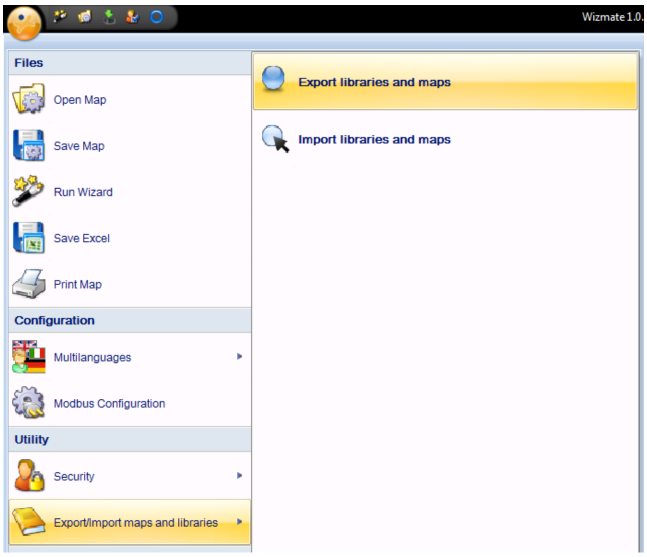
7.3.3 Import/Export Maps And Libraries

“Export/Import libraries and maps” allows the user to import the new library or import new maps.
To import the maps or libraries contained in a *.WME file, select the command “Export/Import maps and libraries”, then select “Import libraries and maps”:

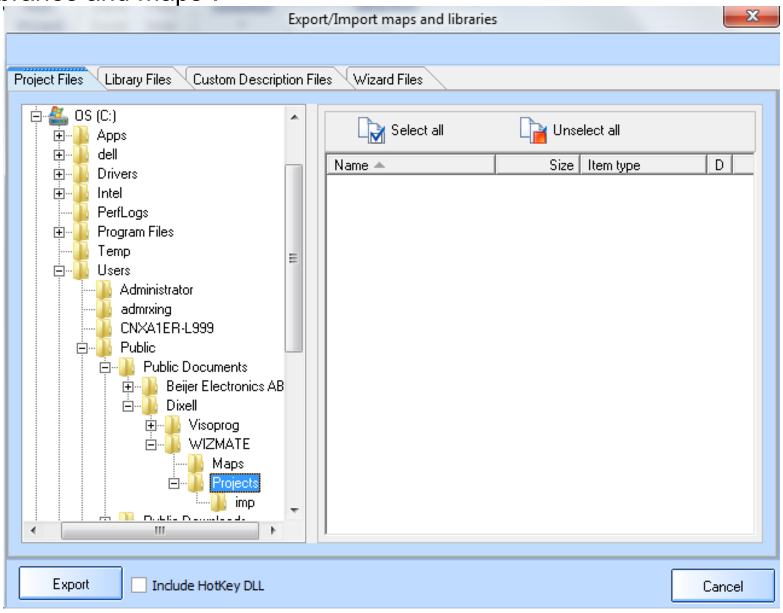




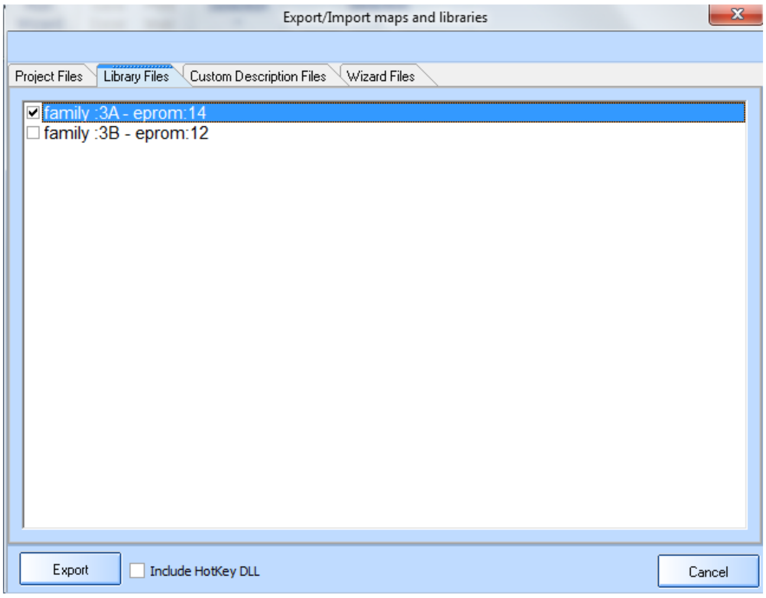
To export the maps or libraries, select the command “Export/Import maps and libraries”.



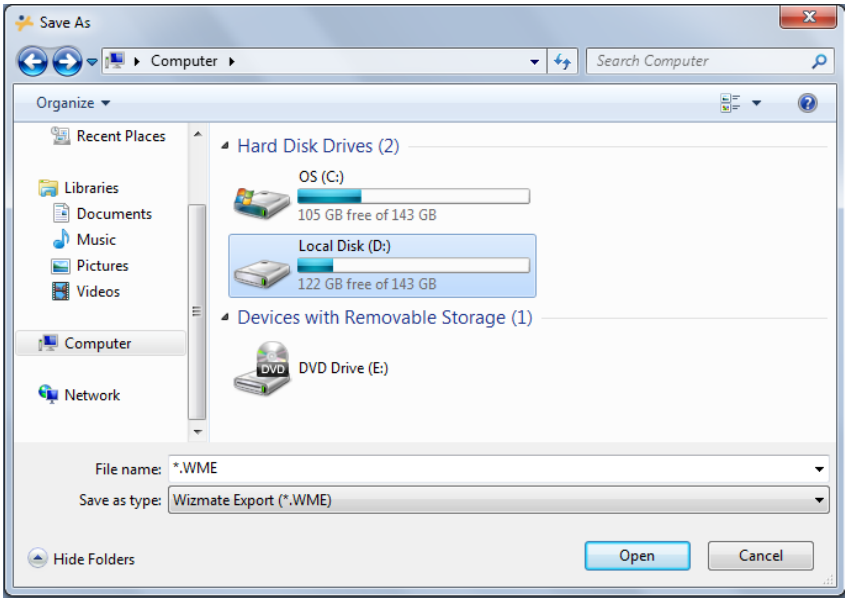
Then select “Export libraries and maps”.



Search the maps to export, select them then press “Export” button:



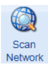
Select the path to save the file and enter the name of the file:

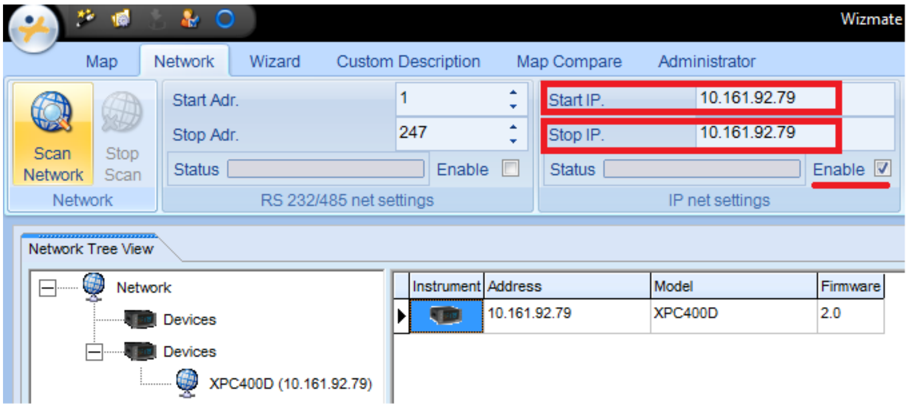


7.4 HOW TO USE WIZMATE

7.4.1 Scan For Device

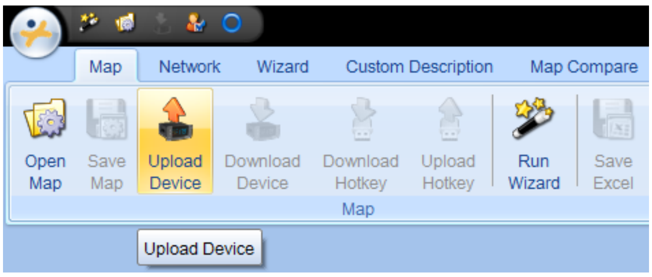
Enter in "Network" menu, set "Start IP" and "Stop IP" according to your Ipro IP address.

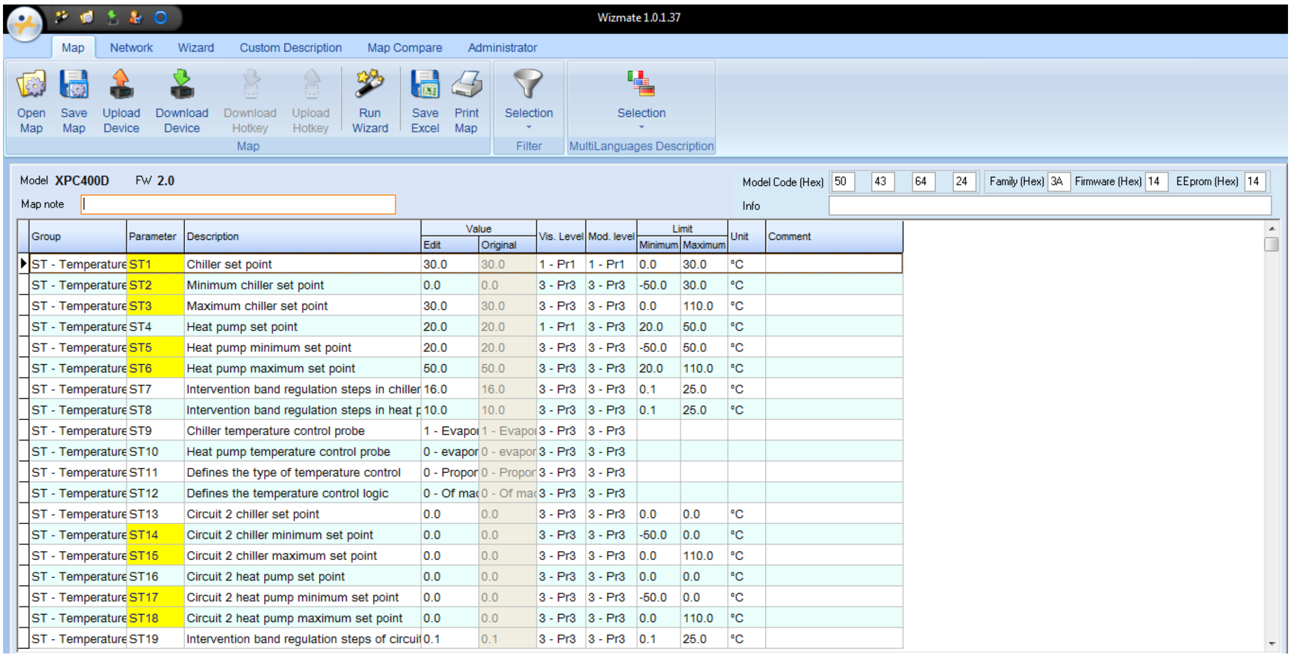
Press button , if the device is connected, it will display in the list.



7.4.2 Read Parameters Value

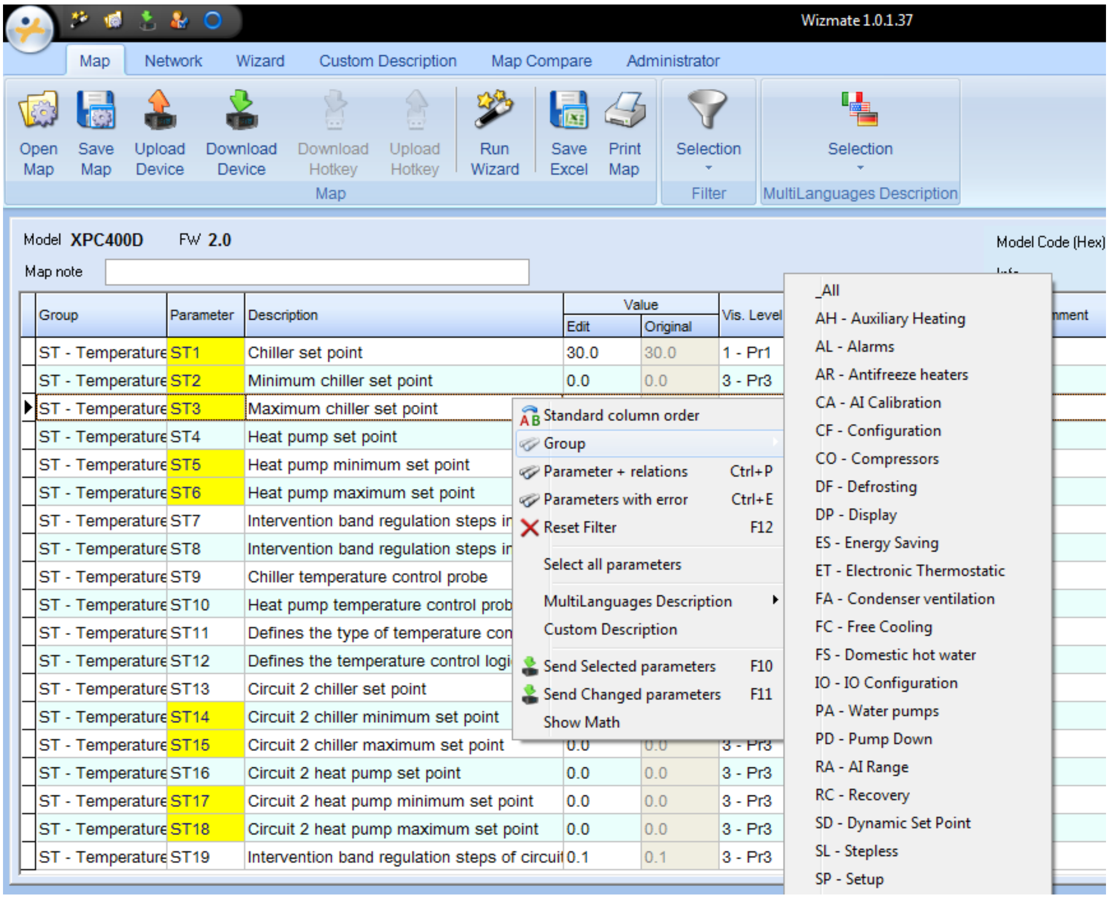
Enter in menu "Map", press button , the parameters value will be read out from the ipro controller and display.

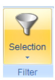


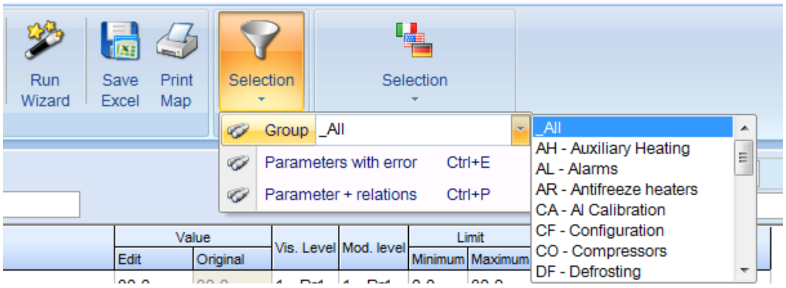


In this screen, it display parameters' group, name, description, value, visibility/changeability level, minimum/maximum limitation and measurement unit.

To facilitate using, it allows to select and display one single parameter group. Right click on the table, in the pop-out menu, chose "Group" and then select the interested group.

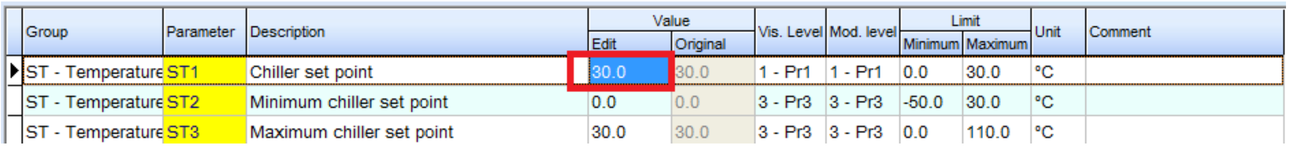


This function can also be done by click button .



7.4.3 Change Parameters Value

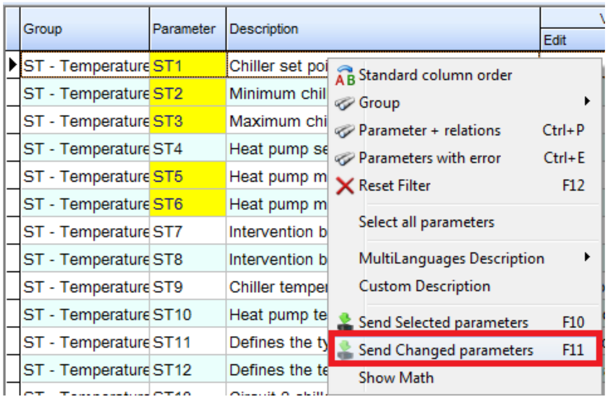
If some parameters' value need to be changed, input the new values in "Value" cell.



Group	Parameter	Description	Value		Vis. Level	Mod. level	Limit		Unit	Comment
			Edit	Original			Minimum	Maximum		
ST - Temperature	ST1	Chiller set point	30.0	30.0	1 - Pr1	1 - Pr1	0.0	30.0	°C	
ST - Temperature	ST2	Minimum chiller set point	0.0	0.0	3 - Pr3	3 - Pr3	-50.0	30.0	°C	
ST - Temperature	ST3	Maximum chiller set point	30.0	30.0	3 - Pr3	3 - Pr3	0.0	110.0	°C	

Then press button 

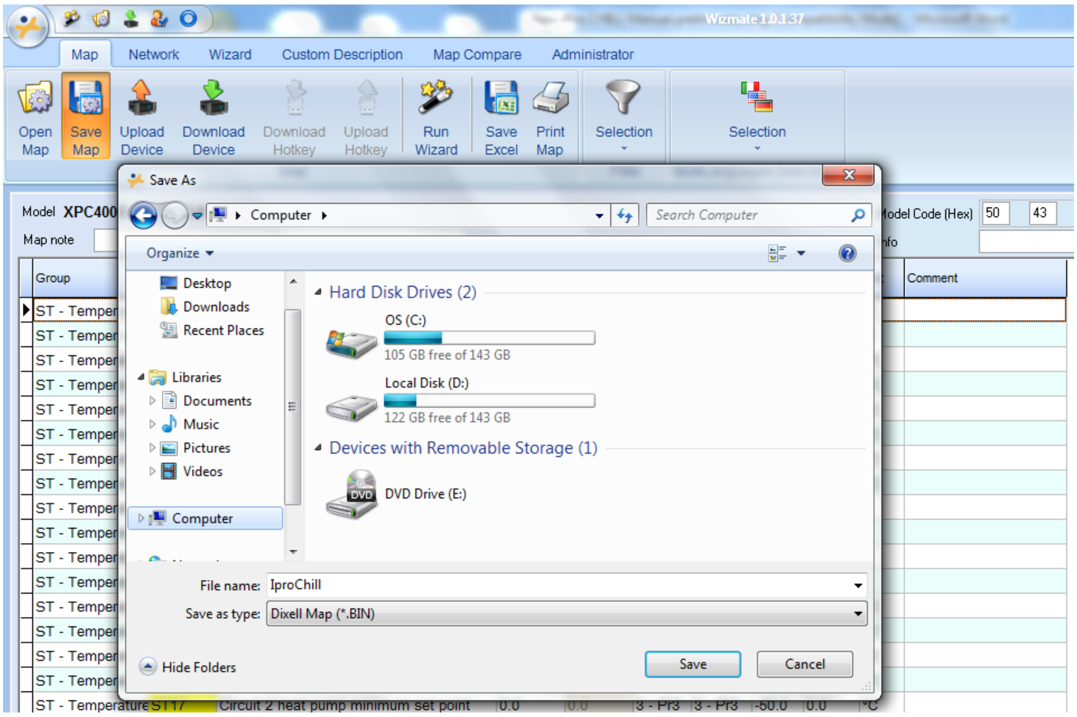
to download new parameters' value into the controller.
Or user can right click on the table, in the pop-out menu, click on "Send Changed parameters".



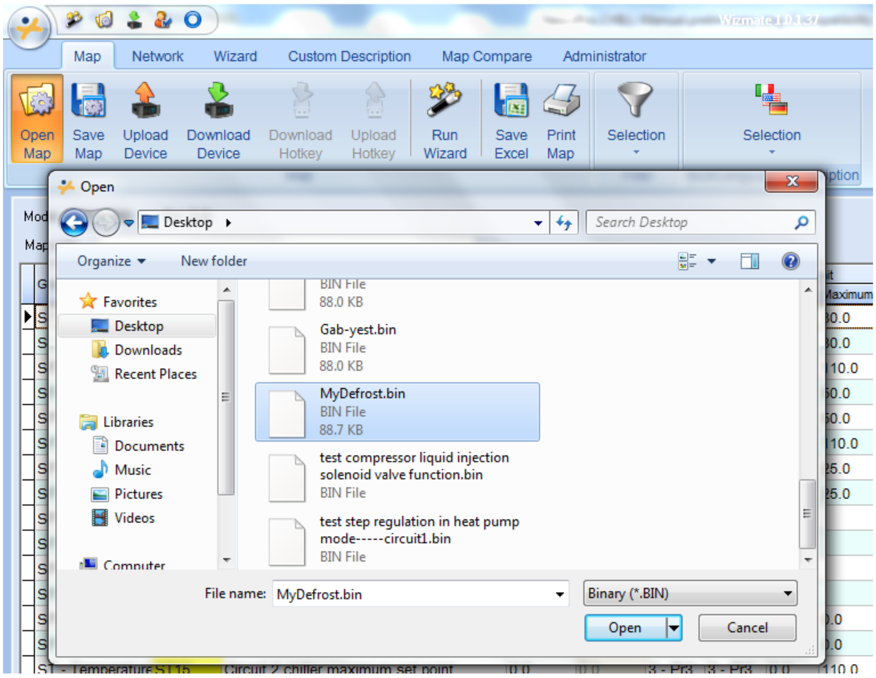
7.4.4 Save/Open Map

Press button 

to save the map. All of the currently parameters value will be wrote into a .bin file which can be open and used in the future.



To open the map file, press button  , then select the .bin file.



8. PARAMETERS IN TABLE FORM

Parameter groups:

Label	Meaning
ST	Display temperature control parameters
DP	Display variables to be shown on the keyboard
CF	Display configuration parameters
SP	Display parameters for machine set up
Sd	Display dynamic set-point parameters
ES	Display energy saving and automatic timed switch-on/off parameters
AH	Display auxiliary heating parameters
CO	Display compressor parameters
SL	Display stepless compressor parameters
PA	Display evaporator/condenser water pump parameters
Pd	Display pump down function parameters
Un	Display unloading function parameters
FA	Display ventilation parameters
Ar	Display anti-freeze heaters parameters
dF	Display defrost parameters
rC	Display heat recovery parameters
FS	Display production of domestic hot water parameters
FC	Display free-cooling function parameters
US	Display auxiliary output parameters
AL	Display alarm parameters
Et	Display parameters for the management of the electronic expansion valve
IO	Display inputs/outputs configuration parameters
CA	Display analog input calibration parameters
RA	Display analog input range parameters

Temperature control					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
ST 1	Chiller set point This allows you to set the working set point in chiller mode	ST02	ST03	°C/°F	Dec/int
ST 2	Minimum chiller set This defines the minimum limit that can be used for the working set point in chiller mode	-50.0 -58	ST03	°C °F	Dec Int
ST 3	Maximum chiller set point This defines the maximum limit that can be used for the working set point in chiller mode	ST02	110 230	°C °F	Dec Int
ST 4	Heat pump set point This allows you to set the working set point in h.p. mode	ST05	ST06	°C/°F	dec/int
ST 5	Heat pump minimum set point This defines the minimum limit that can be used for the working set point in heat pump mode	-50.0 -58	ST06	°C °F	Dec Int
ST 6	Heat pump maximum set point This defines the maximum limit that can be used for the working set point in heat pump mode	ST05	110 230	°C °F	Dec Int
ST 7	Intervention band regulation steps in chiller mode	0.1 1	25.0 45	°C °F	Dec Int
ST 8	Intervention band regulation steps in heat pump mode	0.1 1	25.0 45	°C °F	Dec Int

ST 9	Chiller temperature control probe 0 - evaporator input NTC 1 - Evaporator output 1 NTC 2 - Evaporator output 2 NTC 3 - Evaporator output 3 NTC 4 - Evaporator output 4 NTC 5 - Evaporator common output NTC	0	7		
ST 10	Heat pump temperature control probe 0 - evaporator input NTC 1 - Evaporator output 1 NTC 2 - Evaporator output 2 NTC 3 - Evaporator output 3 NTC 4 - Evaporator output 4 NTC 5 - Evaporator common output NTC 8 - condenser water common input NTC 9 - circuit 1 condenser water input NTC 10 - circuit 2 condenser water input NTC 11 - circuit 3 condenser water input NTC 12 - circuit 4 condenser water input NTC 13 - circuit 1 condenser water output NTC 14 - circuit 2 condenser water output NTC 15 - circuit 3 condenser water output NTC 16 - circuit 4 condenser water output NTC 17 - condenser water common output NTC **WARNING** If the same temperature control is required in cooling and heating mode, set the same value in the ST09 and ST10 parameters	0	17		
ST 11	Defines the type of temperature control 0 = Proportional 2 = Neutral zone	0	4		
ST 12	Defines the temperature control logic 0 = Of machine 1 = on two separate circuits	0	1		
Circuit 2 regulation if temperature control is enabled on two separate circuits					
ST 13	Circuit 2 chiller set point This allows you to set the working set point in chiller mode	ST14	ST15	°C/°F	dec/int
ST 14	Circuit 2 chiller minimum set point This defines the minimum limit that can be used to set the working set point in chiller mode	-50.0 -58	ST15	°C °F	Dec Int
ST 15	Circuit 2 chiller maximum set This defines the maximum limit that can be used to set the working set point in chiller mode	ST14	110 230	°C °F	Dec Int
ST 16	Circuit 2 heat pump set point This allows you to set the working set point in h.p. mode	ST17	ST18	°C/°F	Dec/int
ST 17	Circuit 2 heat pump minimum set point This defines the minimum limit that can be used to set the working set point in heat pump mode	-50.0 -58	ST18	°C °F	Dec int
ST 18	Circuit 2 heat pump maximum set point This defines the maximum limit that can be used to set the working set point in heat pump mode	ST17	110 230	°C °F	Dec int
ST 19	Intervention band regulation steps of circuit 2 in chiller mode	0.1 1	25.0 45	°C °F	Dec int
ST 20	Intervention band regulation steps in circuit 2 heat pump	0.1 1	25.0 45	°C °F	Dec int
ST 21	Circuit 2 chiller temperature control probe 0 - evaporator input NTC 1 - Evaporator output 1 NTC 2 - Evaporator output 2 NTC 3 - Evaporator output 3 NTC 4 - Evaporator output 4 NTC 5 - Evaporator common output NTC	0	7		

ST 22	Circuit 2 heat pump temperature control probe 0 - evaporator input NTC 1 - Evaporator output 1 NTC 2 - Evaporator output 2 NTC 3 - Evaporator output 3 NTC 4 - Evaporator output 4 NTC 5 - Evaporator common output NTC 8 - condenser water common input NTC 9 - circuit 1 condenser water input NTC 10 - circuit 2 condenser water input NTC 11 - circuit 3 condenser water input NTC 12 - circuit 4 condenser water input NTC 13 - circuit 1 condenser water output NTC 14 - circuit 2 condenser water output NTC 15 - circuit 3 condenser water output NTC 16 - circuit 4 condenser water output NTC 17 - condenser water common output NTC	0	17		
	Circuit 1 PID regulation				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
ST 23	Circuit 1 band offset	-25.0 -45	25.0 45	°C °F	Dec Int
ST 24	Circuit 1 integral sampling time	0	250	Sec	
ST 25	Circuit 1 derived sampling time	0	250	Sec	
	Circuit 2 PID regulation				
ST 26	Circuit 2 band offset	-25.0 -45	25.0 45	°C °F	Dec Int
ST 27	Circuit 2 integral sampling time	0	250	Sec	
ST 28	Circuit 2 derived sampling time	0	250	Sec	
ST 29	Activation offset with regulation of the neutral zone When the controlled temperature (coming from neutral zone) enters the compressors activation zone the compressors/capacity steps are enabled only if the variable exceeds (in cooling) or drops below (in heating) the relevant threshold for at least ST30.	0.0 0	25.0 45	°C °F	Dec Int
ST 30	Activation delay with regulation of the neutral zone The controlled variable must be over (in cooling) or under (in heating) the above mentioned activation level for at least the ST30 time before the compressor/capacity step is switched ON.	0	250	Sec	
ST 31	Deactivation offset with regulation of the neutral zone When the controlled temperature (coming from neutral zone) enters the compressors disabling zone the compressors/capacity steps are disabled only if the variable drops below (in cooling) or exceeds(in heating) the relevant threshold of at least ST32.	0.0 0	25.0 45	°C °F	Dec Int
ST 32	Deactivation delay with regulation of the neutral zone The controlled variable must be under (in cooling) or over (in heating) the above mentioned activation level for at least the ST32 time before the compressor/capacity step is switched OFF.	0	250	Sec	
	Displays				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
	Remote terminal 1				
DP1	Row 1 of Visograph keyboard 1 analogue input display 0 = no display (the line remains empty), others are same with probe configuration	0	66		
DP2	Row 2 of Visograph keyboard 1 analogue input display 0 = no display (the line remains empty) , others are same with probe configuration	0	66		
DP3	Row 3 of Visograph keyboard 1 analogue input display 0 = no display (the line remains empty) , others are same with probe configuration	0	66		
DP4	Row 4 of Visograph keyboard 1 analogue input display 0 = no display (the line remains empty) , others are same with probe configuration	0	66		
DP12	HMI type (Can be seen only in Wizmate by Administrator). 0 = Visograph 1 1 = Visograph 2 2 = Visotouch For visograph 2 and Visotouch: Leds green: always on; Leds red: on when alarm active or resettable	0	2		
	Configuration				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
	Unit				

CF 1	Defines the type of unit to control 0 = Air to air unit 1 = Air to water 2 = Water to water	0	2		
CF 2	Selection of unit working mode 1 = chiller only 2 = heat pump only 3 = chiller with heat pump	1	3		
CF 3	Enable compressor operation 0 = chiller and heat pump 1 = chiller only 2 = heat pump only	0	2		
CF 4	Motor-condensing unit 0 = no 1 = yes Temperature control, dynamic set point and energy saving functions are automatically disabled when CF04 = 1	0	1		
Circuits/compressors					
CF 5	Number of compressors in circuit 1	1	4 (2 if CF9≠ 0)		
CF 6	Number of compressors in circuit 2	0	4 (2 if CF10≠ 0)		
CF 7	Number of compressors in circuit 3	0	4 (2 if CF11≠ 0)		
CF 8	Number of compressors in circuit 4	0	4 (2 if CF12≠ 0)		
CF 9	Circuit 1 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
CF 10	Circuit 2 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
CF 11	Circuit 3 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
CF 12	Circuit 4 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
Machine Set Up					
Parameter	**Description**	**min**	**max**	**udm**	**Resolution**
Analogue Inputs					
SP 1	Working in temperature or pressure from an analog input **0 - NTC cond. temperature / evap. pressure 4.0.20mA:** The condensation temperature is controlled through the use of an NTC probe, while a transducer with an input of 4-20 mA must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **1 - Condensation and evaporation pressure 4.0.20mA:** A transducer with an input of 4-20 mA must be used to control the condensation or evaporation pressures **2 - NTC cond. temperature / evap. pressure 0..5V:** The condensation temperature is controlled through the use of an NTC probe, while a ratiometric transducer with an input of 0÷5V must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **3 - Condensation and evaporation pressure 0..5V:** A ratiometric transducer with an input of 0-5 V must be used to control the condensation or evaporation pressures **Note:** SP01 will affect some parameters' measurement unit.	0	3		
Type of gas					

Parameter	Description	min	max	udm	Resolution
SP 2	Type of gas used to calculate the saturated temperatures 1=R22 2=R407c 3=R134a 4=R410a 5=R404a 6=R290	1	6		
SP 3	Choice between absolute and relative pressure to calculate overheating: 0 = Relative 1 = Absolute	0	1		
SP 4	Not used				
SP 5	Not used				
SP 6	Not used				
SP 7	Not used				
Working mode					
SP 8	Operating logic 0= ❄ chiller / ☀ h.p. 1= ☀ chiller / ❄ h.p.	0	1		
Chiller / heat pump mode selection					
SP 9	Chiller / heat pump mode selection 0 = from the keyboard 1 = from a digital input 2 = from an analog input	0	2		
Automatic change over					
Parameter	**Description**	**min**	**max**	**udm**	**Resolution**
SP 10	Automatic chiller / heat pump mode changeover setting	-50.0 -58	110 230	°C °F	Dec Int
SP 11	Automatic chiller / heat pump mode changeover differential	0.1 1	25.0 45	°C °F	Dec Int
Unit of measurement selection					
SP 12	Measurement Unit selection 0 = °C / BAR 1 = °F / psi	0	1		
Network frequency selection					
SP 13	Mains frequency - continuous power supply selection 0= 50 Hz 1= 60 Hz 2= continuous power supply **WARNING** with SP 11 = 2 the PWM proportional outputs for fan speed control are not managed (network frequency alarm is off) If SP13 is different from current network frequency, alarm 'AFr -Power supply freq. alarm' will occur.	0	2		
Serial address					
SP 14	Serial address	1	247		
SP 15	Firmware release				
SP 16	Eeprom map of parameters				
Password					
SP 17	Level 2 password	0	9999		
SP 18	Level 3 password	0	9999		
Dynamic set-point					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
Sd 1	Maximum increase in chiller mode dynamic set point This determines the maximum variation of the working set point in chiller mode	-50.0 -58	110 230	°C °F	Dec Int
Sd 2	Maximum increase in heat pump mode dynamic set point This determines the maximum variation in the working set point in heat pump mode	-50.0 -58	110 230	°C °F	Dec Int
Sd 3	Dynamic set point in chiller mode for the external air temperature setting	-50.0 -58	110 230	°C °F	Dec Int
Sd 4	Dynamic set point in heat pump mode for the external air temperature setting	-50.0 -58	110 230	°C °F	Dec Int
Sd 5	External air temperature differential dynamic set point in chiller mode	-50.0 -58	110 230	°C °F	Dec Int
Sd 6	Dynamic set point in heat pump mode for the external air temperature differential	-50.0 -58	110 230	°C °F	Dec Int
Energy saving					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
ES 1	Start of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 2	End of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 3	Start of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 4	End of working time band 2 (0-24)	0	24.00	Hr	10 Min

ES 5	Start of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES 6	End of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES 7	Monday energy saving time band 0 = None 1 = Time Band 1 2 = Time Band 2 3 = Time Bands 1 and 2 4 = Time Band 3 5 = Time Bands 1 and 3 6 = Time Bands 2 and 3 7 = All time bands	0	7		
ES 8	Tuesday energy saving time band	0	7		
ES 9	Wednesday energy saving time band	0	7		
ES 10	Thursday energy saving time band	0	7		
ES 11	Friday energy saving time band	0	7		
ES 12	Saturday energy saving time band	0	7		
ES 13	Sunday energy saving time band	0	7		
ES 14	Increase energy saving setting in chiller mode	-50.0 -58	110 230	°C °F	Dec Int
ES 15	Energy saving differential in chiller mode	0.1 1	25.0 45	°C °F	Dec Int
ES 16	Energy saving setting increase in heat pump mode	-50.0 -58	110 230	°C °F	Dec Int
ES 17	Energy saving differential increase in heat pump mode	0.1 1	25.0 45	°C °F	Dec Int
ES 18	Monday automatic shutdown time band	0	7		
ES 19	Tuesday automatic shutdown time band	0	7		
ES 20	Wednesday automatic shutdown time band	0	7		
ES 21	Thursday automatic shutdown time band	0	7		
ES 22	Friday automatic shutdown time band	0	7		
ES 23	Saturday automatic shutdown time band	0	7		
ES 24	Sunday automatic shutdown time band	0	7		
ES 25	Maximum unit working time in OFF from RTC if forced ON via a key	0	250	Min	10 Min
Auxiliary heating					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
AH 1	Auxiliary heating function 0 = Disabled 1 = enabled with control in integration mode 2 = enabled with control in heating mode	0	2		
AH 2	External air set point auxiliary heating activation	-50.0 -58	110 230	°C °F	Dec Int
AH 3	External air differential auxiliary heating deactivation	0.1 1	25.0 45	°C °F	Dec Int
AH 4	Auxiliary heating activation delay time	0	250		
AH 5	External air set point that deactivates the compressors working in integration mode	-50.0	110	°C °F	Dec Int
AH 6	External air differential that activates the compressors in integration mode	0.1 1	25.0 45	°C °F	Dec Int
AH 7	Off compressors delay time in integration mode	0	250		
AH 8	Thermoregulation selection set 0 = uses the set point (ST04) and the differential (ST08) of the HP 1 = uses the set point and the differential of the auxiliary heating function 2 = add the parameters AH9/AH11 to HP set point (ST04) and use the differentials AH10/AH12	0	2		
AH 9	Auxiliary heating set point on / off	-50.0 -58	110 230	°C °F	Dec Int
AH 10	Band proportional auxiliary heating ON / OFF	0.1 1	25.0 45	°C °F	Dec Int
AH 11	Auxiliary modulating heating set point	-50.0 -58	110 230	°C °F	Dec Int
AH 12	Auxiliary modulating heating proportional band	0.1 1	25.0 45	°C °F	Dec Int
AH 13	Auxiliary heating modulating minimum output value	0	AH14	%	
AH 14	Auxiliary heating modulating maximum output value	AH13	100	%	
AH 15	Auxiliary Output heating minimum maintaining value of to higher temperatures modulating the set point 0 = Not enabled 1 = Enabled	0	1		
AH 16	Enable the auxiliary heater in defrost 0 = Not enabled 1 = Enabled	0	1		
Compressor					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**

CO 1	Compressor minimum ON time Determines the length of time the compressor must remain **active** after being switched on, even if the request ceases.	0	250	Sec	10 sec
CO 2	Minimum compressor OFF time Determines the length of time the compressor must remain **deactivated** even if a request is transmitted for it to switch on again. During this stage, the LED pertaining to the compressor will flash.	0	250	Sec	10 sec
CO 3	Minimum time between one activation and another on the same compressor	0	250	Sec	10 sec
CO 4	Activation delay between 2 compressors/steps With two compressors this establishes the start-up delay between the two, to reduce absorption at peaks. During this stage, the LED pertaining to the compressor will flash. (only for the compressor) With units with partialised compressor. This determines switch-on time of the unloader solenoid for start-up at minimum capacity (see compressors start-up)	1	250	Sec	
CO 5	Shut off delay between 2 compressors / steps This establishes the shut off delay between the two compressors two unloader steps	1	250	Sec	
CO 6	Not used				
CO 7	Compressor switch-on delay from power ON (power from the mains). Delays activation of all the outputs in order to distribute the mains consumption and protect the compressors from repeated activation in case of frequent power failures	0	250	Sec	10 sec
	Unloaders				
CO 8	Unloaders operation (see unloaders operation) 0 = ON/OFF step insertion 1 = continuous insertion with direct action steps 2 = continuous insertion with inverse action steps 3 = Insertion with continuous direct global steps	0	3		
CO 9	Enabling upon operation of the minimum power of the compressor / idle start-up management 0 = Enables minimum power only upon compressor start-up (start-up upon minimum capacity/idle valve start-up in OFF with compressor off) 1 = Screw valves enable the minimum power at compressor start-up and in temperature control (start-up with minimum capacity / idle start-up valve in OFF with compressor off) 2 = Screw valves enable the minimum power at compressor start-up (start-up with minimum capacity / idle start-up valve in ON with compressor off) 3 = Screw valves enable the minimum power at compressor start-up and in temperature control (start-up with minimum capacity / idle start-up valve in ON with compressor off)	0	3		
	Intermittent valve function				
CO 10	Screw compressor intermittent valve control relay ON time 0 = function is disabled	0	250	Sec	
CO 11	Screw compressor intermittent valve control relay OFF time	0	250	Sec	
	Compressor start-up				
CO 12	Compressor start-up (see compressor start-up) 0 = direct 1 = part - winding 2 = star delta	0	2		
CO 13	Start-up is part-winding or star-delta **If CO12 = 1** part - winding start-up time applies. This allows you to vary the attachment of the two relays that supply the two motor coils. **If CO12 = 2** star triangle start-up time applies. This allows you to vary the simultaneous operation time of the line 1 relay and the relay that closes the star centre connection. (see start-up par.)	0	250	Tenths of sec	0.1 sec
CO 14	Star - Delta start-up **If CO12 = 2** star triangle start-up time applies. This allows you to vary the time from unhooking the star centre relay from the hook on the relay of line 2 (see start-up par.)	0	250	Hund. of sec	0.01 sec
CO 15	Switch-on time with gas bypass valve / idle compressor start-up valve (see unloader mode)	0	250	Sec	
	Compressors rotation – balancing – temperature control				
CO 16	Selection criteria of compressors in the circuit 0 = Fixed sequence 1 = FIFO 2 = Balance 3 = Saturation	0	4		
CO 17	Selection criteria of circuits 0 = Fixed sequence 1 = FIFO 2 = Balance 3 = Saturation	0	4		

CO 18	Balance/saturation criteria 0= Hours 1= Starts	0	1		
CO 19	Not used				
CO 20	Not used				
CO 21	Not used				
CO 22	Not used				
CO 23	Not used				
CO 24	Not used				
CO 25	Not used				
CO 26	Not used				
CO 27	Not used				
CO 28	Not used				
CO 29	Not used				
CO 30	Not used				
CO 31	Not used				
CO 32	Not used				
CO 33	Not used				
CO 34	Not used				
CO 35	Maximum n° of compressor starts after 15 minutes ON 0 = function disabled	0	15		
Resource control in proportional/neutral zone mode					
CO 36	Max time with no resources being inserted with at least one resource active	0	250	Min	10 Min
CO 37	Max time in a neutral zone with no resources rotating	0	999	Hr	1Hr
Compressor in tandem forced rotation function					
CO 38	Maximum continuous working time for individual compressor in the circuit.	0	250	Min	
Compressor with modulating control					
CO 39	Compressor operation time at maximum speed requested by temperature control 0 = function is disabled	0	250	Sec	
CO 40	Minimum value for digital scroll 0-10V analogue output at peak	0	100	%	
CO 41	Power implementation interval at peak	0	250	Sec	
CO 42	Determines the minimum continuative operation percentage of the modulating compressor below which the CO43 time count starts 0 = function is disabled	0	100	%	
CO 43	MAX continuative operation time of modulating compressor with operation percentage below CO42 0 = function is disabled	0	250	Min	10 Min
CO 44	Forced working time at maximum speed	0	250	Sec	10sec
CO 45	Maximum continuative operation time of modulating compressor after which the modulating compressor is switched off and insertion of another compressor is forced depending on rotation 0 = function is disabled	0	999	Hr	1Hr
CO 46	Minimum value for circuit 1 inverter 0-10V analogue output	0	CO47	%	
CO 47	Maximum value for circuit 1 inverter 0-10V analogue output	CO46	100	%	
CO 48	Minimum value for circuit 2 inverter 0-10V analogue output	0	CO49	%	
CO 49	Maximum value for circuit 2 inverter 0-10V analogue output	CO48	100	%	
CO 50	Normal power implementation interval	1	250	Sec	
Compressors liquid injection function					
CO 51	Activation set point of the liquid injection solenoid valve	-50.0 -58	150.0 302	°C °F	Dec int
CO 52	Differential deactivation of the liquid injection solenoid valve	0.1 0	25.0 45	°C °F	Dec int
Loads maintenance					
CO 53	Set compressor 1 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 54	Set compressor 2 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 55	Set compressor 3 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 56	Set compressor 4 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 57	Set compressor 5 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 58	Set compressor 6 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 59	Set compressor 7 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 60	Set compressor 8 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 61	Set compressor 9 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 62	Set compressor 10 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 63	Set compressor 11 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 64	Set compressor 12 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 65	Set compressor 13 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 66	Set compressor 14 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 67	Set compressor 15 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 68	Set compressor 16 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO 69	Delay time in enabling Refcomp Inverter compressor relay based on temperature control request	0	250	sec	
CO 70	Delay in VI valves activation from compressor start-up	0	250	sec	

CO 71	Minimum activation time for VI valves	0	250	sec	
Stepless compressor					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
SL 1	Compressors stepless adjustment 0 = not active function 1 = Bitzer compressor active function 2 = Fu Sheng compressor active function	0	2		
SL 2	Pulses number to consider the stepless compressors of circuit 1 to 100%	1	250		
SL 3	Pulses number to consider the stepless compressors of circuit 2 to 100%	1	250		
SL 4	Pulses number to consider the stepless compressors of circuit 3 to 100%	1	250		
SL 5	Pulses number to consider the stepless compressors of circuit 4 to 100%	1	250		
SL 6	Delay pulse valves	1	250		0.1 sec
SL 7	Minimum interval between two consecutive pulses	1	SL8	Sec	
SL 8	Maximum interval between two consecutive pulses	SL7	250	Sec	
SL 9	Dead band in chiller operation	0.1 1	25.0 45	°C °F	Dec int
SL 10	Dead band in heat pump operation	0.1 1	25.0 45	°C °F	Dec int
Water pump					
Evaporator water pump control					
PA 1	Evaporator pump/supply fan operation mode 0 = Absent (pump and supply fan are not controlled). 1 = Continuous operation: the pump/supply fan is activated when the machine is switched on (chiller/h.p. selection). 2 = Working on demand of the compressors: the water pump/supply fan are linked with the compressors being switched on and off.	0	2		
PA 2	Compressor ON delay from pump/ supply fan start	0	250	Sec	10 Sec
PA 3	Evaporator water pump/supply fan OFF delay from when the compressors are shut off	0	250	Sec	10 Sec
PA 4	Deactivation Pump Delay from when the unit is Switched Off	0	250	Sec	10 Sec
PA 5	Pump Activation and Rotation: 0 = No Rotation; 1 = Manual Rotation; 2 = Start Rotation; 3 = Rotation at Hours; 4 = Rotation at Start and Hours	0	4		
PA 6	Manual Pump Inversion: 0= Pump 1 On; 1= Pump 2 On;	0	1		
PA 7	No. of hours for forced evaporator pump rotation	0	999	Hr	10Hr
PA 8	Simultaneous pump running time after forced pump rotation	0	250	Sec	
Evaporator water pump operation with anti-freeze alarm					
PA9	Determines the evaporator water pump/s anti-freeze operation when the device is OFF or on Stand-by 0 = always OFF in remote OFF or Stand-by 1 = ON, parallel with the anti-freeze heaters 2 = on in remote OFF or Stand-by, depending on the temperature control request	0	2		
PA10	Temperature control probe for anti-freeze evaporator water pump/s operation 0 = disabled 1 = evaporator input 2 = evaporator output 1/2 3 = evaporator output 3/4 4 = evaporator output 1/2/3/4 5 = evaporator output 1/2/3/4 and common output 6 = external air temperature	0	6		
PA11	Evaporator water pump activation set point in anti-freeze mode on the temperature control probe	-50.0 -58	110 230	°C °F	Dec int
PA12	Evaporator water pump differential deactivation in anti-freeze mode on the temperature control probe	0.1 0	25.0 45	°C °F	Dec int
Evaporator water pump maintenance request					
PA 13	Main pump/supply fan timer setting	0	999	Hr	10 Hr
PA 14	Evaporator no. 2 pump timer setting	0	999	10 Hr	10 Hr
Hot start function of the supply fan air/air unit					
PA 15	Hot start set-point	-50.0 -58	110 230	°C °F	Dec int
PA 16	Hot start differential	0.1 1	25.0 45	°C °F	Dec int
Condenser water pump management					

PA 17	Condenser pump operation mode 0 = Absent (pump not controlled). 1 = Continuous operation: the pump being switched on and off is linked with the unit being switched on and off. 2 = Working on demand of the compressors: pump switch-on and off is linked with the compressors being switched on and off.	0	2		
PA 18	Compressor ON delay from condenser pump start-up	0	250	Sec	10 Sec
PA 19	Condenser pump OFF delay from compressor shut off	0	250	Sec	10 Sec
PA 20	Deactivation pump delay from when the unit is switched off	0	250	Sec	10 Sec
PA 21	Pump activation and rotation: 0 = No Rotation; 1 = Manual Rotation; 2 = Start Rotation; 3 = Rotation at Hours; 4 = Rotation at Start and Hours	0	4		
PA 22	Manual pump inversion: 0 = Pump 1 On; 1 = Pump 2 On	0	1		
PA 23	No. of hours for forced condenser pump rotation	0	999	Hr	10Hr
PA 24	Simultaneous pump running time after forced condenser pump rotation	0	250	Sec	
Condenser water pump operation with anti-freeze alarm					
PA 25	Condenser water pump/s anti-freeze operation when the device is OFF or on Stand-by 0 = always OFF in remote OFF or Stand-by 1 = ON, parallel with the anti-freeze heaters 2 = on in remote OFF or Stand-by, depending on the temperature control request	0	2		
PA 26	Condenser anti-freeze temperature control probe alarm 0 = disabled 1 = common condenser water input probe 2 = common condenser water input probe and condenser input 1/2 3 = common condenser water input probe and condenser input 3/4 4 = condenser water output probe 1/2 5 = condenser water output probe 3/4 6 = condenser output 1/2/3/4 7 = condenser output 1/2/3/4 and common output 8 = external air temperature	0	8		
PA 27	Condenser water pump activation set point in anti-freeze mode on the temperature control probe	-50.0 -58	110 230	°C °F	Dec int
PA 28	Condenser water pump differential deactivation in anti-freeze mode on the temperature control probe	0.1 1	25.0 45	°C °F	Dec int
Condenser water pump maintenance request					
PA 29	Condenser pump timer setting	0	999	Hr	10 Hr
PA 30	Condenser no. 2 pump timer setting	0	999	Hr	10 Hr
Pump down function					
Pump down					
Pd 1	Pump down operation 0= function disabled 1= disabled with pump down 2= disabled and enabled with pump down 3= disabled with pump down only in chiller mode 4= enabled with pump down and disabled with pump down only in chiller mode	0	4		
Pd 2	Pump down pressure setting (see pump down chapter)	0.0 0	50.0 725	Bar psi	Dec int
Pd 3	Pump down pressure differential (see pump down chapter)	0.1 1	14.0 203	Bar Psi	Dec int
Pd 4	Maximum time in Pump down when started-up and stopped (see pump down chapter)	0	250	Sec	
Timed pump down					
Pd 5	Pump down time upon start-up 0 = function disabled	0	250	Sec	
Pd 6	Pump down time upon shutdown 0 = function disabled	0	250	Sec	
Pump down alarm					
Pd 7	Maximum number of pump down alarm interventions per hour, at stopped. When exceeded, the alarm is recorded and displayed on the screen with a code and the relay alarm + buzzer is activated Reset is always manual if Pd7 = 0 Reset is always automatic if Pd7 =60 Reset switches from automatic to manual if Pd7 falls between 1 and 59	0	60		

Pd 8	Maximum number of pump down alarm interventions per hour, at started-up. Exceeding this limit, the alarm must be reset manually, it will be saved in the log and the alarm relay + buzzer will be activated Reset is always manual if Pd8 = 0 Reset is always automatic if Pd8 =60 Reset switches from automatic to manual if Pd8 falls between 1 and 59 and based on the configuration of Par. Pd9	0	60		
Pd 9	Pump down alarm automatic or manual reset activation upon start-up 0= the alarm remains in automatic reset even if the number of interventions per hour is met 1=enables manual reset when the number of interventions per hour is met	0	1		
Unloading Function					
Evaporator water high temperate unloading					
Un 1	Comp. unloading set point of the evaporator input high water temperature in chiller mode	-50.0 -58	110.0 230	°C °F	Dec int
Un 2	Compressor unloading differential from the evaporator input high water temperature	0.1 0	25.0 45	°C °F	Dec int
Un 3	Delay for the compressor unloading function to be inserted by an evaporator input high water temperature	0	250	Sec	10 sec
Un 4	MAX time in compressor unloading function by an evaporator input high water temperature	0	250	Min	
Un 5	Analogue input configuration for control of the unloading function of the evaporator high water temperature	1	51		
Evaporator water low temperate unloading					
Un 6	Compressor unloading set point from the evaporator low water temperature	-50.0 -58	110.0 230	°C °F	Dec int
Un 7	Compressor unloading differential from the evaporator low water temperature	0.1 0	25.0 45	°C °F	Dec int
Un 8	Delay for the compressor unloading function to be inserted by an evaporator input low water temperature	0	250	Sec	10 sec
Un 9	MAX time in compressor unloading status due to the evaporator low water temperature	0	250	Min	
Un 10	Analogue input configuration for control of the unloading function of the evaporator low water temperature	1	51		
Chiller condensation unloading					
Un 11	Condensing temperature/pressure compressor unloading set point	-50.0 -58 0.0 0	110.0 230 50.0 725	°C °F Bar Psi	Dec int Dec int
Un 12	Condensing temperature/pressure compressor unloading differential	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
Evaporation unloading					
Un 13	Evaporation pressure compressor unloading set point	-1.0 -14	50.0 725	Bar Psi	Dec int
Un 14	Evaporation pressure compressor unloading differential	0.1 1	14.0 203	Bar Psi	Dec int
Un 15	MAX time in temperature / pressure compressor unloading status	0	250	Min	
Un 16	Choice of steps for circuit to insert in unloading mode	1	8		
Un 17	Not used				
Condensing fan					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
FA1	Fan regulation 0= absent 1= always ON 2 =ON/OFF step insertion 3= continuous ON/OFF step insertion 4= speed proportional regulator	0	4		
FA2	Fan working mode 0= depending on the compressor 1= independent from the compressor	0	1		
FA3	MAX speed fan peak time after ON (TRIAC) At every start-up the fan is powered at maximum voltage for time FA03, irrespective of the condensation temperature/pressure. When this elapses, the fan continues at the speed set by the regulator.	0	250	Sec	
FA4	Fan phase displacement analog output 5 (only if configured as PWM / phase cut)	0	8	micro sec	250µs
FA5	Fan phase displacement analog output 6 (only if configured as PWM / phase cut)	0	8	micro sec	250µs

FA6	Single or separate condensation fan 0= unique condensation (1 / 2 / 3 / 4) 1= separate condensers 2= unique by circuits (1 – 2) / (3 – 4)	0	2		
FA7	Pre ventilation before switching compressor ON. It allows you to set a start up time for the fans at the maximum speed in chiller mode before the compressor is switched on, in order to prepare for the sudden increase in condensation temperature / pressure (that starting up the compressor entails) and improving regulation. (only if FA01 = 4)	0	250	Sec	
Chiller mode					
FA8	Minimum operation speed of the chiller fans. This allows you to set a minimum value for proportional fan regulation in chiller mode. It is expressed as a percentage of the maximum voltage allowed.	0	FA16	%	
FA9	Maximum operation speed of the chiller fans. This allows you to set a maximum value for proportional fan regulation in chiller mode. It is expressed as a percentage of the maximum voltage allowed.	FA16	100	%	
FA10	**Proportional regulation** Minimum fan speed Set temperature/pressure in chiller mode. This allows you to set the condensation temperature / pressure value in **chiller** that corresponds to the minimum fan speed. **Step regulation** **SET 1st STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to operation in ON of the relay output, configured as the 1st condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA11	**Proportional regulation** Set maximum fan speed temperature/pressure in chiller mode. This allows you to set the condensation temperature / pressure value in chiller that corresponds to the maximum fan speed. **Step regulation** **SET 2nd STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to the operation in ON of the relay output, configured as the 2nd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA12	**Proportional regulation** Proportional band regulation of fans in chiller mode This allows you to set a temperature / pressure differential that corresponds to a variation from minimum to maximum fan speed. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 1 in chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA13	**Proportional regulation** Differential CUT- OFF in chiller. This allows you to set a temperature / pressure differential in chiller mode to shut off the fan. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 2 in chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA14	Over ride CUT- OFF in chiller. This allows you to set a temperature / pressure differential in chiller mode, where the fan maintains minimum speed.	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA15	CUT-OFF delay when fans are activated. This allows you to set a delay time for the activation of the CUT - OFF function at fan start-up. If at compressor start-up the proportional regulator requests the fans to be shut off and FA15≠ 0, the fan will be forced at minimum speed for the set time. If FA15=0, the function is not enabled.	0	250	Sec	
FA16	Night function speed in chiller mode. This allows you to set a maximum value for proportional regulation of the fans in chiller mode. It is expressed as a percentage of the maximum voltage allowed.	FA8	FA9	%	
Heat pump mode					
FA17	Minimum fan speed in heat pump mode. This allows you to set a minimum value for the proportional regulation of the fans in h.p. It is expressed as a percentage of the maximum voltage allowed.	0	FA24	%	
FA18	Maximum fan speed in heat pump mode. This allows you to set a maximum value for the proportional regulation of the fans in h.p. It is expressed as a percentage of the maximum voltage allowed.	FA24	100	%	

FA19	**Proportional regulation** Set temperature / pressure for maximum fan speed in h.p. mode. This allows you to set the condensation temperature / pressure value in h.p. mode that corresponds to minimum fan speed. **Step regulation** **SET 4th STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 4th condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA20	**Proportional regulation** Set temperature / pressure for minimum fan speed in h.p. mode. This allows you to set the condensation temperature / pressure value in h.p. mode that corresponds to maximum fan speed. **Step regulation** **SET 3rd STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 3rd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA21	**Proportional regulation** Proportional band regulation of fans in heat pump mode This allows you to set a temperature / pressure differential that corresponds to a variation from minimum to maximum fan speed. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 1 in heat pump (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA22	**Proportional regulation** Differential CUT- OFF in heat pump. This allows you to set a temperature / pressure differential in h.p. mode to shut off the fan. **Step regulation** With Par. FA01**=**2/3 becomes the differential on the step itself of circuit 2 in heat pump mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA23	Over ride CUT- OFF in h.p. This allows you to set a temperature / pressure differential in h.p. mode, where the fan maintains minimum speed.	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA24	Night function speed in HP mode. This allows you to set a maximum value for the proportional regulation of the fans in h.p. It is expressed as a percentage of the maximum voltage allowed.	FA17	FA18	%	
	Condensation fan step 3 / 4 in chiller mode				
FA25	Third step setting in chiller mode **SET 3rd STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to the operation in ON of the relay output, configured as the 3rd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA26	Fourth step setting in chiller mode **SET 4th STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to operation in ON of the relay output, configured as the 4th condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA27	Differential on circ.3 steps in chiller mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 3 chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA28	Differential on circ.4 steps in chiller mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 4 chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
	Condensation fan step 3 / 4 in heat pump mode				
FA29	**SET 2nd STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 2nd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA30	**SET 1st STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 1st condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA31	Differential on circ.3 steps in HP mode With Par. FA01 = 2 / 3 becomes the differential on the step itself of circuit 3 in heat pump mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA32	Differential on circ.4 steps in HP mode With Par. FA01 = 2 / 3 becomes the differential on the step itself of circuit 4 heat pump mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec Int
	Operation in defrost (dF33 = 2)				

FA33	Minimum fan speed in defrost mode. This allows you to set a minimum value for proportional regulation of the fans in defrost mode. It is expressed as a percentage of the maximum voltage allowed.	0	FA40	%	
FA34	Maximum fan speed in defrost mode. This allows you to set a maximum value for proportional regulation of the fans in defrost mode. It is expressed as a percentage of the maximum voltage allowed.	FA40	100	%	
FA35	**Proportional regulation** Set maximum fan speed temperature/pressure in defrost mode. This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to the minimum fan speed. **Step regulation** **SET 4th STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to operation in ON of the relay output, configured as the 4th condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA36	**Proportional regulation** Set minimum fan speed temperature/pressure in defrost mode. This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to the maximum fan speed. **Step regulation** **SET 3rd STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to operation in ON of the relay output, configured as the 3rd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA37	**Proportional regulation** Proportional band regulation of fans in defrost. This allows you to set a temperature / pressure differential that corresponds to a variation from minimum to maximum fan speed. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 1 in defrost mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA38	**Proportional regulation** Differential CUT- OFF in defrost. This allows you to set a temperature / pressure differential in defrost mode to shut off the fan. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 2 in defrost mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA39	Over ride CUT- OFF in defrost. This allows you to set a temperature / pressure differential in defrost where the fan maintains minimum speed.	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA40	Night function speed in defrost mode. This allows you to set a maximum value for proportional regulation of the fans in defrost mode. It is expressed as a percentage of the maximum voltage allowed.	FA33	FA34	%	
FA41	Third step setting in defrosting mode **SET 2nd STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to relay output operation in ON configured as the 2nd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
FA42	Fourth step setting in defrosting mode **SET 1st STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to relay output operation in ON configured as the 1st condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
FA43	Differential on circ.3 steps in defrosting mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 3 defrost mode	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
FA44	Differential on circ.4 steps in defrosting mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 4 defrost mode	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec Int
Anti-freeze heaters – support					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
Ar 1	Antifreeze/support heaters (air/air units) set point in chiller mode. The temperature value below which the heaters start up.	-50.0 -58	110 230	°C °F	Dec Int
Ar 2	Anti-freeze/support heaters band regulation in chiller mode	0.1 1	25.0 45	°C °F	Dec Int
Ar 3	Antifreeze/support heaters (air/air units) set point in heat pump mode The temperature value below which the heaters start up.	-50.0 -58	110 230	°C °F	Dec Int
Ar 4	Anti-freeze/support heaters band regulation in heat pump mode	0.1 1	25.0 45	°C °F	Dec Int

Ar 5	Anti-freeze/support heaters operation in defrosting mode 0 = activated according to temperature control demand 1 = activated according to temperature control demand and during defrost cycle	0	1		
Ar 6	Anti-freeze/support heaters alarm temperature control probe in chiller mode 0 = disabled 1 = evaporator input 2 = evaporator output 1 / 2 3 = evaporator output 3 / 4 4 = evaporator output 1 / 2 / 3 / 4 5 = evaporator output 1 / 2 / 3 / 4 and common output	0	5		
Ar 7	Anti-freeze/support heaters temperature control probe in heat pump mode 0 = disabled 1 = evaporator input 2 = evaporator output 1 / 2 3 = evaporator output 3 / 4 4 = evaporator output 1 / 2 / 3 / 4 5 = evaporator output 1 / 2 / 3 / 4 and common output	0	5		
Ar 8	Condenser anti-freeze heaters temperature control probe 0 = disabled 1 = common condenser water input probe 2 = common condenser water input probe and condenser input 1 / 2 3 = common condenser water input probe and condenser input 3 / 4 4 = condenser water output probe 1 / 2 5 = condenser water output probe 3 / 4 6 = condenser output 1 / 2 / 3 / 4 7 = condenser output 1 / 2 / 3 / 4 and common output	0	7		
Ar 9	Determines the evaporator/condenser anti-freeze heaters function if a probe that is set to control them malfunctions 0 = OFF if the probe malfunctions 1 = ON if the probe malfunctions	0	1		
Ar 10	Determines the anti-freeze heaters operation when the device is in chiller or heat pump mode. 0 = always OFF (chiller and h.p.) 1 = ON only in chiller mode, depending on the temperature control request 2 = ON only in h.p. mode, depending on the temperature control request 3 = ON in chiller and h.p. mode, depending on the temperature control request	0	3		
Ar 11	Determines the evaporator/condenser anti-freeze heaters operation depending on the remote Off Stand-by mode 0 = Always OFF 1 = ON via temperature control	0	1		

Defrost

Parameter	Description	min	max	um	Resolution
dF 1	Defrost mode: 0 = defrost disabled 1 = temperature / pressure 2 = starts according to the value of parameter dF28 and ends according to the time 3 = starts according to the value of parameter dF28 and ends due to an external contact 4 = with a condensation fan	0	4		
dF 2	Defrost begins by temperature/pressure	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec Int Dec Int
dF 3	Defrost ends by temperature/pressure	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec Int Dec Int
dF 4	Minimum defrost duration	0	250	Sec	
dF 5	Maximum defrost duration	1	250	Min	
dF 6	Defrost delay between two circuits	0	250	Min	
dF 7	Idle time in compressor OFF mode before defrosting	0	250	Sec	
dF 8	Idle time in compressor OFF mode after defrosting	0	250	Sec	
dF 9	Defrost interval in the same circuit	1	99	Min	
dF 10	Defrosting cycle start temperature setting together with circuit 1 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec Int
dF 11	Defrosting cycle start temperature setting together with circuit 2 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec Int
dF 12	Defrosting cycle start temperature setting together with circuit 3 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec Int

dF 13	Defrosting cycle start temperature setting together with circuit 4 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec Int
dF 14	End temperature setting of circuit 1 with defrost cycle The actual defrost cycle on circuit 1 terminates when the temperature sensed by the combined defrost temperature probe exceeds the dF14 limit.	-50.0 -58	110 230	°C °F	Dec Int
dF 15	End temperature setting of circuit 2 with defrost cycle	-50.0 -58	110 230	°C °F	Dec Int
dF 16	End temperature setting of circuit 3 with defrost cycle	-50.0 -58	110 230	°C °F	Dec Int
dF 17	End temperature setting of circuit 4 with defrost cycle	-50.0 -58	110 230	°C °F	Dec Int
dF 18	Forcing by switching ON activates all steps in defrosting mode in circuit 1 0 = disabled 1 = enabled	0	1		
dF 19	Forcing by switching ON activates all steps in defrosting mode in circuit 2	0	1		
dF 20	Forcing by switching ON activates all steps in defrosting mode in circuit 3	0	1		
dF 21	Forcing by switching ON activates all steps in defrosting mode in circuit 4	0	1		
dF 22	ON delay between two compressors in defrosting mode	1	250	Sec	
dF 23	Fan ON activation during defrosting/dripping 0 = disabled 1 = enabled only during defrost 2 = enabled during defrosting/dripping	0	2		
dF 24	Temperature/pressure setting that forces the fan ON in defrosting mode	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec Int Dec Int
Defrost with condensation fans					
dF 25	Defrost activation setting with condensation fans The function defrost with outdoor fans is enabled if the external temperature is above the dF25 level.	-50.0 -58	110 230	°C °F	Dec Int
Defrost Start/Stop					
dF 26	Defrosting cycle start in unit 0 = independent 1 = if both have reached the request for defrosting to start 2 = if at least one has reached the request for defrosting to start	0	2		
dF 27	Defrosting cycle end in unit 0 = independent 1 = if both have reached the defrost end status 2 = if at least one has reached the defrost end status	0	2		
Begin end defrost from analog input					
dF 28	Probe that determines the defrost start and end 0= start and end with condensation temperature / pressure probe 1= start with evaporation pressure probe - end with condensation temperature / pressure probe 2= start with condensation temperature / pressure probe - end with evaporation pressure probe 3= start and end by evaporation pressure 4=start and end by auxiliary probe 1	0	4		
Forced defrost					
dF 29	Minimum idle time before forced defrosting The device wait the delay time dF29 before starting a forced defrost cycle after the relevant conditions have reached	0	250	Sec	
dF 30	Forced defrosting temperature/pressure setting	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec Int Dec Int
dF 31	Forced defrosting differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
Supply fan working in defrost mode					
dF 32	Supply fan block in defrosting mode 0 = Not enabled – Supply fan works during defrost 1 = Enabled – Supply fan doesn't work during defrost	0	1		
Anti-freeze security for multi circuit units					
dF 33	Forcing circuits that are not defrosting ON 0 –function is disabled 1 –function is enabled with the fan off 2 –function is enabled with fan controlled by HP circuit	0	2		
Heat recovery					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**

rC 1	Recovery function 0 = Disabled 1 = separate hydraulic circuits 2 = hydraulic circuits in parallel 3 = total recovery gas side	0	3		
rC 2	Choice of recovery function priority 0 = user side 1 = recovery side	0	1		
rC 3	Forced step deactivation time	0	250	Sec	
rC 4	Forced step deactivation time after rotation of recovery valve	0	250	Sec	
rC 5	Minimum operation time in recovery mode Minimum activation time of heat recovery function once enabled	0	250	Min	
rC 6	Minimum delay between recovery end and next recovery Minimum time between disabling and following reactivation of heat recovery function	0	250	Min	
rC 7	Recovery function disabling setting Condensing pressure/temperature level for disabling heat recovery function If the condensing pressure exceeds the rC07 level the heat recovery function is automatically disabled.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
rC 8	Recovery function enabling differential Heat recovery function is reactivated if the condensing pressure/temperature drops below the rC07 – rC08 level	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
rC 9	Maximum condensation pressure / temperature recovery disabling time After expiration of the rC09 delay the heat recovery function is reactivated regardless the condensing pressure/temperature level.	0	250	Min	
rC 10	Condensation ventilation operation in recovery mode 0 = enabled 1 = not enabled	0	1		
rC 11	Minimum recovery setting Defines the minimum limit for the working set-point in heat recovery mode	-50.0 -58	rC12	°C °F	Dec Int
rC 12	Maximum recovery setting Defines the maximum limit for the working set-point in heat recovery mode	rC11	110 230	°C °F	Dec Int
rC 13	Recovery set point Defines the working set-point for heat recovery function (active only in cooling mode)	rC11	rC12	°C/°F	Dec Int
rC 14	Recovery differential Defines the working set-point for heat recovery function	0.1 0	25.0 45	°C °F	Dec Int
rC 15	Defines the temperature control probe of the machine in recovery mode 0 = condenser water common inlet 1 = circuit 1 condenser water input NTC 2 = circuit 2 condenser water input NTC 3 = circuit 3 condenser water input NTC 4 = circuit 4 condenser water input NTC 5 = circuit 1 condenser water output NTC 6 = circuit 2 condenser water output NTC 7 = circuit 3 condenser water output NTC 8 = circuit 4 condenser water output NTC 9 = condenser water common output NTC	0	9		
Function for production of domestic hot water					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
FS 1	Activation of domestic hot water production 0 = Disabled 1 = with common return – User and domestic hot water heat exchanger and water piping are physically the same 2 = with dedicated return – User and domestic hot water heat exchanger and water piping are physically separated	0	2		
FS 2	Operation priorities 0 = domestic water 1 = heating / cooling	0	1		
FS 3	Domestic water set point. Defines the working set point for the production of domestic hot water.	FS05	FS06	°C °F	Dec Int
FS 4	Domestic water regulation steps intervention band	0.1 1	25.0 45	°C °F	Dec Int
FS 5	Minimum domestic water set point value. Minimum limit for the domestic water set point	-50.0 -58	FS06	°C °F	Dec Int
FS 6	Maximum domestic water set point value. Maximum limit for the domestic water set point	FS05	110 230	°C °F	Dec Int
FS 7	Activation of the steps to reach the domestic water set point 0 = activates all the compressors 1 = activates the compressors and heaters	0	1		
FS 8	Connection of the domestic water temperature control heaters 0 = no 1 = yes	0	1		

FS 9	Time to activate maximum power/heaters insertion Delay time from domestic hot water production and electric heaters activation for reaching the domestic hot water set point	0	250	min	
FS 10	Delay in activating outputs for domestic water production	0	999	sec	
FS 11	Delay in cycle inversion during domestic water production	0	999	sec	
FS 12	Type of Anti-legionella activation 0 = timed. The antliegionella cycle is activated every FS13 time period. 1= time band. The antliegionella cycle occurs on the day defined on FS18 and hour defined on FS17	0	1		
FS 13	Delay between two Anti-legionella production cycles. 0 = function disabled	0	250	Hr	
FS 14	Anti legionella set point.	FS15	FS16	°C °F	Dec Int
FS 15	Minimum Anti-legionella set point value	-50.0 -58	FS16	°C °F	Dec Int
FS 16	Maximum Anti-legionella set point value	FS15	110 230	°C °F	Dec Int
FS 17	Anti-legionella activation time	0.00	24.00	Hr	10 min
FS 18	Day of activation Anti-legionella 0 = Disabled 1 = Sunday… 7 = Saturday	0	7		
FS 19	Time in anti-legionella production Once reached the antilegionella set point the antliegionella function is kept active for the FS19 time.	0	250	min	
FS 20	Maximum idle time in Anti-legionella mode The antilegionella cycle is disabled after the time FS20 even though the working set point is not achieved.	0	250	min	
FS 21	Heaters OFF band in Anti-legionella mode The electric heaters activated for the antilegionella function are disabled (before expiration of FS20) if the water temperature exceeds FS14 (antilegionella set)+FS21	0.1 1	25.0 45	°C °F	Dec Int
FS 22	Water set point for solar panel integration	FS24	FS25	°C °F	Dec Int
FS 23	Intervention band for solar panel integration.	0.1 1	25.0 45	°C °F	Dec Int
FS 24	Solar panel water minimum setting	-50.0 -58	FS25	°C °F	Dec Int
FS 25	Solar panel water maximum setting	FS24	110 230	°C °F	Dec Int
FS 26	Domestic water output inversion delay from when the domestic water pump is activated	0	250	sec	
FS 27	Domestic water pump deactivation delay from when the domestic water output is inverted	0	250	sec	
FS 28	Domestic water pump operation mode 0 = operation on demand. The pump is activated only when domestic hot water is required. 1 = continuous operation. The pump is always active when the unit is active. FS26 and FS27 delays are ignored	0	1		
FS 29	Minimum interruption (time) during domestic water production by probe no. 2 and minimum time between two interruptions	0	250	sec	
FS 30	Domestic water probe set point no. 2 to interrupt domestic water production	-50.0 -58	110 230	°C °F	Dec Int
FS 31	Domestic water probe differential no. 2 to interrupt domestic water production	0.1 1	25.0 45	°C °F	Dec Int
FS 32	Overheating set point to activate the charge modulating valve. After activation of the cooling + sanitary water function the circuit charge modulating valve is activated if the superheating is higher than FS32	-50.0 -58	110 230	°C °F	Dec Int
FS 33	Overheating band for the charge modulating valve	0.1 1	25.0 45	°C °F	Dec Int
FS 34	Maximum charge modulating valve time	1	250	min	10 min
FS 35	Water set point to change activation setting and band of the charge modulating valve	-50.0 -58	110 230	°C °F	Dec Int
FS 36	Water band to change activation setting and band of the charge modulating valve	0.1 1	25.0 45	°C °F	Dec Int
FS 37	New overheating set point	-50.0 -58	110 230	°C °F	Dec Int
FS 38	New overheating band	0.1 1	25.0 45	°C °F	Dec Int
FS 39	Charge modulating valve ON time	1	250	sec	
FS 40	Charge modulating valve OFF time	1	250	sec	

FS 41	Condensation fan forced ON during the production of domestic water 0 = function is disabled 1 = during the FS26 time, the ventilation modulates according to the condensing temperature/pressure 2 = during the FS26 time, the ventilation is forced to operate at the night function speed	0	2		
FS 42	Low condensing temperature/pressure threshold to by-pass the ON time of the domestic water pump before the commutation of the valves. If the condensing pressure/temperature drops below the FS42 level during outdoor fans forced activation the same is disabled	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
FS 43	Low evaporating pressure threshold to bypass the ON time of the domestic water pump before the commutation of the valves. If the evaporating pressure/temperature drops below the FS42 level during outdoor fans forced activation the same is disabled	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
FS 44	Evaporator anti-freeze prevention during domestic water production with a single-circuit machine. 0= function is disabled 1=function is enabled For preventing for possible antifreeze alarms due to defrost cycles, if the evaporator water outlet temperature drops below the value defined on parameter FS45 and the external temperature is lower than FS47 the unit is switched to heating function until the water temperature goes higher than FS45+FS46	0	1		
FS 45	Evaporator outlet water set point to prevent anti-freeze	-50.0 -58	110 230	°C °F	Dec Int
FS 46	Band to prevent anti-freeze	0.1 1	25.0 45	°C °F	Dec Int
FS 47	External air set point to prevent anti-freeze	-50.0 -58	110 230	°C °F	Dec Int
FS 48	Do not turn the valves in production of domestic water only with dedicated return. 0= function is disabled 1=function is enabled If the function is active during production of domestic hot water only (no cooling or heating demand) the solenoid valves remain in their standard position and only the domestic hot water pump is activated.	0	1		
FS 49	Switch off evaporator water pump in production of domestic water only with dedicated return. 0= function is disabled 1=function is enabled If the function is active during production of domestic hot water only (no cooling or heating demand) the evaporator pump is switched OFF.	0	1		
FS 50	Overlapping time between evaporator water pump and domestic water pump. If the evaporator water pump is disabled during domestic hot water production only (FS49=1) it is switched OFF FS50 seconds after the activation of the domestic hot water pump	0	250	sec	
FS 51	Standby time before switching inversion valves from chiller to heat pump .Delay time before actual begin of a domestic hot water production	0	250	sec	
FS 52	Not used				
FS 53	Minimum operation time in chiller mode before switching to domestic water production. In case of demand of both domestic hot water and cooling the unit is forced to work for FS53 in cooling mode only to ensure enough refrigerant is stored in the condenser.	0	250	sec	10 sec
FS 54	Minimum chiller demand threshold (power steps) before starting in chiller + domestic water mode. Defines the number of cooling demand capacity steps necessary for activation of cooling + domestic hot water production. In case the domestic hot water production function is active any cooling demand for less than the number of steps defined on FS54 is neglected.	1	16		
FS 55	Minimum heat pump demand threshold (power steps) before stopping the domestic water production (with HP priority). In case the domestic hot water production function is active any heating demand for less than the number of steps defined on FS55 is neglected.	1	16		
FS 56	Power modulation if the user side and domestic water side are demanded simultaneously. 0 = the temperature control satisfies the domestic water demand 1 = enabling of max number of steps between domestic water and user side 2 = 100% enabling of power available (only HP)	0	2		
Free-cooling					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**

FC 1	Activation of free cooling 0 = Disabled 1 = enabled fan control with condensing priority 2 = enabled fan control priority with free cooling priority 3 = enabled with external free cooling ventilation 4 = enabled in water/water unit	0	4		
FC 2	Free cooling mode input/output differential The FC function is enabled if the external temperature drops at least FC02 below the evaporator inlet water temperature for at least FC03	0.1 1	25.0 45	°C °F	Dec Int
FC 3	Free cooling input/output delay	0	250	sec	10 sec
FC 4	Damper closing/3-way water valve differential/free cooling ON-OFF relay with temperature control being satisfired	0.1 1	25.0 45	°C °F	Dec Int
FC 5	Band regulation steps/ventilation modulating output in free cooling mode	0.1 1	25.0 45	°C °F	Dec Int
FC 6	Regulation steps/ventilation modulating output in free cooling mode 0 = 100% on demand 1 = with step/proportional regulation	0	1		
FC 7	Anti-freeze prevention setting with unit in free cooling mode	-50.0 -58	110 230	°C °F	Dec Int
FC 8	Free cooling anti-freeze alarm prevention differential	0.1 1	25.0 45	°C °F	Dec Int
FC 9	Minimum operation speed of the fans in free cooling mode	0	100	%	
FC 10	Maximum operation speed of the fans in free cooling mode	0	100	%	
FC 11	Peak time at maximum speed after switch-on	0	250	sec	
FC 12	Circuit 1 - 2 - 3 - 4 1st step split coil setting	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
FC 13	Circuit 1 - 2 - 3 - 4 1st step split coil differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
FC 14	Circuit 1 - 2 - 3 - 4 2nd step split coil setting	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
FC 15	Circuit 1 - 2 - 3 - 4 2nd step split coil differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
FC 16	Delay for valve exchange of the split coils	0	250	sec	
FC 17	Outside Set point temperature air for free cooling enable	-50.0 -58	110 230	°C °F	Dec Int
FC 18	Condenser water temperature set point for activation free cooling FC	-50.0 -58	110 230	°C °F	Dec Int
FC 19	Delayed activation of the water probe condenser FC free cooling	0	250	sec	
FC 20	Delay switching on / off valves free cooling	0	250	sec	
FC 21	Free cooling set point	-50.0 -58	110 230	°C °F	Dec Int
FC 22	Free cooling differential	0.1 1	25.0 45	°C °F	Dec Int
FC 23	Free cooling delay for the end	0	250	sec	
FC 24	Delay for the activation of preventing frost free cooling	0	250	sec	
FC 25	Free cooling setpoint valve in chillers	-50.0 -58	110 230	°C °F	Dec Int
FC 26	Differential valve free cooling in chiller	0.1 1	25.0 45	°C °F	Dec Int
FC 27	Free cooling valve regulation minimum percentage	0	FC28	%	
FC 28	Free cooling valve regulation maximum percentage	FC27	100	%	
FC 29	Maintaining minimum valve opening 0 = no 1 = yes	0	1		
FC 30	Time to force the Free Cooling starting after start-up (0=function disabled)	0	250	sec	10 sec
FC 31	Set temperature external air to force the Free Cooling status during the start up	-50.0 -58	ST01	°C °F	Dec Int
	Auxiliary relays menu				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
	Auxiliary relay n° 1				
US 1	Auxiliary relay 1 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		

US 2	Analogue input configuration for control of the auxiliary relay 1	1	66		
US 3	Set point of auxiliary relay 1	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 4	Auxiliary relay 1 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
	Auxiliary relay n° 2				
US 5	Auxiliary relay 2 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 6	Analogue input configuration for control of the auxiliary relay 2	1	66		
US 7	Set point of auxiliary relay 2	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 8	Auxiliary relay 2 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
	Auxiliary relay n° 3				
US 9	Auxiliary relay 3 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 10	Analogue input configuration for control of the auxiliary relay 3	1	66		
US 11	Set point of auxiliary relay 3	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 12	Auxiliary relay 3 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
	Auxiliary relay n° 4				
US 13	Auxiliary relay 4 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 14	Analogue input configuration for control of the auxiliary relay 4	1	66		
US 15	Set point of auxiliary relay 4	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 16	Auxiliary relay 4 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
	Auxiliary proportional output n°1 (0÷10V DC)				
US 17	Proportional auxiliary output 1 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 18	Analogue input configuration for control of the proportional auxiliary relay 1	1	66		
US 19	Set point of proportional auxiliary output 1	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 20	Differential of proportional auxiliary output 1	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
US 21	Minimum value for 0-10V analogue 1 output	0	US22	%	
US 22	Maximum value for 0-10V 1 analogue 1 output	US21	100	%	

US 23	Analog output 1 maintaining minimum value 0 = no 1 = yes	0	1		
	Auxiliary proportional output n°2 (0÷10V DC)				
US 24	Proportional auxiliary output 2 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 25	Analogue input configuration for control of the proportional auxiliary relay 2	1	66		
US 26	Set point of proportional auxiliary output 2	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec int
US 27	Differential of proportional auxiliary output 2	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
US 28	Minimum value for 0-10V analogue 2 output	0	US29	%	
US 29	Maximum value for 0-10V 1 analogue 2 output	US28	100	%	
US 30	Analog output 2 maintaining minimum value 0 = no 1 = yes	0	1		
	Auxiliary proportional output n°3 (0÷10V DC)				
US 31	Proportional auxiliary output 3 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 32	Analogue input configuration for control of the proportional auxiliary relay 3	1	66		
US 33	Set point of proportional auxiliary output 3	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 34	Differential of proportional auxiliary output 3	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
US 35	Minimum value for 0-10V analogue 3 output	0	US36	%	
US 36	Maximum value for 0-10V 1 analogue 3 output	US35	100	%	
US 37	Analog output 3 maintaining minimum value 0 = no 1 = yes	0	1		
	Auxiliary proportional output n°4 (0÷10V DC)				
US 38	Proportional auxiliary output 4 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 39	Analogue input configuration for control of the proportional auxiliary relay 4	1	66		
US 40	Set point of proportional auxiliary output 4	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec Int Dec Int
US 41	Differential of proportional auxiliary output 4	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec Int Dec Int
US 42	Minimum value for 0-10V analogue 4 output	0	US43	%	
US 43	Maximum value for 0-10V 1 analogue 4 output	US42	100	%	
US 44	Analog output 4 maintaining minimum value 0 = no 1 = yes	0	1		

Alarms					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
	Low pressure alarm				
AL 1	Low pressure alarm delay from a digital/analogue input	0	250	Sec	
AL 2	Defines low pressure alarm operation with pump-down enabled 0 = independent from the pump down 1 = blocks the compressors until the pressure switch is disabled 2 = lets the compressors reach peak values	0	2		

AL 3	Low pressure alarm set point from an analogue input	-50.0 -58 -1.0 14	110 230 50.0 725	°C °F bar psi	Dec Int Dec Int
AL 4	Low pressure alarm differential from an analogue input	0.1 1 0.1 1	25.0 45 14.0 203	°C °F bar psi	Dec Int Dec Int
AL 5	Maximum number of interventions per hour of the low pressure alarm from a digital/analogue input. If the number exceeds AL05 the alarm becomes manual reset. Reset is always manual if AL05 = 0 Reset is always automatic if AL05 = 60 Reset moves from automatic to manual if AL05 moves from 1 to 59	0	60		
AL 6	Low temperature / pressure alarm in defrost mode 0 = not enabled 1 = enabled	0	1		
AL 7	Low temperature / pressure alarm delay in defrost mode Delay time between alarm condition occurrence and reaction by device	0	250	Sec	
AL 8	Low temperature/pressure alarm with the unit in remote OFF or Stand-by mode 0 = alarm detection disabled 1 = alarm detection enabled	0	1		
High pressure alarm					
AL 9	High condensing pressure/temperature alarm set point from an analogue input	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec Int Dec Int
AL 10	High condensing pressure/temperature differential from an analogue input	0.1 1 0.1 1	25.0 45 14.0 203	°C °F bar psi	Dec Int Dec Int
AL 11	Maximum number of high condensing pressure/temperature interventions per hour from a digital/analogue input. If the number exceeds AL11 the alarm becomes manual reset. Reset is always manual if AL11 = 0 Reset is always automatic if AL11 = 60 Reset moves from automatic to manual if AL11 moves from 1 to 59	0	60		
Oil pressure/level alarm					
AL 12	Low pressure / oil level alarm delay from a digital input	0	250	Sec	
AL 13	Low pressure / oil level alarm input duration from digital input in normal working conditions. After expiration of AL12 the unit waits further AL13 delay before detecting the alarm	0	250	Sec	
AL 14	Low pressure/oil level maximum number of interventions per hour Reset is always manual if AL14 = 0 Reset is always automatic if AL14 = 60 Reset moves from automatic to manual if AL14 moves from 1 to 59	0	60		
AL 15	Oil pressure switch/float alarm with compressor OFF 0 = alarm detection disabled 1 = alarm detection enabled	0	1		
Evaporator flow / supply fan overload alarm working mode					
AL 16	Evaporator flow switch/thermal overload supply fan alarm by-pass by activating the evaporator pump/supply fan	0	250	Sec	
AL 17	Maximum time in evaporator flow switch alarm before switching to manual mode and blocking the evaporator water pump.	0	250	Sec	
AL 18	Evaporator flow switch / thermal overload supply fan input active duration	0	250	Sec	
AL 19	Evaporator flow switch / thermal overload supply fan input not active duration (disabled if the alarm has turned to manual reset)	0	250	Sec	
AL 20	Evaporator flow switch alarm operating logic. If the polarity detection is enabled the alarm occurs if the polarity doesn't change after the pump start regardless the polarity configuration. 0 = polarity control enabled 1 = polarity control disabled	0	1		
Condenser flow alarm working mode					
AL 21	Condenser flow switch operation 0 = disabled 1 = chiller only 2 = heat pump only 3 = chiller and heat pump	0	3		
AL 22	Condenser flow switch alarm delay from when condenser water pump is activated	0	250	Sec	
AL 23	Maximum time in condenser flow switch alarm before switching to manual mode and blocking the condenser water pump	0	250	Sec	
AL 24	Active condenser flow switch input duration	0	250	Sec	

AL 25	Non-active condenser flow switch input duration (disabled if the alarm has turned to manual reset)	0	250	Sec	
AL 26	Condenser flow switch alarm operating logic. If the polarity detection is enabled the alarm occurs if the polarity doesn't change after the pump start regardless the polarity configuration. 0 = polarity control enabled 1 = polarity control disabled	0	1		
	Compressors thermal overload alarm				
AL 27	Compressor thermal overload alarm delay at start-up	0	250	Sec	
AL 28	Maximum number of compressor thermal overload interventions per hour Reset is always manual if AL28 = 0 Reset is always automatic if AL28 = 60 Reset moves from automatic to manual if AL28 moves from 1 to 59	0	60		
AL 29	Compressor thermal overload alarm function 0 = blocks the individual compressor 1 = blocks the circuit	0	1		
AL 30	Compressor thermal overload alarm with compressor OFF 0 = alarm detection disabled 1 = alarm detection enabled	0	1		
AL 31	Compressor thermal overload alarm reset password value (see procedures)	0	999		
	Antifreeze / Low room air temperature / Low outlet air temperature alarm working in cooling mode				
AL 32	Anti-freeze minimum set point limit in chiller mode	-50.0 -58	AL33	°C °F	Dec Int
AL 33	Anti-freeze maximum set point limit in chiller mode	AL32	110 230	°C °F	Dec Int
AL 34	Chiller anti-freeze alarm setting Defines the temperature value below which the antifreeze / low room air temperature / low outlet air temperature alarm is activated	AL32	AL33	°C/°F	Dec Int
AL 35	Anti-freeze alarm differential in chiller-low environmental air temperature-low air temperature output	0.1 1	25.0 45	°C °F	Dec Int
AL 36	Alarm delay anti-freeze -low environmental air temperature-low air temperature output in chiller mode. Delay on activation of the antifreeze / low room air temperature / low outlet air temperature alarm from the occurrence of the alarm condition (temperature below alarm set point)	0	250	Sec	
AL 37	Maximum number of interventions per hour of the anti-freeze-low environmental air temperature in chiller mode alarm. Defines the maximum number of antifreeze / low room air temperature / low outlet air temperature alarms per hour. When this number is exceeded the alarm moves from automatic to manual reset. Reset is always manual if AL37 = 0 Reset is always automatic if AL37 = 60 Reset moves from automatic to manual if AL37 moves from 1 to 59	0	60		
AL 38	Anti-freeze alarm operation in chiller mode 0 = it switches off ONLY the compressors, indicates the alarm but does not trigger the buzzer or the alarm relay 1 = shuts off compressors and activates the buzzer and alarm relay	0	1		
	Antifreeze alarm working in heating mode				
AL 39	Anti-freeze minimum set point limit in heat pump mode	-50.0 -58	AL40	°C °F	Dec Int
AL 40	Anti-freeze maximum set point limit in heat pump mode	AL39	110 230	°C °F	Dec Int
AL 41	Anti-freeze alarm setting in heat pump mode	AL39	AL40	°C/°F	Dec / Int
AL 42	Anti-freeze alarm differential in heat pump-low environmental air temperature-low air temperature output	0.1 1	25.0 45	°C °F	Dec Int
AL 43	Anti-freeze alarm delay when unit starts in heat pump mode **Warning** In case of alarm condition (control probe temperature lower than AL41) in Stand-by or remote OFF status and AL43 not zero, if the unit is activated in heating mode the antifreeze condition is neglected in order to allow the compressors to start at least for the delay AL43 as the unit heats-up the water or the air. On expiry of the AL43 delay time, if the antifreeze condition is still active the AL44 counter is activated.	0	250	Sec	
AL 44	Alarm delay of the anti-freeze-low environmental air temperature-low air temperature output in normal operation in heat pump mode.	0	250	Sec	
AL 45	Maximum number of interventions per hour of the anti-freeze-low environmental air temperature in heat pump mode alarm. When this number is exceeded the alarm moves from automatic to manual reset. Reset is always manual if AL45 = 0 Reset is always automatic if AL45 = 60 Reset moves from automatic to manual if AL45 moves from 1 to 59	0	60		

AL 46	Anti-freeze alarm operation in heat pump mode 0 = it switches off ONLY the compressors, indicates the alarm but does not trigger the buzzer or the alarm relay 1 = shuts off compressors and activates the buzzer and alarm relay	0	1		
	Control probe for antifreeze alarm				
AL 47	Anti-freeze temperature control probe alarm in chiller mode 0 = disabled 1 = evaporator input 2 = evaporator output 1 / 2 3 = evaporator output 3 / 4 4 = evaporator output 1 / 2 / 3 / 4 5 = evaporator output 1 / 2 / 3 / 4 and common output	0	5		
AL 48	Anti-freeze temperature control probe alarm in heat pump mode 0 = disabled 1 = evaporator input 2 = evaporator output 1 / 2 3 = evaporator output 3 / 4 4 = evaporator output 1 / 2 / 3 / 4 5 = evaporator output 1 / 2 / 3 / 4 and common output	0	5		
AL 49	Condenser anti-freeze temperature control probe alarm 0 = disabled 1 = common condenser water input probe 2 = common condenser water input probe and condenser input 1 / 2 3 = common condenser water input probe and condenser input 3 / 4 4 = condenser water output probe 1 / 2 5 = condenser water output probe 3 / 4 6 = condenser output 1 / 2 / 3 / 4 7 = condenser output 1 / 2 / 3 / 4 and common output	0	7		
	Compressors high discharge temperature				
AL 50	Compressor high discharge temperature alarm setting	-50 -58	150 302	°C °F	Dec / Int Int
AL 51	Compressor high discharge temperature alarm differential	0.1 1	25.0 45	°C °F	Dec Int
AL 52	Maximum number of compressor high discharge temperature alarm interventions per hour When this number is exceeded the alarm moves from automatic to manual reset. Reset is always manual if AL52 = 0 Reset is always automatic if AL52 = 60 Reset moves from automatic to manual reset if AL52 moves from 1 to 59	0	60		
	Unit general block alarm n°1				
AL 53	Maximum number of unit general block alarm interventions per hour. Reset is always manual if AL53 = 0 Reset is always automatic if AL53 = 60 Reset moves from automatic to manual reset if AL53 moves from 1 to 59	0	60		
AL 54	Unit general block alarm delay with digital input activated	0	250	Sec	
AL 55	Unit general block alarm delay with digital input deactivated	0	250	10 Sec	10 sec
	Unit general block alarm n° 2				
AL 56	General alarm no. 2 operation 0 = only signals; it does not depend on AL57 (alarm relay and buzzer activated); always resets automatically 1 = the alarm blocks the unit; alarm reset depends on the value of par AL57	0	1		
AL 57	Maximum number of unit general block alarm no. 2 interventions per hour When this number is exceeded the alarm moves from automatic to manual reset. Reset is always manual if AL57 = 0 Reset is always automatic if AL57 = 60 **Reset moves from automatic to manual reset** if AL57 **moves from 1 to 59**	0	60		
AL 58	Unit general block alarm no. 2 delay with digital input activated	0	250	Sec	10 sec
AL 59	Unit general block alarm no. 2 delay with digital input deactivated	0	250	Sec	10 sec
	Evaporator inlet high temperature alarm				
AL 60	Maximum number of system input high water temperature probe alarm interventions per hour Reset is always manual if AL60 = 0 Reset is always automatic if AL60 = 60 Reset moves from automatic to manual if AL60 moves from 1 to 59	0	60		
AL 61	System input high water temperature probe alarm delay from compressor activation	0	250	Sec	10 sec
AL 62	System input high water temperature probe alarm set point	-50.0 -58	110 230	°C °F	Dec Int
AL 63	System input high water temperature probe alarm differential	0.1 1	25.0 45	°C °F	Dec Int
AL 64	NTC/PTC analogue input configuration for control of the system input high water temperature alarm 0 = function disabled	0	51		

Alarm relay					
AL 65	Activation of the alarm relay output in remote OFF or Stand-by mode 0 = alarm output enabled 1 = alarm output disabled	0	1		
AL 66	Alarm log reset password (see procedure)	0	999		
Anti-freeze alarm in free cooling					
AL 67	Alarm delay from signal frost in free cooling.	0	250	Sec	
AL 68	Maximum number hours alarm frost interventions in free cooling	0	60		
Auxiliary heating alarms					
AL 69	Compressor status in case in heating auxiliary alarm 0 = Keep Off 1 = ON again	0	1		
AL 70	Maximum number hours alarm interventions of thermal heaters	0	60		
AL 71	Maximum number interventions alarm time of block heaters	0	60		
Electronic thermostatic driver					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
Et 1	Configuration of probes Pb1 and Pb2 connected to the driver 0 = NTC temperature 1 = PTC temperature 2 = PT1000 temperature	0	2		
Et 2	Configuration of probes Pb3 and Pb4 connected to the driver 0 = NTC temperature 1 = PTC temperature 2 = PT1000 temperature 3 = pressure 4÷20mA 4 = pressure 0÷5V 5 = not present (low pressure defined transducers are used)	0	5		
Et 3	Type of valve: 1 = Unipolar 2 = Bipolar	1	2		
Et 4	Selection of the bipolar valve body connected to the driver (**WARNING the unique and valid reference has to be considered the datasheet made by valve manufacturer;)** 0 = Custom 1 = Alco EX4 – EX5 – EX6 2 = Alco EX7 3 = Alco EX8 4 = Carel E2V* 5 = Carel E2V*P 6 = Danfoss ETS – 25/50 7 = Danfoss ETS – 100 8 = Danfoss ETS – 250/400 9 = Sporlan SEI 0.5 – 11 10 = Sporlan SEI 30 11 = Sporlan SEH 50/100/175	0	11		
Et 5	Selection of the unipolar valve body connected to the driver 0 = Custom	0	0		
Et 6	Valve driving 0 = drives both valves 1 = drives only valve 1	0	1		
Et 7	Valve 1 output operation mode 0 = chiller 1 = heat pump 2 = chiller and heat pump 3 = not used 4 = not used 5 = not used	0	5		
Et 8	Valve 2 output operation mode 0 = chiller 1 = heat pump 2 = chiller and heat pump 3 = not used 4 = not used 5 = not used	0	5		
Et 9	Selection of output circuit valve 1 driver 1 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		

Et 10	Selection of output circuit valve 2 driver 1 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 11	Selection of output circuit valve 1 driver 2 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 12	Selection of output circuit valve 2 driver 2 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 13	Selection of output circuit valve 1 driver 3 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 14	Selection of output circuit valve 2 driver 3 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 15	Selection of output circuit valve 1 driver 4 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 16	Selection of output circuit valve 2 driver 4 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 17	Number of additional steps to achieve complete closure. When a closing request is received, the valve starts from the current number of steps and moves to 0, then closes for the set number of steps	0	250		
Et 18	Number of return steps in opening mode after the valve has been closed completely. These decompress any closing spring inside the valve or to prevent sealing the circuit	0	250		
Et 19	Maximum number of adjusting steps of the valve	Et20	8000		
Et 20	Minimum number of adjusting steps of the valve	0	Et19		
Et 21	Maximum current value per phase of the stepper motor	0	100	mA	x10 mA
Et 22	Current stand-by value	0	100	mA	x10 mA
Et 23	Maximum number of steps per second of the valve	0	600	Hz	
Et 24	Indicates the number of steps the valve has to move before compressor start-up. 0 = function is disabled	0	Et19		
Et 25	Sets valve manual operation mode 0= Automatic 1= Manual	0	1		
Et 26	Absolute number of steps the valve has to move in manual mode	0	Et19		
Et 27	Low pressure alarm activation delay (LOP)	0	250	Sec	
Et 28	High pressure alarm activation delay (MOP)	0	250	Sec	
Et 29	High overheating alarm activation delay	0	250	Sec	10 Sec
Et 30	Low overheating alarm activation delay	0	250	Sec	10 Sec
PID regulation in chiller mode					
Et 31	PID proportional constant in chiller mode	0.0	50.0	°C	Dec
Et 32	PID integral time in chiller mode	0	500	Sec	
Et 33	PID derivative constant in chiller mode	0	250	Sec	
Et 34	Overheating regulation set point during chiller mode	0.0	25.0	°C	Dec
Et 35	Overheating regulation dead band in chiller mode	0.0	5.0	°C	Dec
Et 36	High overheating threshold. The alarm status is signaled after the high overheating alarm activation delay	Et34	80.0	°C	Dec

Et 37	Low overheating threshold. The alarm status is signaled after the low overheating alarm activation delay	0.0	Et34	°C	Dec
Et 38	PID proportional constant in defrost	0.0	50.0	°C	Dec
Et 39	MOP Protection activation threshold. High evaporating temperature threshold. The alarm status is signaled after the high evaporating temperature alarm activation delay	0.0	50.0	°C	Dec
Et 40	STEP RATE during MOP or LOP protection (number of steps every second)	0	ET19		
Et 41	LOP Protection activation threshold. Low evaporating temperature threshold. The alarm status is signaled after the low evaporating temperature alarm activation delay	-50.0	50.0	°C	Dec
Et 42	Max Valve Opening in CH mode (percentage)	0	100	%	
Et 43	Min Valve Opening in CH mode (percentage)	0	100	%	
Et 44	Pressure measure Filter in CH mode	1	250	Sec	
Et 45	Interval of updating the valve output in CH mode	0	250	Sec	
Et 46	Delay of alarm in case of probe error in CH mode	0	250	Sec	
Et 47	% of valve during the ET46 time in CH mode	0	100	%	
	PID regulation in Heat pump mode				
Et 48	PID proportional constant in HP mode	0.0	50.0	°C	Dec
Et 49	PID integral time in HP mode	0	500	Sec	
Et 50	PID derivative constant in HP mode	0	250	Sec	
Et 51	Overheating regulation set point during HP mode	0.0	25.0	°C	Dec
Et 52	Overheating regulation dead band in HP mode	0.0	5.0	°C	Dec
Et 53	High overheating threshold. The alarm status is signaled after the high overheating alarm activation delay	Et54	80.0	°C	Dec
Et 54	Low overheating threshold. The alarm status is signaled after the low overheating alarm activation delay	0.0	Et53	°C	Dec
Et 55	Not used	0.0	50.0	°C	Dec
Et 56	MOP Protection activation threshold. High evaporating temperature threshold. The alarm status is signaled after the high evaporating temperature alarm activation delay	0.0	50.0	°C	Dec
Et 57	STEP RATE during MOP or LOP protection (number of steps every second)	0	100		
Et 58	LOP Protection activation threshold. Low evaporating temperature threshold. The alarm status is signaled after the low evaporating temperature alarm activation delay	-50.0	50.0	°C	Dec
Et 59	Max Valve Opening in HP mode (percentage)	0	100	%	
Et 60	Min Valve Opening in HP mode (percentage)	0	100	%	
Et 61	Pressure measure Filter in HP mode	1	250	Sec	
Et 62	Interval of updating the valve output in HP mode	0	250	Sec	
Et 63	Delay of alarm in case of probe error in HP mode	0	250	Sec	
Et 64	% of valve during the ET46 time in HP mode	0	100	%	
	Input/output				
Parameter	**Description**	**min**	**max**	**mu**	**Resolution**
	Local I/O				
IO 1	Pb1 configuration	0 o1	66 c115		
IO 2	Pb2 configuration	0 o1	66 c115		
IO 3	Pb3 configuration	0 o1	66 c115		
IO 4	Pb4 configuration	0 o1	66 c115		
IO 5	Pb5 configuration	0 o1	66 c115		
IO 6	Pb6 configuration	0 o1	66 c115		
IO 7	Pb7 configuration	0 o1	66 c115		
IO 8	Pb8 configuration	0 o1	66 c115		
IO 9	Pb9 configuration	0 o1	66 c115		
IO 10	Pb10 configuration	0 o1	66 c115		
IO 11	DI1 configuration	0	c115		
IO 12	DI2 configuration	0	c115		

IO 13	DI3 configuration	0	c115		
IO 14	DI4 configuration	0	c115		
IO 15	DI5 configuration	0	c115		
IO 16	DI6 configuration	0	c115		
IO 17	DI7 configuration	0	c115		
IO 18	DI8 configuration	0	c115		
IO 19	DI9 configuration	0	c115		
IO 20	DI10 configuration	0	c115		
IO 21	DI11 configuration	0	c115		
IO 22	DI12 configuration	0	c115		
IO 23	DI13 configuration	0	c115		
IO 24	DI14 configuration	0	c115		
IO 25	DI15 configuration	0	c115		
IO 26	DI16 configuration	0	c115		
IO 27	DI17 configuration	0	c115		
IO 28	DI18 configuration	0	c115		
IO 29	DI19 configuration	0	c115		
IO 30	DI20 configuration	0	c115		
IO 31	RL1 configuration	0	c195		
IO 32	RL2 configuration	0	c195		
IO 33	RL3 configuration	0	c195		
IO 34	RL4 configuration	0	c195		
IO 35	RL5 configuration	0	c195		
IO 36	RL6 configuration	0	c195		
IO 37	RL7 configuration	0	c195		
IO 38	RL8 configuration	0	c195		
IO 39	RL9 configuration	0	c195		
IO 40	RL10 configuration	0	c195		
IO 41	RL11 configuration	0	c195		
IO 42	RL12 configuration	0	c195		
IO 43	RL13 configuration	0	c195		
IO 44	RL14 configuration	0	c195		
IO 45	RL15 configuration	0	c195		
IO 46	AO1 configuration	0 o1	15 c195		
IO 47	AO2 configuration	0 o1	15 c195		
IO 48	AO3 configuration	0 o1	15 c195		
IO 49	AO4 configuration	0 o1	15 c195		
IO 50	AO5 configuration	0 o1	32 c195		
IO 51	AO6 configuration	0 o1	32 c195		
XEV I/O					
IO 52	1st XEV Pb1 configuration	0	66		
IO 53	1st XEV Pb2 configuration	0	66		
IO 54	1st XEV Pb3 configuration	0	66		
IO 55	1st XEV Pb4 configuration	0	66		
IO 56	2nd XEV Pb1 configuration	0	66		
IO 57	2nd XEV Pb2 configuration	0	66		
IO 58	2nd XEV Pb3 configuration	0	66		
IO 59	2nd XEV Pb4 configuration	0	66		
IO 60	3rd XEV Pb1 configuration	0	66		
IO 61	3rd XEV Pb2 configuration	0	66		
IO 62	3rd XEV Pb3 configuration	0	66		
IO 63	3rd XEV Pb4 configuration	0	66		
IO 64	4th XEV Pb1 configuration	0	66		
IO 65	4th XEV Pb2 configuration	0	66		
IO 66	4th XEV Pb3 configuration	0	66		
IO 67	4th XEV Pb4 configuration	0	66		
1st Expansion I/O					
IO 68	1st Expansion Pb1 configuration	0 o1	66 c115		
IO 69	1st Expansion Pb2 configuration	0 o1	66 c115		
IO 70	1st Expansion Pb3 configuration	0 o1	66 c115		
IO 71	1st Expansion Pb4 configuration	0 o1	66 c115		
IO 72	1st Expansion Pb5 configuration	0 o1	66 c115		

IO 73	1st Expansion Pb6 configuration	0 o1	66 c115		
IO 74	1st Expansion Pb7 configuration	0 o1	66 c115		
IO 75	1st Expansion DI1 configuration	0	c115		
IO 76	1st Expansion DI2 configuration	0	c115		
IO 77	1st Expansion DI3 configuration	0	c115		
IO 78	1st Expansion RL1 configuration	0	c195		
IO 79	1st Expansion RL2 configuration	0	c195		
IO 80	1st Expansion RL3 configuration	0	c195		
IO 81	1st Expansion RL4 configuration	0	c195		
IO 82	1st Expansion RL5 configuration	0	c195		
IO 83	1st Expansion RL6 configuration	0	c195		
IO 84	1st Expansion AO1 configuration	0 o1	15 c195		
IO 85	1st Expansion AO2 configuration	0 o1	15 c195		
IO 86	1st Expansion AO3 configuration	0 o1	15 c195		
2nd Expansion I/O					
IO 87	2nd Expansion Pb1 configuration	0 o1	66 c115		
IO 88	2nd Expansion Pb2 configuration	0 o1	66 c115		
IO 89	2nd Expansion Pb3 configuration	0 o1	66 c115		
IO 90	2nd Expansion Pb4 configuration	0 o1	66 c115		
IO 91	2nd Expansion Pb5 configuration	0 o1	66 c115		
IO 92	2nd Expansion Pb6 configuration	0 o1	66 c115		
IO 93	2nd Expansion Pb7 configuration	0 o1	66 c115		
IO 94	2nd Expansion DI1 configuration	0	c115		
IO 95	2nd Expansion DI2 configuration	0	c115		
IO 96	2nd Expansion DI3 configuration	0	c115		
IO 97	2nd Expansion RL1 configuration	0	c195		
IO 98	2nd Expansion RL2 configuration	0	c195		
IO 99	2nd Expansion RL3 configuration	0	c195		
IO 100	2nd Expansion RL4 configuration	0	c195		
IO 101	2nd Expansion RL5 configuration	0	c195		
IO 102	2nd Expansion RL6 configuration	0	c195		
IO 103	2nd Expansion AO1 configuration	0 o1	15 c195		
IO 104	2nd Expansion AO2 configuration	0 o1	15 c195		
IO 105	2nd Expansion AO3 configuration	0 o1	15 c195		
3rd Expansion I/O					
IO 106	3rd Expansion Pb1 configuration	0 o1	66 c115		
IO 107	3rd Expansion Pb2 configuration	0 o1	66 c115		
IO 108	3rd Expansion Pb3 configuration	0 o1	66 c115		
IO 109	3rd Expansion Pb4 configuration	0 o1	66 c115		
IO 110	3rd Expansion Pb5 configuration	0 o1	66 c115		
IO 111	3rd Expansion Pb6 configuration	0 o1	66 c115		
IO 112	3rd Expansion Pb7 configuration	0 o1	66 c115		
IO 113	3rd Expansion DI1 configuration	0	c115		
IO 114	3rd Expansion DI2 configuration	0	c115		
IO 115	3rd Expansion DI3 configuration	0	c115		
IO 116	3rd Expansion RL1 configuration	0	c195		
IO 117	3rd Expansion RL2 configuration	0	c195		
IO 118	3rd Expansion RL3 configuration	0	c195		
IO 119	3rd Expansion RL4 configuration	0	c195		
IO 120	3rd Expansion RL5 configuration	0	c195		
IO 121	3rd Expansion RL6 configuration	0	c195		

IO 122	3rd Expansion AO1 configuration	0 o1	15 c195		
IO 123	3rd Expansion AO2 configuration	0 o1	15 c195		
IO 124	3rd Expansion AO3 configuration	0 o1	15 c195		
4th Expansion I/O					
IO 125	4th Expansion Pb1 configuration	0 o1	66 c115		
IO 126	4th Expansion Pb2 configuration	0 o1	66 c115		
IO 127	4th Expansion Pb3 configuration	0 o1	66 c115		
IO 128	4th Expansion Pb4 configuration	0 o1	66 c115		
IO 129	4th Expansion Pb5 configuration	0 o1	66 c115		
IO 130	4th Expansion Pb6 configuration	0 o1	66 c115		
IO 131	4th Expansion Pb7 configuration	0 o1	66 c115		
IO 132	4th Expansion DI1 configuration	0	c115		
IO 133	4th Expansion DI2 configuration	0	c115		
IO 134	4th Expansion DI3 configuration	0	c115		
IO 135	4th Expansion RL1 configuration	0	c195		
IO 136	4th Expansion RL2 configuration	0	c195		
IO 137	4th Expansion RL3 configuration	0	c195		
IO 138	4th Expansion RL4 configuration	0	c195		
IO 139	4th Expansion RL5 configuration	0	c195		
IO 140	4th Expansion RL6 configuration	0	c195		
IO 141	4th Expansion AO1 configuration	0 o1	15 c195		
IO 142	4th Expansion AO2 configuration	0 o1	15 c195		
IO 143	4th Expansion AO3 configuration	0 o1	15 c195		
Analog Input Calibration					
Parameter	**Description**	**min**	**max**	**mu**	**Resolution**
Local I/O					
CA 1	Pb1 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 2	Pb2 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 3	Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 4	Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 5	Pb5 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 6	Pb6 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 7	Pb7 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 8	Pb8 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole

CA 9	Pb9 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 10	Pb10 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
XEV I/O					
CA 11	1st XEV Pb1 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 12	1st XEV Pb2 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 13	1st XEV Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 14	1st XEV Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 15	2nd XEV Pb1 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 16	2nd XEV Pb2 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 17	2nd XEV Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 18	2nd XEV Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 19	3rd XEV Pb1 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 20	3rd XEV Pb2 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 21	3rd XEV Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 22	3rd XEV Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 23	4th XEV Pb1 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 24	4th XEV Pb2 calibration	-12.0 -21	12.0 21	°C °F	decimal whole
CA 25	4th XEV Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 26	4th XEV Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
1st Expansion I/O					
CA 27	1st Expansion Pb1 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 28	1st Expansion Pb2 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 29	1st Expansion Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 30	1st Expansion Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole

CA 31	1st Expansion Pb5 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 32	1st Expansion Pb6 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 33	1st Expansion Pb7 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
2nd Expansion I/O					
CA 34	2nd Expansion Pb1 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 35	2nd Expansion Pb2 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 36	2nd Expansion Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 37	2nd Expansion Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 38	2nd Expansion Pb5 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 39	2nd Expansion Pb6 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 40	2nd Expansion Pb7 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
3rd Expansion I/O					
CA 41	3rd Expansion Pb1 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 42	3rd Expansion Pb2 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 43	3rd Expansion Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 44	3rd Expansion Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 45	3rd Expansion Pb5 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 46	3rd Expansion Pb6 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 47	3rd Expansion Pb7 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
4th Expansion I/O					
CA 48	4th Expansion Pb1 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole

CA 49	4th Expansion Pb2 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 50	4th Expansion Pb3 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 51	4th Expansion Pb4 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 52	4th Expansion Pb5 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 53	4th Expansion Pb6 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
CA 54	4th Expansion Pb7 calibration	-12.0 -21 -5.0 -72	12.0 21 5.0 72	°C °F bar PSI	decimal whole decimal whole
Analog Input Ranges					
Parameter	**Description**	**min**	**max**	**mu**	**Resolution**
Local I/O					
RA 1	Pb1 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 2	Pb1 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 3	Pb2 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 4	Pb2 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 5	Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 6	Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 7	Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 8	Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 9	Pb5 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 10	Pb5 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 11	Pb6 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 12	Pb6 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 13	Pb7 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 14	Pb7 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 15	Pb8 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 16	Pb8 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 17	Pb9 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 18	Pb9 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 19	Pb10 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 20	Pb10 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
XEV I/O					
RA 21	1st XEV Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 22	1st XEV Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 23	1st XEV Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole

RA 24	1st XEV Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 25	2nd XEV Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 26	2nd XEV Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 27	2nd XEV Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 28	2nd XEV Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 29	3rd XEV Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 30	3rd XEV Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 31	3rd XEV Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 32	3rd XEV Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 33	4th XEV Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 34	4th XEV Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 35	4th XEV Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 36	4th XEV Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
1st Expansion I/O					
RA 37	1st Expansion Pb1 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 38	1st Expansion Pb1 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 39	1st Expansion Pb2 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 40	1st Expansion Pb2 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 41	1st Expansion Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 42	1st Expansion Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 43	1st Expansion Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 44	1st Expansion Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 45	1st Expansion Pb5 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 46	1st Expansion Pb5 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 47	1st Expansion Pb6 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 48	1st Expansion Pb6 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 49	1st Expansion Pb7 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 50	1st Expansion Pb7 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
2nd Expansion I/O					
RA 51	2nd Expansion Pb1 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 52	2nd Expansion Pb1 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 53	2nd Expansion Pb2 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 54	2nd Expansion Pb2 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 55	2nd Expansion Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 56	2nd Expansion Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 57	2nd Expansion Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 58	2nd Expansion Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 59	2nd Expansion Pb5 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole

RA 60	2nd Expansion Pb5 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 61	2nd Expansion Pb6 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 62	2nd Expansion Pb6 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 63	2nd Expansion Pb7 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 64	2nd Expansion Pb7 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
3rd Expansion I/O					
RA 65	3rd Expansion Pb1 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 66	3rd Expansion Pb1 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 67	3rd Expansion Pb2 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 68	3rd Expansion Pb2 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 69	3rd Expansion Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 70	3rd Expansion Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 71	3rd Expansion Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 72	3rd Expansion Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 73	3rd Expansion Pb5 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 74	3rd Expansion Pb5 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 75	3rd Expansion Pb6 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 76	3rd Expansion Pb6 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 77	3rd Expansion Pb7 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 78	3rd Expansion Pb7 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
4th Expansion I/O					
RA 79	4th Expansion Pb1 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 80	4th Expansion Pb1 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 81	4th Expansion Pb2 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 82	4th Expansion Pb2 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 83	4th Expansion Pb3 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 84	4th Expansion Pb3 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 85	4th Expansion Pb4 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 86	4th Expansion Pb4 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 87	4th Expansion Pb5 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 88	4th Expansion Pb5 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 89	4th Expansion Pb6 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 90	4th Expansion Pb6 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 91	4th Expansion Pb7 Pressure value at 0,5V / 4mA	-1.0 -14	50.0 725	bar PSI	decimal whole
RA 92	4th Expansion Pb7 Pressure value at 4,5V / 20mA	-1.0 -14	50.0 725	bar PSI	decimal whole

9. ANALOGUE - DIGITAL INPUTS/OUTPUTS CONFIGURATIONS

On board of the controller, it allows to configure 20 DI, 15 DO, 10 AI and 6 AO in maximum. If more I/O needed, please use expansion module IPROEX60D. For one IPROEX60D, it can connect with 3 DI, 6 DO, 7 AI and 3 AO. It can has 4 IPROEX60D at most. In addition, 4 electronic thermostatic drivers XEV20D can provide 16 more AI (4 for each).

Use parameters in group IO to configure analogue-digital inputs/outputs.

DIGITAL INPUTS CONFIGURATION

- IO11 – IO30: On board DI (1 - 20)
- IO75 – IO77: 1st expansion DI (1 - 3)
- IO94 – IO96: 2nd expansion DI (1 - 3)
- IO113 – IO115: 3rd expansion DI (1 - 3)
- IO132 – IO134: 4th expansion DI (1 - 3)

DIGITAL OUTPUTS CONFIGURATION

- IO31 – IO45: On board relays (1 - 15)
- IO78 – IO83: 1st expansion relays (1 - 6)
- IO97 – IO102: 2nd expansion relays (1 - 6)
- IO116 – IO121: 3rd expansion relays (1 - 6)
- IO135 – IO140: 4th expansion relays (1 - 6)

ANALOGUE INPUTS CONFIGURATION

- IO01 – IO10: On board probes (1 - 10)
- IO52 – IO55: 1st XEV20D probes (1 - 4)
- IO56 – IO59: 2nd XEV20D probes (1 - 4)
- IO60 – IO63: 3rd XEV20D probes (1 - 4)
- IO64 – IO67: 4th XEV20D probes (1 - 4)
- IO68 – IO74: 1st expansion probes (1 - 7)
- IO87 – IO93: 2nd expansion probes (1 - 7)
- IO106 – IO112: 3rd expansion probes (1 - 7)
- IO125 – IO131: 4th expansion probes (1 - 7)

ANALOGUE OUTPUTS CONFIGURATION

- IO46 – IO51: On board AO (1 - 6)
- IO84 – IO86: 1st expansion AO (1 - 3)
- IO103 – IO105: 2nd expansion AO (1 - 3)
- IO122 – IO124: 3rd expansion AO (1 - 3)
- IO141 – IO143: 4th expansion AO (1 - 3)

Note:
For digital inputs/outputs, it is possible to select polarity. In I/O configuration, use prefix “o” to indicate “open” polarity which means the DI/DO is activated when contact is open; use prefix “c” to indicate “close” polarity which means the DI/DO is activated when contact is closed.
For example:
IO11 = o1 - Remote ON/OFF
IO11 = c1 - Remote ON/OFF
They all mean DI01 is configured as “Remote ON/OFF” but with different polarity. And the DI type is 1.
In the paragraphs below, we will use “**DI type**”, “**DO type**”, “**AI type**” and “**AO type**” to indicated function index of all the I/O.
For analogue inputs/outputs, it is also possible to configured as digital inputs/outputs. For example an AI can assume values from 0 to 66 (if configured as analog) and from 67 (that correspond to o1) to 296 (that correspond to c115).

Remember that:

- AO1, AO2, AO3 and AO4 can be configured only as 0-10V;
- AO5 and AO6 can be configured as 0-10V, PWM and 4-20mA;
- in the expansions modules, the AO can be configured only as 0-10V.

9.1 DI1 – DI20 DIGITAL INPUTS CONFIGURATION (DI TYPE)

0. Disabled
1. Remote ON/OFF
2. Remote cooling/heating
3. Evaporator flow switch
4. Condenser flow switch
5. Sanitary water flow switch
6. Antifreeze alarm circuit 1
7. Antifreeze alarm circuit 2
8. Antifreeze alarm circuit 3
9. Antifreeze alarm circuit 4
10. High pressure switch circuit 1
11. High pressure switch circuit 2
12. High pressure switch circuit 3
13. High pressure switch circuit 4
14. Low pressure switch circuit 1
15. Low pressure switch circuit 2
16. Low pressure switch circuit 3
17. Low pressure switch circuit 4
18. Compressor 1 discharge thermostat
19. Compressor 2 discharge thermostat
20. Compressor 3 discharge thermostat
21. Compressor 4 discharge thermostat
22. Compressor 5 discharge thermostat
23. Compressor 6 discharge thermostat
24. Compressor 7 discharge thermostat
25. Compressor 8 discharge thermostat
26. Compressor 9 discharge thermostat
27. Compressor 10 discharge thermostat
28. Compressor 11 discharge thermostat
29. Compressor 12 discharge thermostat
30. Compressor 13 discharge thermostat
31. Compressor 14 discharge thermostat
32. Compressor 15 discharge thermostat
33. Compressor 16 discharge thermostat
34. Compressor 1 thermal overload
35. Compressor 2 thermal overload
36. Compressor 3 thermal overload
37. Compressor 4 thermal overload
38. Compressor 5 thermal overload
39. Compressor 6 thermal overload
40. Compressor 7 thermal overload
41. Compressor 8 thermal overload
42. Compressor 9 thermal overload
43. Compressor 10 thermal overload
44. Compressor 11 thermal overload
45. Compressor 12 thermal overload
46. Compressor 13 thermal overload
47. Compressor 14 thermal overload
48. Compressor 15 thermal overload
49. Compressor 16 thermal overload
50. Fan Overload Circuit 1
51. Fan Overload Circuit 2
52. Fan Overload Circuit 3
53. Fan Overload Circuit 4
54. Fan Overload Circuit 1/2
55. Fan Overload Circuit 3/4
56. Evaporator main pump / Supply fan Overload
57. Evaporator support pump Overload
58. Condenser main pump Overload
59. Condenser support pump Overload

60. Circuit 1 heat recovery request
61. Circuit 2 heat recovery request
62. Circuit 3 heat recovery request
63. Circuit 4 heat recovery request
64. End of circuit 1 defrost
65. End of circuit 2 defrost
66. End of circuit 3 defrost
67. End of circuit 4 defrost
68. Energy Saving
69. Oil pressure/level switch compressor 1
70. Oil pressure/level switch compressor 2
71. Oil pressure/level switch compressor 3
72. Oil pressure/level switch compressor 4
73. Oil pressure/level switch compressor 5
74. Oil pressure/level switch compressor 6
75. Oil pressure/level switch compressor 7
76. Oil pressure/level switch compressor 8
77. Oil pressure/level switch compressor 9
78. Oil pressure/level switch compressor 10
79. Oil pressure/level switch compressor 11
80. Oil pressure/level switch compressor 12
81. Oil pressure/level switch compressor 13
82. Oil pressure/level switch compressor 14
83. Oil pressure/level switch compressor 15
84. Oil pressure/level switch compressor 16
85. Circuit 1 pump down pressure switch
86. Circuit 2 pump down pressure switch
87. Circuit 3 pump down pressure switch
88. Circuit 4 pump down pressure switch
89. Generic alarm 1 digital input
90. Generic alarm 2 digital input
91. Digital input working in RTC automatic enabling (time band)/manual (keyboard) mode
92. Digital input working with supply fan only
93. Cooling/Heating demand digital input (condensing unit)
94. Cooling demand digital input (condensing unit)
95. Heating demand digital input (condensing unit)
96. Capacity step 1 demand digital input (condensing unit)
97. Capacity step 2 demand digital input (condensing unit)
98. Capacity step 3 demand digital input (condensing unit)
99. Capacity step 4 demand digital input (condensing unit)
100. Capacity step 5 demand digital input (condensing unit)
101. Capacity step 6 demand digital input (condensing unit)
102. Capacity step 7 demand digital input (condensing unit)
103. Capacity step 8 demand digital input (condensing unit)
104. Capacity step 9 demand digital input (condensing unit)
105. Capacity step 10 demand digital input (condensing unit)
106. Capacity step 11 demand digital input (condensing unit)
107. Capacity step 12 demand digital input (condensing unit)
108. Capacity step 13 demand digital input (condensing unit)
109. Capacity step 14 demand digital input (condensing unit)
110. Capacity step 15 demand digital input (condensing unit)
111. Capacity step 16 demand digital input (condensing unit)
112. Solar panels flow switch
113. Phase sequence relay
114. Thermal heaters
115. Block heaters

9.2 RL1- RL15 DIGITAL OUTPUTS CONFIGURATION (DO TYPE)

0. Disabled
1. Alarm
2. Evaporator main pump/supply fan
3. Evaporator support pump
4. Antifreeze heaters / support / boiler 1st step
5. Antifreeze heaters / support / boiler 2nd step
6. Antifreeze heaters / support / boiler 3rd step
7. Antifreeze heaters / support / boiler 4th step
8. Heat recovery condenser main pump
9. Heat recovery condenser support water pump
10. Cycle inversion valve circuit 1
11. Cycle inversion valve circuit 2
12. Cycle inversion valve circuit 3
13. Cycle inversion valve circuit 4
14. Circuit 1 ON/OFF Fan 1st step
15. Circuit 1 ON/OFF Fan 2nd step
16. Circuit 1 ON/OFF Fan 3rdstep
17. Circuit 1 ON/OFF Fan 4th step
18. Circuit 2 ON/OFF Fan 1st step
19. Circuit 2 ON/OFF Fan 2nd step
20. Circuit 2 ON/OFF Fan 3rdstep
21. Circuit 2 ON/OFF Fan 4th step
22. Circuit 3 ON/OFF Fan 1st step
23. Circuit 3 ON/OFF Fan 2nd step
24. Circuit 3 ON/OFF Fan 3rdstep
25. Circuit 3 ON/OFF Fan 4th step
26. Circuit 4 ON/OFF Fan 1st step
27. Circuit 4 ON/OFF Fan 2nd step
28. Circuit 4 ON/OFF Fan 3rdstep
29. Circuit 4 ON/OFF Fan 4th step
30. Circuit 1 pump down solenoid valve
31. Circuit 2 pump down solenoid valve
32. Circuit 3 pump down solenoid valve
33. Circuit 4 pump down solenoid valve
34. Circuit 1 heat recovery valve
35. Circuit 2 heat recovery valve
36. Circuit 3 heat recovery valve
37. Circuit 4 heat recovery valve
38. Free-cooling ON/OFF valve
39. Free-cooling ON/OFF fan
40. Circuit 1 1st step split coil
41. Circuit 1 2ndstep split coil
42. Circuit 2 1st step split coil
43. Circuit 2 2ndstep split coil
44. Circuit 3 1st step split coil
45. Circuit 3 2ndstep split coil
46. Circuit 4 1st step split coil
47. Circuit 4 2ndstep split coil
48. Auxiliary output n° 1
49. Auxiliary output n° 2
50. Auxiliary output n° 3
51. Auxiliary output n° 4
52. (Screw) Compressor 1 intermittent valve
53. (Screw) Compressor 2 intermittent valve
54. (Screw) Compressor 3 intermittent valve
55. (Screw) Compressor 4 intermittent valve
56. (Screw) Compressor 5 intermittent valve
57. (Screw) Compressor 6 intermittent valve
58. (Screw) Compressor 7 intermittent valve
59. (Screw) Compressor 8 intermittent valve

60. Compressor 1 liquid injection solenoid valve
61. Compressor 2 liquid injection solenoid valve
62. Compressor 3 liquid injection solenoid valve
63. Compressor 4 liquid injection solenoid valve
64. Compressor 5 liquid injection solenoid valve
65. Compressor 6 liquid injection solenoid valve
66. Compressor 7 liquid injection solenoid valve
67. Compressor 8 liquid injection solenoid valve
68. Domestic hot water valve 1
69. Domestic hot water valve 2
70. Domestic hot water heater (1st step)
71. Domestic hot water heater (2nd step)
72. Domestic hot water heater (3rd step)
73. Solar panels pump
74. Solar coil enabling/exclusion ON/OFF valve
75. Domestic hot water pump
76. Compressor 1 Direct start-up
    Compressor 1 Winding 1 Part Winding start-up
    Compressor 1 Line 1 Star Delta start-up
77. Compressor 1 Winding 2 Part Winding start-up
    Compressor 1 Line 2 Star Delta start-up
78. Compressor 1 Star Delta start-up: Star centre
79. Compressor 1 Unloader 1
80. Compressor 1 Unloader 2
81. Compressor 1 Unloader 3
82. Compressor 1 Unloader 4
83. Compressor 1 gas by-pass valve during start-up
84. Compressor 2 Direct start-up
    Compressor 2 Winding 1 Part Winding start-up
    Compressor 2 Line 1 Star Delta start-up
85. Compressor 2 Winding 2 Part Winding start-up
    Compressor 2 Line 2 Star Delta start-up
86. Compressor 2 Star Delta start-up: Star centre
87. Compressor 2 Unloader 1
88. Compressor 2 Unloader 2
89. Compressor 2 Unloader 3
90. Compressor 2 Unloader 4
91. Compressor 2 gas by-pass valve during start-up
92. Compressor 3 Direct start-up
    Compressor 3 Winding 1 Part Winding start-up
    Compressor 3 Line 1 Star Delta start-up
93. Compressor 3 Winding 2 Part Winding start-up
    Compressor 3 Line 2 Star Delta start-up
94. Compressor 3 Star Delta start-up: Star centre
95. Compressor 3 Unloader 1
96. Compressor 3 Unloader 2
97. Compressor 3 Unloader 3
98. Compressor 3 Unloader 4
99. Compressor 3 gas by-pass valve during start-up
100. Compressor 4 Direct start-up
    Compressor 4 Winding 1 Part Winding start-up
    Compressor 4 Line 1 Star Delta start-up
101. Compressor 4 Winding 2 Part Winding start-up
    Compressor 4 Line 2 Star Delta start-up
102. Compressor 4 Star Delta start-up: Star centre
103. Compressor 4 Unloader 1
104. Compressor 4 Unloader 2
105. Compressor 4 Unloader 3
106. Compressor 4 Unloader 4
107. Compressor 4 gas by-pass valve during start-up

108. Compressor 5 Direct start-up
Compressor 5 Winding 1 Part Winding start-up
Compressor 5 Line 1 Star Delta start-up
109. Compressor 5 Winding 2 Part Winding start-up
Compressor 5 Line 2 Star Delta start-up
110. Compressor 5 Star Delta start-up: Star centre
111. Compressor 5 Unloader 1
112. Compressor 5 Unloader 2
113. Compressor 5 Unloader 3
114. Compressor 5 Unloader 4
115. Compressor 5 gas by-pass valve during start-up
116. Compressor 6 Direct start-up
Compressor 6 Winding 1 Part Winding start-up
Compressor 6 Line 1 Star Delta start-up
117. Compressor 6 Winding 2 Part Winding start-up
Compressor 6 Line 2 Star Delta start-up
118. Compressor 6 Star Delta start-up: Star centre
119. Compressor 6 Unloader 1
120. Compressor 6 Unloader 2
121. Compressor 6 Unloader 3
122. Compressor 6 Unloader 4
123. Compressor 6 gas by-pass valve during start-up
124. Compressor 7 Direct start-up
Compressor 7 Winding 1 Part Winding start-up
Compressor 7 Line 1 Star Delta start-up
125. Compressor 7 Winding 2 Part Winding start-up
Compressor 7 Line 2 Star Delta start-up
126. Compressor 7 Star Delta start-up: Star centre
127. Compressor 7 Unloader 1
128. Compressor 7 Unloader 2
129. Compressor 7 Unloader 3
130. Compressor 7 Unloader 4
131. Compressor 7 gas by-pass valve during start-up
132. Compressor 8 Direct start-up
Compressor 8 Winding 1 Part Winding start-up
Compressor 8 Line 1 Star Delta start-up
133. Compressor 8 Winding 2 Part Winding start-up
Compressor 8 Line 2 Star Delta start-up
134. Compressor 8 Star Delta start-up: Star centre
135. Compressor 8 Unloader 1
136. Compressor 8 Unloader 2
137. Compressor 8 Unloader 3
138. Compressor 8 Unloader 4
139. Compressor 8 gas by-pass valve during start-up
140. Compressor 9 Direct start-up
141. Compressor 10 Direct start-up
142. Compressor 11 Direct start-up
143. Compressor 12 Direct start-up
144. Compressor 13 Direct start-up
145. Compressor 14 Direct start-up
146. Compressor 15 Direct start-up
147. Compressor 16 Direct start-up
148. Charge modulating valve circuit 1
149. Charge modulating valve circuit 2
150. Charge modulating valve circuit 3
151. Charge modulating valve circuit 4
152. Unit enabled
153. APS Alarm (Phase sequence)
154. HP1 Alarm (High pressure circuit 1)
155. HP2 Alarm (High pressure circuit 2)
156. HP3 Alarm (High pressure circuit 3)
157. HP4 Alarm (High pressure circuit 4)

158. LP1 Alarm (Low pressure circuit 1)
159. LP2 Alarm (Low pressure circuit 2)
160. LP3 Alarm (Low pressure circuit 3)
161. LP4 Alarm (Low pressure circuit 4)
162. AEFL Alarm (Evaporator Flow)
163. ACFL Alarm (Condenser Flow)
164. AHFL Alarm (Domestic Water Flow)
165. APFL Alarm (Solar Panels Flow)
166. ALC1 Alarm (Unit Block #1)
167. ALC2 Alarm (Unit Block #1)
168. C1tr Alarm (Overload Compressor 1)
169. C2tr Alarm (Overload Compressor 2)
170. C3tr Alarm (Overload Compressor 3)
171. C4tr Alarm (Overload Compressor 4)
172. C5tr Alarm (Overload Compressor 5)
173. C6tr Alarm (Overload Compressor 6)
174. C7tr Alarm (Overload Compressor 7)
175. C8tr Alarm (Overload Compressor 8)
176. C9tr Alarm (Overload Compressor 9)
177. C10tr Alarm (Overload Compressor 10)
178. C11tr Alarm (Overload Compressor 11)
179. C12tr Alarm (Overload Compressor 12)
180. C13tr Alarm (Overload Compressor 13)
181. C14tr Alarm (Overload Compressor 14)
182. C15tr Alarm (Overload Compressor 15)
183. C16tr Alarm (Overload Compressor 16)
184. B1A Alarm (Anti-freeze Circuit 1)
185. B2A Alarm (Anti-freeze Circuit 2)
186. B3A Alarm (Anti-freeze Circuit 3)
187. B4A Alarm (Anti-freeze Circuit 4)
188. Auxiliary heating 1st step
189. Auxiliary heating 2nd step
190. Auxiliary heating 3rd step
191. Auxiliary heating 4th step
192. Refcomp Inverter Power
193. IV management valve 14
194. IV management valve 15
195. IV management valve 16

9.3 ANALOGUE INPUTS PB1 - PB10 CONFIGURATION (AI TYPE)

0. Disabled
1. Compressor 1 PTC discharge temperature probe
2. Compressor 2 PTC discharge temperature probe
3. Compressor 3 PTC discharge temperature probe
4. Compressor 4 PTC discharge temperature probe
5. Compressor 5 PTC discharge temperature probe
6. Compressor 6 PTC discharge temperature probe
7. Compressor 7 PTC discharge temperature probe
8. Compressor 8 PTC discharge temperature probe
9. Compressor 9 PTC discharge temperature probe
10. Compressor 10 PTC discharge temperature probe
11. Compressor 11 PTC discharge temperature probe
12. Compressor 12 PTC discharge temperature probe
13. Compressor 13 PTC discharge temperature probe
14. Compressor 14 PTC discharge temperature probe
15. Compressor 15 PTC discharge temperature probe
16. Compressor 16 PTC discharge temperature probe
17. Evaporator common input NTC temperature probe
18. Evaporator 1 output NTC temperature probe
19. Evaporator 2 output NTC temperature probe
20. Evaporator 3 output NTC temperature probe

21. Evaporator 4 output NTC temperature probe
22. Evaporator common outlet NTC temperature probe
23. Condenser hot water common input NTC temperature probe
24. Circuit 1 condenser hot water input NTC temperature probe
25. Circuit 2 condenser hot water input NTC temperature probe
26. Circuit 3 condenser hot water input NTC temperature probe
27. Circuit 4 condenser hot water input NTC temperature probe
28. Circuit 1 condenser hot water output NTC temperature probe
29. Circuit 2 condenser hot water output NTC temperature probe
30. Circuit 3 condenser hot water output NTC temperature probe
31. Circuit 4 condenser hot water output NTC temperature probe
32. Condenser hot water common output NTC temperature probe
33. System water inlet NTC temperature probe (free-cooling)
34. External air temperature NTC temperature probe (free-cooling)
35. Dynamic/boiler function/change over set-point external air temperature NTC temperature probe
36. Circuit n° 1 combined defrost NTC temperature probe
37. Circuit n° 2 combined defrost NTC temperature probe
38. Circuit n° 3 combined defrost NTC temperature probe
39. Circuit n° 4 combined defrost NTC temperature probe
40. Circuit n° 1 auxiliary outlet NTC temperature probe
41. Circuit n° 2 auxiliary outlet NTC temperature probe
42. Circuit n° 3 auxiliary outlet NTC temperature probe
43. Circuit n° 4 auxiliary outlet NTC temperature probe
44. Domestic hot water temperature control NTC temperature probe
45. Domestic hot water temperature safety NTC temperature probe
46. Discharge NTC temperature probe
47. Solar panel NTC temperature probe
48. Circuit 1 condensing temperature NTC probe
49. Circuit 2 condensing temperature NTC probe
50. Circuit 3 condensing temperature NTC probe
51. Circuit 4 condensing temperature NTC probe
52. Circuit n° 1 condensing pressure probe (4÷20 mA / 0÷ 5 Volt)
53. Circuit n° 2 condensing pressure probe (4÷20 mA / 0÷ 5 Volt)
54. Circuit n° 3 condensing pressure probe (4÷20 mA / 0÷ 5 Volt)
55. Circuit n° 4 condensing pressure probe (4÷20 mA / 0÷ 5 Volt)
56. Circuit n° 1 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt)
57. Circuit n° 2 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt)
58. Circuit n° 3 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt)
59. Circuit n° 4 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt)
60. Auxiliary output n° 1 pressure probe (4÷20 mA / 0÷ 5 Volt)
61. Auxiliary output n° 2 pressure probe (4÷20 mA / 0÷ 5 Volt)
62. Auxiliary output n° 3 pressure probe (4÷20 mA / 0÷ 5 Volt)
63. Auxiliary output n° 4 pressure probe (4÷20 mA / 0÷ 5 Volt)
64. Dynamic set-point 4÷20 mA probe

Digital input (o1-c115, see relevant configurations)

9.4 CONFIGURATION OF THE OUT1 / OUT4 PROPORTIONAL OUTPUTS (AO TYPE)

0÷10V output signal

0. Output disabled
1. 0÷10V proportional output for circuit n° 1 fan speed control
2. 0÷10V proportional output for circuit n° 2 fan speed control
3. 0÷10V proportional output for circuit n° 3 fan speed control
4. 0÷10V proportional output for circuit n° 4 fan speed control
5. 0÷10V dampers control proportional output / free-cooling mixer valve
6. 0÷10V hot water three-way valve control 0÷10V proportional output
7. 0÷10V auxiliary output n° 1
8. 0÷10V auxiliary output n° 2
9. 0÷10V auxiliary output n° 3
10. 0÷10V auxiliary output n° 4
11. Circuit n° 1 compressor 1 0÷10V modulating output
12. Circuit n° 2 compressor 1 0÷10V modulating output
13. Circuit n° 3 compressor 1 0÷10V modulating output
14. Circuit n° 4 compressor 1 0÷10V modulating output
15. Modulating output 0÷10V auxiliary heating

External relay driving ON/OFF output (o1-c195, see relevant configurations)

9.5 CONFIGURATION OF THE OUT5 / OUT6 PROPORTIONAL OUTPUTS

4÷20mA - 0÷10V - PWM configurable output signal

From 0 to 14 as Out1-Out4 configuration

16. Circuit N° 1 external phase-cut command PWM signal = TF 1
17. Circuit N° 2 external phase-cut command PWM signal = TF 2
18. 4÷20mA proportional output for circuit n° 1 fan speed control
19. 4÷20mA proportional output for circuit n° 2 fan speed control
20. 4÷20mA proportional output for circuit n° 3 fan speed control
21. 4÷20mA proportional output for circuit n° 4 fan speed control
22. 4÷20mA dampers control proportional output / free-cooling mixer valve
23. 4÷20mA hot water three-way valve control proportional output
24. 4÷20mA auxiliary output n° 1
25. 4÷20mA auxiliary output n° 2
26. 4÷20mA auxiliary output n° 3
27. 4÷20mA auxiliary output n° 4
28. Circuit n° 1 compressor 1 4÷20mA modulating output
29. Circuit n° 2 compressor 1 4÷20mA modulating output
30. Circuit n° 3 compressor 1 4÷20mA modulating output
31. Circuit n° 4 compressor 1 4÷20mA modulating output
32. Modulating output 4÷20mA auxiliary heating

External relay driving ON/OFF output (o1-c195, see relevant configurations)

9.6 ANALOGUE INPUTS CALIBRATION

In case of analogue input value is not very precise, you can use parameters in group CA to set a offset to probe value to make the measurement more close to the actual value.

AI value used for controlling = AI measured value + calibration

- CA01 – CA10: On board probes calibration (1 - 10)
- CA11 – CA14: 1st XEV20D probes calibration (1 - 4)
- CA15 – CA18: 2nd XEV20D probes calibration (1 - 4)
- CA19 – CA22: 3rd XEV20D probes calibration (1 - 4)
- CA23 – CA26: 4th XEV20D probes calibration (1 - 4)
- CA27 – CA33: 1st expansion probes calibration (1 - 7)
- CA34 – CA40: 2nd expansion probes calibration (1 - 7)
- CA41 – CA47: 3rd expansion probes calibration (1 - 7)
- CA48 – CA54: 4th expansion probes calibration (1 - 7)

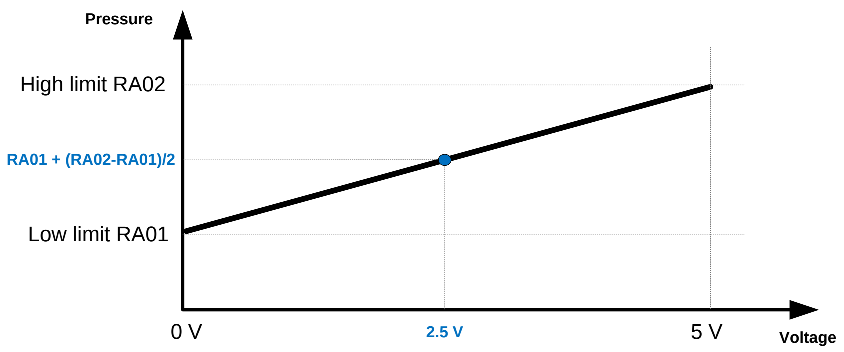
9.7 ANALOGUE INPUTS RANGE

When an AI is configured as a pressure probe (4÷20 mA / 0÷ 5 Volt), the value is restrained to range set by parameters in group RA.

- RA01 – RA20: On board probes range (1 - 10)
- RA21 – RA24: 1st XEV20D probes range (3 - 4)
- RA25 – RA28: 2nd XEV20D probes range (3 - 4)
- RA29 – RA32: 3rd XEV20D probes range (3 - 4)
- RA33 – RA36: 4th XEV20D probes range (3 - 4)
- RA37 – RA50: 1st expansion probes range (1 - 7)
- RA51 – RA64: 2nd expansion probes range (1 - 7)
- RA65 – RA78: 3rd expansion probes range (1 - 7)
- RA79 – RA92: 4th expansion probes range (1 - 7)

The probe type is determined by parameter SP01.
If SP01=0/1, the probe is current type (4÷20 mA).
If SP01=2/3, the probe is voltage type (0÷ 5 Volt).

For example, suppose:
IO01 = 52 - Circuit n° 1 condensing pressure probe (4÷20 mA / 0÷ 5 Volt)
RA01 = 1.0 Bar
RA02 = 10.0 Bar
SP01 = 2
So probe 1 measured pressure will be:
If AI01 = 0V, probe 1 pressure = 1.0 Bar (RA01)
If AI01 = 5V, probe 1 pressure = 10.0 Bar (RA02)
If AI01 = 2.5V, probe 1 pressure = 6.0 Bar (RA01 + (RA02 - RA01) / 2)
See graph below:



9.8 FURTHER CONNECTIONS

1 USB
1 Network
1 connecter for/GSM modem /XWEB modem
1 RS485 master
1 RS485 slave
1 CANbus

10. CHOSE PROBES FOR COMPRESSORS TEMPERATURE CONTROL

10.1 COMPRESSOR TEMPERATURE CONTROL IN CHILLER MODE

ST 9	Chiller temperature control probe 0 - evaporator input NTC 1 - Evaporator output 1 NTC 2 - Evaporator output 2 NTC 3 - Evaporator output 3 NTC 4 - Evaporator output 4 NTC 5 - Evaporator common output NTC	0	7		

The Par **ST09** defines the probe for temperature control of the unit (if ST12 = 1 just for circuit 1) in chiller working mode
0= Evaporator inlet NTC temperature probe
1= Evaporator 1 outlet NTC temperature probe
2= Evaporator 2 outlet NTC temperature probe
3= Evaporator 3 outlet NTC temperature probe
4= Evaporator 4 outlet NTC temperature probe
5= Evaporator common outlet NTC temperature probe

10.2 COMPRESSOR TEMPERATURE CONTROL IN HEAT PUMP MODE

ST10	Heat pump temperature control probe 0 - evaporator input NTC 1 - Evaporator output 1 NTC 2 - Evaporator output 2 NTC 3 - Evaporator output 3 NTC 4 - Evaporator output 4 NTC 5 - Evaporator common output NTC 8 - condenser water common input NTC 9 - circuit 1 condenser water input NTC 10 - circuit 2 condenser water input NTC 11 - circuit 3 condenser water input NTC 12 - circuit 4 condenser water input NTC 13 - circuit 1 condenser water output NTC 14 - circuit 2 condenser water output NTC 15 - circuit 3 condenser water output NTC 16 - circuit 4 condenser water output NTC 17 - condenser water common output NTC **WARNING** If the same temperature control is required in cooling and heating mode, set the same value in the ST09 and ST10 parameters	0	17		

The Par **ST10** defines the probe for unit temperature control (if ST12= 1 just for circuit 1) in heat pump working mode
0= Evaporator inlet NTC temperature probe
1= Evaporator 1 outlet NTC temperature probe
2= Evaporator 2 outlet NTC temperature probe
3= Evaporator 3 outlet NTC temperature probe
4= Evaporator 4 outlet NTC temperature probe
5= Evaporator common outlet NTC temperature probe
8= condenser water common inlet NTC temperature probe
9= circuit 1 condenser water inlet NTC temperature probe
10= circuit 2 condenser water inlet NTC temperature probe
11= circuit 3 condenser water inlet NTC temperature probe
12= circuit 4 condenser water inlet NTC temperature probe
13= circuit 1 condenser water outlet NTC temperature probe
14= circuit 2 condenser water outlet NTC temperature probe
15= circuit 3 condenser water outlet NTC temperature probe
16= circuit 4 condenser water outlet NTC temperature probe
17=condenser water common outlet NTC temperature probe

WARNING

If the same temperature control is required in cooling and heating working mode, set the same value in the ST09 and ST10 parameters

10.3 TEMPERATURE CONTROL ON TWO INDEPENDENT CIRCUITS

ST12	Defines the temperature control logic 0 = Of machine 1 = on two separate circuits	0	1		

If ST12 = 0, the 4 units are treated as a whole system. The temperature is detected by one single probe. Par ST09/ST10 is used for probe selection.

If ST12 = 1, circuit 1 and circuit 2 will be treated as two independent systems. They are controlled by different probes. ST09/ST10 is used for circuit 1 probe selection. ST21/ST22 is used for circuit 2 probe selection.

11. CHOICE OF THE TYPE OF TEMPERATURE CONTROL

ST11	Defines the type of temperature control 0 = Proportional 2 = Neutral zone	0	4		

Par **ST11** defines the type of unit temperature control
0 = Proportional
2 = Neutral zone

11.1 COMPRESSORS PROPORTIONAL TEMPERATURE CONTROL GRAPHICS (UNIT)

CF 5	Number of compressors in circuit 1	1	4 (2 if CF9≠ 0)		
CF 6	Number of compressors in circuit 2	0	4 (2 if CF10≠ 0)		
CF 7	Number of compressors in circuit 3	0	4 (2 if CF11≠ 0)		
CF 8	Number of compressors in circuit 4	0	4 (2 if CF12≠ 0)		
CF 9	Circuit 1 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
CF 10	Circuit 2 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
CF 11	Circuit 3 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		
CF 12	Circuit 4 compressor unloaders 0 = 1 step per compressor 1 = 2 steps per compressor 2 = 3 steps per compressor 3 = 4 steps per compressor	0	3		

ST 1	Chiller set point This allows you to set the working set point in chiller mode	ST02	ST03	°C/°F	Dec/int
ST 4	Heat pump set point This allows you to set the working set point in h.p. mode	ST05	ST06	°C/°F	dec/int
ST 7	Intervention band regulation steps in chiller mode	0.1 1	25.0 45	°C °F	Dec int
ST 8	Intervention band regulation steps in heat pump mode	0.1 1	25.0 45	°C °F	Dec int
ST13	Circuit 2 chiller set point This allows you to set the working set point in chiller mode	ST14	ST15	°C/°F	dec/int
ST16	Circuit 2 heat pump set point This allows you to set the working set point in h.p. mode	ST17	ST18	°C/°F	dec/int
ST19	Intervention band regulation steps of circuit 2 in chiller mode	0.1 1	25.0 45	°C °F	Dec int
ST20	Intervention band regulation steps in circuit 2 heat pump	0.1 1	25.0 45	°C °F	Dec int

ST12 = 0

If ST12=0, the controller can manage up to 32 steps in maximum. The actual steps number depends on the compressor configuration by Par CF.

steps number = CF05*(CF09+1) + CF06*(CF10+1) + CF07*(CF11+1) + CF08*(CF12+1).

Warning1: Please configure digital output for compressors corresponding to CF05-CF12, and the configured compressor number must **continuous**, don't skip any compressor. Otherwise, alarm ACF3 will occur.

For example: only configure compressor 1 and 3 without compressor 2 is not allowed.

Warning2:

After parameters CF05-CF12 changed, please restart the iPro.

Each step has the same cooling/heating power, so the interval between two steps is calculated by the formula: **ST07** / **steps number (chiller)**. **ST08** / **steps number (heat pump)**.

If only one step is activated for the time set in par CO36, another step will be added.

If AO (compressor 1 0÷10V modulating output) is configured:

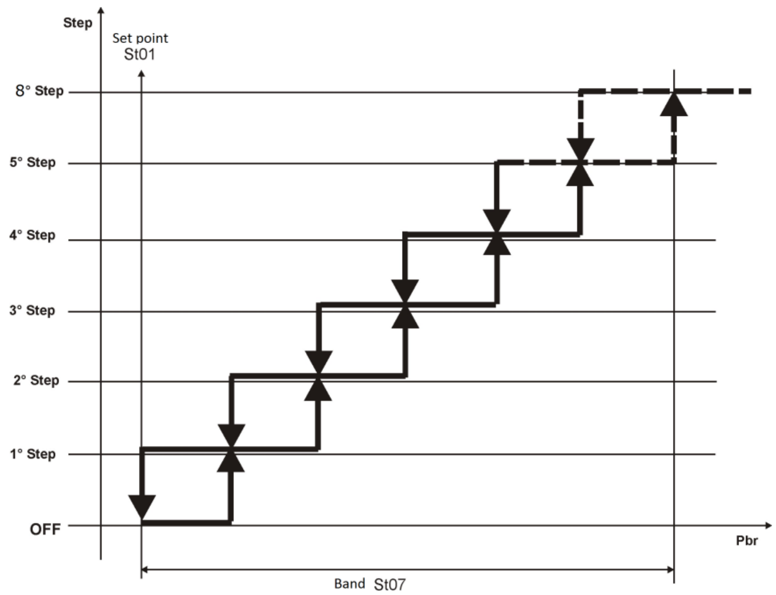
When the step number is increasing, this analog output will be 100%;
When the step number is decreasing, this analog output will be changed from 100% to 0%.

ST12 = 1

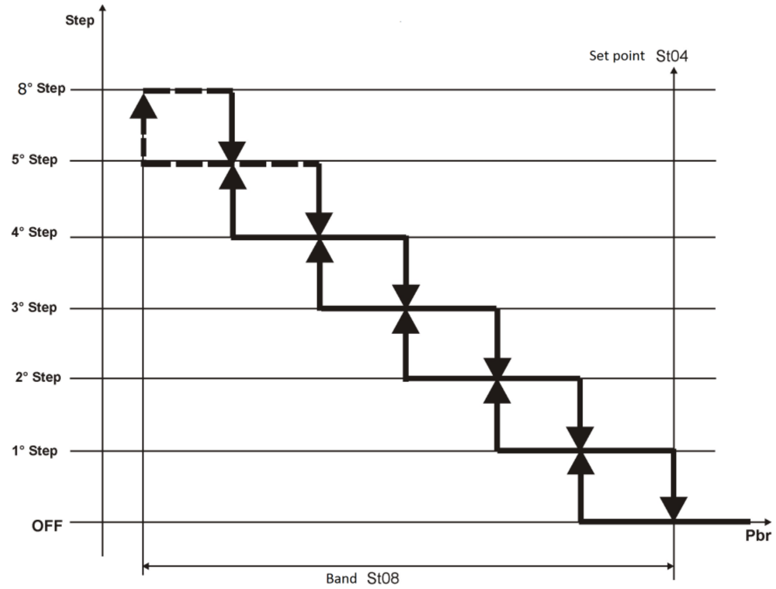
If ST12=1, the controller can manage up to 8 steps in maximum for each circuit. The actual steps number depends on the compressor configuration by Par CF.
steps number of circuit 1 = CF05*(CF09+1).
steps number of circuit 2 = CF06*(CF10+1).
Each step has the same cooling/heating power, so the interval between two steps is calculated by the formula:
circuit 1: ST07 / **steps number of circuit 1**. **(chiller), ST08** / **steps number of circuit 1**. **(heat pump)**
circuit 2: ST19 / **steps number of circuit 2**. **(chiller), ST20** / **steps number of circuit 2**. **(heat pump)**
Warning: Please make sure the interval > 0.1°C (1°F)

If only one step in one circuit is activated for the time set in par CO36, another step will be added.
If AO (compressor 1/2 0÷10V modulating output) is configured:
When the step number is increasing, this analog output will be 100%;
When the step number is decreasing, this analog output will be changed from 100% to 0%.

Compressors regulator working in chiller mode graphics (if ST12 = 1 just for circuit 1)

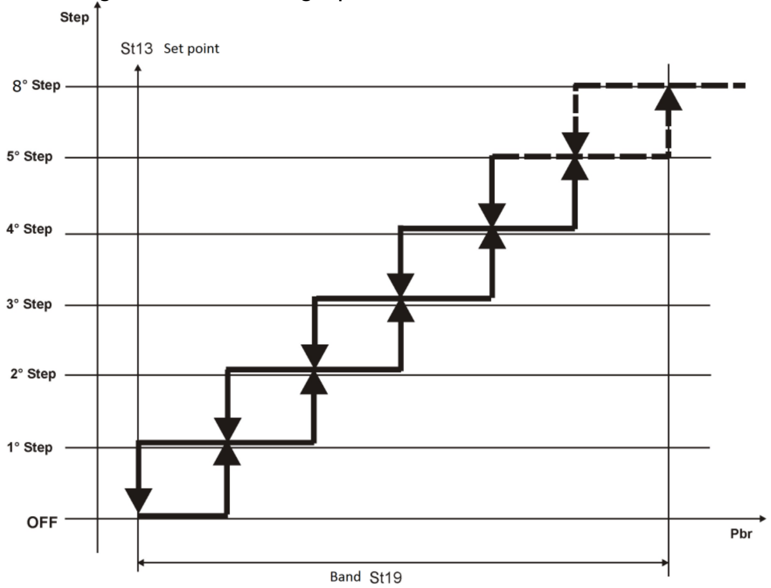


Compressors regulator function in heat pump mode graphics **(if ST12 = 1 just for circuit 1)**

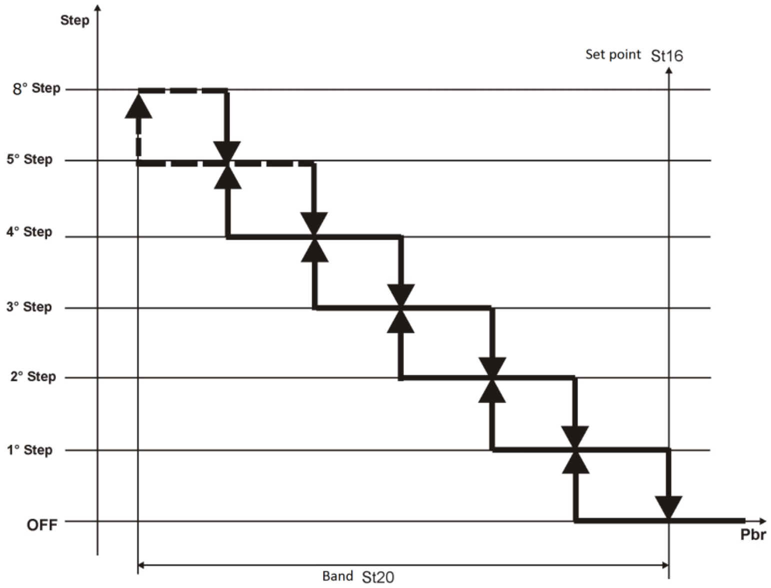


11.2 CIRCUIT 2 COMPRESSORS PROPORTIONAL TEMPERATURE CONTROL GRAPHICS

Compressors regulator working in chiller mode graphics with **ST12 = 1**



Compressors regulator working in heat pump mode graphics with **ST12 = 1**



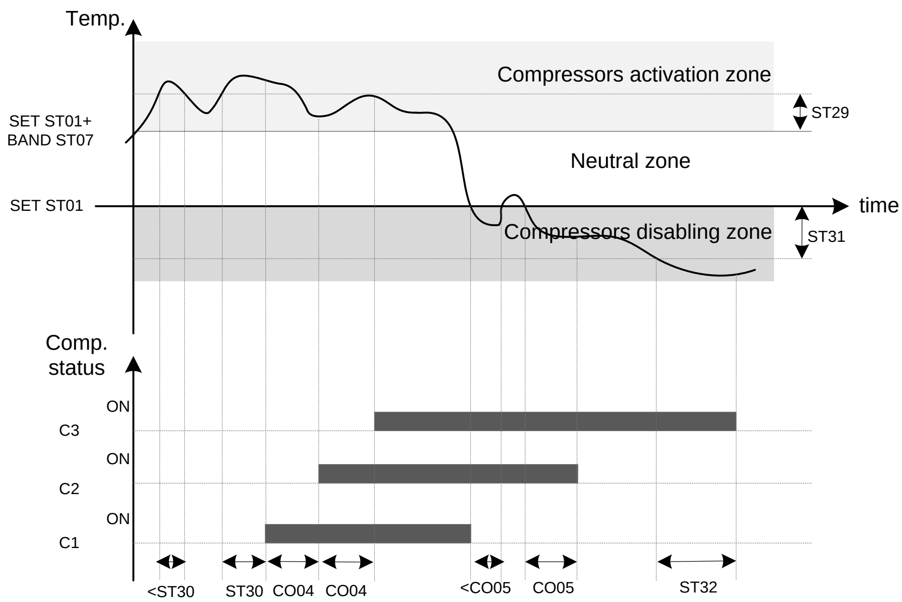
11.3 COMPRESSORS NEUTRAL ZONE TEMPERATURE CONTROL GRAPHICS

ST 1	Chiller set point This allows you to set the working set point in chiller mode	ST02	ST03	°C/°F	Dec/int
ST 7	Intervention band regulation steps in chiller mode	0.1 1	25.0 45	°C °F	Dec int
ST13	Circuit 2 chiller set point This allows you to set the working set point in chiller mode	ST14	ST15	°C/°F	dec/int
ST16	Circuit 2 heat pump set point This allows you to set the working set point in h.p. mode	ST17	ST18	°C/°F	dec/int
ST19	Intervention band regulation steps of circuit 2 in chiller mode	0.1 1	25.0 45	°C °F	Dec int
ST20	Intervention band regulation steps in circuit 2 heat pump	0.1 1	25.0 45	°C °F	Dec int
ST29	Activation offset with regulation of the neutral zone When the controlled temperature (coming from neutral zone) enters the compressors activation zone the compressors/capacity steps are enabled only if the variable exceeds (in cooling) or drops below (in heating) the relevant threshold for at least ST30.	0.0 0	25.0 45	°C °F	Dec Int

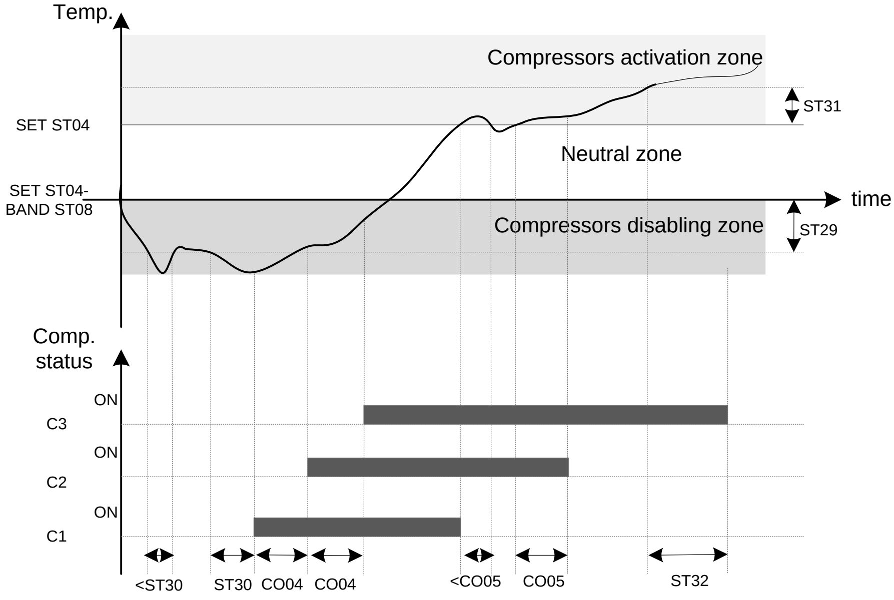
ST30	Activation delay with regulation of the neutral zone The controlled variable must be over (in cooling) or under (in heating) the above mentioned activation level for at least the ST30 time before the compressor/capacity step is switched ON.	0	250	Sec	
ST31	Deactivation offset with regulation of the neutral zone When the controlled temperature (coming from neutral zone) enters the compressors disabling zone the compressors/capacity steps are disabled only if the variable drops below (in cooling) or exceeds(in heating) the relevant threshold of at least ST32.	0.0 0	25.0 45	°C °F	Dec Int
ST32	Deactivation delay with regulation of the neutral zone The controlled variable must be under (in cooling) or over (in heating) the above mentioned activation level for at least the ST32 time before the compressor/capacity step is switched OFF.	0	250	Sec	

CO4	Activation delay between 2 compressors/steps With two compressors this establishes the start-up delay between the two, to reduce absorption at peaks. During this stage, the LED pertaining to the compressor will flash. (only for the compressor) With units with partialised compressor. This determines switch-on time of the unloader solenoid for start-up at minimum capacity (see compressors start-up)	1	250	Sec	
CO5	Shut off delay between 2 compressors / steps This establishes the shut off delay between the two compressors two unloader steps	1	250	Sec	

Compressors regulator function in chiller mode graphics (Circuit 1)
(If ST12 = 1, the working set point of circuit 2 is ST13 and the band is ST19)
Here is an example in the graphic below. It has 3 compressors configured. If the unit doesn't have 3 compressors but has 3 power steps, this graphic is also available by replace "C1, C2, C3" with "step1, step2, step3". The total power steps number is calculated by parameter CF05-CF12.
Warning:
Neutral zone regulation can't be used for compressor with inverter. So please don't configure inverter relay, otherwise alarm ACF12 will occur.



Compressors regulator working in heat pump mode graphics (Circuit 1)
(If ST12 = 1 the working set point of circuit 2 is ST16 and the band is ST20)



11.4 WORKING DESCRIPTION

While the controlled variable (defined on parameter ST09 for chiller mode and ST10 for heat pump mode) remains inside the neutral zone, nothing happens in terms of activation or disabling of compressors/capacity steps.
If the controlled variables enter the “Compressors activation zone” of at least the activation offset (ST29) for at least the ON Delay time (ST30) one compressor/capacity step is activated. More compressors/capacity steps will be activated after the delay time CO04 if the controlled variable remains always inside the compressors activation zone.
If the controlled variables enter the “Compressors disabling zone” of at least the disabling offset (ST31) for at least the OFF Delay time (ST32) one compressor/capacity step is disabled. More compressors/capacity steps will be disabled after the delay time CO05 if the controlled variable remains always inside the compressors disabling zone.

12. NOTES COMPRESSORS TEMPERATURE CONTROL WORKING

CO04	Activation delay between 2 compressors/steps With two compressors this establishes the start-up delay between the two, to reduce absorption at peaks. During this stage, the LED pertaining to the compressor will flash. (only for the compressor) With units with partialised compressor. This determines switch-on time of the unloader solenoid for start-up at minimum capacity (see compressors start-up)	1	250	Sec	
CO36	Max time with no resources being inserted with at least one resource active	0	250	Min	10 Min
CO37	Max time in a neutral zone with no resources rotating	0	999	Hr	1Hr

COMPRESSORS WORKING INSIDE THE NEUTRAL OR PROPORTIONAL ZONE
A particular function is envisioned by rotation or forced insertion of compressors or steps during loads working inside the neutral zone Par CO (see resources management in neutral zone working mode) to prevent prolonged working without interruption of continuity in compressors working mode.

Par CO04 Maximum time to keep current working steps number without insert new steps when temperature control in neutral zone
With at least one compressor on when the temperature control returns within the neutral zone the time set in the par is calculated. On the expiry of this time, the insertion of a compressor or unloader step is forced.
The step switch-on time is established by the "switch-on delay between steps parameter"
The solution is fixed in tens of minutes. The function is disabled if the value of the parameter is 0.

Par CO36 Maximum working time with proportional temperature control of a step without insertion of other resources with at least one step inserted
If only one compressor is working, this timer will start to run. On expiry of this time, the insertion of a compressor or unloader step is forced in order to reach the set work set-point.

If there are no variations coming from the temperature control, every "Maximum working time with proportional temperature control" will have forced insertion of a compressor or unloader step.
The solution is fixed in tens of minutes. The function is disabled if the value of the parameter is 0.

Par CO37 Maximum stay time in neutral zone without rotation of the resources
When the working returns within the neutral zone, the time set in the par. is calculated. On expiry of this time, the compressor engaged is switched-off and the insertion of another compressor is forced on the basis of rotation.
The solution is fixed in hours. The function is disabled if the value of the parameter is 0.

13. DYNAMIC SET-POINT FUNCTION

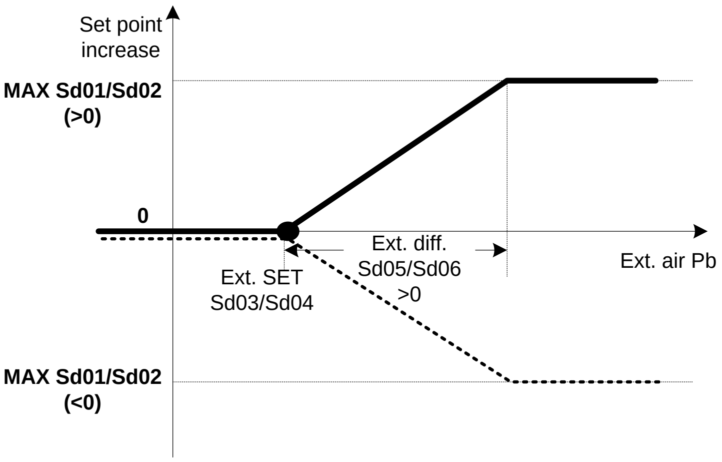
Sd 1	Maximum increase in chiller mode dynamic set point This determines the maximum variation of the working set point in chiller mode	-50.0 -58	110 230	°C °F	Dec int
Sd 2	Maximum increase in heat pump mode dynamic set point This determines the maximum variation in the working set point in heat pump mode	-50.0 -58	110 230	°C °F	Dec int
Sd 3	Dynamic set point in chiller mode for the external air temperature setting	-50.0 -58	110 230	°C °F	Dec int
Sd 4	Dynamic set point in heat pump mode for the external air temperature setting	-50.0 -58	110 230	°C °F	Dec int
Sd 5	External air temperature differential dynamic set point in chiller mode	-50.0 -58	110 230	°C °F	Dec int
Sd 6	Dynamic set point in heat pump mode for the external air temperature differential	-50.0 -58	110 230	°C °F	Dec int

The regulator allows to modify the set-point by adding a proportional value to the 4-20 mA analogue input or depending on the temperature of the external air measured by the probe. There are two purposes to this function: save energy or make the unit function with particularly critical external temperatures. For this reason, both in cooling and in heating mode, it is possible to add or subtract a determined proportional value to the original set-point. The changed value is depending on parameters Sd01 / Sd02 and external temperature.
The regulator is active if
- the activation parameter Sd01 is different to 0 in cooling working mode
- the activation parameter Sd02 is different to 0 in heating working mode
- a probe is configured as **dynamic set-point 4÷20 mA probe**(AI type=64) or **dynamic set-point external air temperature NTC probe** (AI type=35).

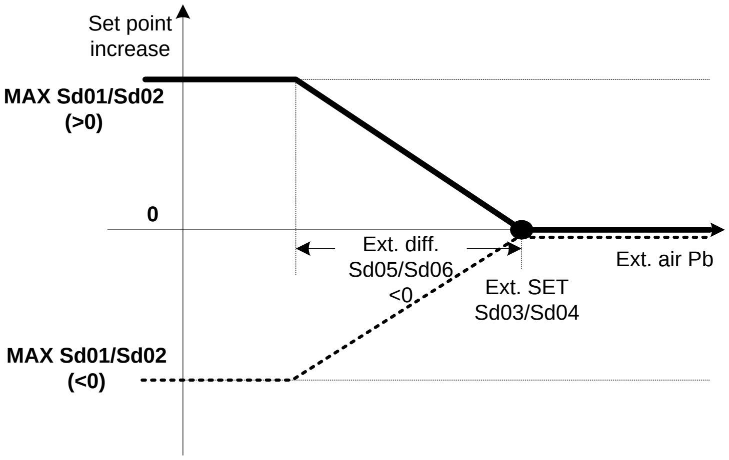
Note: In case of these 2 kinds of probes all configured, only use the **Dynamic set-point 4÷20 mA probe**.

13.1 DYNAMIC SET-POINT WORKING GRAPHICS

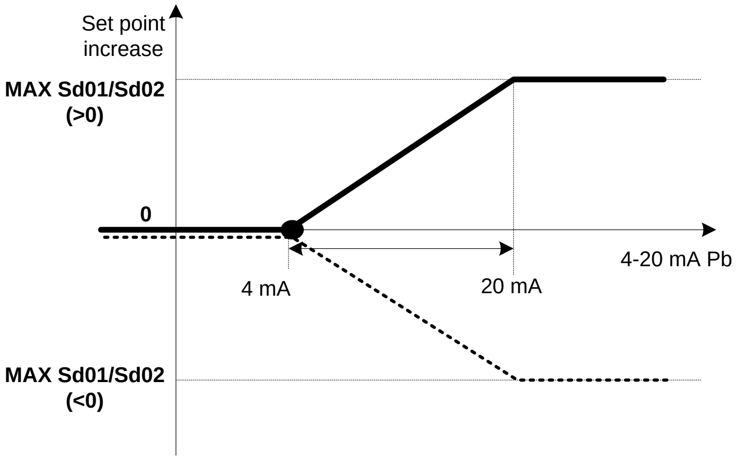
With **dynamic set-point external air temperature NTC probe** (AI type=35)
(a) With positive NTC probe differential:



(b) With negative NTC probe differential:



With **dynamic set-point 4÷20 mA probe**(AI type=64)



14. ENERGY SAVING FROM DIGITAL INPUT

If one of the digital inputs is configured as **Energy Saving** (DI type=68) and active, the energy saving will work. In this case, working with RTC will be not available.

15. ENERGY SAVING FUNCTION SETTING

15.1 ENABLES THE DAILY/WEEKLY WORKING IN ENERGY SAVING MODE

ES 1	Start of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 2	End of working time band 1 (0-24)	0	24.00	Hr	10 Min
ES 3	Start of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 4	End of working time band 2 (0-24)	0	24.00	Hr	10 Min
ES 5	Start of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES 6	End of working time band 3 (0-24)	0	24.00	Hr	10 Min
ES 7	Monday energy saving time band 0 = None 1 = Time Band 1 2 = Time Band 2 3 = Time Bands 1 and 2 4 = Time Band 3 5 = Time Bands 1 and 3 6 = Time Bands 2 and 3 7 = All time bands	0	7		
ES 8	Tuesday energy saving time band	0	7		
ES 9	Wednesday energy saving time band	0	7		
ES10	Thursday energy saving time band	0	7		
ES11	Friday energy saving time band	0	7		
ES12	Saturday energy saving time band	0	7		
ES13	Sunday energy saving time band	0	7		

Precondition:
1. The ES request with times is enabled
2. For three time periods, ES01 / ES06 are different to zero and not all of the couples: ES01-ES02, ES03-ES04 and ES05-ES06 have the same value.

This configuration can be done from the keyboard in two ways.
<u>The first method:</u>
Enter in ES group parameters programming:
1. Set time band with the parameter ES01 / ES06.
2. Select daily/weekly working time band with parameter ES07 / ES13.

<u>The second method:</u>
1. Enter in the **TIME/TIME PERIOD** screen from **SERVICE** menu.
2. Set **Time band N1/N3** in page 2 with the **Start** time and **End** time;
3. Select time band from **Monday** to **Sunday** in the next pages' middle column **Energy Saving**.

Don't forget enable the **Energy Saving** option, otherwise the energy saving will not work.

15.2 ENERGY SAVING FUNCTION

ES14	Increase energy saving setting in chiller mode	-50.0 -58	110 230	°C °F	Dec int
ES15	Energy saving differential in chiller mode	0.1 1	25.0 45	°C °F	Dec int
ES16	Energy saving setting increase in heat pump mode	-50.0 -58	110 230	°C °F	Dec int
ES17	Energy saving differential increase in heat pump mode	0.1 1	25.0 45	°C °F	Dec int

Cooling mode:
Energy saving **set point** = original set point + ES14
Energy saving **differential** = ES15
Heating mode:
Energy saving **set point** = original set point + ES16
Energy saving **differential** = ES17

16. AUXILIARY HEATING

Manage heaters for domestic water production with a maximum of 4 heater steps and one proportional output.

Notes
The function will take effect only when the unit is configured in the right way:
- At least one digital output configured as **Auxiliary heating step** (DO type = 188-191). If two steps are needed, one digital output must set as **Auxiliary heating 1st step**, another digital output must set as **Auxiliary heating 2nd step**;
- One analogue output is configured as **Modulating output auxiliary heating** (AO type=15/32);
- One analogue input is configured as **Dynamic/boiler function/change over set-point external air temperature NTC temperature probe** (AI type=35). This probe will be used for external air temperature detection;
- The unit is working in heat pump mode;
- Par AH01≠0

16.1 AUXILIARY HEATER REGULATION

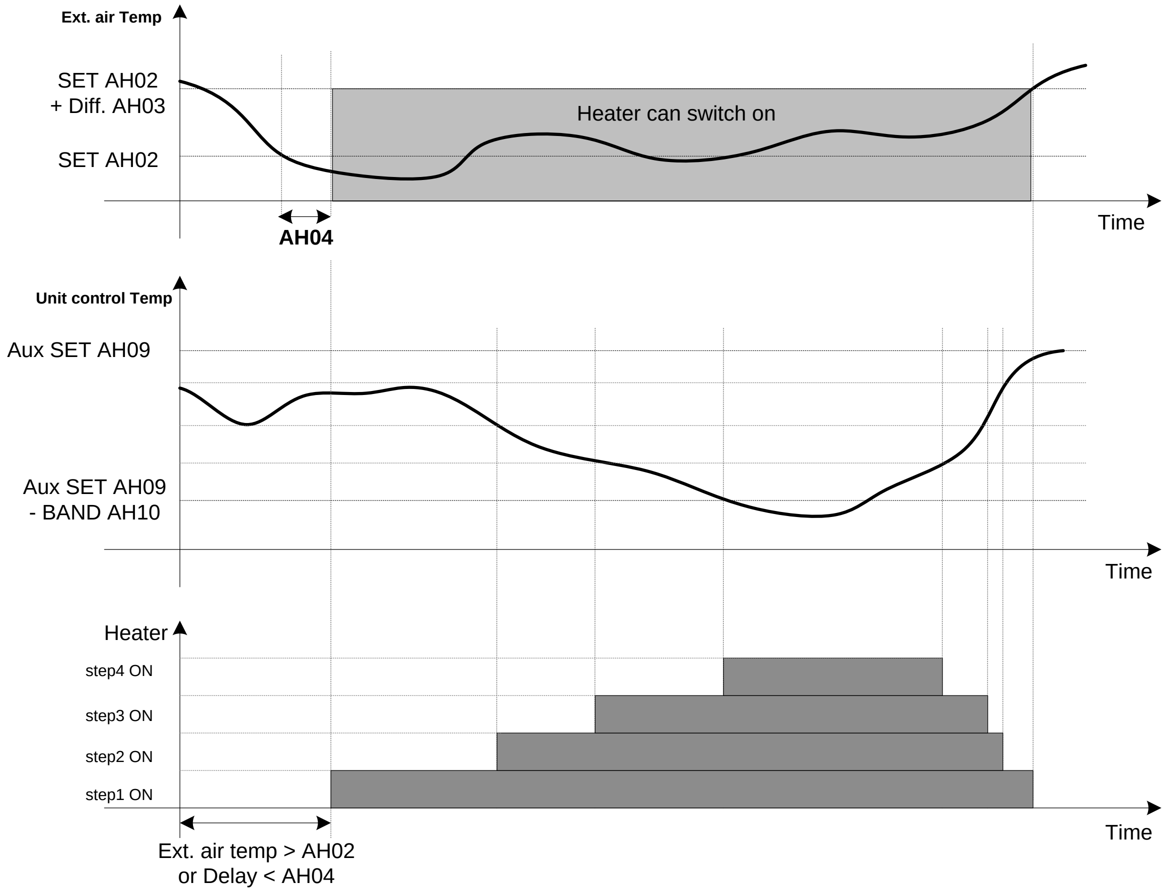
AH 1	Auxiliary heating function 0 = Disabled 1 = enabled with control in integration mode 2 = enabled with control in heating mode	0	2		
AH 2	External air set point auxiliary heating activation	-50.0 -58	110 230	°C °F	Dec int
AH 3	External air differential auxiliary heating deactivation	0.1 1	25.0 45	°C °F	Dec int
AH 4	Auxiliary heating activation delay time	0	250		

AH 5	External air set point that deactivates the compressors working in integration mode	-50.0	110	°C °F	Dec int
AH 6	External air differential that activates the compressors in integration mode	0.1 1	25.0 45	°C °F	Dec int
AH 7	Off compressors delay time in integration mode	0	250		
AH 8	Thermoregulation selection set 0 = uses the set point (ST04) and the differential (ST08) of the HP 1 = uses the set point and the differential of the auxiliary heating function 2 = add the parameters AH9/AH11 to HP set point (ST04) and use the differentials AH10/AH12	0	2		
AH 9	Auxiliary heating set point on / off	-50.0 -58	110 230	°C °F	Dec int
AH10	Band proportional auxiliary heating ON / OFF	0.1 1	25.0 45	°C °F	Dec int

Manage digital output configured as Auxiliary heating steps.
When the external air temperature decrease below the set point AH02, the heater steps will be switch ON/OFF according to the unit control probe temperature (select by ST10).
When the external air temperature is increase above AH02+AH03, all the heater steps will be switch OFF.

the unit control temperature regulation
AH08 = 0:
Do regulation when ST04-ST08 < temp. < ST04
Temp. Interval for each step = ST08 / total heater steps number
AH08 = 1:
Do regulation when AH09-AH10 < temp. < AH09
Temp. Interval for each step = AH10 / total heater steps number
AH08 = 2:
Do regulation when ST04+AH09-AH10 < temp. < ST04+AH09
Temp. Interval for each step = AH10 / total heater steps number
Note 1: Here we suppose no energy saving and dynamic set point function is in progress. Otherwise, please replace ST04 and ST08 with the new set point and band.
Note 2: The timer for AH04 will reset only when Ext. air temp > AH02+AH03.

Here below an example when AH08=1.



16.2 AUXILIARY HEATING PROPOTIONAL OUTPUT

AH11	Auxiliary modulating heating set point	-50.0 -58	110 230	°C °F	Dec int
AH12	Auxiliary modulating heating proportional band	0.1 1	25.0 45	°C °F	Dec int
AH13	Auxiliary heating modulating minimum output value	0	AH14	%	
AH14	Auxiliary heating modulating maximum output value	AH13	100	%	
AH15	Auxiliary Output heating minimum maintaining value of to higher temperatures modulating the set point 0 = Not enabled 1 = Enabled	0	1		

Manage analogue output configured as Modulating output auxiliary heating.
When the external air temperature is decrease below the set point AH02, the heating proportional output can be regulate according to the unit control temperature (select by ST10).
When the external air temperature is increase above AH02+AH03, all the heating proportional output will be zero.

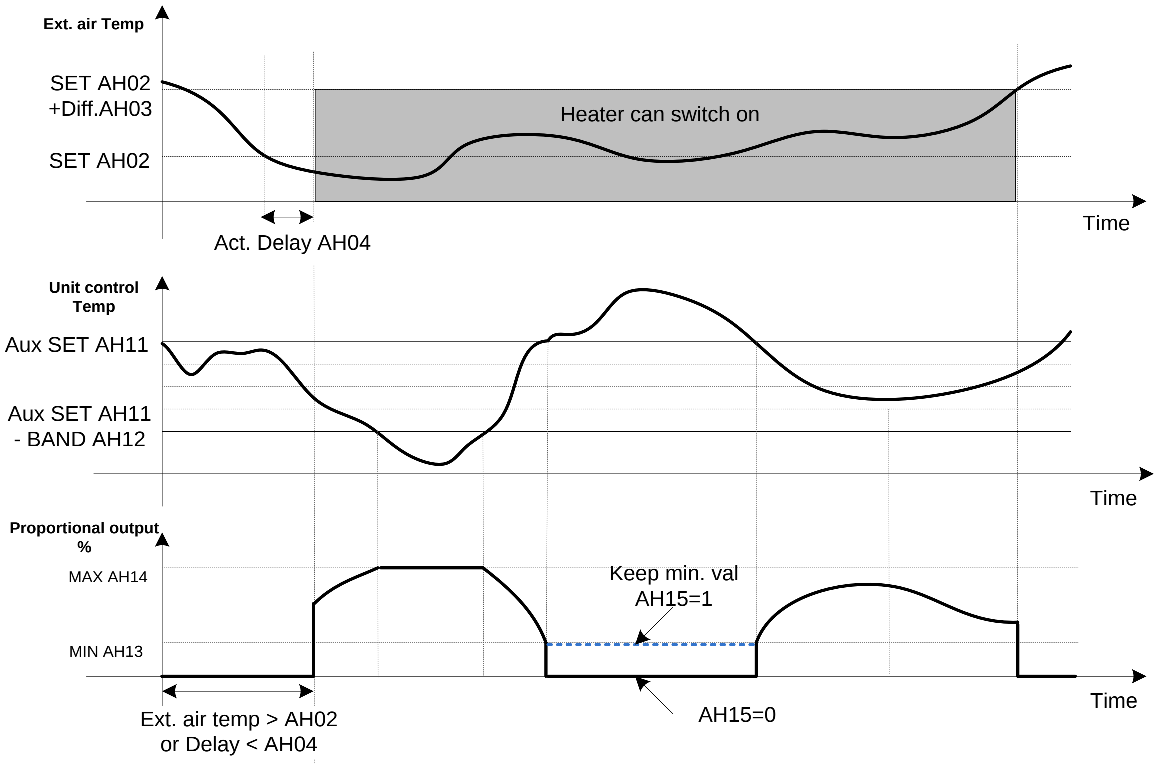
the unit control temperature regulation

AH08 = 0:
Do regulation when ST04-ST08 < temp. < ST04

AH08 = 1:
Do regulation when AH11-AH12 < temp. < AH11

AH08 = 2:
Do regulation when ST04+AH11-AH12 < temp. < ST04+AH11

Here below an example when AH08=1.



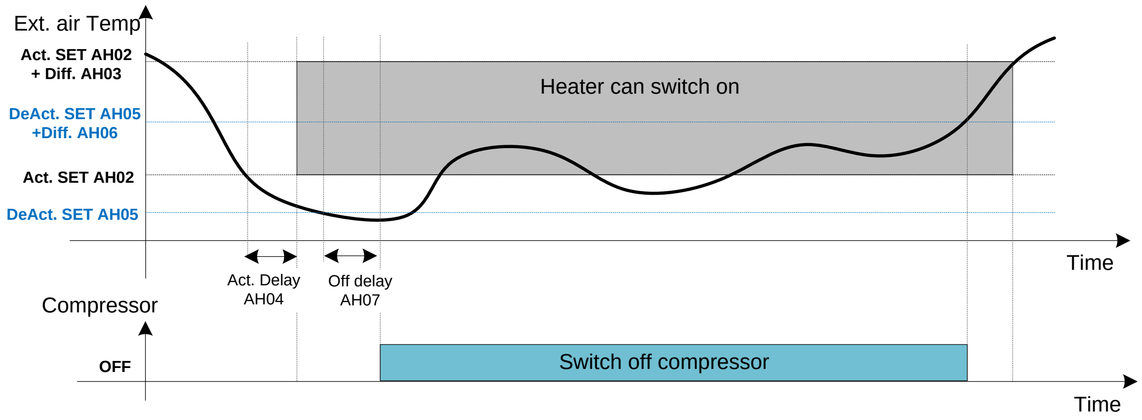
16.3 DEACTIVATE THE COMPRESSORS FOR AUXILIARY HEATING

When the auxiliary heating is working, the compressor may need to switch off in some case.

AH01 = 0 (Disabled):
Function disabled.

AH01 = 1 (Integration):
The compressor will be forced to switch off when external air temperature < AH05 after a delay AH07;

The compressor will re-active when external air temperature > AH05 + AH06.



AH01 = 2(Replace):

The compressor will be forced to switch off when at least one heater step is on.

16.4 AUXILIARY HEATING IN DEFROST

AH16	Enable the auxiliary heater in defrost 0 = Not enabled 1 = Enabled	0	1		

If AH16=0, when defrost in progress, the auxiliary heater is not available.

17. CIRCUITS AND COMPRESSORS ROTATION CONTROL

Manage working of compressors in chiller and heat pump mode. The maximum capacity is up to 4 circuits with a maximum of 4 compressors per circuit.

Note

The function manages the rotations and the switch-on/off times of the compressors. The unit controlled can be equipped with:

- unloading;
- partialised compressors:
- heat recovery;
- pump down;
- defrost (therefore heating unit);

Note

If the unit is equipped with inverter compressor, these inverter compressors should always the first ones to switch on and the last ones to switch off. In case of more than one inverters exists, they will be rotated according to CO16, CO17 setting.

17.1 CIRCUITS ROTATION

CO17	Selection criteria of circuits 0 = Fixed sequence 1 = FIFO 2 = Balance 3 = Saturation	0	4		
CO18	Balance/saturation criteria 0= Hours 1= Starts	0	1		

Note: Only when Par ST12 = 0, circuit rotation will follow this regulation. If ST12=1, no circuit rotation.

Fixed sequence in selection of the circuits (CO17=0)

The switch-on sequence is according to the increasing order of the circuits. Switch-off follows the sequence opposite to switch-on.

For example: if 2 circuits are configured. When capacity request increasing, switch on circuit 1 first, then circuit 2. When capacity request decreasing, switch off circuit 2 first, then circuit 1.

Circuit FIFO rotation (CO17=1)

This procedure manages start-up and stopping of all circuits according to **FIFO logic**.
When switch-on, the circuit is selected which can switch on a compressor with the least "number of working hours" or least "number of peaks per hour". The indicator is set by Par CO18.
When switch-off, the circuit is selected which can switch off a compressor with the greatest "number of working hours" or greatest "number of peaks per hour". The indicator is set by Par CO18.

Selection of the Circuit for Balancing (CO17 = 2)
Balancing the circuits, the power steps are on in a way that the circuits distribute the same power.

Switch-on:
The circuit is selected which in that moment has the least number of resources (compressors and unloaders) activate.
If the resources used are the same, the circuit is selected that can switch the compressor on with the least "number of working hours" or least "number of starting per hour". The indicator is set by Par CO18.

Switch-off:
The circuit is selected which in that moment has the greatest number of resources (compressors and unloaders) activate.
If the resources used are the same, the circuit is selected that can switch the compressor off with the greatest “number of working hours" or greatest "number of starting per hour". The indicator is set by Par CO18.

Selection of the Circuit for Saturation (CO17=3)
Before switching a new circuit on all resources of the circuits already on are activated.

Switch-on:
The circuit is selected that can switch the compressor on with the least "number of working hours" or least "number of starting per hour". The indicator is set by Par CO18.

Switch-off:
The circuit is selected that can switch the compressor off with the greatest "number of working hours" or greatest "number of peaks per hour". The indicator is set by Par CO18.

17.2 COMPRESSOR ROTATION

CO16	Selection criteria of compressors in the circuit 0 = Fixed sequence 1 = FIFO 2 = Balance 3 = Saturation	0	4		

This rotation is used for select compressor to switch on inside one circuit.
Fixed sequence in selection of the compressors (CO16=0)
The switch-on sequence is according to the increasing order of the compressors. Switch-off follows the sequence opposite to switch-on.
For example: if 2 compressors are configured in a circuit. When capacity request increasing, switch on compressor 1 first, then compressor 2. When capacity request decreasing, switch off compressor 2 first, then compressor 1.

Compressors FIFO rotation (CO16=1)
This procedure manages start-up and stopping of all compressors inside the circuit according to **FIFO logic**.
When switch-on, the compressor is selected with the least "number of working hours" or least "number of peaks per hour". The indicator is set by Par CO18.
When switch-off, the compressor is selected with the greatest "number of working hours" or greatest "number of peaks per hour". The indicator is set by Par CO18.

Selection of the compressors for Balancing (CO16 = 2)
The compressors are **only** balanced in the presence of partialised compressors.

Switch-on:
The compressor is selected which in that moment has the least number of resources (unloaders) activate.

If the resources used are the same, the compressor is selected with the least "number of working hours" or least "number of peaks per hour". The indicator is set by Par CO18.

Switch-off:
The circuit is selected which in that moment has the greatest number of resources (unloaders) activate.
If the resources used are the same, the compressor is selected with the greatest "number of working hours" or greatest "number of peaks per hour". The indicator is set by Par CO18.

Selection of the compressors for Saturation (CO16=3)
The compressors are **only** saturated in the presence of partialised compressors.
Before switching on a new compressor, all resources of the current compressor must already activate.

Switch-on:
The compressor is selected with the least "number of working hours" or least "number of starting per hour". The indicator is set by Par CO18.

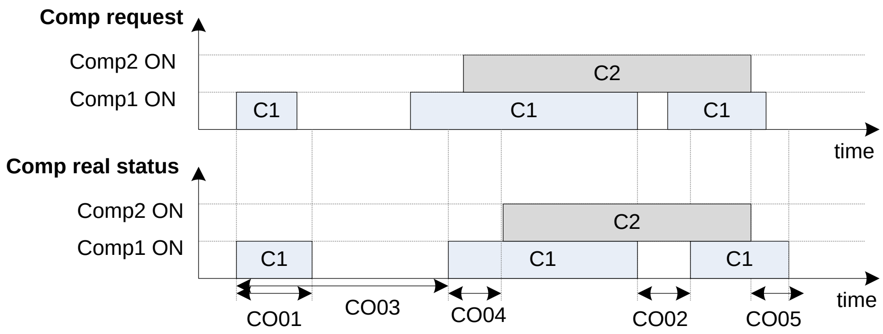
Switch-off:
The compressor is selected with the greatest "number of working hours" or greatest "number of starting per hour". The indicator is set by Par CO18.

NOTES REGARDING THE COMPRESSOR REGULATOR

CO 1	Compressor minimum ON time Determines the length of time the compressor must remain **active** after being switched on, even if the request ceases.	0	250	Sec	10 sec
CO 2	Minimum compressor OFF time Determines the length of time the compressor must remain **deactivated** even if a request is transmitted for it to switch on again. During this stage, the LED pertaining to the compressor will flash.	0	250	Sec	10 sec
CO 3	Minimum time between one activation and another on the same compressor	0	250	Sec	10 sec
CO 4	Activation delay between 2 compressors/steps With two compressors this establishes the start-up delay between the two, to reduce absorption at peaks. During this stage, the LED pertaining to the compressor will flash. (only for the compressor) With units with partialised compressor. This determines switch-on time of the unloader solenoid for start-up at minimum capacity (see compressors start-up)	1	250	Sec	
CO 5	Shut off delay between 2 compressors / steps This establishes the shut off delay between the two compressors two unloader steps	1	250	Sec	

- Every compressor must remain active at least for CO01 after its activation. The switch-off causes due to **alarm, STAND-BY / ON OFF remote or defrost or unloader from NTC probe transducer** are an exception to this rule
- After its deactivation, every compressor must remain off at least for CO02.
- If the regulator requests the switch-on of the same compressor, the two activations are delayed by CO03 seconds.
- If the regulator requests the switch-on of the two compressors/steps with the fixed sequence and rotation enabled, start-up between the two is delayed by CO04 seconds
- If the regulator requests the switch-off of the two compressors/steps with the fixed sequence and rotation enabled, switch-off between the two compressors/steps s delayed by CO05 seconds
- In the case of a mains power-cut, on restore **ALL OUTPUTS** are forced into OFF for the time CO05.

For example, 2 compressors are configured. Here below the graphic for their operation sequence.



18. COMPRESSORS SWITCH-ON

CO12	Compressor start-up (see compressor start-up) 0 = direct 1 = part - winding 2 = star delta	0	2		
CO13	Start-up is part-winding or star-delta **If CO12 = 1** part - winding start-up time applies. This allows you to vary the attachment of the two relays that supply the two motor coils. **If CO12 = 2** star triangle start-up time applies. This allows you to vary the simultaneous operation time of the line 1 relay and the relay that closes the star centre connection. (see start-up par.)	0	250	Tenths of sec	0.1 sec
CO14	Star - Delta start-up **If CO12 = 2** star triangle start-up time applies. This allows you to vary the time from unhooking the star centre relay from the hook on the relay of line 2 (see start-up par.)	0	250	Hund. of sec	0.01 sec
CO15	Switch-on time with gas bypass valve / idle compressor start-up valve (see unloader mode)	0	250	Sec	

The type of start-up is chosen via the compressor start-up parameter CO12:
0 = direct start-up
1 = part winding start-up
2 = star delta start-up
The relay resources must be configured correctly in the IO family in order to manage compressor/s start-up
Once the type of start-up has been selected, if the resources (relay outputs) are incorrectly configured (over-dimensioned or insufficient) an ACF6 configuration error is generated on the display

18.1 DESCRIPTION OF DIRECT START-UP

CO12 = 0. It is used with alternative hermetic, semi-hermetic, screw and scroll compressors with small-medium dimensions.

18.2 DIRECT START-UP WITH NO PARTIALISED

One compressor can start-up only by one relay configured as “Compressor x Direct start-up”. (Relay K1 Fig.1). It is possible to configure the relay outputs up to a MAX of 16 compressors.

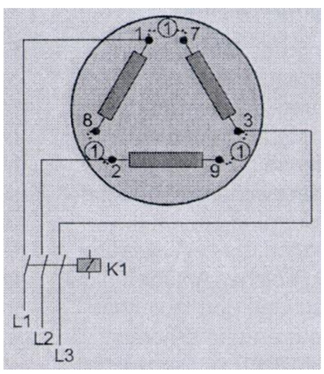


Fig.1

18.3 DIRECT START-UP OF A PARTIALISED COMPRESSOR

The switch-on procedure is the same as written above. If compressors with unloaders have been configured, when switch-on is requested at full compressor load, first the unloaders are excited with the minimum capacity. After 1 second (fixed time), the compressor relay is activated. On passing the delay CO15, unloaders can work response to temperature controlling request. If the time set in Par CO15 = 0 the delay is disabled.

After CO15 time expired:

- If CO9=0/2, the minimum capacity step will not used in temperature control. So the total steps number will decrease 1. The 2nd capacity steps will be treated as 1st step. The 3rd capacity steps will be treated as 2nd step. The 4th capacity steps will be treated as 3rd step.
- If CO9=1/3, the capacity will work normally.

18.4 DESCRIPTION OF PART WINDING START-UP

CO12 = 1. This type of start-up allows to drastically reducing the peak current on compressor start-up. It is used with alternative hermetic, semi-hermetic or screw compressors with medium-large dimensions.

Two relay outputs must be configured for every compressor: (x can be 1 to 8)

One as compressor x PW start-up 1

One as compressor x PW start-up 2

This is because the compressor electric motor is composed of two separate windings that must be powered at a distance of about 1 second (time can be set using parameter CO13) from each other.

It is possible to configure up to 16 relay outputs for a maximum of 8 compressors with Part Winding start-up.

18.5 PART WINDING START-UP OF A COMPRESSOR WITH NO PARTIALISED

With request from the temperature regulator, first, the relay configured as compressor x PW 1 is excited (relay K1 Fig. 2), after the time set in the par CO13 the second relay configured as compressor x PW 2 is excited (relay K2 Fig. 2). Compressor start-up is concluded at this point.

However, when temperature control requires the switch-off, the 2 relay outputs are lowered at the same time

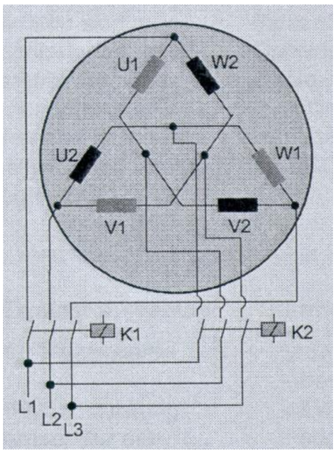


Fig. 2

18.6 PART WINDING START-UP OF A COMPRESSOR WITH 1 OR MORE UNLOADERS

The start-up procedure is the same as that stated above. If compressors with unloaders have been configured, when switch-on is requested at full compressor load, first the unloaders are excited with the minimum capacity. After 1 second (fixed time), the relay configured as compressor x PW 1 (relay K1 Fig. 2) is activated. After the time set in the par CO13 the second relay configured as compressor x PW 2 is excited (relay K2 Fig. 2).

From the moment unloader is excited, the compressor keeps run with the lowest capacity for time set by par CO15. After this delay, unloaders can work response to temperature controlling request. If the time set in Par CO15 = 0 the delay is disabled.

After CO15 time expired:

- If CO9=0/2, the minimum capacity step will not used in temperature control. So the total steps number will decrease 1. The 2nd capacity steps will be treated as 1st step. The 3rd capacity steps will be treated as 2nd step. The 4th capacity steps will be treated as 3rd step.
- If CO9=1/3, the capacity will work normally.

19. UNLOADERS WORKING

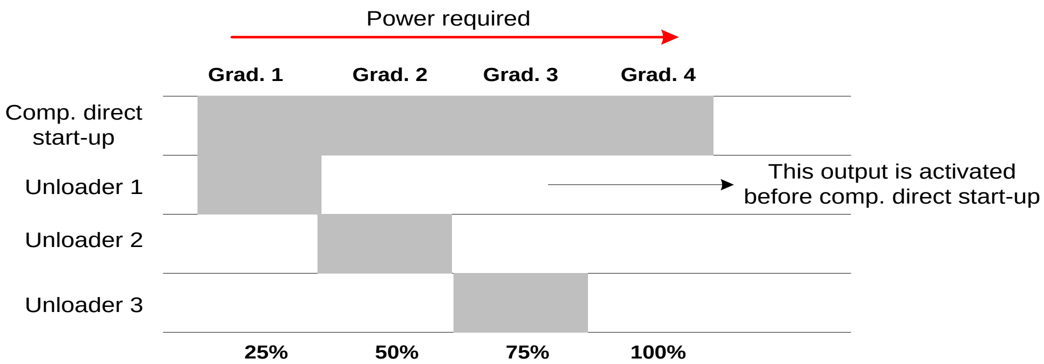
CO 8	Unloaders operation (see unloaders operation) 0 = ON/OFF step insertion 1 = continuous insertion with direct action steps 2 = continuous insertion with inverse action steps 3 = Insertion with continuous direct global steps	0	3		

CO08 is used to select unloaders operation mode.
The relays configured as unloader are managed by on/off temperature control as per compressor regulator graphics and in the three tables given below.
Par CO08=0 ON/OFF insertion with steps
When temperature regulation needs more/less cooling, unloader steps will change accordingly. Only one step can be inserted/removed at a time, one step must be off before another is inserted.

When compressor is OFF, unloader 1 will keep ON if par CO09=2/3.

1 compressor with three unloaders. 4 steps are available in the circuit.

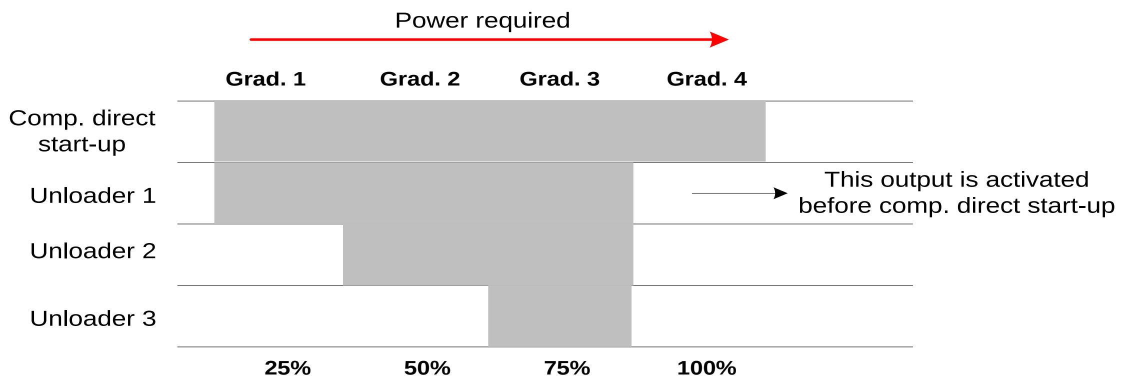
Capacity	25%	50%	75%	100%
compressor	ON	ON	ON	ON
Unloader1	ON	OFF	OFF	OFF
Unloader2	OFF	ON	OFF	OFF
Unloader3	OFF	OFF	ON	OFF



Par CO08=1 continuous insertion with direct action steps
When temperature regulation needs more/less cooling, unloader steps will change accordingly. Only the requested step is inserted/removed. The others all remain inserted/removed on the basis of the polarity chosen.

1 compressor with three unloaders. 4 steps are available in the circuit.

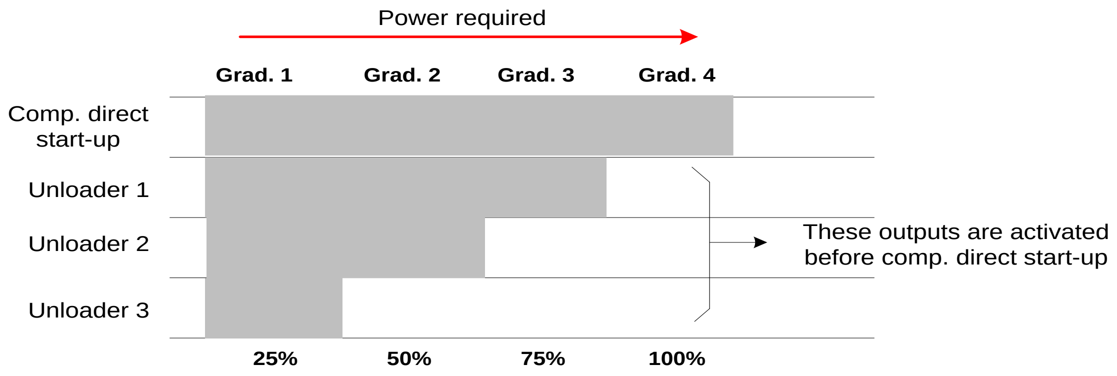
Capacity	25%	50%	75%	100%
compressor	ON	ON	ON	ON
Unloader1	ON	ON	ON	OFF
Unloader2	OFF	ON	ON	OFF
Unloader3	OFF	OFF	ON	OFF



Par CO08=2 continuous insertion with reverse action steps
In the case of unloader request due to temperature control, only the requested step is inserted/removed. The others all remain inserted/removed on the basis of the polarity chosen.

Capacity	25%	50%	75%	100%
compressor	ON	ON	ON	ON
Unloader1	ON	ON	ON	OFF
Unloader2	ON	ON	OFF	OFF
Unloader3	ON	OFF	OFF	OFF

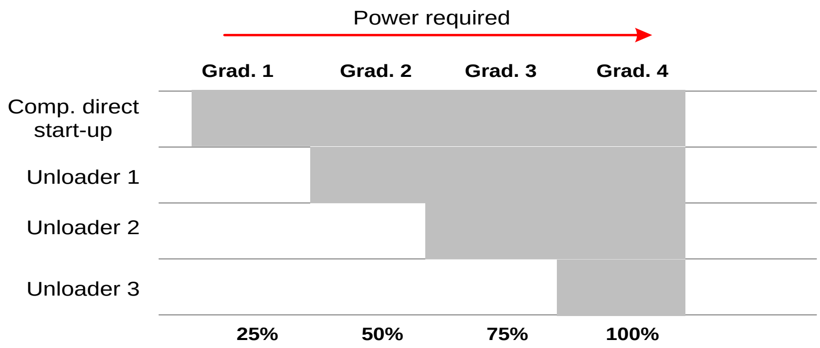
1 compressor with three unloaders. 4 steps are available in the circuit.



Par CO08 = 3 Continuous direct global step insertion
In the case of unloader request due to temperature control, only the requested step is inserted/removed. The others all remain inserted/removed on the basis of the polarity chosen.

1 compressor with three unloaders. 4 steps are available in the circuit.

Capacity	25%	50%	75%	100%
compressor	ON	ON	ON	ON
Unloader1	OFF	ON	ON	ON
Unloader2	OFF	OFF	ON	ON
Unloader3	OFF	OFF	OFF	ON



19.1 START-UP WITH PARTIALISED COMPRESSOR / IDLE START-UP

CO 9	Enabling upon operation of the minimum power of the compressor / idle start-up management 0 = Enables minimum power only upon compressor start-up (start-up upon minimum capacity/idle valve start-up in OFF with compressor off) 1 = Screw valves enable the minimum power at compressor start-up and in temperature control (start-up with minimum capacity / idle start-up valve in OFF with compressor off) 2 = Screw valves enable the minimum power at compressor start-up (start-up with minimum capacity / idle start-up valve in ON with compressor off) 3 = Screw valves enable the minimum power at compressor start-up and in temperature control (start-up with minimum capacity / idle start-up valve in ON with compressor off)	0	3		

Par CO09 enabling minimum capacity working according to the type of compressor used.
It allows the management of the relay output configured as compressor unloader 1, which is used for a compressor partialised start-up (alternative) or a compressor idle start-up (screw).
Using this parameter CO09, it is possible to decide how to use the unloader with lower index in configuration (unloader 1 of the compressor normally 25%).
In some case, this unloader can be used both for a minimum capacity start-up (partialised start-up/idle start-up) and normal temperature control.
In some other case, this unloader only used for a minimum capacity start-up (partialised start-up/idle start-up), and never used as a unloader step in normal working conditions.

EXAMPLE (Suppose CO08=0)

If compressor 1 is configured with three unloaders and **CO09=0**, when compressor off, unloader 1 is deactivated. On compressor start-up, the minimum capacity step remains active for CO15. During this time, unloader 1 will act accordingly as minimum capacity request, so it is activated (because CO08=0). After this delay, the minimum capacity step will not be used for temperature control. The time CO15 is reloaded every time the compressor is switched-off.
If compressor 1 is configured with three unloaders and **CO09=1,** when compressor off, unloader 1 is deactivated. On compressor start-up, the minimum capacity step remains active for CO15. During this time, unloader 1 will act accordingly as minimum capacity request, so it is activated (because CO08=0). If after time CO15 there is a temperature control request, the minimum step still can work as a power step. The time CO15 is reloaded every time the compressor is switched-off.

EXAMPLE WITH SCREW COMPRESSORS (Suppose CO08=0)

If compressor 1 is configured with three unloaders and **CO09=2,** even when compressor is off, unloader 1 will always keep the status as minimum capacity request, so it is activated (because CO08=0). This allows the compressor to start in minimum load conditions. On compressor start-up, the minimum capacity step remains active for CO15. After this delay, the minimum capacity step will not be used for temperature control. The time CO15 is reloaded every time the compressor is switched-off.

If compressor 1 is configured with three unloaders and **CO09=3,** even when compressor is off, unloader 1 will always keep the status as minimum capacity request, so it is activated (because CO08=0). This allows the compressor to start in minimum load conditions. On compressor start-up, the minimum capacity step remains active for CO15. If after time CO15 there is a temperature control requests, the minimum step still can work as a power step. The time CO15 is reloaded every time the compressor is switched-off.

19.2 INTERMITTENT VALVE FUNCTION FOR SCREW COMPRESSORS

CO10	Screw compressor intermittent valve control relay ON time 0 = function is disabled	0	250	Sec	
CO11	Screw compressor intermittent valve control relay OFF time	0	250	Sec	

Configure digital output as:
(Screw) Compressor x intermittent valve (x=1-8, DO type=52-59)

This type of regulation is particularly suitable in systems with great thermic inertia, e.g. in indirect cooling. A typical application example is the cooling (liquid refrigerators). The working of this valve seems only to be used by Bitzer.
If the intermittent valve is configured, its output goes to ON together with compressor switch-on (in the case of part winding or star delta with activation of the first relay) for the time set in Par CO10. Then the valve is switch off for the time set in the Par CO11.
Intermittent valve will repeat this ON-OFF cycle according to Par CO10 and CO11 until the compressor switch off.
WARNING: even if the intermittence function is configured, it is only enabled if the ON time is different to 0.

20. COMPRESSOR LIQUID INJECTION SOLENOID VALVE FUNCTION

CO51	Activation set point of the liquid injection solenoid valve	-50.0 -58	150.0 302	°C °F	Dec int
CO52	Differential deactivation of the liquid injection solenoid valve	0.1 0	25.0 45	°C °F	Dec int

Eight relay outputs are available for the management of a liquid injection solenoid valve for the compressor 1 to 8. They are: Compressor x liquid injection solenoid valve (x=1-8. DO type=60-67).

The function is active for the compressor if:
If a relay output is configured as a compressor liquid injection solenoid valve and an analogue input as compressor x PTC discharge temperature probe (AI type=1-8).

20.1 WORKING

With compressor in OFF the relay output that controls the liquid injection solenoid valve is **ALWAYS** in OFF mode. With compressor in ON, if the temperature measured by the compressor discharge temperature PTC probe reaches the set-point CO51, the solenoid valve is activated. The valve is deactivated when the temperature measured drops below the CO51 set point - the CO52 differential.

21. COMPRESSOR WITH INVERTER MANAGEMENT

CO39	Compressor operation time at maximum speed requested by temperature control 0 = function is disabled	0	250	Sec	
CO40	Minimum value for digital scroll 0-10V analogue output at peak	0	100	%	
CO41	Power implementation interval at peak	0	250	Sec	
CO42	Determines the minimum continuative operation percentage of the modulating compressor below which the CO43 time count starts 0 = function is disabled	0	100	%	
CO43	MAX continuative operation time of modulating compressor with operation percentage below CO42 0 = function is disabled	0	250	Min	10 Min
CO44	Forced working time at maximum speed	0	250	Sec	10sec
CO45	Maximum continuative operation time of modulating compressor after which the modulating compressor is switched off and insertion of another compressor is forced depending on rotation 0 = function is disabled	0	999	Hr	1Hr
CO46	Minimum value for circuit 1 inverter 0-10V analogue output	0	CO47	%	
CO47	Maximum value for circuit 1 inverter 0-10V analogue output	CO46	100	%	
CO48	Minimum value for circuit 2 inverter 0-10V analogue output	0	CO47	%	
CO49	Maximum value for circuit 2 inverter 0-10V analogue output	CO46	100	%	

To use inverter, please configure analog output as:
Circuit n° x compressor 1 0÷10V modulating output (x=1-4, AO type=11-14)
Or Circuit n° x compressor 1 4÷20mA modulating output (x=1-4, AO type=28-31)
In one circuit, only the first compressor can be configured with inverter.

- The signal can be controlled in pressure or in temperature mode (NTC probe)
- There can be up to 4 steps in one circuit, 1 modulating comp. and 3 ON/OFF comp.

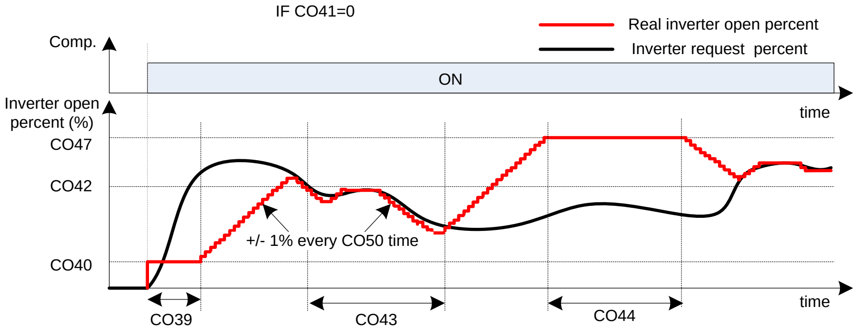
For inverter regulation, the temperature control type must be proportional (ST11=0).
During temperature control, requested power steps number will change according to temperature changing, in this case:
When the step number is increasing, the inverter request percent will be 100%;
When the step number is decreasing, the inverter request percent will changes from 100% to 0%.
When one power step needs to switch off due to temperature changing, this step will not switch off immediately. The inverter output will start to decrease. After inverter start time (CO39) past, and the inverter output reaches the maximum or minimum value, the step is allowed to switch off. And inverter will output a value calculated by current temperature.

In fact, the real inverter open percentage may different from the request percent.
If ST12=0, the real inverter open percentage is confined to limitation of CO46-CO47.

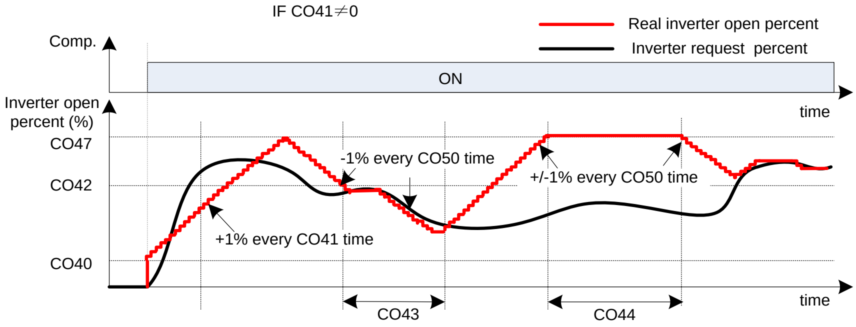
If ST12=1, the real inverter open percentage of circuit 1 is confined to limitation of CO46-CO47.
the real inverter open percentage of circuit 2 is confined to limitation of CO48-CO49.
For example (assume ST12=0):
If CO46=0, CO47=100, when inverter request is 50%, the real inverter open percentage will also 50%.
If CO46=50, CO47=100, when inverter request is 50%, the real inverter open percentage will be 75%.

And the real inverter open percentage will change step by step, to avoid sudden variations.
The real inverter open percentage is increased by a delay that can be set from 1 to 250 seconds at peak and normal conditions (with resolution of 1 second). The percentage will be increased 1% after a delay and finally reach 100% if requested, without sudden variations.
The maximum time that inverter can keeps on is set by par CO45. If time expired, a rotation will be needed.
Here below the graphics for inverter modulating:

If CO41=0, In the start phase, the inverter should output percent CO40 for CO39 time. (Suppose CO46=0, CO47=100)



If CO41≠0, In the start phase, the inverter should output to maximum percent CO47. The percentage will be increased 1% after a delay CO41. (Suppose CO46=0, CO47=100)



If there are more than one compressor in one circuit, the compressor with inverter will be start first.
The multi-steps working logic in chiller and heat pump mode is described in the graphics below:
(When the inverter compressor is deactivate, its analog output always keeps the minimum value set by CO46.)

Working example in chiller mode

Fig. 1 Regulation of 2 compressors with inverter
Set parameters as: ST11=0, ST12=0, CF05=1, CF06=1, CF09=0, CF10=0.
Configure 2 analog outputs as:
Circuit n° 1 compressor 1 0÷10V modulating output
Circuit n° 2 compressor 1 0÷10V modulating output

Fig. 1

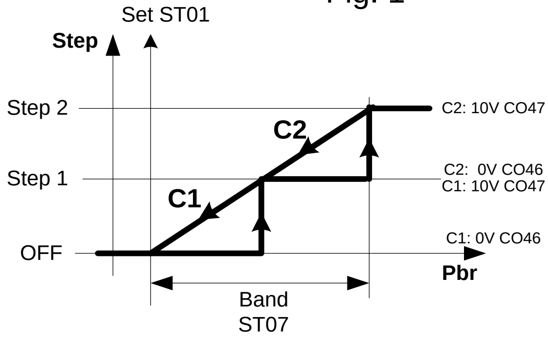
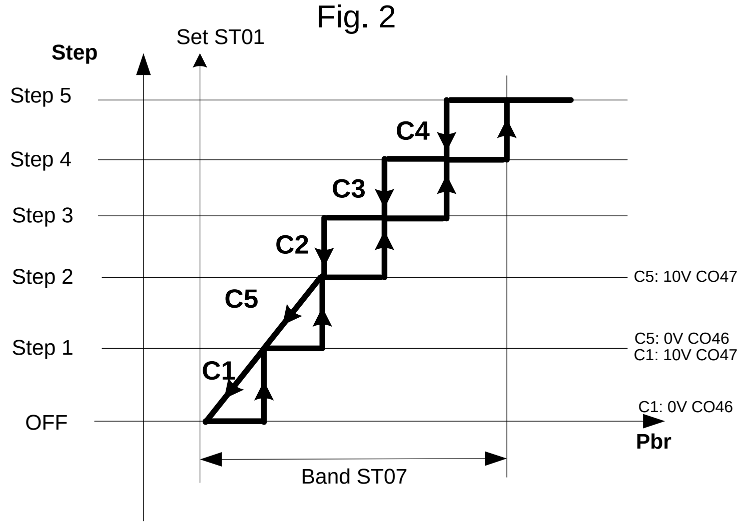
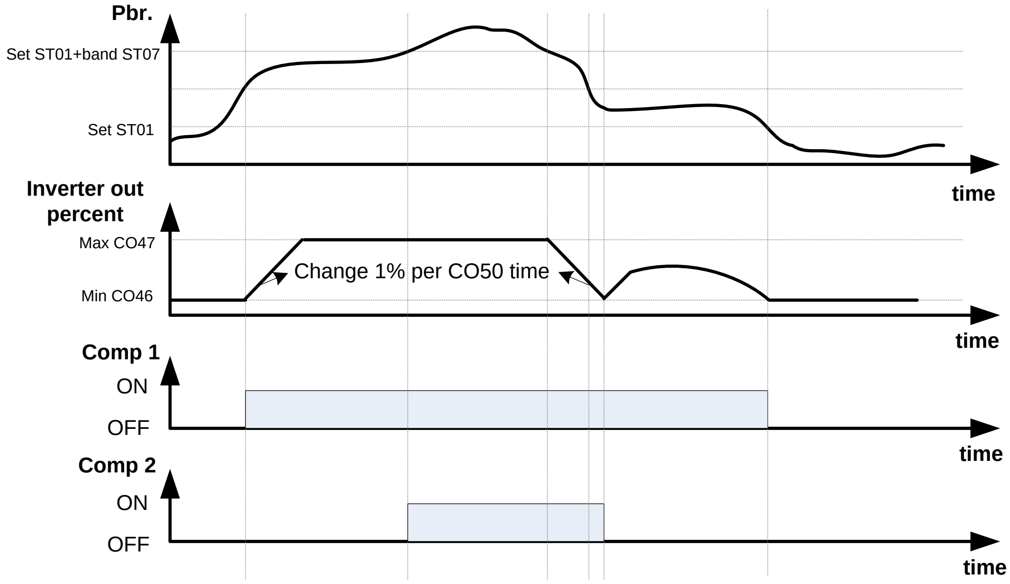


Fig. 2 Regulation of 5 compressors and 2 of them are configured with inverter
Set parameters as: ST11=0, ST12=0, CF05=4, CF06=1, CF09=0, CF10=0.
Configure 2 analog outputs as:
Circuit n° 1 compressor 1 0÷10V modulating output
Circuit n° 2 compressor 1 0÷10V modulating output
In this case, compressors 1/2/3/4 belong to circiut1; compressor 5 belongs to circuit 2.
Compressor 1 and 5 are equipped with inverter.

Fig. 2



Another example in chiller mode:
There are 2 compressors configured, one is with inverter, another one is ON/OFF compressor. The status of compressors and inverter due to temperature changing are show below.



Working example in heat pump mode

Fig. 1 Regulation of 2 compressors with inverter
Set parameters as: ST11=0, ST12=0, CF05=1, CF06=1, CF09=0, CF10=0.
Configure 2 analog outputs as:
Circuit n° 1 compressor 1 0÷10V modulating output
Circuit n° 2 compressor 1 0÷10V modulating output

Fig. 1

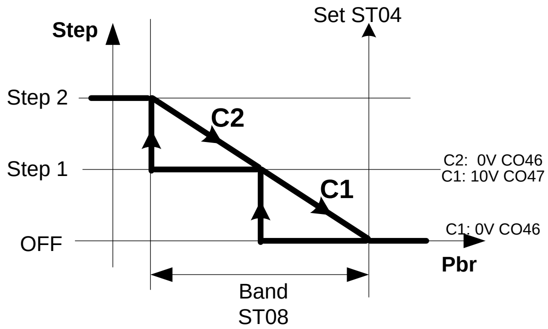
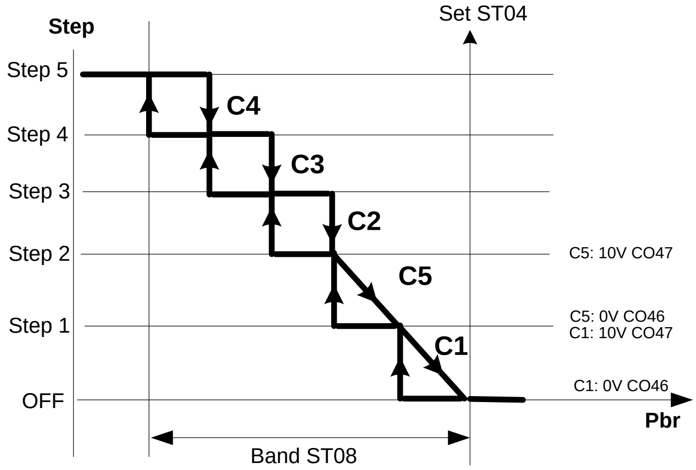


Fig. 2 Regulation of 5 compressors and 2 of them are configured with inverter
Set parameters as: ST11=0, ST12=0, CF05=4, CF06=1, CF09=0, CF10=0.
Configure 2 analog outputs as:
Circuit n° 1 compressor 1 0÷10V modulating output
Circuit n° 2 compressor 1 0÷10V modulating output
In this case, compressors 1/2/3/4 belong to circiut1; compressor 5 belongs to circuit 2.
Compressor 1 and 5 are equipped with inverter.

Fig. 2



If enabled, the first step requested is always the modulating compressor. On request for insertion of other steps, the modulating step will be transferred last, while all of the previous ones will be made up from ON/OFF steps. The same principle is valid for switch-off.

22. COMPRESSORS IN TANDEM

CO38	Maximum continuous working time for individual compressor in the circuit.	0	250	Min	

It is possible to establish the maximum continuous working time of a compressor by par CO38. On the expiry of which the compressor is switched-off and another compressor in the same circuit is switched-on (the compressor will be chosen according to the least working hours/least peaks per hour logic)

23. COMPRESSORS MAINTENANCE REQUEST FUNCTION

CO53	Set compressor 1 hour meter	0	999	Hr	10 Hr
CO54	Set compressor 2 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO55	Set compressor 3 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO56	Set compressor 4 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO57	Set compressor 5 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO58	Set compressor 6 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO59	Set compressor 7 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO60	Set compressor 8 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO61	Set compressor 9 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO62	Set compressor 10 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO63	Set compressor 11 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO64	Set compressor 12 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO65	Set compressor 13 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO66	Set compressor 14 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO67	Set compressor 15 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr
CO68	Set compressor 16 hour meter (see chap. maintenance request function)	0	999	Hr	10 Hr

The parameters CO53 – CO68 are the working timer set for compressor 1 to compressor 16.
They establishes the number of working hours of the compressors, beyond which a maintenance request is made. (If the working timer =0, disables the function). The function is also disabled if the relay is configured as compressor unloader

24. REFCOMP COMPRESSOR MANAGEMENT

CO69	Delay time in enabling Refcomp Inverter compressor relay based on temperature control request	0	250	sec	
CO70	Delay in VI valves activation from compressor start-up	0	250	sec	
CO71	Minimum activation time for VI valves	0	250	sec	

Only compressor 1 is allowed to configure as a RefComp compressor. And besides the relay "compressor 1 Direct start-up", there must has another relay configured as **Refcomp Inverter Power** (DO type=192).
Configure one analog output as:

Circuit n° 1 compressor 1 0÷10V modulating output (AO type=11)
Or Circuit n° 1 compressor 1 4÷20mA modulating output (AO type=28)

Relay **Refcomp Inverter Power** will always keep active after power on except situations below:

- Alarms occur
- Switch off the unit after all compressors had been kept off for 70 seconds.

24.1 REFCOMP COMPRESSOR START-UP

The RefComp compressor start-up is similar to direct start up. The difference is that: When device power on , relay "RefComp Inverter Power" will be activated firstly. After a delay set in par CO69, the relay "compressor 1 Direct start-up" can be activated.

24.2 REFCOMP COMPRESSOR VALVE CONTROL

The RefComp compressor controlling needs 3 valves. They are controlled by relays configured as below:

Management VI valve 14 (DO type=193)
Management VI valve 15 (DO type=194)
Management VI valve 16 (DO type=195)

In case Management VI valve 15 does not exist, the controlling also can be done with 2 valves.

The RefComp compressor regulate according to two analog inputs configured as:
Circuit 1 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=52)
Circuit 1 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=56)

When the RefComp compressor is activated, after a delay set by par CO70, the valves start to regulate.
<u>With 3 valves configured:</u>
If condensing pressure/ evaporating pressure >= 5.4, only valve 14 will be activated;
If 3.8 <= condensing pressure/ evaporating pressure < 5.4, only valve 15 will be activated;
If 3.2 <= condensing pressure/ evaporating pressure < 3.8, only valve 16 will be activated;
If condensing pressure/ evaporating pressure < 3.2, no valves will be activated.

<u>With 2 valves configured:</u>
If 3.8 <= condensing pressure/ evaporating pressure, only valve 14 will be activated;
If 3.2 <= condensing pressure/ evaporating pressure < 3.8, only valve 16 will be activated;
If condensing pressure/ evaporating pressure < 3.2, no valves will be activated.

Every active IV management valve changing will take place after a delay set by CO71.

24.3 REFCOMP COMPRESSOR INFORMATION READING

RefComp compressor information can be read out via Modbus RS485 communication, and display in Visograph.
There are 14 kinds of information, like frequency, speed and so on. These information are monitored by the controller in real time.

25. COMPRESSOR STEPLESS REGULATION

SL 1	Compressors stepless adjustment 0 = not active function 1 = Bitzer compressor active function 2 = Fu Sheng compressor active function	0	2		
SL 2	Pulses number to consider the stepless compressors of circuit 1 to 100%	1	250		
SL 3	Pulses number to consider the stepless compressors of circuit 2 to 100%	1	250		
SL 4	Pulses number to consider the stepless compressors of circuit 3 to 100%	1	250		
SL 5	Pulses number to consider the stepless compressors of circuit 4 to 100%	1	250		
SL 6	Delay pulse valves	1	250		0.1 sec
SL 7	Minimum interval between two consecutive pulses	1	SL8	Sec	
SL 8	Maximum interval between two consecutive pulses	SL7	250	Sec	
SL 9	Dead band in chiller operation	0.1 1	25.0 45	°C °F	Dec int
SL10	Dead band in heat pump operation	0.1 1	25.0 45	°C °F	Dec int

25.1 STEPLESS CONFIGURATION

Stepless regulation will be enabled if par SL01 $\neq$ 0.
It is necessary to set parameters as below. Otherwise, alarm **ACF18** will be signal.
ST11 = 2, because stepless compressor regulation can only be Neutral Zone;
CF5…CF8 <= 1, because for each circuit, it can only has one compressor configured.
SL06 < 10*SL07. Delay pulse valves must < Minimum interval between two consecutive pulses.
For each circuit with compressor configured, one relay must configure as: **(Screw) Compressor x intermittent valve** (x can be 1 to 4) (DO type=52…55).

It is necessary to set CO09=0/2, and for each circuit with compressor configured, two relays must configure as: **Unloader 1 compressor x, Unloader 2 compressor x** (x can be 1 to 4). Otherwise, alarm **Function not available** will be signal.

In stepless regulation, the total power steps number is calculated by common ON/OFF type compressor number plus stepless compressor steps.
For example:
If ST12=0, CF05=1, CF06=1, CF07=1, CF08=1,
then the total power steps number = 4+SL02+SL03+SL04+SL05.

The stepless compressor capacity increasing is take effect by output pulse to Screw Compressor x intermittent valve, and drive the screw compressor. When maximum step (SL02…SL05) is reached, the intermittent valve will output pulse set by par CO10 and CO11.

The stepless compressor capacity decreasing is take effect by output pulse to Unloader 2 compressor x valve.

The probe for setpless regulation is selected by par ST09/ST10.

25.2 STEPLESS START-UP

When stepless compressor needs to start-up, first, switch on compressor direct start-up relay. Then the Screw Compressor x intermittent valve will output pulse and keeps for time set in par CO04. The ON/OFF time of the pulse is set by par CO10 and CO11.

25.3 STEPLESS REGULATION

Par CO17 can set the stepless regulation mode.
CO17 (Selection criteria of circuits)
0 = Fixed sequence
1 = FIFO
2 = Balance
3 = Saturation

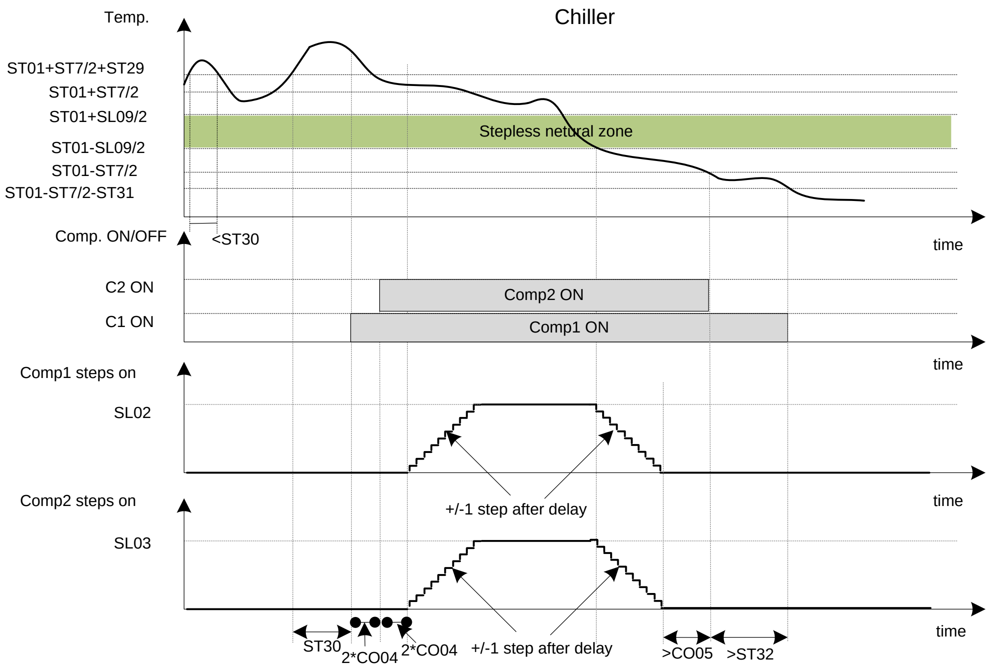
Balance mode

If CO17=2, balance mode is selected.
When the temperature exceeds the neutral zone and more cooling/heating needed, compressor will switch ON one by one. After all the compressor activated, every compressor's step will start to increase. In this way, each circuit's load will be balanced.

Step number is increased by outputting pulse from relay (Screw Compressor x intermittent valve) to drive the screw compressor. The step interval is set by par SL7 and SL8, and changed according to temperature.

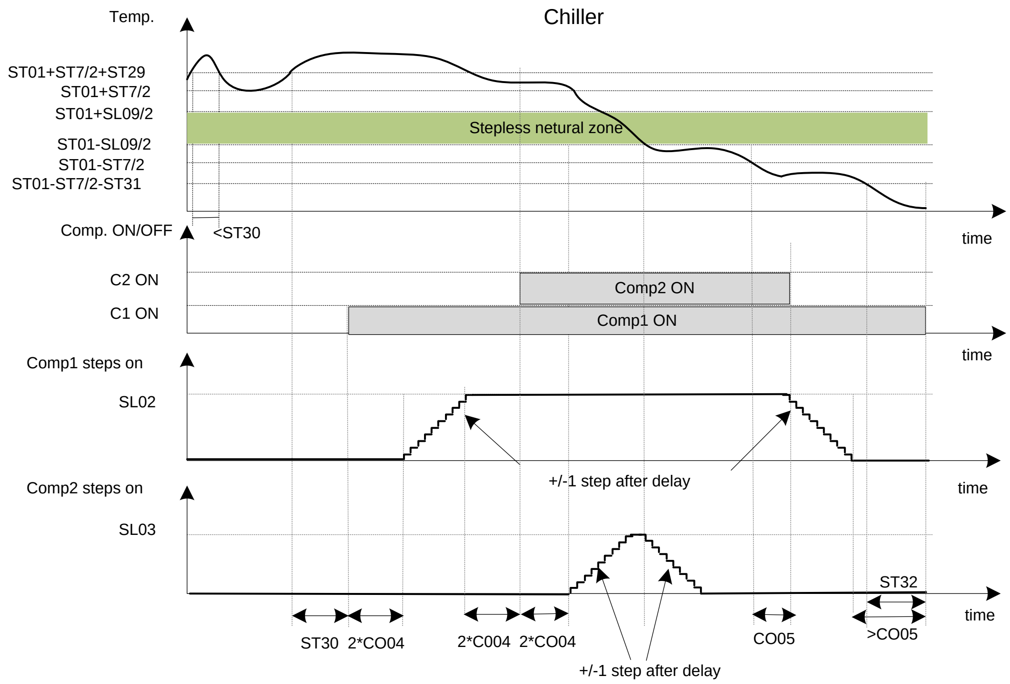
Temp. <= ST01-ST07/2 or Temp. >ST01+ST07/2	Step interval =SL07 (minimum)
ST01-SL09/2 < Temp. <= ST01+SL09/2	Step interval =SL08 (maximum)
Other	SL07<Step interval<SL08

Here below a graphic for balance stepless regulation in chiller mode:
Suppose: Energy saving and dynamic set point are not considered.
ST12=0, CF05=1, CF06=1.



Saturation mode

If CO17≠2, Saturation mode is selected.
Saturation mode is similar to balance mode. The difference is: only after one compressor's entire steps all activated, another compressor is allowed to switch ON.



26. EVAPORATOR WATER PUMP WORKING

26.1 ONLY ONE RELAY CONFIGURED AS EVAPORATOR WATER PUMP

If only one relay is configured as evaporator water pump, no rotation needed. The relay can be configured as:
Evaporator main pump/supply fan (DO type =2)
Or Evaporator support pump (DO type =3)

Evaporator pump/supply fan operation mode is set by par PA01.

PA 1	Evaporator pump/supply fan operation mode 0 = Absent (pump and supply fan are not controlled). 1 = Continuous operation: the pump/supply fan is activated when the machine is switched on (chiller/h.p. selection). 2 = Working on demand of the compressors: the water pump/supply fan are linked with the compressors being switched on and off.	0	2		
PA 2	Compressor ON delay from pump/ supply fan start	0	250	Sec	10 Sec
PA 3	Evaporator water pump/supply fan OFF delay from when the compressors are shut off	0	250	Sec	10 Sec
PA 4	Deactivation Pump Delay from when the unit is Switched Off	0	250	Sec	10 Sec

PA01= 0: The pump is not managed.
PA01= 1: Continuous Working. Pump switch-on/off is linked to unit switch-on/off. If the unit is on, the water pump will be activated. After a delay set by par PA02, the compressor is allowed to switch-on if requested.
The water pump only deactivate when the unit switches-off (unit in stand-by/remote OFF). When the unit is switch off, the pump will not deactivated immediately, it will keep on for a period set by par PA04. After the time pass, pump is switch off (only when pump does not forced to active by PA09).

PA01= 2: Working on compressor call. Pump switch-on/off is linked to compressor switch-on/off both in chiller and heat pump working mode. If the temperature controlling requests compressor to switch-on, the water pump will be activated first, after a delay set by par PA02, the compressor can switch-on.
If the temperature controlling requests compressor to switch-off, the compressor will deactivated first, after a delay set by par PA03, the water pump will be switch-off.
If the water pump is active and then the unit is switch off, the pump will switch off after a delay set by par PA04(only when pump does not forced to active by PA09).

The pump is switched off if:
The unit is positioned in OFF from remote(only when pump does not forced to active by PA09).
When digital input configured as Evaporator main pump / Supply fan Overload is active or manual reset needing, switch off Evaporator main pump / Supply fan.
When digital input configured as Evaporator support pump Overload is active or manual reset needing, switch off Evaporator support pump.
Digital input configured as Evaporator flow switch is active or manual reset needing.

(in defrost mode in the periods in which the compressor is in OFF mode for dripping, the pump remains on)

If PA01=0, and one or two relays is/are configured as **Evaporator main pump/supply fan** (DO type =2) or **Evaporator support pump** (DO type =3), alarm ACF9 will occur.
If PA01≠0, and no relays configured as **Evaporator main pump/supply fan** (DO type =2) and **Evaporator support pump** (DO type =3), alarm ACF9 will occur.

27. EVAPORATOR WATER PUMP ROTATION

27.1 2 RELAYS CONFIGURED AS EVAPORATOR WATER PUMP

If 2 relays are configured for evaporator water pump, rotation management is enabled.
1 relay (pump 1): Evaporator main pump/supply fan (DO type =2)
Another relay (pump 2): Evaporator support pump (DO type =3)

In this situation, the pump regulation is the same with that when only one pump configured. The difference is that the 2 pumps will rotation depending on the value of the **pumps rotation enabling** par PA05.

PA 5	Pump Activation and Rotation: 0 = No Rotation; 1 = Manual Rotation; 2 = Start Rotation; 3 = Rotation at Hours; 4 = Rotation at Start and Hours	0	4		
PA 6	Manual Pump Inversion: 0= Pump 1 On; 1= Pump 2 On;	0	1		
PA 7	No. of hours for forced evaporator pump rotation	0	999	Hr	10Hr
PA 8	Simultaneous pump running time after forced pump rotation	0	250	Sec	

If a pump request to switch-on, no matter it is caused by unit switch on/off or compressor on/off (see par PA01), select the proper pump according to PA05 setting.

PA05=0: no rotation.
PA05=1: manual inversion depends on par PA06
If PA06=0, pump 1 will switch on if demanded.
If PA06=1, pump 2 will switch on if demanded.
PA05=2: start rotation
For the first time that pump request to switch on, pump1 is start-up as default. When the demand disappeared, pump 1 is switch off. Then when the demand comes again, pump 2 will start.
Every time when water pump needs to restart, the pump not activated before will be requested to switch on.

PA05=3: rotation at working hours.
When pump needs to switch on or restart, the pump with less working hours will be selected to start.
During one of the pump working, if its working hour reach the hours limitation set by par PA07, a rotation is request. The operating pump is switched-off and another pump is switch-on. If par PA08 is different to 0 (simultaneous pump working enabled), the first pump will switch-off after PA08 time. Therefore, in PA08 period, both 2 pumps are active. After time pass, the pump with less hours of working will works alone.

PA05=4: start rotation plus working hours
It is a combination of start rotation and working hour rotation.

The pump rotates every time that the pump request changing and when the working hours are reached.

Warning: also with the pumping unit function enabled the switch-on/off times between the compressors and pump are respected.

27.2 ROTATION OF THE EVAPORATOR WATER PUMPS FROM DIGITAL INPUT

The function is enabled when:
Two digital inputs are configured as:
Evaporator main pump / Supply fan Overload (DI type=56)
Evaporator support pump Overload (DI type=57)

When an evaporator (main/support) pump overload DI is active, it switches the corresponding pump off and the other switches on automatically, independently from the working hours. If only 1 digital input is configured as an evaporator (main/support) pump overload in normal working, when the DI is active, it only switches the corresponding pump off.

When the evaporator (main/support) pump overload DI is return to deactivate, manual reset is needed to make the corresponding pump available.

28. EVAPORATOR PUMP ANTI-FREEZE MANAGEMENT

PA 9	Determines the evaporator water pump/s anti-freeze operation when the device is OFF or on Stand-by 0 = always OFF in remote OFF or Stand-by 1 = ON, parallel with the anti-freeze heaters 2 = on in remote OFF or Stand-by, depending on the temperature control request	0	2		
PA10	Temperature control probe for anti-freeze evaporator water pump/s operation 0 = disabled 1 = evaporator input 2 = evaporator output 1/2 3 = evaporator output 3/4 4 = evaporator output 1/2/3/4 5 = evaporator output 1/2/3/4 and common output 6 = external air temperature	0	6		
PA11	Evaporator water pump activation set point in anti-freeze mode on the temperature control probe	-50.0 -58	110 230	°C °F	Dec int
PA12	Evaporator water pump differential deactivation in anti-freeze mode on the temperature control probe	0.1 0	25.0 45	°C °F	Dec int

It is possible to manage pump working when the device is in OFF or Stand-by with anti-freeze function mode to protect the evaporator.
Par PA09 determines pump/s working when the device is in OFF or Stand - by
0= always off in remote OFF or Stand-by mode
1= on in parallel with the anti-freeze heaters
2= on in OFF remote or Stand-by (depending on the request of the heat regulator)

<u>Select probe for anti-freeze pump activation by par PA10</u>
Suppose configure probes as below:
Pb1: Evaporator common input NTC temperature probe
Pb2: Evaporator 1 output NTC temperature probe
Pb3: Evaporator 2 output NTC temperature probe
Pb4: Evaporator 3 output NTC temperature probe
Pb5: Evaporator 4 output NTC temperature probe
Pb6: Evaporator common outlet NTC temperature probe
Pb7: Dynamic/boiler function/change over set-point external air temperature NTC temperature probe

Par PA10: Pump working temperature control probe
0= disabled
1= Pb1
2= minimum between Pb2, Pb3
3= minimum between Pb4, Pb5
4= minimum between Pb2, Pb3, Pb4, Pb5
5= minimum between Pb2, Pb3, Pb4, Pb5, Pb6

6= Pb7

When unit off, if PA09=2, then:
When selected probe temperature >= PA11+PA12, the pump is switch OFF.
When selected probe temperature <= PA11, the pump is switch ON.

29. WATER PUMP MAINTENANCE REQUEST FUNCTION

PA13	Main pump/supply fan timer setting	0	999	Hr	10 Hr
PA14	Evaporator no. 2 pump timer setting	0	999	10 Hr	10 Hr

The parameters **PA13/PA14** are the evaporator water pump/evaporator support water pump working timer setting.
They establish the number of working hours of the pumps, beyond which a maintenance request is made. (If PA13/PA14 = zero, disables the function).
When maintenance request is ask, user must reset the corresponding pump working hours from the keyboard, otherwise the pump is not available.

30. SUPPLY FAN WORKING

If the unit is configured as air/air (CF01=0), the relay **Evaporator main pump/supply fan** (DO type =2) will used for fan controlling. The evaporate support pump will not work even if one relay is configured as **Evaporator support pump** (DO type =3).
Since only one fan is controlled, no rotation needed, PA05-PA08 is useless.

Supply fan regulation takes place if:

Use par PA01 to set Supply fan operational mode

PA01= 0: The supply fan is not managed.
PA01= 1: Continuous Working. Fan switch-on/off is linked to unit switch-on/off. If the unit is on, the supply fan will be activated. After a delay set by par PA02, the compressor is allowed to switch on if requested.
The supply fan only deactivate when the unit switches-off (unit in stand-by). When the unit is switch-off, the supply fan will not deactivated immediately, it will keep on for a period set by par PA04. After the time pass, supply fan is switch-off (only when fan does not forced to active by PA09).

PA01= 2: Working on compressor call. Supply fan switch-on/off is linked to compressor switch-on/off both in chiller and heat pump working mode. If the temperature controlling requests compressor to switch-on, the supply fan will be activated first, after a delay set by par PA02, the compressor can switch-on.
If the temperature controlling requests compressor to switch-off, the compressor will deactivated first, after a delay set by par PA03, the supply fan will switch off.
If the supply fan is active and then the unit is switch off, the supply fan will switch off after a delay set by par PA04(only when fan does not forced to active by PA09).

30.1 SUPPLY FAN DURING DEFROST

dF32	Supply fan block in defrosting mode 0 = Not enabled – Supply fan works during defrost 1 = Enabled – Supply fan doesn’t work during defrost	0	1		

The supply fan can be stopped during defrost of the air/air heating units to block the introduction of cold air into the room during the defrost phase.

WARNING:
With several circuits configured the function is only active if:

- dF32 ≠ 0 when they enter defrost together
- FA06 = 0 unique condensation ventilation

30.2 HOT START FUNCTION

PA15	Hot start set-point	-50.0 -58	110 230	°C °F	Dec int
PA16	Hot start differential	0.1 1	25.0 45	°C °F	Dec int

This function is **only** active with air/air units configured as **heat pump**. It allows start-up of the supply fan only if the temperature of the condensing coil is sufficiently hot. In this way, cold air flow into the environment is prevented.
PA15 Hot start set-point
It allows to set a temperature value detected by the probe configures as common evaporator air outlet, below which the supply fan is blocked.
PA16 Hot start differential
Allows setting a differential on the hot start function

The supply fan is off if:

Unit in remote OFF/stand-by

Digital input configured as Evaporator main pump / Supply fan Overload is active or manual reset needing.
Digital input configured as Evaporator flow switch is active or manual reset needing

31. FUNCTION OF SUPPLY FAN MAINTENANCE REQUEST

The **PA13** parameter is the supply fan working timer setting.
It establishes the number of working hours of the supply fan, beyond which a maintenance request is made. (If PA13 = zero, disables the function).
When maintenance request is ask, user must reset the corresponding fan working hours from the keyboard, otherwise the supply fan is not available.

32. CONDENSER WATER PUMP WORKING

32.1 ONLY ONE RELAY CONFIGURED AS CONDENSER WATER PUMP

If only one relay is configured as condenser water pump, no rotation needed. The relay can be configured as:
Heat recovery condenser main pump (DO type =8)
Or Heat recovery condenser support water pump (DO type =9)

Condenser pump/supply fan operation mode is set by par PA17.

PA17	Condenser pump operation mode 0 = Absent (pump not controlled). 1 = Continuous operation: the pump being switched on and off is linked with the unit being switched on and off. 2 = Working on demand of the compressors: pump switch-on and off is linked with the compressors being switched on and off.	0	2		
PA18	Compressor ON delay from condenser pump start-up	0	250	Sec	10 Sec
PA19	Condenser pump OFF delay from compressor shut off	0	250	Sec	10 Sec
PA20	Deactivation pump delay from when the unit is switched off	0	250	Sec	10 Sec

PA17= 0: The pump is not managed.
PA17= 1: Continuous Working. Pump switch-on/off is linked to unit switch-on/off. If the unit is on, the water pump will be activated. After a delay set by par PA18, the compressor is allowed to switch-on if requested.
The water pump only deactivate when the unit switches-off (unit in stand-by). When the unit is switch off, the pump will not deactivated immediately, it will keep on for a period set by par PA20. After the time pass, pump is switch off.

PA17= 2: Working on compressor call. Pump switch-on/off is linked to compressor switch-on/off both in chiller and heat pump working mode. If the temperature controlling requests compressor to switch-on, the water pump will be activated first, after a delay set by par PA18, the compressor can switch-on.
If the temperature controlling requests compressor to switch-off, the compressor will deactivated first, after a delay set by par PA19, the water pump will be switch-off.
If the water pump is active and then the unit is switch off, the pump will switch off after a delay set by par PA20.

The pump is switched off if:

The unit is positioned in OFF from remote

Digital input configured as Condenser main pump Overload is active or manual reset needing.
Digital input configured as Condenser support pump Overload is active or manual reset needing.
Digital input configured as Condenser flow switch is active or manual reset needing

(in defrost mode in the periods in which the compressor is in OFF mode for dripping, the pump remains on)
If only one pump is configured, the pump keeps working; if two pumps are configured, there is the rotation.

If PA17=0, and one or two relay is configured as **Heat recovery condenser main pump** (DO type =8) or **Heat recovery condenser support water pump** (DO type =9), alarm ACF9 will occur.
If PA17≠0, and no relay configured as **Heat recovery condenser main pump** (DO type =8) and **Heat recovery condenser support water pump** (DO type =9), alarm ACF9 will occur.

33. CONDENSER WATER PUMP ROTATION

33.1 2 RELAYS CONFIGURED AS CONDENSER WATER PUMP

If 2 relays are configured for condenser water pump, rotation management is enabled.
1 relay: Heat recovery condenser main pump (DO type =8)
Another relay: Heat recovery condenser support pump (DO type =9)

The rotation depends on the value of the **pumps rotation enabling** par PA21

PA21	Pump activation and rotation: 0 = No Rotation; 1 = Manual Rotation; 2 = Start Rotation; 3 = Rotation at Hours; 4 = Rotation at Start and Hours	0	4		
PA22	Manual pump inversion: 0 = Pump 1 On; 1 = Pump 2 On	0	1		
PA23	No. of hours for forced condenser pump rotation	0	999	Hr	10Hr
PA24	Simultaneous pump running time after forced condenser pump rotation	0	250	Sec	

PA21=0: no rotation.
PA21=1: manual inversion depends on par PA22
If PA22=0, pump 1 will switch on.
If PA22=1, pump 2 will switch on.
PA21=2: start rotation
When the unit power on, pump1 is start-up as default. If the unit is put in stand-by or remote-off status, pump 1 is switch off. When the unit get back to the normal working status (cooling/heating), pump 2 will start. The same thing will happen when the pump is switch off and on by compressor request.
Every time when water pump needs to restart, the pump not activated before will be requested.

PA21=3: rotation at working hours.
When the unit power on, the pump with less working hours will select to start first.
During one of the pump working, if its working hour reach the hours limitation set by par PA23, a rotation is request. The operating pump is switched-off and another pump is switch-on. If par PA24 is different to 0 (simultaneous pump working enabled), the first pump will switch-off after PA24 time. Therefore, in PA24 period, both 2 pumps are active. After time pass, the pump with less hours of working will works alone.

PA21=4: start rotation plus working hours
It is a combination of start rotation and working hour rotation.
The pump rotates every time that the unit is switched-off and when the working hours are reached.

33.2 ROTATION OF THE CONDENSER WATER PUMPS FROM DIGITAL INPUT

The function is enabled when:
Two digital inputs are configured as:
Condenser main pump Overload (DI type=58)
Condenser support pump Overload (DI type=59)

When a condenser (main/support) pump overload DI is active, it switches the corresponding pump off and the other switches on automatically, independently from the working hours. If only 1 digital input is configured as a condenser (main/support) pump overload in normal working, when the DI is active, it only switches the corresponding pump off.

When the condenser (main/support) pump overload DI is return to deactivate, manual reset is needed to make the corresponding pump available.

34. CONDENSER PUMP ANTI-FREEZE MANAGEMENT

PA25	Condenser water pump/s anti-freeze operation when the device is OFF or on Stand-by 0 = always OFF in remote OFF or Stand-by 1 = ON, parallel with the anti-freeze heaters 2 = on in remote OFF or Stand-by, depending on the temperature control request	0	2		
PA26	Condenser anti-freeze temperature control probe alarm 0 = disabled 1 = common condenser water input probe 2 = common condenser water input probe and condenser input 1/2 3 = common condenser water input probe and condenser input 3/4 4 = condenser water output probe 1/2 5 = condenser water output probe 3/4 6 = condenser output 1/2/3/4 7 = condenser output 1/2/3/4 and common output 8 = external air temperature	0	8		
PA27	Condenser water pump activation set point in anti-freeze mode on the temperature control probe	-50.0 -58	110 230	°C °F	Dec int
PA28	Condenser water pump differential deactivation in anti-freeze mode on the temperature control probe	0.1 1	25.0 45	°C °F	Dec int

It is possible to manage pump working when the device is in OFF or Stand-by with anti-freeze function mode to protect the evaporator.
Par PA25 determines pump/s working when the device is in OFF or Stand - by
0= always off in remote OFF or Stand-by mode
1= on in parallel to the anti-freeze heaters
2= on in OFF remote or Stand-by (depending on the request of the heat regulator)

Select probe for anti-freeze pump activation by par PA26
Suppose configure probes as below:
Pb1: Condenser hot water common input NTC temperature probe
Pb2: Circuit 1 condenser hot water input NTC temperature probe
Pb3: Circuit 2 condenser hot water input NTC temperature probe
Pb4: Circuit 3 condenser hot water input NTC temperature probe
Pb5: Circuit 4 condenser hot water input NTC temperature probe
Pb6: Circuit 1 condenser hot water output NTC temperature probe
Pb7: Circuit 2 condenser hot water output NTC temperature probe
Pb8: Circuit 3 condenser hot water output NTC temperature probe
Pb9: Circuit 4 condenser hot water output NTC temperature probe
Pb10: Condenser hot water common output NTC temperature probe
Pb11: Dynamic/boiler function/change over set-point external air temperature NTC temperature probe

Par PA26: Pump working temperature control probe
0= disabled
1= Pb1
2= minimum between Pb1, Pb2, Pb3
3= minimum between Pb1, Pb4, Pb5
4= minimum between Pb6, Pb7

5= minimum between Pb8, Pb9
6= minimum between Pb6, Pb7, Pb8, Pb9
7= minimum between Pb6, Pb7, Pb8, Pb9, Pb10
8=Pb11

When unit off, if PA25=2, then:
When selected probe temperature >= PA27+PA28, the pump is switch OFF.
When selected probe temperature <= PA27, the pump is switch ON.

35. WATER PUMP MAINTENANCE REQUEST FUNCTION

PA29	Condenser pump timer setting	0	999	Hr	10 Hr
PA30	Condenser no. 2 pump timer setting	0	999	Hr	10 Hr

The **PA29/PA30** parameters are the condenser water pump/condenser support water pump working timer setting.
They establish the number of working hours of the pumps, beyond which a maintenance request is made. (If PA29/PA30 = zero, disables the function).
When maintenance request is ask, user must reset the corresponding pump working hours from the keyboard, otherwise the pump is not available.

36. SWITCH-ON/OFF WORKING WITH PUMP-DOWN

Pd 1	Pump down operation 0= function disabled 1= disabled with pump down 2= disabled and enabled with pump down 3= disabled with pump down only in chiller mode 4= enabled with pump down and disabled with pump down only in chiller mode	0	4		
Pd 2	Pump down pressure setting	0.0 0	50.0 725	Bar psi	Dec int
Pd 3	Pump down pressure differential	0.1 1	14.0 203	Bar Psi	Dec int
Pd 4	Maximum time in Pump down when started-up and stopped	0	250	Sec	

The pump-down working can be based on 3 kinds of input. See the list below, the priority is decreasing from the 1st to the 3rd. If more than one input is configured, use the one with higher priority. (**x** can be 1-4)

1. Digital input configured as **Circuit x pump down pressure switch** (DI type = 85-88).
2. Analog input configured as **Circuit x evaporating pressure probe (4÷20 mA / 0÷ 5 Volt)** (AI type = 56-59).
3. Digital input configured as **Low pressure switch circuit x** (DI type = 14-17).

If none of the input 1-3 configured and the pump-down is active, a configuration alarm occurs.

For pump-down, the relay for driving solenoid valve must be configured, it is set as:
Circuit x pump down solenoid valve (**x** can be 1-4, DO type=30-33)

Pd01 determines if pump down is available when compressors shutdown and start-up.
Pd01=0, pump down never take effects.
Pd01=1, pump down only take effects when compressors shutdown.
Pd01=2, pump down take effects both when compressors shutdown and start-up.
Pd01=3, pump down only take effects when compressors shutdown, and the unit must works in chiller mode.
Pd01=4, pump down take effects when compressors start-up. If the unit is working in chiller mode, pump down also take effects when compressors shutdown.

Pump-down when compressor shutdown: (Available when Pd01=1/2. And also available when Pd01=3/4 in chiller mode)
This function active in two cases: 1. when temperature control requests the last active compressor (or power step) in the circuit to switch off. 2. The unit is switch off from keyboard or remote while compressor is running. Besides, **if the shutdown is caused by alarm, the pump-down at shutdown is by-passed.**
The procedure of pump-down is:
Step1: the last compressor step in the circuit needs to switch off for reasons mentioned above.
Step2: deactivate the solenoid valve, keep compressor ON. At this time, pump-down is started.
Step3: when an effective pump-down **switch-off condition** takes place, pump-down stop and switch off the compressor. Keep solenoid valve off.
This pump-down **switch-off condition** can be expressed as anyone below:

- Activation of digital input or analog input (their priority is mentioned in paragraph above):
    - Activation of the digital input **pump down pressure switch** of the circuit.
    - Exceeding (downwards) the threshold set in parameter Pd02 by the pressure detected by the **Circuit x evaporating pressure probe** of the circuit. When this pressure >=set Pd02+band Pd03, pump-down will not forced to switch –off.
    - Activation of the digital input **Low pressure switch** of the circuit
- Exceeding the maximum duration of the pump-down cycle defined at parameter Pd04. In this case a pump-down alarm on shutdown will be signalled

Pump-down when compressor start-up: (Available when Pd01=2/4.)
Function active when the temperature control requests start-up of the first compressor (or power step) of the circuit.
The procedure of pump-down is:
Step1: the first compressor step in the circuit needs to switch on for reasons mentioned above.
Step2: active the solenoid valve, keep compressor OFF. At this time, pump-down is started.
Step3: when an effective pump-down switch-off condition takes place, pump-down stop and switch on the compressor. Keep the solenoid valve on.
This condition can be expressed as anyone below:

- Deactivation of the digital input **pump down pressure switch** of the circuit
- Deactivation of the digital input **Low pressure switch** of the circuit
- Exceeding (upwards) the threshold set in parameter Pd02 added to the hysteresis set in parameter Pd03 by the pressure detected by the **evaporating pressure** transducer of the circuit.
- Exceeding the maximum duration of the pump-down cycle defined at parameter Pd04. In this case, a pump-down alarm will be signalled on start-up

36.1 PUMP-DOWN FUNCTION WITH CIRCUIT PUMP DOWN PRESSURE SWITCH DI

Once the pump-down function has been activated, on **shutdown**, the solenoid valve switch OFF and waits for the activation of the digital input **circuit pump-down pressure switch** or expiry of the maximum time before switching the compressor off.

If configured (parameter Pd01=2 or 4), when the pump-down function is activated on **start-up**, the solenoid valve switch ON and the compressor/step is not activated while the digital input **pump-down pressure switch** remains active or the maximum time has not expired.

36.2 PUMP-DOWN FUNCTION WITH CIRCUIT LOW PRESSURE PRESSURE SWITCH DI

Once the pump-down function has been activated, on **shutdown** the solenoid valve switch off and waits for the activation of the digital input **circuit low pressure pressure switch** or expiry of the maximum time before switching the compressor off.

If configured (parameter Pd01=2 or 4), when the pump-down function is activated on **start-up**, the solenoid valve is switch on and the compressor/step is not activated while the digital input l**ow pressure pressure switch** remains active or the maximum time has not expired.

36.3 PUMP-DOWN FUNCTION FROM ANALOGUE INPUT

Once the pump-down function is activated on shutdown, the solenoid valve switch off and waits for the pressure detected by the evaporating pressure transducer to fall below the value set in parameter Pd02 before switching the compressor off.

If configured (parameter Pd01=2 or 4) when the pump-down function is activated on start-up, the solenoid valve is switch on and the compressor/step is not activated. This status will be kept until the pressure detected by the evaporating pressure transducer exceeds the value set by parameter Pd02 add to the hysteresis set at parameter Pd03.

36.4 PUMP-DOWN FUNCTION IN CHILLER MODE ONLY

This function is only available for reversible units with the enabling of the working of the compressors in heat pump mode.
When Pd01=3/4, the function of pump-down at compressor shutdown is active in chiller mode only. In heat pump mode, the solenoid valve is piloted in parallel to the compressors.

36.5 TIMED PUMP DOWN FUNCTION

Pd 5	Pump down time upon start-up 0 = function disabled	0	250	Sec	
Pd 6	Pump down time upon shutdown 0 = function disabled	0	250	Sec	

Timed pump down can be managed by setting parameters Pd05 and Pd06. This timed pump down function is enable by set Pd05≠0 and Pd06≠0.

WARNING:
The enabling of the timed pump down function disables all other types of working inherent to this function.
In this case, pump-down starting and ending is not based on digital input and analog input. It is only controlled by time set in Pd05 and Pd06.

Par **Pd05** Pump down time in start-up
0 = function disabled
≠ 0 function enabled for the set time

Par **Pd06** Pump down time in stop
0 = function disabled
≠ 0 function enabled for the set time

36.6 PUMP DOWN ALARM IN START-UP AND SHUT-OFF

Pd 4	Maximum time in Pump down when started-up and stopped	0	250	Sec	
Pd 7	Maximum number of pump down alarm interventions per hour, at stopped. when exceeded, the alarm is recorded and displayed on the screen with a code and the relay alarm + buzzer is activated Reset is always manual if Pd7 = 0 Reset is always automatic if Pd7 =60 Reset switches from automatic to manual if Pd7 falls between 1 and 59	0	60		
Pd 8	Maximum number of pump down alarm interventions per hour, at started-up. Exceeding this limit, the alarm must be reset manually, it will be saved in the log and the alarm relay + buzzer will be activated Reset is always manual if Pd8 = 0 Reset is always automatic if Pd8 =60 Reset switches from automatic to manual if Pd8 falls between 1 and 59 and based on the configuration of Par. Pd9	0	60		
Pd 9	Pump down alarm automatic or manual reset activation upon start-up 0= the alarm remains in automatic reset even if the number of interventions per hour is met 1=enables manual reset when the number of interventions per hour is met	0	1		

Pump down alarm occurs when the pump down duration exceeds the time set by par Pd04.
It is possible to manage the reset and memorisation in the historical alarms of the pump down alarms in start-up and stopping by means of the Pd family parameters.

Par **Pd07** Maximum number of pump down alarm interventions per hour when compressor **shut-off**
Exceeding which the alarm is recorded and signalled with code on the display and the alarm relay+ buzzer are activated
Every 1 minute, if pump-down alarm active, counting increase 1, so in one hour, the total number of pump-down alarm can be 60 in maximum.
Reset is always manual if Pd07 = 0
Reset is always automatic if Pd07 = 60
Reset passes from automatic to manual if Pd07 goes from 1 to 59

Par **Pd08** Maximum number of pump down alarm interventions per hour when compressor **start-up**
exceeding which the alarm becomes with manual reset, it is recorded and the alarm + buzzer are activated
The minimum interval between two pump-down alarm counting is 1 minute, so in one hour, the total number of pump-down alarm can be 60 in maximum.
Reset is always manual if Pd08 = 0
Reset is always automatic if Pd08 = 60
The reset passes from automatic to manual if Pd08 goes from 1 to 59 and on the basis of the configuration of Par. Pd09

Par **Pd09** Enabling of pump down alarm in start-up automatic or manual reset if the number of hourly interventions is reached Pd08
0= remains at automatic reset even if the number of interventions/hour are reached
1=enables manual reset on reaching the number of interventions/hour

36.7 LOW PRESSURE ALARM DURING THE PUMP-DOWN

AL 1	Bypass time for low pressure alarm from digital / analog input from the start-up of the first compressor of the circuit and from the shut off of the last compressor of the circuit	0	250	Sec	
AL 2	Defines low pressure alarm operation with pump-down enabled 0 = independent from the pump down 1 = blocks the compressors until the pressure switch is disabled 2 = lets the compressors reach peak values	0	2		

The AL02 parameter defines the working of the low pressure alarm with pump-down enabled
The low pressure alarm can be detected both by analog input (**Low pressure switch)** and digital input (**pump down pressure switch)**.

Par **AL02** = 0 the low pressure alarm is independent from pump-down. It can active in normal working mode.

Par **AL02** = 1 the low pressure alarm is inhibited when the compressor required to start in pump down mode. When compressor need to start-up, if the low pressure alarm is active, opening of the solenoid valve is allowed only to favour the balance of the pressure, but compressor is not allowed to start-up until the low pressure pressure alarm is deactivated. After time AL01, if this alarm is still active, LP alarm is signalled and compressor is allowed to start.

Par **AL02** = 2 the low pressure alarm is always inhibited, and compressor working will not be affected.

WARNING:
In the case of pump-down from **pump down pressure switch** or **Low pressure switch** analogue input, it is possible that the pressure at which compressor/step switch-off is allowed is lower than the activation threshold of the LP pressure switch. In this case, during the pump-down phase, the input relative to the LP pressure switch will be surely activated and will remain so at least until the re-opening of the solenoid valve, with one compressor/step still active.
Similarly, it is possible that the pressure at which the compressor/step is enabled is lower than the deactivation threshold of the LP pressure switch. In this case, there will be a switch-on request of one compressor/step with the digital input relative to the LP pressure switch active.
These are limit conditions that can be managed via parameter AL02, but which should be avoided in order to prevent possible alarm conditions that are difficult to overcome.

37. CIRCUITS UNLOADING

When the unit is working in critical conditions, unloading function will be activated. It force the circuit works with certain number of steps. This function manages the unloader due to overloads of cooling and heating units with a maximum of 4 circuits, in a way to guarantee a continuity of service even in the most heavy duty conditions.

<u>The critical conditions are identified as:</u>

- Evaporator inlet water temperature is too high (chiller mode only);
- Evaporator outlet water temperature is too low;
- Condenser temperature/pressure is too high;
- Evaporate pressure is too low.

Unloading function only takes effect when temperature management needs at least one compressor to switch on.

The unloading can be activated on all circuits due to high/low evaporator water temperature or individually on the circuit for high condensation pressure/temperature and low evaporation pressure.

In the main screen of keyboard,  indicates that the UNLOADING mode is in progress.

37.1 UNLOADING FROM EVAPORATE HIGH WATER TEMPERATURE PROBE

Un 1	Comp. unloading set point of the evaporator input high water temperature in chiller mode	-50.0 -58	110.0 230	°C °F	Dec int
Un 2	Compressor unloading differential from the evaporator input high water temperature	0.1 0	25.0 45	°C °F	Dec int
Un 3	Delay for the compressor unloading function to be inserted by an evaporator input high water temperature	0	250	Sec	10 sec
Un 4	MAX time in compressor unloading function by an evaporator input high water temperature	0	250	Min	
Un 5	Analogue input configuration for control of the unloading function of the evaporator high water temperature	1	51		
Un16	Choice of steps for circuit to insert in unloading mode	1	8		

Manage the unloading due to unit evaporator inlet water temperature. The function is enabled in chiller mode only, and the unit type must not be Air/Air (CF01$\neq$0).

This function is used to allow the unit to function (via -unloader of the compressors) also with evaporator water inlet high temperatures (start-ups in summer with very hot storage tank), and to prevent a possible high pressure intervention. Once unloading is activated, it will take effect on all the circuit.

The unloading function is managed via the analogue input configured as temperature probe selected by parameter Un05. If the selected probe is not configured, unloading function is not available. Here below the list of Un05 value:

1. Compressor 1 PTC discharge temperature probe
2. Compressor 2 PTC discharge temperature probe
3. Compressor 3 PTC discharge temperature probe
4. Compressor 4 PTC discharge temperature probe
5. Compressor 5 PTC discharge temperature probe
6. Compressor 6 PTC discharge temperature probe
7. Compressor 7 PTC discharge temperature probe
8. Compressor 8 PTC discharge temperature probe
9. Compressor 9 PTC discharge temperature probe
10. Compressor 10 PTC discharge temperature probe
11. Compressor 11 PTC discharge temperature probe
12. Compressor 12 PTC discharge temperature probe
13. Compressor 13 PTC discharge temperature probe
14. Compressor 14 PTC discharge temperature probe
15. Compressor 15 PTC discharge temperature probe
16. Compressor 16 PTC discharge temperature probe
17. Evaporator common input NTC temperature probe
18. Evaporator 1 output NTC temperature probe
19. Evaporator 2 output NTC temperature probe
20. Evaporator 3 output NTC temperature probe

21. Evaporator 4 output NTC temperature probe
22. Evaporator common outlet NTC temperature probe
23. Condenser hot water common input NTC temperature probe
24. Circuit 1 condenser hot water input NTC temperature probe
25. Circuit 2 condenser hot water input NTC temperature probe
26. Circuit 3 condenser hot water input NTC temperature probe
27. Circuit 4 condenser hot water input NTC temperature probe
28. Circuit 1 condenser hot water output NTC temperature probe
29. Circuit 2 condenser hot water output NTC temperature probe
30. Circuit 3 condenser hot water output NTC temperature probe
31. Circuit 4 condenser hot water output NTC temperature probe
32. Condenser hot water common output NTC temperature probe
33. System water inlet NTC temperature probe (free-cooling)
34. External air temperature NTC temperature probe (free-cooling)
35. Dynamic/boiler function/change over set-point external air temperature NTC temperature probe
36. Circuit n° 1 combined defrost NTC temperature probe
37. Circuit n° 2 combined defrost NTC temperature probe
38. Circuit n° 3 combined defrost NTC temperature probe
39. Circuit n° 4 combined defrost NTC temperature probe
40. Circuit n° 1 auxiliary outlet NTC temperature probe
41. Circuit n° 2 auxiliary outlet NTC temperature probe
42. Circuit n° 3 auxiliary outlet NTC temperature probe
43. Circuit n° 4 auxiliary outlet NTC temperature probe
44. Domestic hot water temperature control NTC temperature probe
45. Domestic hot water temperature safety NTC temperature probe
46. Discharge NTC temperature probe
47. Solar panel NTC temperature probe
48. Circuit 1 condensing temperature NTC probe
49. Circuit 2 condensing temperature NTC probe
50. Circuit 3 condensing temperature NTC probe
51. Circuit 4 condensing temperature NTC probe

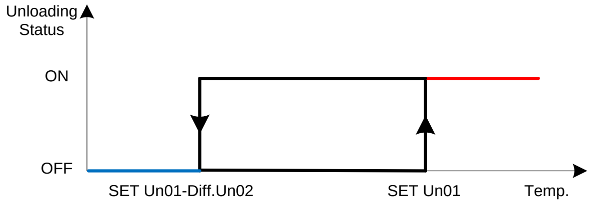
Warning:
If the probe set by Un05 and Un10 are not configured, alarm ACF19 will occur.

FUNCTION ACTIVATED:
If the temperature measured by the probe >= Un01 for Un03 time, all active circuits are put in Unloading mode. In this case, the maximum power steps number per circuit is limited by par Un16. If one circuit has more active steps than Un16, the redundant steps will be switch off.

FUNCTION DEACTIVATED:
When the temperature measured <= Un01- Un02, the function is deactivated. In this case, Steps number limitation by Un16 is disabled. However to prevent prolonged working in unloading mode, if the unloading is active and temperature is between Un01- Un02 and Un01, a time is counted on the expiry of time set by par Un04, the function is deactivated.

Example of working

- Unit with just 1 compressor per circuit and 3 circuits configured, 3 steps available and the par Un16 = 1. In this case, the unit unloading doesn't switch off any compressors. The maximum number of compressors active in unloading is 3.
- Unit with 2 compressors per circuit and 3 circuits configured, 6 steps available and the par Un16 = 1. In this case, the circuit unloading switches off the compressor inside the circuit that has the greatest number of hours or peaks per hour. The maximum number of compressors active in unloading is 3.



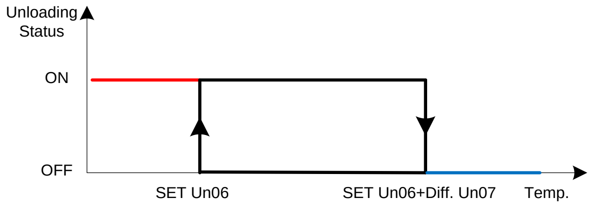
37.2 UNLOADING FROM EVAPORATE LOW WATER TEMPERATURE PROBE

Un 6	Compressor unloading set point from the evaporator low water temperature	-50.0 -58	110.0 230	°C °F	Dec int
Un 7	Compressor unloading differential from the evaporator low water temperature	0.1 0	25.0 45	°C °F	Dec int
Un 8	Delay for the compressor unloading function to be inserted by an evaporator input low water temperature	0	250	Sec	10 sec
Un 9	MAX time in compressor unloading status due to the evaporator low water temperature	0	250	Min	
Un 10	Analogue input configuration for control of the unloading function of the evaporator low water temperature	1	51		
Un16	Choice of steps for circuit to insert in unloading mode	1	8		

Manage the unloading due to unit evaporator outlet water temperature. The function is enabled both in chiller and heat pump mode. The unit type must not be Air/Air (CF01≠0).
This function is used to allow the unit to function (via -unloader of the compressors) also with evaporator water outlet low temperatures. Once unloading is activated, it will take effect on all the circuit.
The unloading function is managed via the analogue input configured as temperature probe selected by parameter Un10 which has same value list as Un05. If the selected probe is not configured, unloading function is not available.

FUNCTION ACTIVATED:
If the temperature measured by the probe <= Un06 for Un08 time, all active circuits are put in Unloading mode. In this case, the maximum power steps number per circuit is limited by par Un16. If one circuit has more active steps than Un16, the redundant steps will be switch off.

FUNCTION DEACTIVATED:
When the temperature measured >= Un06+ Un07, the function is deactivated. In this case, Steps number limitation by Un16 is disabled. However to prevent prolonged working in unloading mode, if the unloading is active and temperature is between Un06 and Un06+ Un07, a time is counted on the expiry of time set by par Un09, the function is deactivated.



37.3 UNLOADING FROM CONDENSATION HIGH TEMPERATURE/PRESSURE PROBE

Un11	Condensing temperature/pressure compressor unloading set point	-50.0 -58 0.0 0	110.0 230 50.0 725	°C °F Bar Psi	Dec int Dec int
Un12	Condensing temperature/pressure compressor unloading differential	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
Un15	MAX time in temperature / pressure compressor unloading status	0	250	Min	
Un16	Choice of steps for circuit to insert in unloading mode	1	8		
SP 1	Working in temperature or pressure from an analog input **0 - NTC cond. temperature / evap. pressure 4.0.20mA:** The condensation temperature is controlled through the use of an NTC probe, while a transducer with an input of 4-20 mA must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **1 - Condensation and evaporation pressure 4.0.20mA:** A transducer with an input of 4-20 mA must be used to control the condensation or evaporation pressures **2 - NTC cond. temperature / evap. pressure 0..5V:** The condensation temperature is controlled through the use of an NTC probe, while a ratiometric transducer with an input of 0÷5V must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **3 - Condensation and evaporation pressure 0..5V:** A ratiometric transducer with an input of 0-5 V must be used to control the condensation or evaporation pressures	0	3		

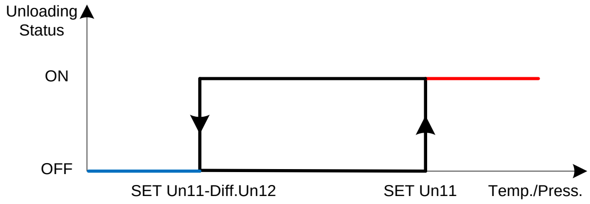
The condenser high temperature/pressure unloading function is active both in chiller and heat pump units. Every circuit has its own unloading function, they will not interfere each other.
To enable this function, at least one circuit must has more than one compressor (step) configured.
The function is managed by means of the analogue input configured as circuit condensation high temperature/pressure probe depending on par SP01. If the probe is not configured, the unloading function is not available.

<u>If SP01=0 or 2, use temperature probe.</u>
Configure analogue input as below for each circuit:
Circuit 1 condensing temperature NTC probe (AI type=48)
Circuit 2 condensing temperature NTC probe (AI type=49)
Circuit 3 condensing temperature NTC probe (AI type=50)
Circuit 4 condensing temperature NTC probe (AI type=51)

<u>If SP01=1 or 3, use pressure probe.</u>
Configure analogue input as below for each circuit:
Circuit 1 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=52)
Circuit 2 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=53)
Circuit 3 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=54)
Circuit 4 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=55)

FUNCTION ACTIVATED:
If the temperature/pressure measured by the probe >= Un11, the corresponding circuit is put in Unloading mode. In this case, the maximum power steps number per circuit is limited by par Un16. If one circuit has more active steps than Un16, the redundant steps will be switch off.

FUNCTION DEACTIVATED:
When the temperature/pressure measured <= Un11- Un12, the function is deactivated. In this case, Steps number limitation by Un16 is disabled. However to prevent prolonged working in unloading mode, if the unloading is active and temperature is between Un11- Un12 and Un11, a time is counted on the expiry of time set by par Un15, the function is deactivated.



37.4 UNLOADING FROM EVAPORATOR LOW PRESSURE PROBE

Un13	Evaporation pressure compressor unloading set point	-1.0 -14	50.0 725	Bar Psi	Dec int
Un14	Evaporation pressure compressor unloading differential	0.1 1	14.0 203	Bar Psi	Dec int
Un15	MAX time in temperature / pressure compressor unloading status	0	250	Min	
Un16	Choice of steps for circuit to insert in unloading mode	1	8		

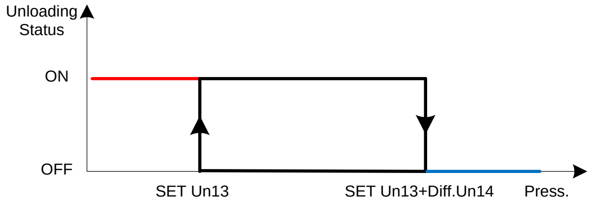
The evaporator low pressure unloading function is active both in chiller and heat pump units. Every circuit has its own unloading function, they will not interfere each other.
To enable this function, at least one circuit must has more than one compressor (step) configured.

When defrost is in progress, this unloading function is not available.

The function is managed by means of the analogue input configured as circuit evaporator low pressure probe. If the probe is not configured, this unloading function is not available.
Configure analogue input as below for each circuit:
Circuit 1 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=56)
Circuit 2 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=57)
Circuit 3 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=58)
Circuit 4 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=59)

FUNCTION ACTIVATED:
If the pressure measured by the probe <= Un13, the corresponding circuit is put in Unloading mode. In this case, the maximum power steps number per circuit is limited by par Un16. If one circuit has more active steps than Un16, the redundant steps will be switch off.

FUNCTION DEACTIVATED:
When the pressure measured >= Un13+Un14, the function is deactivated. In this case, Steps number limitation by Un16 is disabled. However to prevent prolonged working in unloading mode, if the unloading is active and temperature is between Un13 and Un13+Un14, a time is counted on the expiry of time set by par Un15, the function is deactivated.



38. CONDENSATION FANS REGULATOR

FA 1	Fan regulation 0= absent 1= always ON 2 =ON/OFF step insertion 3= continuous ON/OFF step insertion 4= speed proportional regulator	0	4		
FA 2	Fan working mode 0= depending on the compressor 1= independent from the compressor	0	1		
SP 1	Working in temperature or pressure from an analog input **0 - NTC cond. temperature / evap. pressure 4.0.20mA:** The condensation temperature is controlled through the use of an NTC probe, while a transducer with an input of 4-20 mA must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **1 - Condensation and evaporation pressure 4.0.20mA:** A transducer with an input of 4-20 mA must be used to control the condensation or evaporation pressures **2 - NTC cond. temperature / evap. pressure 0..5V:** The condensation temperature is controlled through the use of an NTC probe, while a ratiometric transducer with an input of 0÷5V must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **3 - Condensation and evaporation pressure 0..5V:** A ratiometric transducer with an input of 0-5 V must be used to control the condensation or evaporation pressures	0	3		

Condensation fan management is configured by parameters FA01 and FA02.

Parameter FA01 decides the fan’s regulation type.
 0 = no ventilation output/s
 1 = always on
 2= step ON/OFF regulation
 3= ON/OFF continuous step regulation
 4= proportional speed regulation

Par **FA01** = **0**
Fan always OFF.
Par **FA01** = **1**
Fan 1st step always ON except the unit is OFF/Stand-by.
Par **FA01** = **2**
Fan will be switch ON/OFF step by step. Only one step can be switch on at one moment.
Par **FA01** = **3**
Fan will be switch ON/OFF step by step. The total number of activated steps will be increase/decrease according to the fan’s capacity request.
Par **FA01** = **4**
Fan speed will be controlled by analog output with proportional regulation.

Parameter FA02 decides the fan’s operation mode.
 0 = depends on the compressor, fans only active if compressor is active
 1 = independent from the active fans compressor with selected working mode off in stand-by/OFF
Par **FA02** = **0**
When compressor is active, the fan regulation will follow FA01 setting. When compressor is deactivate, fan will be switch off.
Par **FA02** = **1**
Fan regulation will always follow FA01 setting, regardless the compressor status.

38.1 IO CONFIGURATOPN FOR FAN REGULATION

- **Analog input configuration**

If FA01 = 2 or 3 or 4, fan will be regulated by the condensation temperature/pressure or evaporation pressure.

When the unit is working in chiller mode:
Use condensation temperature/pressure.
SP01=0/2, configure probes as: Circuit x condensing temperature NTC probe. (x is 1-4, AI type =48-51)
SP01=1/3, configure probes as: Circuit x condensing pressure probe (4÷20 mA / 0÷ 5 Volt). (x is 1-4, AI type =52-55)

When the unit is working in heat pump mode (or in defrost with dF33=2):
Use evaporation pressure. But it is also need to configure condensing probes like that in chiller mode. Otherwise, ACF2 alarm will occur. Because in case of no evaporating pressure probes configured, you can use condensing probes instead.
Configure probes as: Circuit x evaporating pressure probe (4÷20 mA / 0÷ 5 Volt). (x is 1-4, AI type =56-59)

- **Digital output configuration**

Configure relay as: Circuit x ON/OFF Fan 1st (…4th) step. (x is 1-4, DO type=14-29)

- **Analog output configuration**

Configure AO as: 0÷10V proportional output for circuit x fan speed control. (x is 1-4, AO type = 1-4)
or 4÷20mA proportional output for circuit x fan speed control. (x is 1-4, AO type = 18-21)

Warning:
For each circuit, if it has no compressor configured, don't configure condensation temperature/pressure probe or evaporating pressure probe for this circuit. Otherwise, alarm ACF3 will occur.

38.2 STEP REGULATION

Relative parameters for chiller mode:

Parameter	Description	min	max	um	Resolution
FA 8	Minimum operation speed of the chiller fans. This allows you to set a minimum value for proportional fan regulation in chiller mode. It is expressed as a percentage of the maximum voltage allowed.	0	FA16	%	
FA 9	Maximum operation speed of the chiller fans. This allows you to set a maximum value for proportional fan regulation in chiller mode. It is expressed as a percentage of the maximum voltage allowed.	FA16	100	%	
FA10	**Proportional regulation** Minimum fan speed Set temperature/pressure in chiller mode. This allows you to set the condensation temperature / pressure value in **chiller** that corresponds to the minimum fan speed. **Step regulation** **SET 1st STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to operation in ON of the relay output, configured as the 1st condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA11	**Proportional regulation** Set maximum fan speed temperature/pressure in chiller mode. This allows you to set the condensation temperature / pressure value in chiller that corresponds to the maximum fan speed. **Step regulation** **SET 2nd STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to the operation in ON of the relay output, configured as the 2nd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA12	**Proportional regulation** Proportional band regulation of fans in chiller mode This allows you to set a temperature / pressure differential that corresponds to a variation from minimum to maximum fan speed. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 1 in chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

FA13	**Proportional regulation** Differential CUT- OFF in chiller. This allows you to set a temperature / pressure differential in chiller mode to shut off the fan. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 2 in chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA14	Over ride CUT- OFF in chiller. This allows you to set a temperature / pressure differential in chiller mode, where the fan maintains minimum speed.	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA15	CUT-OFF delay when fans are activated. This allows you to set a delay time for the activation of the CUT - OFF function at fan start-up. If at compressor start-up the proportional regulator requests the fans to be shut off and FA15≠0, the fan will be forced at minimum speed for the set time. If FA15=0, the function is not enabled.	0	250	Sec	
FA16	Night function speed in chiller mode. This allows you to set a maximum value for proportional regulation of the fans in chiller mode. It is expressed as a percentage of the maximum voltage allowed.	FA8	FA9	%	
FA25	Third step setting in chiller mode **SET 3rd STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to the operation in ON of the relay output, configured as the 3rd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA26	Fourth step setting in chiller mode **SET 4th STEP** This allows you to set the condensation temperature / pressure value in chiller mode that corresponds to operation in ON of the relay output, configured as the 4th condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA27	Differential on circ.3 steps in chiller mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 3 chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA28	Differential on circ.4 steps in chiller mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 4 chiller (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

Relative parameters for heat pump mode:

Parameter	Description	min	max	um	Resolution
FA17	Minimum fan speed in heat pump mode. This allows you to set a minimum value for the proportional regulation of the fans in h.p. It is expressed as a percentage of the maximum voltage allowed.	0	FA24	%	
FA18	Maximum fan speed in heat pump mode. This allows you to set a maximum value for the proportional regulation of the fans in h.p. It is expressed as a percentage of the maximum voltage allowed.	FA24	100	%	
FA19	**Proportional regulation** Set temperature / pressure for maximum fan speed in h.p. mode. This allows you to set the condensation temperature / pressure value in h.p. mode that corresponds to minimum fan speed. **Step regulation** **SET 4th STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 4th condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA20	**Proportional regulation** Set temperature / pressure for minimum fan speed in h.p. mode. This allows you to set the condensation temperature / pressure value in h.p. mode that corresponds to maximum fan speed. **Step regulation** **SET 3rd STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 3rd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA21	**Proportional regulation** Proportional band regulation of fans in heat pump mode This allows you to set a temperature / pressure differential that corresponds to a variation from minimum to maximum fan speed. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 1 in heat pump (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA22	**Proportional regulation** Differential CUT- OFF in heat pump. This allows you to set a temperature / pressure differential in h.p. mode to shut off the fan. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 2 in heat pump mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

FA23	Over ride CUT- OFF in h.p. This allows you to set a temperature / pressure differential in h.p. mode, where the fan maintains minimum speed.	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA24	Night function speed in HP mode. This allows you to set a maximum value for the proportional regulation of the fans in h.p. It is expressed as a percentage of the maximum voltage allowed.	FA17	FA18	%	
FA29	**SET 2nd STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 2nd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA30	**SET 1st STEP** This allows you to set the condensation temperature / pressure value in heat pump mode that corresponds to the operation of the relay output in ON configured as the 1st condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA31	Differential on circ.3 steps in HP mode With Par. FA01 = 2 / 3 becomes the differential on the step itself of circuit 3 in heat pump mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA32	Differential on circ.4 steps in HP mode With Par. FA01 = 2 / 3 becomes the differential on the step itself of circuit 4 heat pump mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

Relative parameters for defrost:

Parameter	Description	min	max	um	Resolution
FA33	Minimum fan speed in defrost mode. This allows you to set a minimum value for proportional regulation of the fans in defrost mode. It is expressed as a percentage of the maximum voltage allowed.	0	FA40	%	
FA34	Maximum fan speed in defrost mode. This allows you to set a maximum value for proportional regulation of the fans in defrost mode. It is expressed as a percentage of the maximum voltage allowed.	FA40	100	%	
FA35	**Proportional regulation** Set maximum fan speed temperature/pressure in defrost mode. This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to the minimum fan speed. **Step regulation** **SET 4th STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to operation in ON of the relay output, configured as the 4th condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA36	**Proportional regulation** Set minimum fan speed temperature/pressure in defrost mode. This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to the maximum fan speed. **Step regulation** **SET 3rd STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to operation in ON of the relay output, configured as the 3rd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA37	**Proportional regulation** Proportional band regulation of fans in defrost. This allows you to set a temperature / pressure differential that corresponds to a variation from minimum to maximum fan speed. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 1 in defrost mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA38	**Proportional regulation** Differential CUT- OFF in defrost. This allows you to set a temperature / pressure differential in defrost mode to shut off the fan. **Step regulation** With Par. FA01=2/3 becomes the differential on the step itself of circuit 2 in defrost mode (see fans regulation graph).	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA39	Over ride CUT- OFF in defrost. This allows you to set a temperature / pressure differential in defrost where the fan maintains minimum speed.	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA40	Night function speed in defrost mode. This allows you to set a maximum value for proportional regulation of the fans in defrost mode. It is expressed as a percentage of the maximum voltage allowed.	FA33	FA34	%	

FA41	Third step setting in defrosting mode **SET 2nd STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to relay output operation in ON configured as the 2nd condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA42	Fourth step setting in defrosting mode **SET 1st STEP** This allows you to set the condensation temperature / pressure value in defrost mode that corresponds to relay output operation in ON configured as the 1st condensation fan speed step.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FA43	Differential on circ.3 steps in defrosting mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 3 defrost mode	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FA44	Differential on circ.4 steps in defrosting mode With Par. FA01=2/3 becomes the differential on the step itself of circuit 4 defrost mode	0.1 0 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

FA01=2/3. Up to 4 relay outputs are available for the control condensation fans. Each relay configured as a ventilation step is assigned with its own activation/deactivation set and differential.

WORKING LOGIC

1 circuit with 4 ventilation steps

Par FA01 = 2, step ON / OFF regulation

When fan capacity request increase, fan operation sequence changes from 1 to 4. See table below.
Step 1 relay drives the minimum capacity. Step 4 relay drives the maximum capacity.
Each time only one step is activated. When a new step activated, the old step must be switch off. The interval for steps switching is a fix time 1 second.

Operation sequence	Step 1 relay	Step 2 relay	Step 3 relay	Step 4 relay
1	**ON**	**OFF**	**OFF**	**OFF**
2	**OFF**	**ON**	**OFF**	**OFF**
3	**OFF**	**OFF**	**ON**	**OFF**
4	**OFF**	**OFF**	**OFF**	**ON**

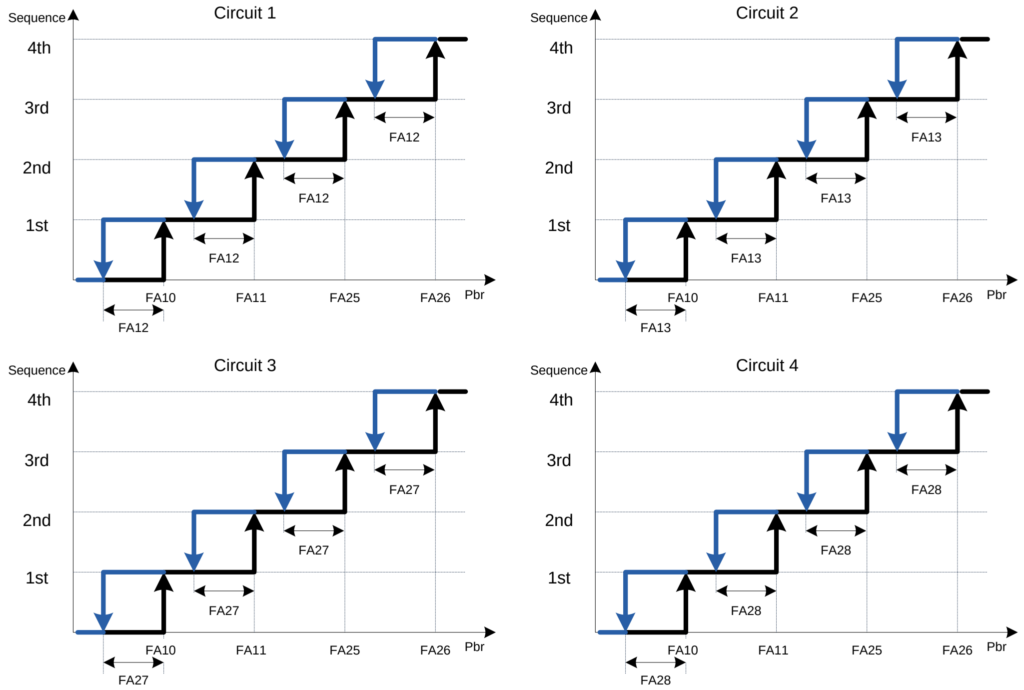
Par FA01 = 3 ON / OFF continuous step insertion
When fan capacity request increase, more steps will be involved. When a new step is inserted, the other activated steps are not affected.

Operation sequence	Step 1 relay	Step 2 relay	Step 3 relay	Step 4 relay
1	**ON**	**OFF**	**OFF**	**OFF**
2	**ON**	**ON**	**OFF**	**OFF**
3	**ON**	**ON**	**ON**	**OFF**
4	**ON**	**ON**	**ON**	**ON**

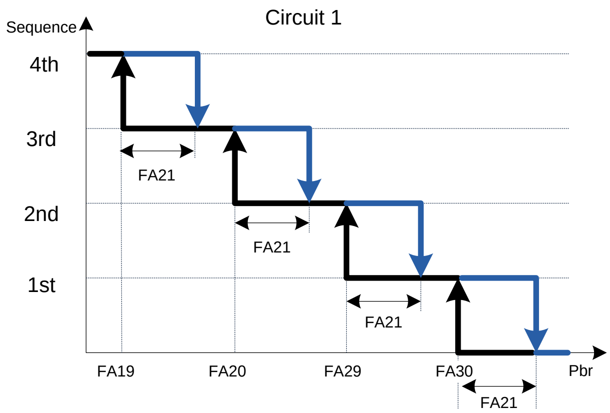
Warning:
It is necessary to make sure:
FA10 < FA11 < FA25 < FA26.
FA19 < FA20 < FA29 < FA30.
FA35 < FA36 < FA41 < FA42.
Otherwise, the configuration error alarm ACF2 will be signal.
In addition, make sure the step band <= step n set point – setp n-1 set point. For example: FA12 <= FA11-FA10.
Note:
If FA01=1, fan step 1 must keep on for FA07 time before compressor on.
If FA01=2/3, fan steps must keep on at maximum capacity for FA07 time before compressor on.

STEP REGULATION GRAPHIC
(suppose 4 steps are configured for one circuit)

Chiller mode:

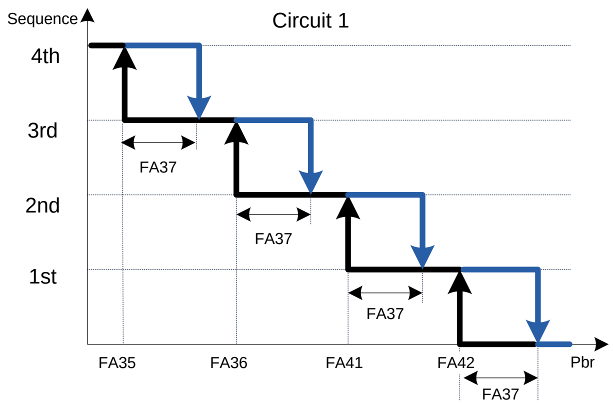


Heat pump mode:



For circuit 2, replace FA21 with FA22.
For circuit 3, replace FA21 with FA31.
For circuit 4, replace FA21 with FA32.

In defrost:



For circuit 2, replace FA37 with FA38.
For circuit 3, replace FA37 with FA43.
For circuit 4, replace FA37 with FA44.

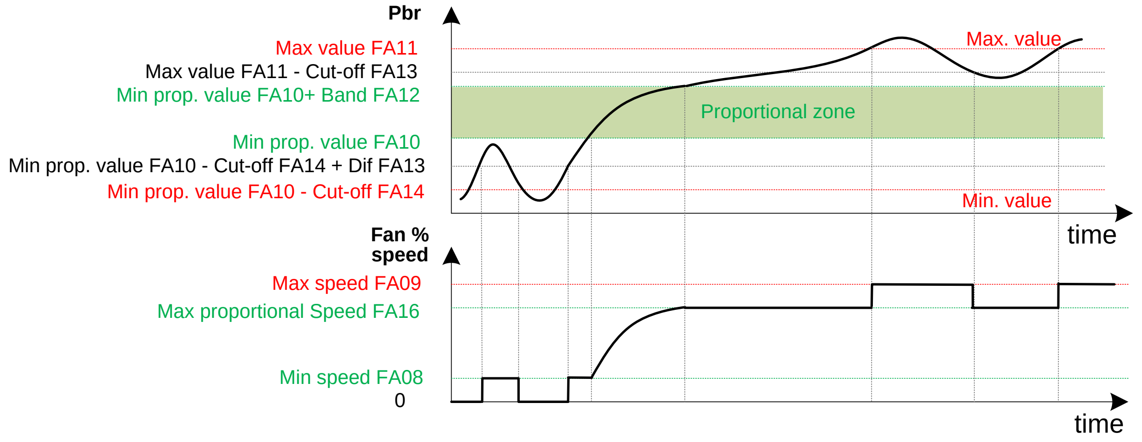
This (in defrost) regulation only used in situations that fan is not forced to shut off or run in maximum capacity by defrost. (See defrost chapter for reference). And it is necessary to configure:
FA06 = 0/2,
dF33 = 2,
dF23 > 0 (Enable fan ON activation during defrosting/dripping)
Warning: For the circuit in defrosting, its pressure probe is excluded for fan regulation. Only use the probes in circuits which are not in defrosting.

On the contrary, if FA06 = 1, when one circuit is doing defrost and fans are not forced to shut off, its condensation fan will regulate as in chiller mode (with parameters FA10, FA11, FA25, FA26).

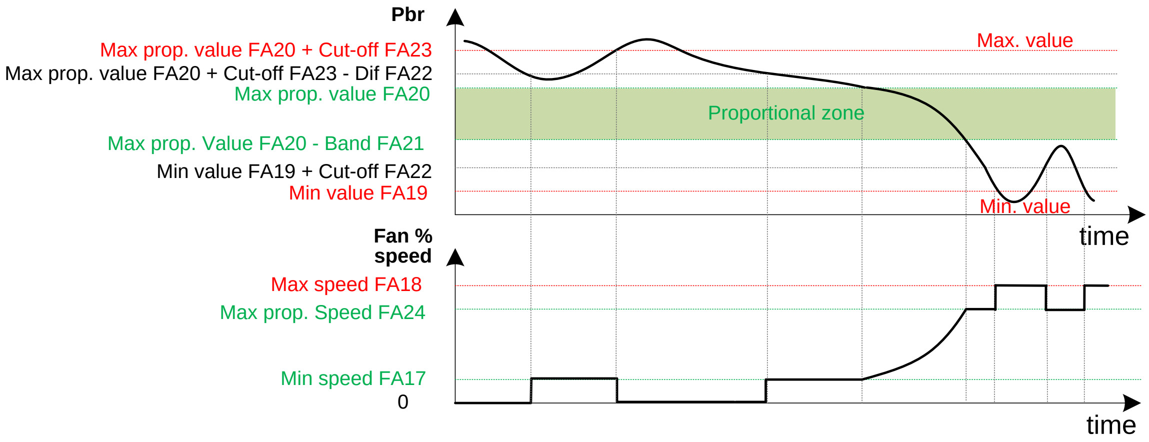
38.3 PROPORTIONAL REGULATION

FA 3	MAX speed fan peak time after ON (TRIAC) At every start-up the fan is powered at maximum voltage for time FA03, irrespective of the condensation temperature/pressure. When this elapses, the fan continues at the speed set by the regulator.	0	250	Sec	
FA 7	Pre-fan before compressor ON. It allows you to set a start up time for the fans at the maximum speed in chiller mode before the compressor is switched on, in order to prepare for the sudden increase in condensation temperature / pressure (that starting up the compressor entails) and improving regulation. (only if FA01 = 4)	0	250	Sec	

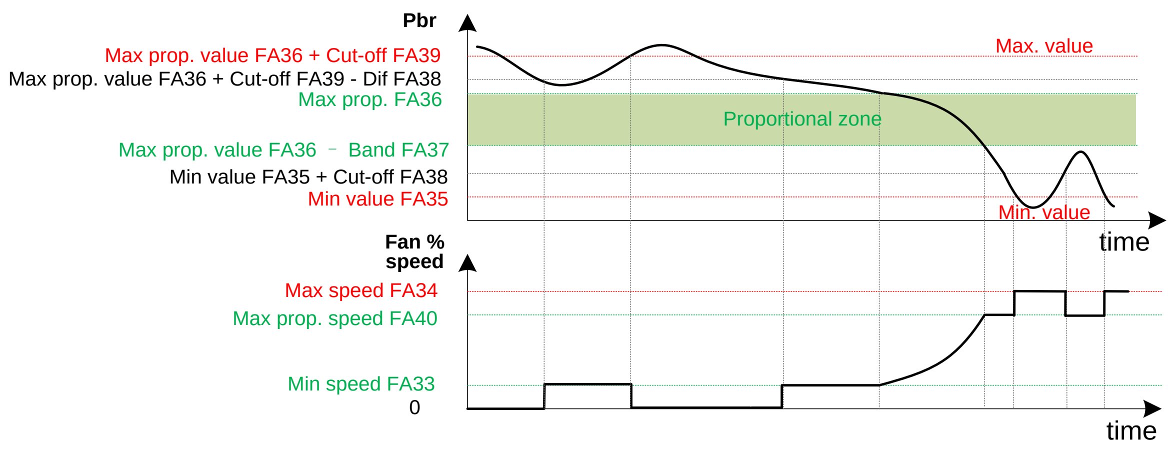
If FA01=4, fan speed will be controlled by analog output with proportional regulation.
See graph below: (suppose FA03=0)
Chiller mode:



Heat pump mode:



In defrost:
This (in defrost) proportional regulation only used in some special situations (the same with step regulation in defrost).



In chiller mode, if FS41 = 2, during the FS26 time, the ventilation is forced to operate at the night function speed FA16 (Refer to domestic hot water chapter for details)

<u>Output delay in proportional regulation:</u>

At every start-up the fan is powered at maximum voltage for time FA03 independently from the condensation temperature/pressure.
The maximum speed is:

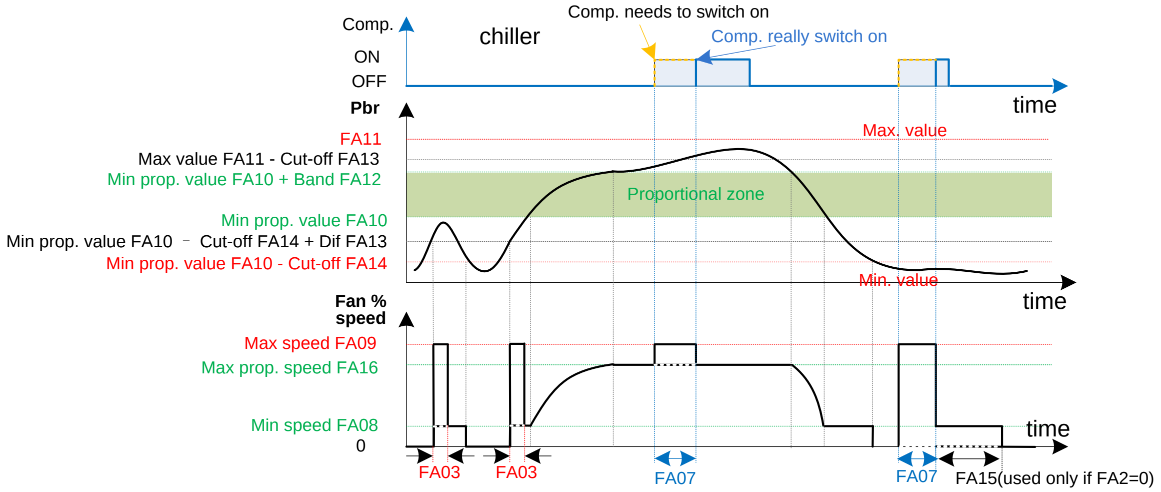
- Chiller mode: FA09
- Heat pump mode: FA18
- Defrost: FA34

On the expiry of this time period the fan will continue at the speed set by the regulator.
On start-up of the compressor, fan must run at maximum speed for FA07 time first. (No matter FA02=0 or 1)
After FA07 time period, If FA02=0 and the proportional regulator requests fan to switch-off (cut-off), the fan will be forced to run at minimum speed for FA15 time. If FA15=0, this function will be disabled.
The minimum speed is:

- Chiller mode: FA08
- Heat pump mode: FA17
- Defrost: FA33

FA15 delay is useful because after FA07 time, the cond. Pressure may become very low and the fan needs to be OFF. We presume that in few seconds the pressure will rise, (the compressor needs some seconds to start working properly) and we should restart fans again.
To avoid the fan turn off/on, during the time FA15 after the compressor start-up, the fans are forced to minimum speed, even if they should be off.

Output delay graph (take chiller mode for example):



<u>If the PWM output is used</u>

FA 4	Fan phase displacement analog output 5 (only if configured as PWM / phase cut)	0	8	micro sec	250µs

FA 5	Fan phase displacement analog output 6 (only if configured as PWM / phase cut)	0	8	micro sec	250µs

If FA01=4 and the condensation fan/s are connected to the PWM analog output, parameters FA04, FA05 have meaning. FA04/FA05 establishes a delay in micro seconds to compensate the different features of the electric motors.
In this case, analog output 5/6 configure as:
Circuit 1 external phase-cut command PWM signal = TF 1 (AO type=16)
Circuit 2 external phase-cut command PWM signal = TF 2 (AO type=17)

38.4 UNIQUE OR SEPARATE CONDENSATION

FA 6	Single or separate condensation fan 0= unique condensation (1 / 2 / 3 / 4) 1= separate condensers 2= unique by circuits (1 – 2) / (3 – 4)	0	2		

Using parameter FA06 is possible to configure which circuits will share one condenser.
0= unique condensation (1 / 2 / 3 / 4).
1= separate condensers
2= circuits unique condensation (1 – 2) / (3 – 4)

Unique condensation

FA06 = 0 means all the 4 circuits will use one unique condensation.
The fan will be only controlled by 4 relays configured as **Circuit 1 ON/OFF Fan (1st …4th) step.**
If FA01=4 (proportional regulation), the fan speeds for the 4 circuits are in parallel. The percent will be output from 4 AO configured for **proportional output for circuit 1(…4) fan speed control.**

For unique condensation, the fan will regulate according to probe's value selected from configured circuits. The rule is:

- **in chiller mode:** use **maximum** between the configured circuits' condensation temperature/pressure probes
- **in heat pump mode and defrost:** use the **minimum** between the configured circuits' evaporation pressure probes. If the evaporation pressure probes not exist, use condensation temperature/pressure probes instead. For circuit in defrosting, its pressure probe value is excluded.

WARNING: if the Par FA01 = 2/3 and the Par FA06 = 0, the fan circuit breaker alarm comes from the common fan circuit breaker input.

Separate condensers

FA06 = 1 means for all the 4 circuits, each circuit has its own condensation. Each circuit's fan regulates independently with the circuit's own resource.
For example, circuit 1 fan is controlled by probe configured for circuit 1, and output to relays and AO belong to circuit 1.

Circuits unique condensation

FA06 = 2 means: circuit 1 and circuit 2 are regarded as a couple which uses one unique condensation.
Circuit 3 and circuit 4 are regarded as another couple which uses one unique condensation.

Warning:
In this mode, resources must configured for both 2 couples. For each couple, it needs to configure compressors, condenser/evaporator probes and fan step relays for at least one circuit. Otherwise, configuration error alarm will occur.

For each couple, the fan will regulate according to probe's value selected from 2 circuits. The rule is:

- **in chiller mode:** use **maximum** between the 2 circuits condensation temperature/pressure probes
- **in heat pump mode and defrost:** use the **minimum** between the 2 circuits evaporation pressure probes. If the evaporation pressure probes not exist, use condensation temperature/pressure probes instead. For circuit in defrosting, its pressure probe value is excluded.

For the couple circuit1 and circuit 2:
Fan request is output from relays configured for circuit 1. If proportional regulation is used, fan request will output from AO configured for circuit 1 and 2.
The ventilation circuit breaker alarm is detected via the circuit 1 / 2 fan circuit breaker input.

For the couple circuit3 and circuit 4:
Fan request is output from relays configured for circuit 3. If proportional regulation is used, fan request will output from AO configured for circuit 3 and 4.
The ventilation circuit breaker alarm is detected via the circuit 3 / 4 fan circuit breaker input.

39. ANTI-FREEZE/SUPPORT HEATERS REGULATOR

To enable anti-freese/support heaters regulation, 4 relays must be configured as:
Antifreeze heaters / support / boiler 1st step (DO type=4)
Antifreeze heaters / support / boiler 2nd step (DO type=5)
Antifreeze heaters / support / boiler 3rd step (DO type=6)
Antifreeze heaters / support / boiler 4th step (DO type=7)

39.1 HEATER OUTPUT WORKING WHEN UNIT IS SWITCH-ON OR SWITCH-OFF

Ar10	Determines the anti-freeze heaters operation when the device is in chiller or heat pump mode. 0 = always OFF (chiller and h.p.) 1 = ON only in chiller mode, depending on the temperature control request 2 = ON only in h.p. mode, depending on the temperature control request 3 = ON in chiller and h.p. mode, depending on the temperature control request	0	3		
Ar11	Determines the evaporator/condenser anti-freeze heaters operation depending on the remote Off Stand-by mode 0 = Always OFF 1 = ON via temperature control	0	1		

<u>Unit is switch-ON:</u>
Par Ar10 Determines the working of the anti-freeze heaters when the unit is switch on and working in chiller or heat pump mode.
0= always off (chiller and heat pump)
1= ON only in cooling mode depending on the request of the heat regulator
2= ON only in heating mode depending on the request of the heat regulator
3= ON in cooling and heating mode depending on the request of the heat regulator

<u>Unit is switch-OFF:</u>
Par Ar11 Determines the working of the anti-freeze heaters when the unit is in stand-by or OFF from remote working mode.
0= always OFF
1= ON via temperature control

No matter the unit is ON or OFF, the anti-freeze heaters will response to heating request for both evaporator and condenser.

39.2 TEMPERATURE CONTROL FOR EVAPORATOR ANTI-FREEZE HEATERS IN CHILLER MODE

Ar 1	Antifreeze/support heaters (air/air units) set point in chiller mode. The temperature value below which the heaters start up.	-50.0 -58	110 230	°C °F	Dec int
Ar 2	Anti-freeze/support heaters band regulation in chiller mode	0.1 0	25.0 45	°C °F	Dec Int
Ar 6	Anti-freeze/support heaters alarm temperature control probe in chiller mode 0 = disabled 1 = evaporator input 2 = evaporator output 1 / 2 3 = evaporator output 3 / 4 4 = evaporator output 1 / 2 / 3 / 4 5 = evaporator output 1 / 2 / 3 / 4 and common output	0	5		

Make sure the unit is working in chiller mode now, and Ar10=1 or 3.
In this mode, anti-freeze heaters controlled based on evaporator temperature probe will be enabled.

39.2.1 Chose Probe For Evaporator Heater Control In Chiller Mode

The probes can be used for evaporator anti-freeze heater control is list below (Let's call them **Evap Probe 1-6**):

1. Evaporator common input NTC temperature probe (AI type=17)
2. Evaporator 1 output NTC temperature probe (AI type=18)
3. Evaporator 2 output NTC temperature probe (AI type=19)
4. Evaporator 3 output NTC temperature probe (AI type=20)
5. Evaporator 4 output NTC temperature probe (AI type=21)
6. Evaporator common outlet NTC temperature probe (AI type=22)

Configure only one probe:
If only one probe configured, the unit will be treated as a whole system, and heater regulateds based on this probe value. Use par Ar06 to select the probe:
Ar06=0 temperature control disabled
Ar06=1 regulates on Evap Probe 1
Ar06=2 regulates on Evap Probe 2 / 3.
Ar06=3 regulates on Evap Probe 4 / 5.
Ar06=4 regulates on Evap Probe 2 / 3 / 4 / 5.
Ar06=5 regulates on Evap Probe 2 / 3 / 4 / 5 / 6.

If the selected probe is not configured or in error status, anti-freeze heater control by evaporator temperature is disabled.

Configure more than one probe:
If more than one probe configured, it gives the possibility to regulate each heater step individually.
Use par Ar06 to select the probe.
Ar06=0 temperature control disabled
Ar06=1 regulates heater step 1-4 as one group on Evap Probe 1
Ar06=2 regulates heater step 1 on Evap Probe 2
Regulates heater step 2 on Evap Probe 3
Ar06=3 regulates heater step 3 on Evap Probe 4
Regulates heater step 4 on Evap Probe 5
Ar06=4 regulates heater step 1 on Evap Probe 2
Regulates heater step 2 on Evap Probe 3
Regulates heater step 3 on Evap Probe 4
Regulates heater step 4 on Evap Probe 5
Ar06=5 Regulates heater step 1 on Evap Probe 2 and 6
Regulates heater step 2 on Evap Probe 3 and 6
Regulates heater step 3 on Evap Probe 4 and 6
Regulates heater step 4 on Evap Probe 5 and 6

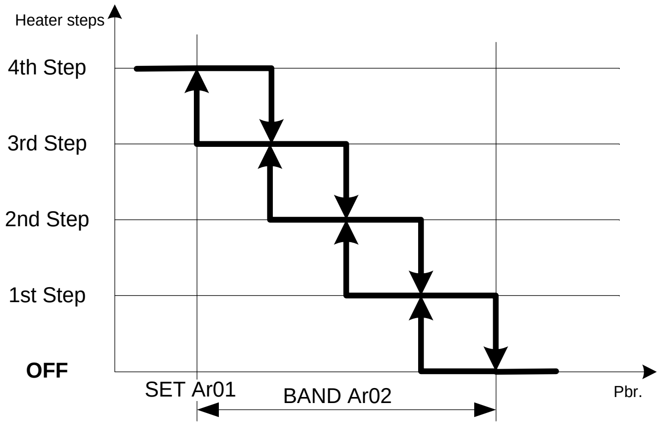
39.2.2 Evaporator Anti-Freeze Heater Control In Chiller Mode

CF 1	Defines the type of unit to control 0 = Air to air unit 1 = Air to water 2 = Water to water	0	2		

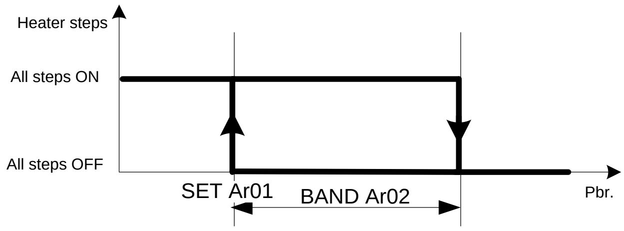
Configure only one probe:

If only one probe configured, the unit will be treated as a whole system, and heater regulateds based on this probe value.

If CF01=0 (Air/air unit), when more heating request, more steps will switch on.



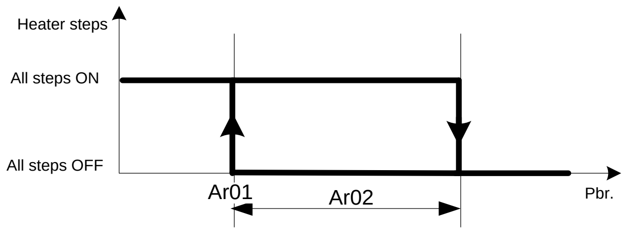
If CF01≠0 (Air/water or water/water unit). All the 4 heater steps are seem as one group. When heating needed, all the 4 heater steps will switch on; when no heating request, all the 4 steps will switch off.



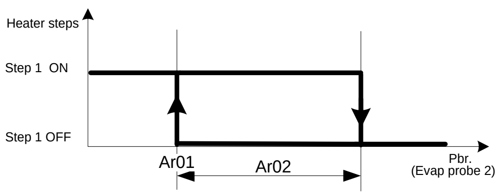
Configure more than one probe:

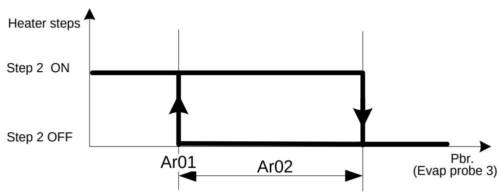
Ar06=0 temperature control disabled

Ar06=1 regulates heater step 1-4 as one group on Evap Probe 1. When heating needed, all the 4 heater steps will switch on; when no heating request, all the 4 steps will switch off.

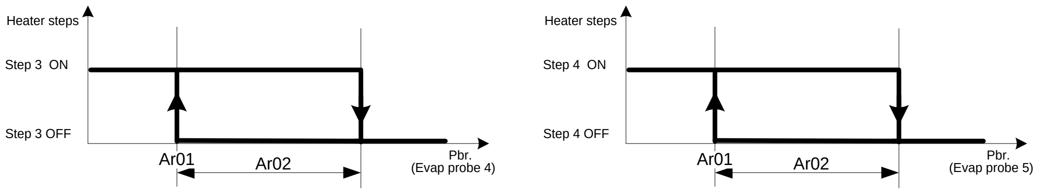


Ar06=2 regulates heater step 1 on Evap Probe 2
Regulates heater step 2 on Evap Probe 3

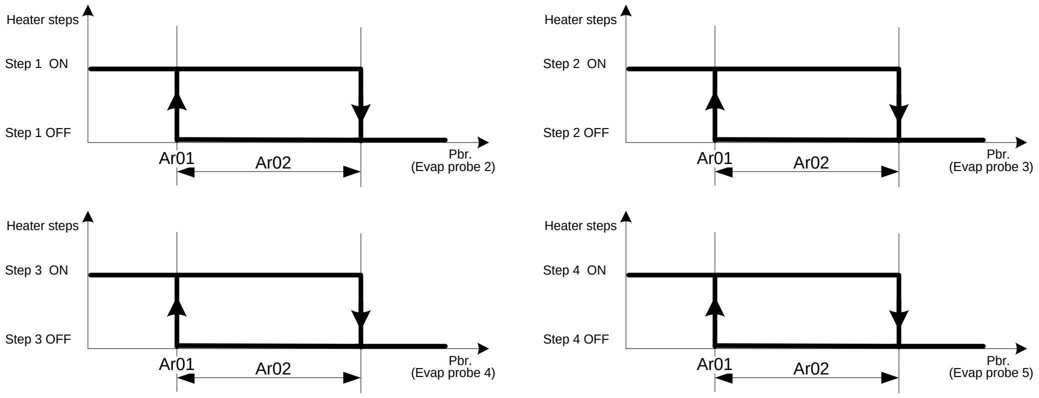




Ar06=3 regulates heater step 3 on Evap Probe 4
Regulates heater step 4 on Evap Probe 5

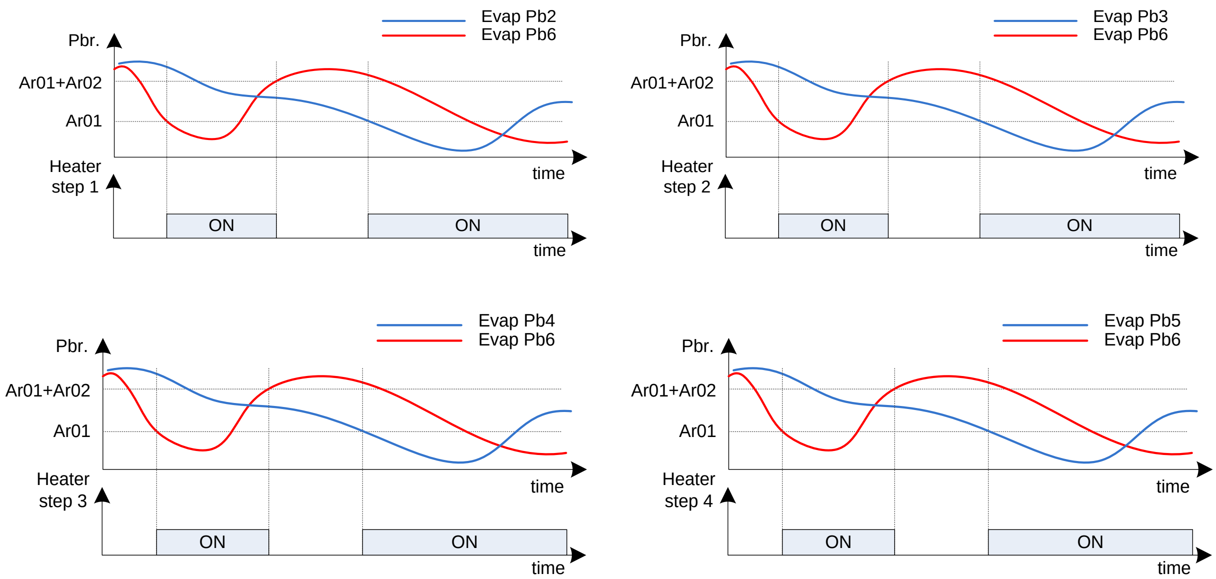


Ar06=4 regulates heater step 1 on Evap Probe 2
Regulates heater step 2 on Evap Probe 3
Regulates heater step 3 on Evap Probe 4
Regulates heater step 4 on Evap Probe 5



Ar06=5 Regulates heater step 1 on Evap Probe 2 and 6
Regulates heater step 2 on Evap Probe 3 and 6
Regulates heater step 3 on Evap Probe 4 and 6
Regulates heater step 4 on Evap Probe 5 and 6

If Evap Probe 6 <= SET Ar01, all the 4 heater steps will switch on. Else, check other probe value:
If Evap Probe 2 <= SET Ar01, heater step1 will switch on.
If Evap Probe 3 <= SET Ar01, heater step2 will switch on.
If Evap Probe 4 <= SET Ar01, heater step3 will switch on.
If Evap Probe 5 <= SET Ar01, heater step4 will switch on.
In a word, if any one of the two probes (Evap Probe 6 and Evap Probe x) <= SET Ar01, switch on corresponding heater step.



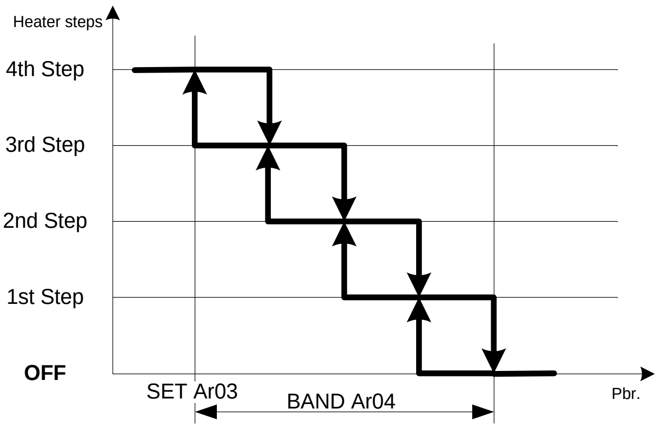
39.3 TEMPERATURE CONTROL FOR EVAPORATOR ANTI-FREEZE HEATERS IN HEAT PUMP MODE

Ar 3	Antifreeze/support heaters (air/air units) set point in heat pump mode The temperature value below which the heaters start up.	-50.0 -58	110 230	°C °F	Dec int
Ar 4	Anti-freeze/support heaters band regulation in heat pump mode	-50.0 -58	110 230	°C °F	Dec int
Ar 5	Anti-freeze/support heaters operation in defrosting mode 0 = activated according to temperature control demand 1 = activated according to temperature control demand and during defrost cycle	0	1		
Ar 7	Anti-freeze/support heaters temperature control probe in heat pump mode 0 = disabled 1 = evaporator input 2 = evaporator output 1 / 2 3 = evaporator output 3 / 4 4 = evaporator output 1 / 2 / 3 / 4 5 = evaporator output 1 / 2 / 3 / 4 and common output	0	5		

Make sure the unit is working in heat pump mode now, and Ar10=2 or 3.
Evaporator anti-freeze heater regulation in heat pump mode is similar to that in chiller mode. The only difference lies in:

1. Probe selection. Use parameter Ar07 to select probe in heat pump mode.
2. Use Ar03 as the set point and Ar04 as band for the heater regulation in heat pump mode.

For example:
If CF01=0(Air/air unit) and only one evaporator probe configured. The regulation graphic will be:



WORKING OF THE SUPPORT HEATERS DURING THE DEFROST CYCLE
The parameter Ar05 establishes working of the support heaters during the defrost cycle. If the value is 0 during the defrost cycle the heaters are only activated by their temperature control. If the value is 1, the heaters are always on during the defrost cycle:
they switch on when the reversing valve converts working from heating to cooling and they switch off when the dripping time has ended and the compressor re-starts.

WARNING: For Air/air unit(CF01=0), the support heaters are always off if the supply fan is off. Including cases that the unit is in stand-by or OFF remote and also in the case of breakdown of the probe prepared for their control, even if the Par Ar09=1.

39.4 TEMPERATURE CONTROL FOR CONDENSER ANTI-FREEZE HEATERS

Ar 8	Condenser anti-freeze heaters temperature control probe 0 = disabled 1 = common condenser water input probe 2 = common condenser water input probe and condenser input 1 / 2 3 = common condenser water input probe and condenser input 3 / 4 4 = condenser water output probe 1 / 2 5 = condenser water output probe 3 / 4 6 = condenser output 1 / 2 / 3 / 4 7 = condenser output 1 / 2 / 3 / 4 and common output	0	7		

39.4.1 Chose Probe For Condenser Heater Control

The probes can be used for condenser anti-freeze heater control is list below (Let's call them **Cond Probe 1-10**):

1. Condenser hot water common input NTC temperature probe
2. Circuit 1 condenser hot water input NTC temperature probe
3. Circuit 2 condenser hot water input NTC temperature probe
4. Circuit 3 condenser hot water input NTC temperature probe
5. Circuit 4 condenser hot water input NTC temperature probe
6. Circuit 1 condenser hot water output NTC temperature probe
7. Circuit 2 condenser hot water output NTC temperature probe
8. Circuit 3 condenser hot water output NTC temperature probe
9. Circuit 4 condenser hot water output NTC temperature probe
10. Condenser hot water common output NTC temperature probe

Configure only one probe:

If only one probe configured, the unit will be treated as a whole system, and heater regulateds based on this probe value. Use par Ar08 to select the probe:
Ar08=0 temperature control disabled
Ar08=1 regulates on Cond Probe 1
Ar08=2 regulates on Cond Probe 1 / 2 / 3
Ar08=3 regulates on Cond Probe 1 / 4 / 5
Ar08=4 regulates on Cond Probe 6 / 7
Ar08=5 regulates on Cond Probe 8 / 9
Ar08=6 regulates on Cond Probe 6 / 7 / 8 / 9
Ar08=7 regulates on Cond Probe 6 / 7 / 8 / 9 / 10

If the selected probe is not configured or in error status, anti-freeze heater control by condenser temperature is disabled.

Configure more than one probe:

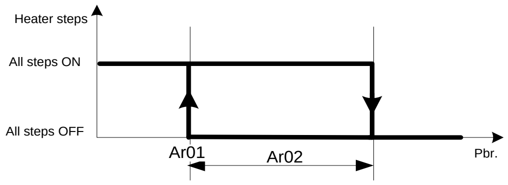
If more than one probe configured, it gives the possibility to regulate each heater step individually.
Use par Ar08 to select the probe.
Ar08=0 temperature control disabled
Ar08=1 regulates heater step 1-4 as one group on Cond Probe 1
Ar08=2 regulates heater step 1 on Cond Probe 2 and 1
Regulates heater step 2 on Cond Probe 3 and 1
Ar08=3 regulates heater step 3 on Cond Probe 4 and 1
Regulates heater step 4 on Cond Probe 5 and 1
Ar08=4 regulates heater step 1 on Cond Probe 6
Regulates heater step 2 on Cond Probe 7
Ar08=5 regulates heater step 3 on Cond Probe 8
Regulates heater step 4 on Cond Probe 9
Ar08=6 regulates heater step 1 on Cond Probe 6
Regulates heater step 2 on Cond Probe 7
Regulates heater step 3 on Cond Probe 8
Regulates heater step 4 on Cond Probe 9
Ar08=7 regulates heater step 1 on Cond Probe 6 and 10
Regulates heater step 2 on Cond Probe 7 and 10
Regulates heater step 3 on Cond Probe 8 and 10
Regulates heater step 4 on Cond Probe 9 and 10

39.4.2 Condenser Anti-Freeze Heater Control

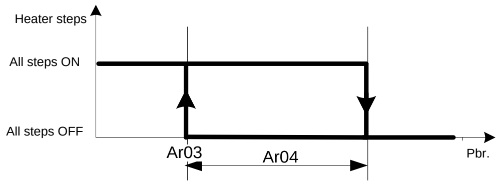
Configure only one probe:

If only one probe configured, regulates heater step 1-4 as one group on this probe. When heating needed, all the 4 heater steps will switch on; when no heating request, all the 4 steps will switch off.

Chiller mode

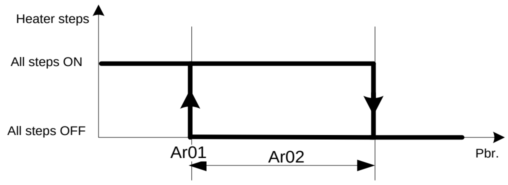


Heat pump mode



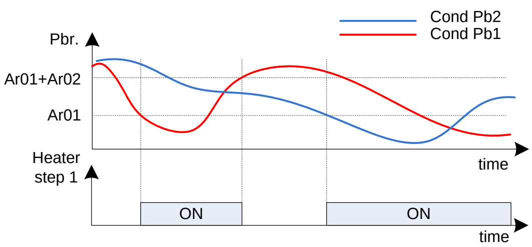
Configure more than one probe:

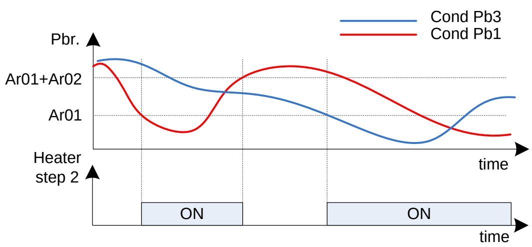
Here below the graphic for chiller mode: (for heat pump mode, please replace Ar01, Ar02 with Ar03, Ar04)
Ar08=0 temperature control disabled
Ar08=1 regulates heater step 1-4 as one group on Cond Probe 1. When heating needed, all the 4 heater steps will switch on; when no heating request, all the 4 steps will switch off.



Ar08=2 regulates heater step 1 on Cond Probe 2 and 1
Regulates heater step 2 on Cond Probe 3 and 1

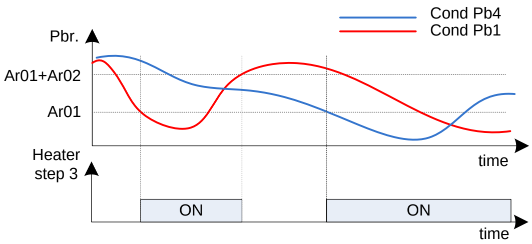
If Cond Probe 1 <= SET Ar01, all the 2 heater steps will switch on. Else, check other probe value:
If Cond Probe 2 <= SET Ar01, heater step1 will switch on.
If Cond Probe 3 <= SET Ar01, heater step2 will switch on.
In a word, if any one of the two probes (Cond Probe 1 and Cond Probe x) <= SET Ar01, switch on corresponding heater step.

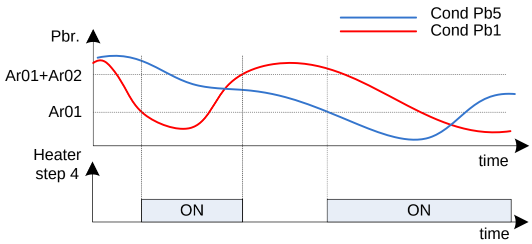




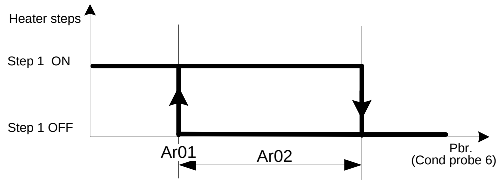
Ar08=3 regulates heater step 3 on Cond Probe 4 and 1
Regulates heater step 4 on Cond Probe 5 and 1

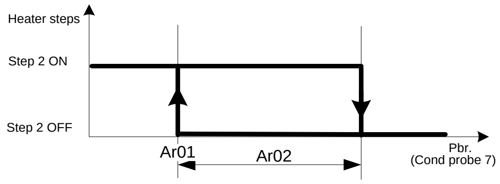
If Cond Probe 1 <= SET Ar01, all the 2 heater steps will switch on. Else, check other probe value:
If Cond Probe 4 <= SET Ar01, heater step3 will switch on.
If Cond Probe 5 <= SET Ar01, heater step4 will switch on.
In a word, if any one of the two probes (Cond Probe 1 and Cond Probe x) <= SET Ar01, switch on corresponding heater step.



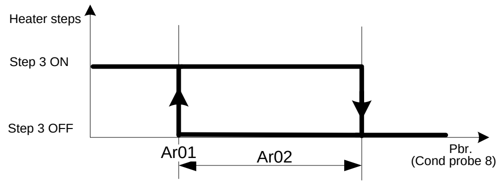


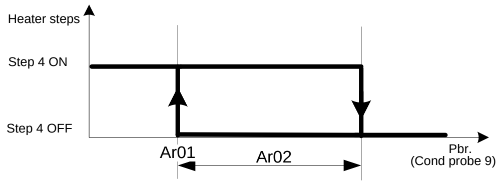
Ar08=4 regulates heater step 1 on Cond Probe 6
Regulates heater step 2 on Cond Probe 7



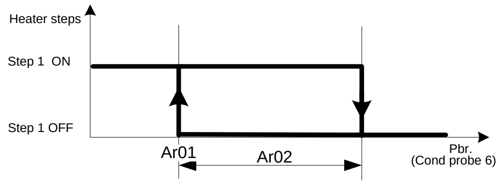


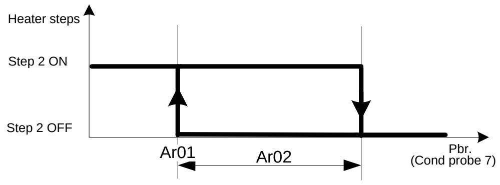
Ar08=5 regulates heater step 3 on Cond Probe 8
Regulates heater step 4 on Cond Probe 9

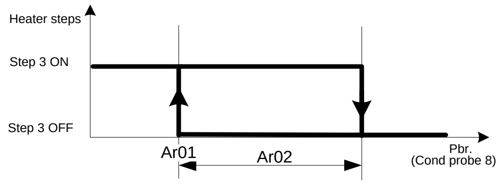


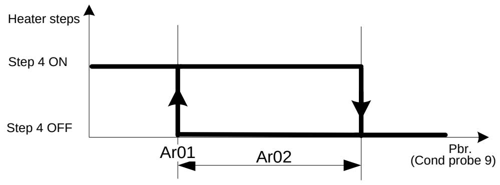


Ar08=6 regulates heater step 1 on Cond Probe 6
Regulates heater step 2 on Cond Probe 7
Regulates heater step 3 on Cond Probe 8
Regulates heater step 4 on Cond Probe 9



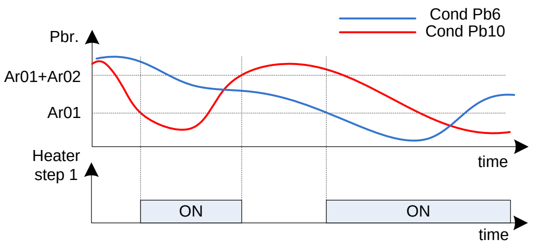


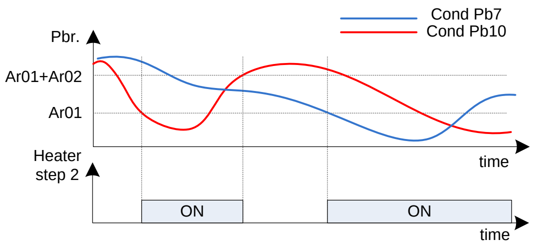


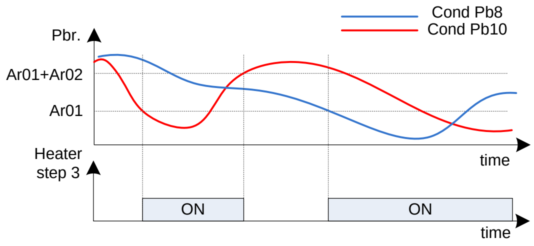


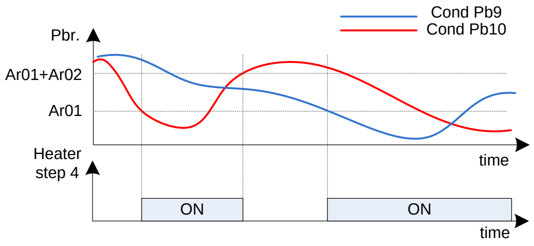
Ar08=7 regulates heater step 1 on Cond Probe 6 and 10
Regulates heater step 2 on Cond Probe 7 and 10
Regulates heater step 3 on Cond Probe 8 and 10
Regulates heater step 4 on Cond Probe 9 and 10

If Cond Probe 10 <= SET Ar01, all the 4 heater steps will switch on. Else, check other probe value:
If Cond Probe 6 <= SET Ar01, heater step1 will switch on.
If Cond Probe 7 <= SET Ar01, heater step2 will switch on.
If Cond Probe 8 <= SET Ar01, heater step3 will switch on.
If Cond Probe 9 <= SET Ar01, heater step4 will switch on.
In a word, if any one of the two probes (Cond Probe 10 and Cond Probe x) <= SET Ar01, switch on corresponding heater step.









39.5 ANTI-FREEZE HEATERS CONTROL WHEN UNIT IS SWITCH-OFF

When the unit is in stand-by or OFF from remote working mode:
If Ar11=0, anti-freeze heater control is disabled
If Ar11=1, anti-freeze heater regulates via temperature control. It is similar to the regulation when unit is switch-ON. The difference is:

Set point selection

It is not necessary to distinguish chiller and heat pump mode. Just chose the higher value of Ar01 and Ar03 as the set point.

Evaporator anti-freeze heater control

Both Ar06 and Ar07 are used for probe selection for evaporator anti-freeze heater control.

39.6 ANTI-FREEZE HEATERS WORKING FROM DIGITAL INPUT

This function is enabled when there are digital inputs configured as:
Antifreeze alarm circuit 1 (DI type=6)
Antifreeze alarm circuit 2 (DI type=7)
Antifreeze alarm circuit 3 (DI type=8)
Antifreeze alarm circuit 4 (DI type=9)

If only one digital input is configured as “Antifreeze alarm circuit”, all the heater relays will switch on when the digital input is activated.
If more than one digital inputs are configured as “Antifreeze alarm circuit”, each digital input only control the corresponding heater.
For example:
If “Antifreeze alarm circuit 1” and “Antifreeze alarm circuit 3” are configured,
When DI “Antifreeze alarm circuit 1” active, relay “Antifreeze heaters 1st step” is switch on;
When DI “Antifreeze alarm circuit 3” active, relay “Antifreeze heaters 3st step” is switch on;

Digital input and temperature control have combined action towards anti-freeze heaters. It means anti-freeze heaters can be switch on both via digital input and temperature control.

40. DEFROST FUNCTION

dF 1	Defrost mode: 0 = defrost disabled 1 = temperature / pressure 2 = starts according to the value of parameter dF28 and ends according to the time 3 = starts according to the value of parameter dF28 and ends due to an external contact 4 = with a condensation fan	0	4		
dF28	Probe that determines the defrost start and end 0= start and end with condensation temperature / pressure probe 1= start with evaporation pressure probe - end with condensation temperature / pressure probe 2= start with condensation temperature / pressure probe - end with evaporation pressure probe 3= start and end by evaporation pressure 4=start and end by auxiliary probe 1	0	4		

Defrost can only take place if the following necessary conditions are present at the same time:

- unit with heating. (CF02≠1)
- dF01 is different to 0 (0=defrost disabled)
- CF01≠2 (not in water/water unit)
- unit in heating working mode with at least one compressor running or domestic hot water production is active with cycle inversed (see domestic hot water chapter for detail).
- the evaporation/condensation probe must be defined (per circuit). If the evaporation probe/s is/are defined in heating mode the start/end of the defrost cycle is managed on the basis of the configuration of parameter dF28

If even just one of the conditions is not satisfired, the defrost procedure will not take place.

40.1 IO CONFIGURATION FOR DEFROST

SP 1	Working in temperature or pressure from an analog input **0 - NTC cond. temperature / evap. pressure 4.0.20mA:** The condensation temperature is controlled through the use of an NTC probe, while a transducer with an input of 4-20 mA must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **1 - Condensation and evaporation pressure 4.0.20mA:** A transducer with an input of 4-20 mA must be used to control the condensation or evaporation pressures **2 - NTC cond. temperature / evap. pressure 0..5V:** The condensation temperature is controlled through the use of an NTC probe, while a ratiometric transducer with an input of 0÷5V must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **3 - Condensation and evaporation pressure 0..5V:** A ratiometric transducer with an input of 0-5 V must be used to control the condensation or evaporation pressures	0	3		
FA 6	Single or separate condensation fan 0= unique condensation (1 / 2 / 3 / 4) 1= separate condensers 2= unique by circuits (1 – 2) / (3 – 4)	0	2		

Probe configuration

If dF01≠0, defrost may begin or end from analog input. Related probes must be configured:
Par dF28 determines which probes are used.
If dF28=0, defrost begin and end with **condenser probes**
If dF28=1, defrost begin with **evaporator probes** and end with **condenser probes**
If dF28=2, defrost begin with **condenser probes** and end with **evaporator probes**
If dF28=3, defrost begin and end with **evaporator probes**
If dF28=4, defrost begin and end with **auxiliary probes**

Which are condenser probes?
It depends on par SP01.
If SP01=0 or 2, Configure probes for each circuit:
Circuit 1 condensing temperature NTC probe (AI type=48)
Circuit 2 condensing temperature NTC probe (AI type=49)
Circuit 3 condensing temperature NTC probe (AI type=50)
Circuit 4 condensing temperature NTC probe (AI type=51)

If SP01=1 or 3, Configure probes for each circuit:
Circuit 1 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=52)
Circuit 2 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=53)
Circuit 3 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=54)
Circuit 4 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=55)

Which are evaporator probes?
Circuit 1 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=56)
Circuit 2 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=57)
Circuit 3 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=58)
Circuit 4 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=59)

Special case:
If probe is not configured appropriately, there are some alternative solutions.
When **FA06=0** (Unique condensation), if configured circuit number is not equal to configured condenser/evaporator probe number, it will calculate the minimum value of all condenser/evaporator probes, and use it for all circuits. If no evaporator probe is configured, defrost will begin and end with condenser probes.
When **FA06=1** (Separated condensation), if the circuit has no evaporator probe configured, defrost will begin and end with condenser probes for this circuit.
When **FA06=2** (Circuit couple unique condensation), if only circuit 1 configured with condenser/evaporator probe, use it for all the circuits.
If configured circuit number is not equal to configured condenser/evaporator probe number, use minimum value of condenser/evaporator probe 1 and 2 as the first couple's condenser/evaporator probe value. Use minimum value of condenser/evaporator probe 3 and 4 as the second couple's condenser/evaporator probe value.

Which are auxiliary probes?
It depends on par SP01.
If SP01=0 or 2, Configure probe as:
Circuit 1 auxiliary outlet NTC temperature probe (AI type=40)
If SP01=1 or 3, Configure probe as:
Auxiliary output 1 pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=60)
Note: this probe will be used for all the 4 circuits.

Combined defrost probes
If dF01=1, defrost may end from combined defrost NTC temperature probe, to enable this function, configure probe as:
circuit 1 combined defrost NTC temperature probe (AI type=36)
circuit 2 combined defrost NTC temperature probe (AI type=37)
circuit 3 combined defrost NTC temperature probe (AI type=38)
circuit 4 combined defrost NTC temperature probe (AI type=39)

Digital input configuration
If dF01=3, defrost end from digital input, so it is necessary to configure DI for defrost ending.
End of circuit 1 defrost (DI type=64)
End of circuit 2 defrost (DI type=65)
End of circuit 3 defrost (DI type=66)
End of circuit 4 defrost (DI type=67)
When the digital input deactivate, defrost will be end.

Digital output configuration

Defrost will take effect by turn the inversion valves. So it is necessary to configure DO as below for each circuit. When defrost in progress, inversion valve is deactivate.

Cycle inversion valve circuit 1 (DO type=10)
Cycle inversion valve circuit 2 (DO type=11)
Cycle inversion valve circuit 3 (DO type=12)
Cycle inversion valve circuit 4 (DO type=13)

40.2 DESCRIPTION OF DEFROST CYCLE

AUTOMATIC DEFROST CYCLE:

PHASE 1: dF09 count down for DEFROST INTERVAL

dF 2	Defrost begins by temperature/pressure	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec int Dec Int
dF 3	Defrost ends by temperature/pressure	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec int Dec Int
dF 9	Defrost interval in the same circuit	1	99	Min	

This phase must always be performed (There must be at least one compressor running)

1. **The timer is reloaded at dF09** if there is a power cut or after having performed the defrost cycle or on changing of the working mode.
2. **The timer is reloaded** if the unit switches off or if the condensation or evaporation temperature/pressure detected by the probe in dF28 (Start temp.) exceeds dF03.
3. **The timer is stopped** if the compressor switches off or if the condensation or evaporation temperature/pressure detected by the probe in dF28 (Start temp.) exceeds dF02.
4. **The timer decreases** if the temperature/pressure detected by the probe in dF28 is below the dF02 set
5. Pass to phase 2 when the timer dF09 expires.

PHASE 2: check the cycle start conditions

dF 6	Defrost delay between two circuits	0	250	Min	
dF10	Defrosting cycle start temperature setting together with circuit 1 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec int
dF11	Defrosting cycle start temperature setting together with circuit 2 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec int
dF12	Defrosting cycle start temperature setting together with circuit 3 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec int
dF13	Defrosting cycle start temperature setting together with circuit 4 after the count of parameter dF09 elapses	-50.0 -58	110 230	°C °F	Dec int
dF26	Defrosting cycle start in unit 0 = independent 1 = if both have reached the request for defrosting to start 2 = if at least one has reached the request for defrosting to start	0	2		
dF27	Defrosting cycle end in unit 0 = independent 1 = if both have reached the defrost end status 2 = if at least one has reached the defrost end status	0	2		

1. If the digital input configured as “End of circuit x defrost” (x=1-4, DI type=64-67) is active, wait for it to be deactivated. Otherwise, go on checking.
2. If the probe configured as “Circuit x combined defrost NTC temperature probe” (x=1-4, AI type=36-39) is exist:
    - if the temperature measured by this probe < dF10 for circuit 1,< dF11 for circuit 2,< dF12 for circuit 3,< dF13 for circuit 4 go to phase 3
    - otherwise wait to satisfy the dF10-dF13 set
3. If no probe has been configured as combined defrost NTC, pass to phase 3
4. If the circuit has passed to phase 3, it will display as in defrost mode in the keyboard.
5. If the condensation or evaporation temperature/pressure detected by the probe in dF28 (Start temp.) exceeds dF03, go back to phase 1.

WARNING:
For none-unique condensation unit (FA06$\neq$0), before starting the phase 3 defrost cycle, the delay (dF06) between two circuits must have passed.
Both manual defrost (that can be performed without conditions satisfired) and forced defrost (with conditions satisfired) do not consider the delay times set in par dF09 / dF06 and the defrost cycle will be performed immediately by all circuits.

START OF THE DEFROST CYCLE IN UNITS WITH SEVERAL CIRCUITS
Depends on the value of the parameter dF26
0= independent
1= if all have reached the defrost start request
2= if at least one has reached the defrost start request

In case of several circuits are configured, when PHASE 2 has finished, check parameter dF26 to see if it can pass to PHASE 3.

If dF26=0, once the circuit has defrost request and no other circuit is doing defrost, it will start directly.
If dF26=1, wait other circuits defrost start.
   If FA06=0/1 (Unique or separate condensation), wait for all the other configured circuits defrost start.
   If FA06=2 (Circuit couple unique condensation), wait for all circuits in the couple defrost start.
If dF26=2, start when just one circuit can start its defrosting.
   If FA06=0/1 (Unique or separate condensation), if any circuit defrost can start, force all circuits start.
   If FA06=2 (Circuit couple unique condensation), if any circuit of the couple defrost can start, force all circuits of the couple start.

PHASE 3: management of the reverse valve. Wait for time **dF07** (stand-by time in OFF of the compressor before defrost) before defrost

dF 7	Idle time in compressor OFF mode before defrosting	0	250	Sec	
dF18	Forcing by switching ON activates all steps in defrosting mode in circuit 1 0 = disabled 1 = enabled	0	1		
dF19	Forcing by switching ON activates all steps in defrosting mode in circuit 2	0	1		
dF20	Forcing by switching ON activates all steps in defrosting mode in circuit 3	0	1		
dF21	Forcing by switching ON activates all steps in defrosting mode in circuit 4	0	1		
dF22	ON delay between two compressors in defrosting mode	1	250	Sec	

If dF07=0:
The reverse valve is turned without any compressor block and the defrost cycle is carried out immediately if temperature control or parameter dF18/19/20/21 request start-up of more than one compressor per circuit.
Switch-on between the compressors of that circuit takes place after time dF22 has passed (switch-on delay time between defrost steps).

If dF07$\neq$0:
This phase must always be performed
1. If dF33 = 0, force the condensation fans switch off.
2. All compressors and/or unloaders present in the unit are switched off (the compressor/s icon) flashes during this phase)
3. Wait for a time equal to dF07/2
4. Turn the reverse valve (valve deactivated)
5. Wait for a time equal to dF07/2
6. Start compressors. Pass to phase 4
   If dF18=1, All steps of circuit 1 ON, otherwise keep the steps that already on before defrost start, and should no less than CF09.
   If dF19=1, All steps of circuit 2 ON, otherwise keep the steps that already on before defrost start, and should no less than CF10.
   If dF20=1, All steps of circuit 3 ON, otherwise keep the steps that already on before defrost start, and should no less than CF11.
   If dF21=1, All steps of circuit 4 ON, otherwise keep the steps that already on before defrost start, and should no less than CF12.
   Switch-on between the compressors of that circuit takes place after time dF22 has passed (switch-on delay time between defrost steps).

Special case to enter PHASE 3

If FA06 = 2 (Circuit couple unique condensation) and dF26≠1, when only one circuit of the couple requests do defrost (enter in fhase 3), another circuit will forced to enter in phase 3 too.

PHASE 4: defrost

dF 4	Minimum defrost duration	0	250	Sec	
dF 5	Maximum defrost duration	1	250	Min	
dF14	End temperature setting of circuit 1 with defrost cycle The actual defrost cycle on circuit 1 terminates when the temperature sensed by the combined defrost temperature probe exceeds the dF14 limit.	-50.0 -58	110 230	°C °F	Dec int
dF15	End temperature setting of circuit 2 with defrost cycle	-50.0 -58	110 230	°C °F	Dec int
dF16	End temperature setting of circuit 3 with defrost cycle	-50.0 -58	110 230	°C °F	Dec int
dF17	End temperature setting of circuit 4 with defrost cycle	-50.0 -58	110 230	°C °F	Dec int
dF23	Fan ON activation during defrosting/dripping 0 = disabled 1 = enabled only during defrost 2 = enabled during defrosting/dripping	0	2		
dF24	Temperature/pressure setting that forces the fan ON in defrosting mode	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec int Dec Int

This phase must always be performed

In this phase:

- If dF23=0 the condensation fans are not forced to activated.
- If dF23=1/2 the condensation fans start if the condensation pressure/temperature > dF24.
  If FA06 = 1, fan works in chiller mode regulation.
  If FA06 = 0/2 and dF33 = 2, fan works in defrost mode regulation.

This phase must have duration of at least the time dF04 and may end if the duration exceeds maximum time dF05. After duration dF04, some other cases can cause defrost ended:

1. If dF01=1
   - If the circuit 1 combined defrost NTC temperature is greater than dF14
   - If the circuit 2 combined defrost NTC temperature is greater than dF15
   - If the circuit 3 combined defrost NTC temperature is greater than dF16
   - If the circuit 4 combined defrost NTC temperature is greater than dF17
   - Otherwise if the combined defrost NTC temperature probe is not configured, when the temperature/pressure detected by the probe/s configured in dF28 exceeds dF03
2. If dF01=3, if DI configured as defrost end is deactivated. Then go to phase 5

PHASE 5: Dripping time. Management of the reverse valve.

This phase must always be performed

dF 8	Idle time in compressor OFF mode after defrosting	0	250	Sec	
dF25	Defrost activation setting with condensation fans The function defrost with outdoor fans is enabled if the external temperature is above the dF25 level.	-50.0 -58	110 230	°C °F	Dec int

1. All compressors and/or unloaders present in the unit are switched off (the compressor/s icon flashes during this phase)
2. If dF23=2 and the external air probe is configured. The condensation fans start at maximum speed if the pressure/temperature > dF25
3. If dF23=2 and the external air valve is not configured, the condensation fans start at top-speed
4. Wait for a time equal to dF08/2
5. Deactivate the reverse valve
6. Wait for a time equal to dF08/2
7. The fans are switched-off. From this moment, all regulators re-start all normal regulation procedures in heating mode.

If dF08=0 the valve is turned without any compressor block

The following phases must be performed in sequence to start a manual defrost cycle:

PHASE 6: wait for other circuit defrost end.

dF26	Defrosting cycle start in unit 0 = independent 1 = if both have reached the request for defrosting to start 2 = if at least one has reached the request for defrosting to start	0	2		
dF27	Defrosting cycle end in unit 0 = independent 1 = if both have reached the defrost end status 2 = if at least one has reached the defrost end status	0	2		

If dF27=0, don't wait other circuit. Defrost ends directly.
If dF27=1, wait other circuit defrost end.
If FA06=0/1 (Unique or separate condensation), wait for all the other configured circuits defrost end.
If FA06=2 (Circuit couple unique condensation), wait for all circuits in the couple defrost end.
If dF27=2, end when just one circuit has ended its defrosting.
If FA06=0/1 (Unique or separate condensation), if any circuit defrost end, force all circuits to phase 5.
If FA06=2 (Circuit couple unique condensation), if any circuit of the couple defrost end, force all circuits of the couple to phase 5.

MANUAL DEFROST

- Press a particular button in the keyboard to start manual defrost
- The unit must be in heating mode
- If CF02 ≠1 and if the condensation/evaporation control probe is not in error conditions,
- At least one compressor running
- Defrost already in defrost PHASE 1 or PHASE 2

If these conditions are present, defrost will be carried out from phase 3. Otherwise, there will be no effect by pressing the key.
WARNING: An ACF1 configuration error alarm is generated if the dF26 and dF27 parameters assume values that are not accepted, see table below:

	dF27=0	**dF27=1**	**dF27=2**
dF26=0	**OK**	**not possible (ACF1)**	**not possible (ACF1)**
dF26=1	**OK**	**OK**	**OK**
dF26=2	**not possible (ACF1)**	**OK**	**not possible (ACF1)**

For unit with UNIQUE condensation, dF26 / dF27 must be set different to 0.
WARNING: It is not possible to modify the parameters of the dF menu when defrost is active in a circuit

FORCED DEFROST

dF29	Minimum idle time before forced defrosting The device wait the delay time dF29 before starting a forced defrost cycle after the relevant conditions have reached	0	250	Sec	
dF30	Forced defrosting temperature/pressure setting	-50.0 -58 0.0 0	110 230 50.0 725	°C °F bar psi	Dec int Dec Int
dF31	Forced defrosting differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

The function is enabled if the parameter dF29 is different to zero. Allows to perform a forced defrost cycle if the condensation or evaporation temperature/pressure remain below the dF30 set for time dF29. If during the count of time dF29 the condensation or evaporation temperature/pressure rises above the dF30 set plus the differential dF31, the time dF29 is reloaded.

40.3 DEFROST WITH CONDENSATION FANS

If dF01 = 4 defrost is enabled via the condensation fans. And set FA01>0, enable fan works.
If the temperature measured by the probe configured as **Dynamic/boiler function/change over set-point external air temperature NTC temperature probe** (AI type=35) > the value set in par dF25, when defrost needed, instead of using reverse valve, force the compressor stop and activate condensation ventilation to maximum.
The condition for defrost ending:

- If combined defrost is enabled, for temperature or max. time
- If only NTC probes are configured, for temperature or max. time
- If only pressure probes are configured for max. time

For defrost with condensation fans, in PHASE 3, it can pass to PHASE 4 directly after the compressors switch off, not need to wait for dF07 time.

WARNING:
Even if the defrost via condensation ventilation is enabled, if the external air temperature(AI type=35) < than dF25, defrost takes place via hot gas (compressor on).
If dF23 = 2 during dripping time (if dF08 set different to 0) ventilation is forced to maximum for the time set in dF08 only if the temperature measured by the probe configured as external air temperature probe(AI type=35) > value set in par dF25 and also if this probe is not configured.
WARNING:
With defrost with just ventilation enabled, forced defrost always takes place with hot gas.

40.4 SUPPLY FAN DURING DEFROST

dF32	Supply fan block in defrosting mode 0 = Not enabled – Supply fan works during defrost 1 = Enabled – Supply fan doesn't work during defrost	0	1		

The supply fan can be stopped during defrost of the air/air heating units to block the introduction of cold air into the room during the defrost phase.

WARNING:
With several circuits configured, the function is only active if:

- dF32 ≠ 0 when they enter defrost together
- FA06 = 0 unique condensation ventilation

41. HEAT RECOVERY FUNCTION

rC 1	Recovery function 0 = Disabled 1 = separate hydraulic circuits 2 = hydraulic circuits in parallel 3 = total recovery gas side	0	3		
rC15	Defines the temperature control probe of the machine in recovery mode 0 = condenser water common inlet 1 = circuit 1 condenser water input NTC 2 = circuit 2 condenser water input NTC 3 = circuit 3 condenser water input NTC 4 = circuit 4 condenser water input NTC 5 = circuit 1 condenser water output NTC 6 = circuit 2 condenser water output NTC 7 = circuit 3 condenser water output NTC 8 = circuit 4 condenser water output NTC 9 = condenser water common output NTC	0	9		

SP 1	Working in temperature or pressure from an analog input **0 - NTC cond. temperature / evap. pressure 4.0.20mA:** The condensation temperature is controlled through the use of an NTC probe, while a transducer with an input of 4-20 mA must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **1 - Condensation and evaporation pressure 4.0.20mA:** A transducer with an input of 4-20 mA must be used to control the condensation or evaporation pressures **2 - NTC cond. temperature / evap. pressure 0..5V:** The condensation temperature is controlled through the use of an NTC probe, while a ratiometric transducer with an input of 0÷5V must be used to control the evaporation pressure of the circuits and the pressure of the pressure probe configured as an auxiliary output **3 - Condensation and evaporation pressure 0..5V:** A ratiometric transducer with an input of 0-5 V must be used to control the condensation or evaporation pressures	0	3		

The precondition to enable recovery function is:

1. The par **rC01** is different to 0
2. The unit is switch on and working in chiller mode
3. The heat recovery key heat recovery icon is pressed in ON mode from keyboard
(Press the key for 1 second in heat recovery menu to enable the function.)
4. If rC01=1/2, digital inputs / digital outputs are configured. The digital input configured as recovery request is active. At least one compressor is switch on in the circuit.
5. If rC01=3, analogue inputs / digital outputs are configured. And the probe for disable the recovery function is not inside the disabling zone (See detail in following chapters).

Resources necessary for circuit working in heat recovery mode

If recourse configuration is not correct, you will see ACF9 configuration error alarm.

<u>Analog input configuration:</u>

When rC01=3, heat recovery is controlled by probe values. There are two kinds of probes needed:

1. The temperature control probe of the machine in recovery mode. Please configure this probe as rC15 appointed.

Condenser hot water common input NTC temperature probe (AI type = 23)
Circuit 1 condenser hot water input NTC temperature probe (AI type = 24)
Circuit 2 condenser hot water input NTC temperature probe (AI type = 25)
Circuit 3 condenser hot water input NTC temperature probe (AI type = 26)
Circuit 4 condenser hot water input NTC temperature probe (AI type = 27)
Circuit 1 condenser hot water output NTC temperature probe (AI type = 28)
Circuit 2 condenser hot water output NTC temperature probe (AI type = 29)
Circuit 3 condenser hot water output NTC temperature probe (AI type = 30)
Circuit 4 condenser hot water output NTC temperature probe (AI type = 31)
Condenser hot water common output NTC temperature probe (AI type = 32)

2. The probe to disable the recovery function.

It depends on par SP01.

<u>If SP01=0 or 2, Configure probes for each circuit:</u>

Circuit 1 condensing temperature NTC probe (AI type=48)
Circuit 2 condensing temperature NTC probe (AI type=49)
Circuit 3 condensing temperature NTC probe (AI type=50)
Circuit 4 condensing temperature NTC probe (AI type=51)

<u>If SP01=1 or 3, Configure probes for each circuit:</u>

Circuit 1 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=52)
Circuit 2 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=53)
Circuit 3 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=54)
Circuit 4 condensing pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type=55)

<u>Digital input configuration:</u>

When rC01=1/2, heat recovery is controlled by digital input.
On the basis of the circuits enabled, the respective digital input configured as heat recovery request.
Circuit 1 heat recovery request (DI type = 60)
Circuit 2 heat recovery request (DI type = 61)
Circuit 3 heat recovery request (DI type = 62)

Circuit 4 heat recovery request (DI type = 63)

Digital output configuration:
On the basis of the circuits enabled, the respective outputs configured as circuit recovery valve
Circuit 1 heat recovery valve (DO type = 34)
Circuit 2 heat recovery valve (DO type = 35)
Circuit 3 heat recovery valve (DO type = 36)
Circuit 4 heat recovery valve (DO type = 37)

42. HEAT RECOVERY WORKING FROM DIGITAL INPUT

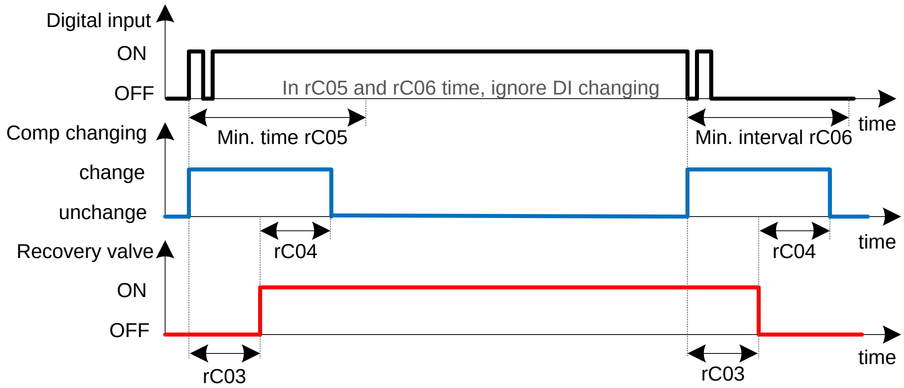
rC 3	Forced step deactivation time	0	250	Sec	
rC 4	Forced step deactivation time after rotation of recovery valve	0	250	Sec	
rC 5	Minimum operation time in recovery mode Minimum activation time of heat recovery function once enabled	0	250	Min	
rC 6	Minimum delay between recovery end and next recovery Minimum time between disabling and following reactivation of heat recovery function	0	250	Min	

If rC01=1 or 2, heat recovery is controlled by digital input. In addition, the working can be different depends on the hydraulic circuit type of the unit.

42.1 UNIT WITH SEPARATE HYDRAULIC CIRCUITS

Par **rC01** = 1 unit with separate hydraulic circuits:
All the four circuits are independent, but their heat recovery regulations are the same. Take circuit 1 for example, the same working is obtained in the other configured circuits with their own digital input and output.

CIRCUIT 1 WORKING
Check all the preconditions to make sure heat recovery function is enabled.
Configure one digital input as **Circuit 1 heat recovery request**. With digital input active, the relay output configured as **Circuit 1 heat recovery valve** is activated.
The recovery working sequence is shown in the graph below:



Enter to recovery mode
When the digital input **Circuit 1 heat recovery request** activated, unit enters heat recovery mode. At this moment, the maximum compressor step number of the circuit needs to decrease by one (if more than one step is configured).
For example, if circuit 1 configured with 3 compressors and all 3 on. Switch off one compressor, only left 2 compressor working. See the graph above, this process is shown as “Comp changing -change” in blue line.
After a delay of rC03, the **Circuit 1 heat recovery valve** is activated.
Then, after a delay of rC04, the compressor maximum step number changing is stopped. The compressor can back to its normal working mode.

Exit from recovery mode
When the digital input **Circuit 1 heat recovery request** deactivated, unit exits heat recovery mode. At this moment, the maximum compressor step number of the circuit needs to decrease by one (if more than one step is configured).
After a delay of rC03, the **Circuit 1 heat recovery valve** is deactivated.

Then, after a delay of rC04, the compressor maximum step number changing is stopped. The compressor can back to its normal working mode.

Note:
Par rC05 defines the minimum activation time of heat recovery function once enabled.
Par rC06 defines the minimum delay between recovery end and next recovery.
So During the rC05 and rC06 period, ignore the digital input changing.
If the circuit only configured 1 power step, rC05 and rC06 will not considered.

42.2 UNIT WITH TWO PARALLEL HYDRAULIC CIRCUITS

Par **rC01** = 2 units with parallel hydraulic circuits:
In this situation, the heat recovery valve and compressor steps control is the same as that when rC01=1. All 4 circuits are independent. They have their own heat recovery valve.
The only difference lies in the logic of the digital input request. In this case, the digital inputs serve as heat recovery request steps number.

For example:
If 4 digital inputs are configured as **Circuit 1/2/3/4 heat recovery request**, and 2 of them are activated. At this moment, circuit 1/3/4 have compressors running. Therefore, circuit 1 and 3 will start to enter heat recovery mode.
If only one digital input activated, circuit 1 will start to enter heat recovery mode.

43. HEAT RECOVERY WORKING BY MEANS OF TEMPERATURE/PRESSURE PROBE

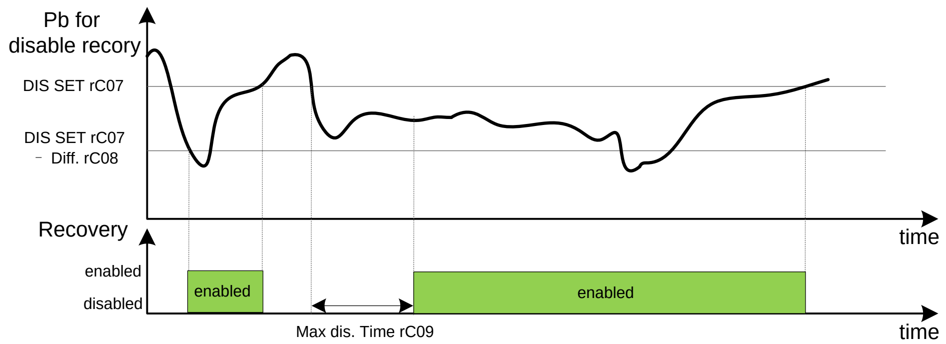
rC 7	Recovery function disabling setting Condensing pressure/temperature level for disabling heat recovery function If the condensing pressure exceeds the rC07 level the heat recovery function is automatically disabled.	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
rC 8	Recovery function enabling differential Heat recovery function is reactivated if the condensing pressure/temperature drops below the rC07 – rC08 level	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
rC 9	Maximum condensation pressure / temperature recovery disabling time After expiration of the rC09 delay the heat recovery function is reactivated regardless the condensing pressure/temperature level.	0	250	Min	

Except digital input, the heat recovery requests also can be managed by the temperature/pressure probe positioned on the heat recovery units. To use this function, set par rC01=3.
In this probe-controlled heat recovery situation, if the recovery is activated, no compressor steps number changing is request. Only heat recovery valve take action.

43.1 DISABLING/ENABLING OF HEAT RECOVERY WORKING DUE TO CONDENSATION PRESSURE/TEMPERATURE

The heat recovery mode is disabled to allow the unit to function in cooling plus recovery mode to prevent a possible high pressure intervention. Disabling of the heat recovery working mode is managed via the analogue input configured as circuit condensation probe.

Check the probe for disable the recovery function, see if it takes effects. Here below the graph:



If probe for disable recovery <= rC07-rC08, recovery function is enabled.

If probe for disable recovery >= rC07, recovery function is disabled.
If rC07-Rc08 < probe for disable recovery< rC07, recovery function is enabled after rC09 time. This is used to prevent prolonged working in heat recovery disabling with temperature/pressure between deactivation set and activation differential,

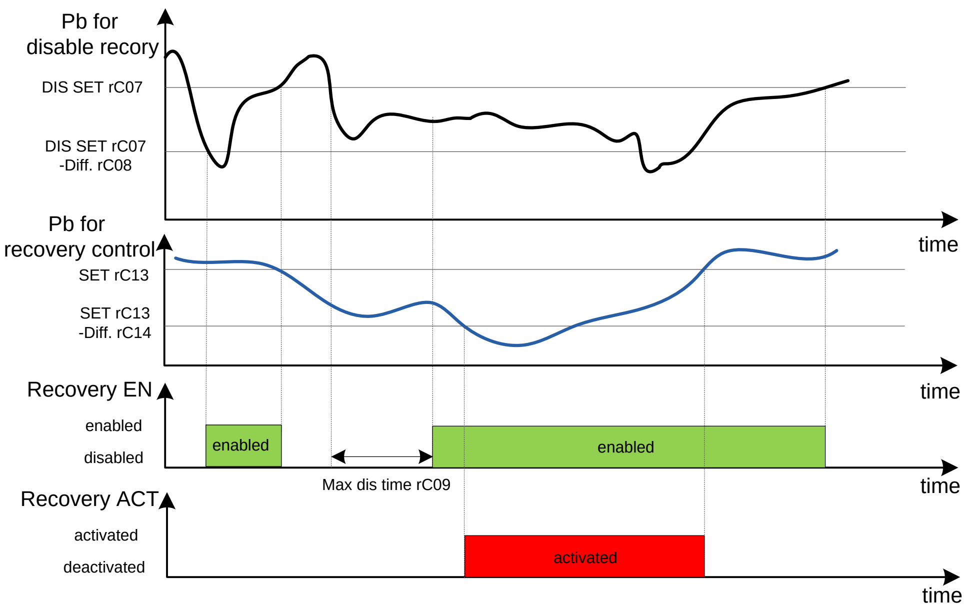
Only when the recovery function enabled, it has the possibility to be activated according to the par rC02.
Par rC02 is used for choose recovery function priority, which can be user side priority or recovery side priority.

43.2 USER SIDE PRIORITY

rC 2	Choice of recovery function priority 0 = user side 1 = recovery side	0	1		
rC13	Recovery set point Defines the working set-point for heat recovery function (active only in cooling mode)	rC11	rC12	°C/°F	Dec / int
rC14	Recovery differential Defines the working set-point for heat recovery function	0.1 0	25.0 45	°C °F	Dec int
rC15	Defines the temperature control probe of the machine in recovery mode 0 = condenser water common inlet 1 = circuit 1 condenser water input NTC 2 = circuit 2 condenser water input NTC 3 = circuit 3 condenser water input NTC 4 = circuit 4 condenser water input NTC 5 = circuit 1 condenser water output NTC 6 = circuit 2 condenser water output NTC 7 = circuit 3 condenser water output NTC 8 = circuit 4 condenser water output NTC 9 = condenser water common output NTC	0	9		

rC02 = 0 User side priority
In this situation, cooling has higher priority, compressors are not affected by heat recovery. They still controlled by the probe selected by ST09. And use ST01/ST07 as set point / band.

The recovery is activated according to probe selected by rC15.
If probe for recovery control <= rC13-rC14, recovery is activated.
If probe for recovery control >= rC13, recovery is deactivated.



43.3 HEAT RECOVERY SIDE PRIORITY

rC02 = 1 Heat recovery side priority
In this situation, heat recovery has higher priority.

If all the preconditions are satisfired, and the recovery function is not disabled due to the condensation pressure/temperature, heat recovery will be activated when:
If probe for recovery control >= rC13+rC14, recovery is activated.
If probe for recovery control <= rC13, recovery is deactivated.

When heat recovery activated, compressors will regulate according to the probe selected by rC15. And use rC13/rC14 as set point / band.

44. CONDENSATION FAN MANAGEMENT IN HEAT RECOVERY MODE

rC10	Condensation ventilation operation in recovery mode 0 = enabled 1 = not enabled	0	1		
FA 6	Single or separate condensation fan 0= unique condensation (1 / 2 / 3 / 4) 1= separate condensers 2= unique by circuits (1 – 2) / (3 – 4)	0	2		

The working of the condensation fan may affected by heat recovery depends on par rC10.
If rC10 = 0,
Heat recovery will not influence condensation fan working.

If rC10 = 1,
When heat recovery is activated, condensation fan working will be influenced.
FA06=0 (unique condensation):
If all the configured circuits are working in heat recovery mode, the condensation fan will force to switch off.
FA06=1 (separate condensers):
For each circuit, if it is configured and working in heat recovery mode, this circuit's condensation fan will force to switch off.
FA06=2 (unique by circuits):
For the couple circuit 1 and circuit 2, if all the configured circuits are working in heat recovery mode, the condensation fan of this couple will force to switch off.
For the couple circuit 3 and circuit 4, if all the configured circuits are working in heat recovery mode, the condensation fan of this couple will force to switch off.

45. FUNCTION FOR PRODUCTION OF DOMESTIC HOT WATER

FS 1	Activation of domestic hot water production 0 = Disabled 1 = with common return – User and domestic hot water heat exchanger and water piping are physically the same 2 = with dedicated return – User and domestic hot water heat exchanger and water piping are physically separated	0	2		
CF 1	Defines the type of unit to control 0 = Air to air unit 1 = Air to water 2 = Water to water	0	2		
CF 2	Selection of unit working mode 1 = chiller only 2 = heat pump only 3 = chiller with heat pump	1	3		

The preconditions to enable this function are:

1. The unit is ON, not OFF or Stand-by.
2. The unit is not air/air type. (CF01≠0)
3. The unit is not chiller only type. (CF02≠1)
4. Activation of domestic hot water production is not disabled by parameter. (FS01≠0)
5. Activation of domestic hot water production is not disabled by keyboard.
6. One probe is configured as: **Domestic hot water temperature control NTC temperature probe** (AI type=44)
7. 2 relays are configured as: **Domestic hot water pump relay** (DO type=75) and **Domestic hot water valve 1**(DO type=68).

If any condition is not satisfied, the production of domestic hot water is not available.

45.1 DOMESTIC HOT WATER PRODUCTION START AND STOP

FS 3	Domestic water set point. Defines the working set point for the production of domestic hot water.	FS05	FS06	°C °F	dec int
FS 4	Domestic water regulation steps intervention band	0.1 1	25.0 45	°C °F	dec int
FS29	Minimum interruption (time) during domestic water production by probe no. 2 and minimum time between two interruptions	0	250	sec	
FS30	Domestic water probe set point no. 2 to interrupt domestic water production	-50.0 -58	110 230	°C °F	dec int
FS31	Domestic water probe differential no. 2 to interrupt domestic water production	0.1 1	25.0 45	°C °F	dec int

Two situations can cause the domestic hot water production start:

1. Value of probe **Domestic hot water temperature control NTC temperature probe** (AI type=44) <= set point FS03 – band FS04.
2. There is an anti-legionella function request (See chapters below for details).

During the domestic hot water production, some reasons can stop the procedure.

1. If value of probe **Domestic hot water temperature control NTC temperature probe** (AI type=44) >= set point FS03, domestic hot water production ends.
2. After a delay FS29 from the domestic water production starting, if the value of probe **Domestic hot water temperature safety NTC temperature probe** (AI type=45) >= FS30, the production will be interrupted. Once the interruption occurs, the domestic water production is stopped and keeps OFF for at least FS29 time. After this, if evaporator anti-freeze prevention function is not activated (see chapters below) and **Domestic hot water temperature safety NTC temperature probe** drops below FS30-FS31, the domestic water production can start again.
   In this way, it can avoid the hot water temperature goes too high which is dangerous.
3. Defrost can intervene the domestic hot water production (See chapters below for details).

45.2 EVAPORATOR ANTI-FREEZE PREVENTION DURING DOMESTIC HOT WATER PRODUCTION

FS44	Evaporator anti-freeze prevention during domestic water production with a single-circuit machine. 0= function is disabled 1=function is enabled For preventing for possible antifreeze alarms due to defrost cycles, if the evaporator water outlet temperature drops below the value defined on parameter FS45 and the external temperature is lower than FS47 the unit is switched to heating function until the water temperature goes higher than FS45+FS46	0	1		
FS45	Evaporator outlet water set point to prevent anti-freeze	-50.0 -58	110 230	°C °F	dec int
FS46	Band to prevent anti-freeze	0.1 1	25.0 45	°C °F	dec int
FS47	External air set point to prevent anti-freeze	-50.0 -58	110 230	°C °F	dec int

Evaporator anti-freeze prevention during domestic hot water production is enabled when:

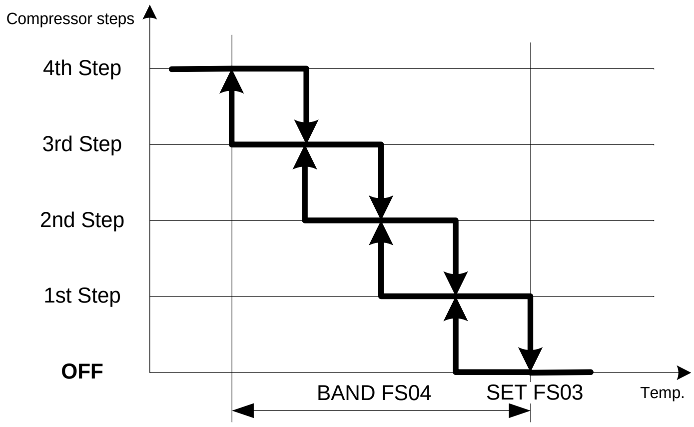
1. FS44=1 (function is enabled)
2. Unit is working in heat pump mode and configured with dedicated return(FS01=2)
3. External air temperature (detected by: Dynamic/boiler function/change over set-point external air temperature NTC temperature probe (AI type=35)) <FS47.

If all the preconditions satisfired:
When the temperature **Evaporator common input NTC temperature probe** (AI type=17) <=FS45, evaporator anti-freeze prevention activated, and domestic hot water production is stopped.
When the temperature **Evaporator common input NTC temperature probe** (AI type=17) >=FS45 + FS46, evaporator anti-freeze prevention deactivated, domestic hot water production restart.

In case of the domestic hot water production is interrupted by **Domestic hot water temperature safety NTC temperature probe,** it can't be restart if the evaporator anti-freeze prevention is activated, even though **Domestic hot water temperature safety NTC temperature probe** drops below FS30-FS31.

45.3 MANAGEMENT OF COMPRESSORS AND HEATERS IN DOMESTIC HOT WATER PRODUCTION

Compressor regulation for production of domestic hot water
The domestic hot water is mainly produced using the compressors.
The regulation of the production of domestic hot water is controlled by probe **Domestic hot water temperature control NTC temperature probe** (AI type=44).
If the temperature is inside the area of FS03 and FS03-FS04, compressors will switch on step by step.
The band between each step is calculated by FS04 divides total compressor power steps in the unit.
Here below the graph. (Suppose 4 compressor steps are configured)



The insertion/removal of the steps follows the rules of normal temperature control for that concerning:

- switch-on/off of the compressors (due to working hours or number of switch-on)
- balancing/saturation of the circuits
- steps insertion/removal times

Warning: If the unit is working in chiller mode, and there is a domestic hot water production request, the reverse valves need to change over. Before changing over, when the compressors are switched off, the compressors protection times are annulled. After changing over, the delay times between the switch-off of two steps and between the successive re-starts of the same compressor is kept.

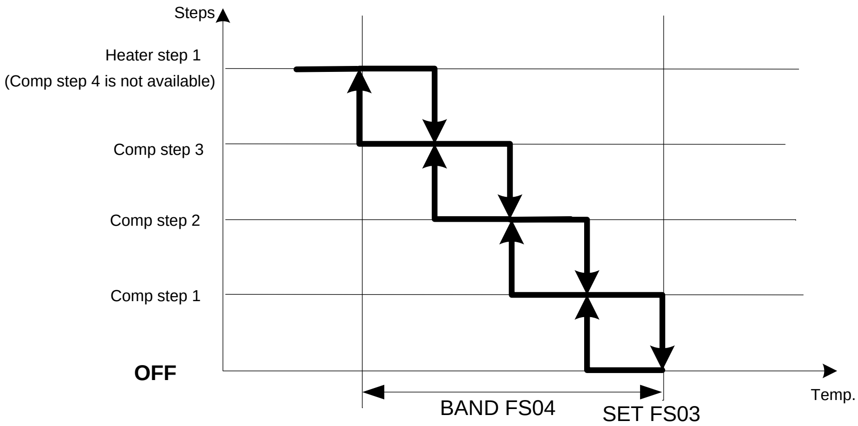
Heaters regulation for production of domestic hot water

FS 7	Activation of the steps to reach the domestic water set point 0 = activates all the compressors 1 = activates the compressors and heaters	0	1		
FS 8	Connection of the domestic water temperature control heaters 0 = no 1 = yes	0	1		
CO 2	Minimum compressor OFF time Determines the length of time the compressor must remain deactivated even if a request is transmitted for it to switch on again. During this stage, the LED pertaining to the compressor will flash.	0	250	Sec	10 sec
CO 3	Minimum time between one activation and another on the same compressor	0	250	Sec	10 sec
CO 4	Activation delay between 2 compressors/steps With two compressors this establishes the start-up delay between the two, to reduce absorption at peaks. During this stage, the LED pertaining to the compressor will flash. (only for the compressor) With units with partialised compressor. This determines switch-on time of the unloader solenoid for start-up at minimum capacity (see compressors start-up)	1	250	Sec	
CO 5	Shut off delay between 2 compressors / steps This establishes the shut off delay between the two compressors two unloader steps	1	250	Sec	

Except compressors, the heaters also can be used for domestic hot water production.
Heater relays are:
Domestic hot water heater (1st step) (DO type=70)
Domestic hot water heater (2nd step) (DO type=71)
Domestic hot water heater (3rd step) (DO type=72)

Heaters are used in 2 cases:
CASE 1: Par FS08=1, and compressors are not temporarily available due to some reasons, switch on heaters instead. For example, compressor is disabled by alarm, in protection time (CO2, CO3, CO4) or intervene by unloading. The maximum domestic hot water steps = the total compressor power steps.
CASE 2: On expiry of **maximum time for reaching the domestic hot water production set-point** (FS09), if the set point FS03 still has not been reached, the unit will work in whole capacity.
If FS07=0, all compressors are activated
If FS07=1, all compressors and heaters are activated.
In these 2 cases, seconds between steps when turning on are set by par CO04; seconds between steps when turning off are different for compressors and heaters. Heater can switch off directly while compressor need to wait for delay CO05.
Once all available steps have been inserted, they remain on until the domestic hot water set-point has been reached. On reaching the set-point, the heaters are switched-off immediately while the compressors are switched-off one by one in sequence with interval CO05.

Here below in the graph an example for CASE 1:
(Suppose 4 compressor steps and 2 heater steps are configured)
The band between each step is calculated by FS04 divides the number of compressors.



Inverter regulation for domestic water
If inverter (AO compressor x 0÷10V modulating output.AO type=11-14 or 28-31) is configured:
When the activated step number is increasing, this analog output will be 100%;
When the activated step number is decreasing, this analog output will be changed from 100% to 0% depends on domestic hot water temperature.

Special cases
If there is a domestic hot water probe 1 error (temperature control probe), the domestic hot water function is prevented and the controller will function normally in cooling or heating mode.
If there is a domestic hot water probe 2 error (display/inhibition probe) the alarm is displayed without any action on temperature control. The production of domestic hot water will continue regularly even if the display probe is in error conditions.
If the temperature control probe (cooling or heating) goes into error condition during the production of domestic hot water, the unit will not be blocked but the cooling or heating temperature control will be disabled and the production of domestic hot water will remain active.
If an alarm occurs that blocks the unit during the production of domestic hot water, on return of the alarm the controller checks the conditions (temperature) and the settings appointed to the FS parameters and performs normal temperature control or produces domestic hot water.

Unloading condenser/evaporator
The unloading function is activated also during the production of domestic hot water with the same modes as the standard device.
If an unloading event occurs, the compressors/steps established by the parameter Un16 will be left running. If the heaters are not active, on the basis of the configuration of parameter FS08, they will be inserted to compensate the compressors switch-off.

Power modulation if the user side and domestic water side are demanded simultaneously.

FS56	Power modulation if the user side and domestic water side are demanded simultaneously. 0 = the temperature control satisfies the domestic water demand 1 = enabling of max number of steps between domestic water and user side 2 = 100% enabling of power available (only HP)	0	2		

If temperature regulation and domestic water production all need heating, the power steps request is depending on par FS56.
If FS56=0, the temperature control satisfies the domestic water demand
If FS56=1, enabling of max number of steps between domestic water and temperature control.
If FS56=2, and unit is working in heat pump mode, all compressors and heaters are activated.

45.4 MANAGEMENT OF THE DOMESTIC HOT WATER PUMP

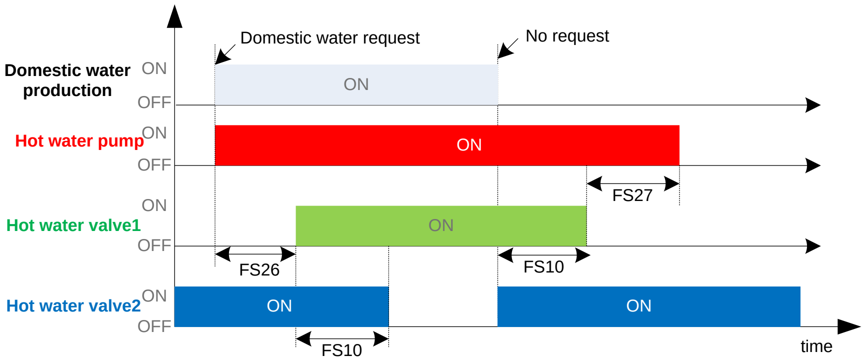
FS10	Delay in activating outputs for domestic water production	0	999	sec	
FS26	Domestic water output inversion delay from when the domestic water pump is activated	0	250	sec	
FS27	Domestic water pump deactivation delay from when the domestic water output is inverted	0	250	sec	
FS28	Domestic water pump operation mode 0 = operation on demand. The pump is activated only when domestic hot water is required. 1 = continuous operation. The pump is always active when the unit is active. FS26 and FS27 delays are ignored	0	1		
FS48	Do not turn the valves in production of domestic water only with dedicated return. 0= function is disabled 1=function is enabled If the function is active during production of domestic hot water only (no cooling or heating demand) the solenoid valves remain in their standard position and only the domestic hot water pump is activated.	0	1		
FS49	Switch off evaporator water pump in production of domestic water only with dedicated return. 0= function is disabled 1=function is enabled If the function is active during production of domestic hot water only (no cooling or heating demand) the evaporator pump is switched OFF.	0	1		

FS50	Overlapping time between evaporator water pump and domestic water pump. If the evaporator water pump is disabled during domestic hot water production only (FS49=1) it is switched OFF FS50 seconds after the activation of the domestic hot water pump	0	250	sec	

There are 3 relays related to domestic hot water pump.
1. Domestic hot water pump (DO type=75)
2. Domestic hot water valve 1 (DO type=68)
3. Domestic hot water valve 2 (DO type=69)

The domestic hot water pump is managed during the production of domestic hot water or during the antilegionella cycle as described in the relative paragraphs.

The management Times of the domestic hot water pump are the following:
- the change over of the hot water valve 1 and hot water valve 2 outputs takes place with the delay **FS26** from pump switch-on
- Domestic hot water pump switch-off takes place with delay **FS27** from the changeover of hot water valve 1 and hot water valve 2.



Continuous working of the domestic hot water pump
If the parameter **FS28** = 0 (domestic hot water pump operational mode), domestic hot water pump management follow the sequence mentioned above.
If **FS28** =1, domestic hot water pump is always on when unit is on. When domestic water production is request/not request, only switch on/off the hot water valve1/2.

Do not use domestic hot water valves for unit with dedicate return
For the unit configured with dedicate return (FS01=2):
If parameter **FS48** = 0, domestic hot water pump management follow the sequence mentioned above.
If parameter **FS48** = 1, the hot water valve1/2 are not used. Only use domestic hot water pump is enough.

The domestic hot water pump can take effects on evaporator pumps
For the unit configured with dedicate return (FS01=2), in some cases, evaporator pumps need to switch off when domestic hot water production in progress. It will happen when the following conditions all satisfired:
1. Parameter **FS49** = 1(Switch off evaporator water pump in production of domestic water function enabled)
2. The unit is working in heat pump mode, or in chiller mode but no cooling demand.

If the evaporator water pump is disabled by domestic hot water production, actually it will keep on working for FS50 time. After this delay, it will switch OFF.
When domestic hot water production stopped, after the delay FS50, the evaporator can restart again.

45.5 ANTILEGIONELLA FUNCTION

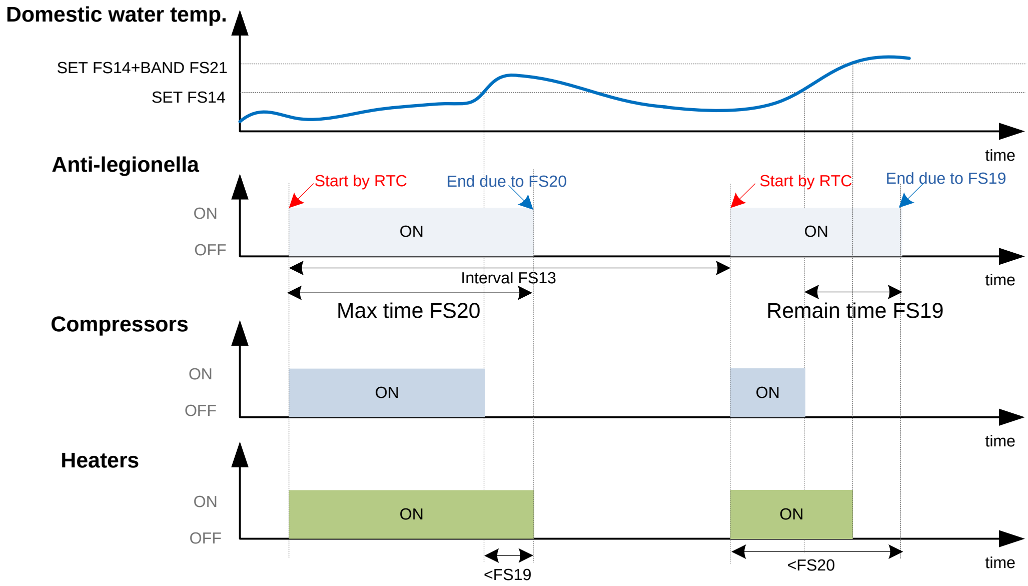
FS 2	Operation priorities 0 = domestic water 1 = heating / cooling	0	1		
FS12	Type of Anti-legionella activation 0 = timed. The antliegionella cycle is activated every FS13 time period. 1= time band. The antliegionella cycle occurs on the day defined on FS18 and hour defined on FS17	0	1		
FS13	Delay between two Anti-legionella production cycles. 0 = function disabled	0	250	Hr	
FS14	Anti legionella set point.	FS15	FS16	°C °F	dec int
FS17	Anti-legionella activation time	0.00	24.00	Hr	10 min
FS18	Day of activation Anti-legionella 0 = Disabled 1 = Sunday… 7 = Saturday	0	7		
FS19	Time in anti-legionella production Once reached the antilegionella set point the antliegionella function is kept active for the FS19 time.	0	250	min	
FS20	Maximum idle time in Anti-legionella mode The antilegionella cycle is disabled after the time FS20 even though the working set point is not achieved.	0	250	min	
FS21	Heaters OFF band in Anti-legionella mode The electric heaters activated for the antilegionella function are disabled (before expiration of FS20) if the water temperature exceeds FS14 (antilegionella set)+FS21	0.1 1	25.0 45	°C °F	dec int

The anti-legionella function is achieved by heat the water to a high temperature, and kills germs.
This function can be activated using parameter **FS12**.

- **FS12 = 0**: at intervals of time between two successive anti-legionella cycles, the anti-legionella procedure is activated when time **FS13** has passed from the last activation. The timer is always active both with the unit on and with unit in remote OFF or stand-by. If there is no power supply, the timer value is memorised and the count re-starts the next time the unit is switched-on.
- **FS12 = 1**: time period (the day of activation must always be set by **FS18** along with the start time **FS17**).

To disable the function, set the parameters FS12=0 and FS13=0 or FS12=1 and FS18=0.
If FS12=1 and the clock is in error, the function is disabled.

The function is activated with the unit running. If the anti-legionella cycle request takes place with the unit off or in stand-by, the anti-legionella cycle will be activated immediately on successive switch-on if the priority is given to the production of domestic hot water. If, however, the priority is given to temperature control, the anti-legionella cycle will be carried out when the cooling/heating set is satisfired.
The function must remain active for the minimum time set via the parameter **FS19** (active from when the temperature of the domestic hot water reaches the anti-legionella set-point) and can last for a maximum time **FS20**.
All compressors and all heaters configured for domestic hot water will be on (eventually the compressors will be switched-off by the unloading) in order to take the water to set-point. Once the **Domestic hot water temperature control NTC temperature probe** (AI type=44) >= set-point **FS14**, the compressors are switched-off in succession with delay defined by the parameter CO5, while the heaters are switched off on reaching the set-point **FS14** + band **FS21**.
During the minimum working time in antilegionella mode, the compressors and the heaters are forced on.
Once this procedure has been concluded, the controller goes back to domestic hot water production or to normal temperature control.
If the parameter FS02 (Working priority) is set as priority to regulation and antilegionella production needs to active, this will only take place when the regulation set-point has been reached.
The anti-legionella cycle must always be terminated before passing to temperature control also if the parameter FS02 gives the priority to temperature control.
Here below a graphic example (FS12=0):



45.6 MANAGEMENT OF THE PRIORITY BETWEEN THE PRODUCTION OF DOMESTIC HOT WATER AND WATER CIRCUIT UTILITIES

If the parameter FS02 is set at 0 the priority is given to the production of domestic hot water (or antilegionella). Once the production of domestic hot water has been satisfired, proceed with production of water for the utilities (if requested).
If the parameter FS02 is set at 1 the priority is given to the production of water for the utilities circuit with classic temperature control. Once the utilities have been satisfired, proceed with the production of domestic hot water.
If temperature control is requested during the antilegionella cycle, this is interrupted to give way to the temperature control request.

If defrost is requested, this has priority over the production of domestic hot water or antilegionella also if FS02=0.

45.7 SOLAR PANELS WATER PUMP

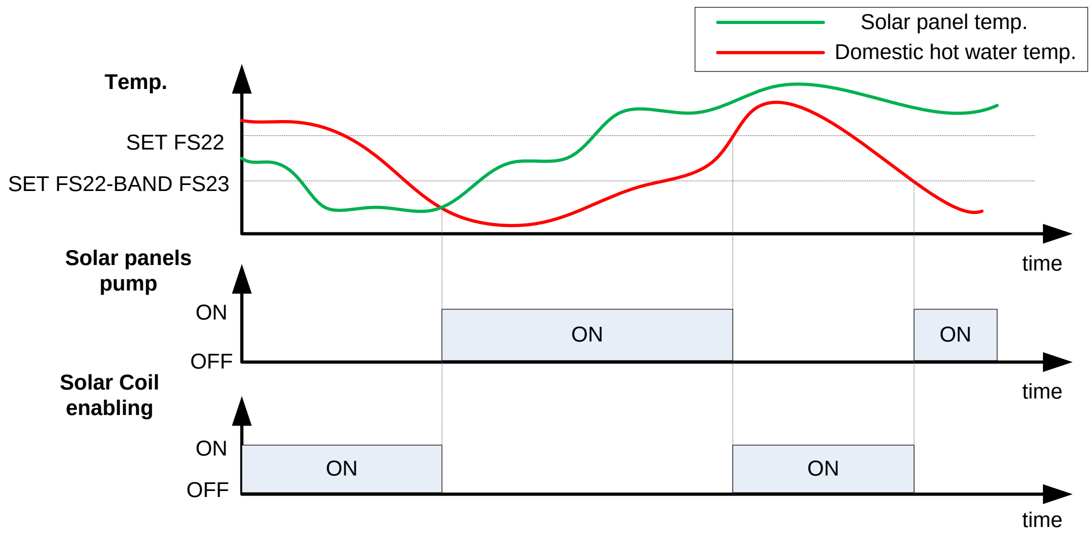
FS22	Water set point for solar panel integration	FS24	FS25	°C °F	dec int
FS23	Intervention band for solar panel integration.	0.1 1	25.0 45	°C °F	Dec int

The solar panels pump is enabled with the setting of appropriately configured relays.
- Solar panels pump (DO type=73)
- Solar coil enabling/exclusion ON/OFF valve (DO type=74)

The status of the solar panels water pump depends on the value of two probes:
- Domestic hot temperature control NTC temperature probe (AI type=44)
- Solar panel NTC temperature probe(AI type=47)

If the temperature detected by the **Solar panel NTC temperature probe** is higher than that detected by the **Domestic hot water temperature control NTC temperature probe**, the management of the solar panels pump is enabled according to the following logic:
- if the temperature detected by the **Domestic hot water temperature control NTC temperature probe** is <= FS22 - FS23, then the solar panels pump is started.
- if the temperature detected by **Domestic hot water temperature control NTC temperature probe** is >= FS22, then the solar panels pump is switched-off.

The status of **Solar coil enabling/exclusion ON/OFF valve** is contrary to **Solar panels pump**. With the solar panel pump off, the **Solar coil enabling/exclusion ON/OFF valve** output is activated. The water no longer circulates in the solar coil inside the cylinder and remains at a standstill inside the solar panels, where an appropriate expansion vessel manages the pressure variation depending on the temperature.



45.8 DOMESTIC HOT WATER FLOW SWITCH AND SOLAR PANELS MANAGEMENT

FS11	Delay in cycle inversion during domestic water production	0	999	sec	
FS51	Standby time before switching inversion valves from chiller to heat pump .Delay time before actual begin of a domestic hot water production	0	250	sec	
FS53	Minimum operation time in chiller mode before switching to domestic water production. In case of demand of both domestic hot water and cooling the unit is forced to work for FS53 in cooling mode only to ensure enough refrigerant is stored in the condenser.	0	250	sec	10sec
FS54	Minimum chiller demand threshold (power steps) before starting in chiller + domestic water mode. Defines the number of cooling demand capacity steps necessary for activation of cooling + domestic hot water production. In case the domestic hot water production function is active any cooling demand for less than the number of steps defined on FS54 is neglected.	1	16		
FS55	Minimum heat pump demand threshold (power steps) before stopping the domestic water production (with HP priority). In case the domestic hot water production function is active any heating demand for less than the number of steps defined on FS55 is neglected.	1	16		

Domestic hot water flow switch alarm and solar panels flow switch alarm come from the digital inputs configured as:

Sanitary water flow switch (DI type=5)
Solar panels flow switch (DI type=112)

The by-pass time, activate time and deactivate time of these two alarms are the same as the utilities flow switch (evaporator pump). See parameter AL16-AL20 for details.
When the sanitary water flow switch alarm activated and in manual mode (keep active for AL17 time), the domestic hot water function will be disabled and the controller will perform the normal cooling/heating temperature control.
With similar logic, the solar panels flow switch alarm leads to the switch-off of the solar panels pump.

45.9 WHOLE PROCESS FOR DOMESTIC HOT WATER PRODUCTION IN COMMON RETURN MODE

If FS01=1, domestic hot water is produced with common return. User and domestic hot water heat exchanger and water piping are physically the same.

45.9.1 Domestic hot water production in heat pump mode

Starting sequence

In this mode, the unit is already working for heating, so when there is a domestic hot water request, no cycle reverse required. The only operation is for domestic hot water pump.

Step1: Manage water pump and valves

- Activate Domestic hot water pump, wait for delay FS26. (if FS28=1, skip this operation)
- Activate domestic hot water valve 1, wait for delay FS10.
- Deactivate domestic hot water valve 2.

Step2: Domestic hot water production running

Compressors and heaters will be regulated as chapters mentioned above.

During Step1, in “Sanitary Water” screen of the keyboard, the status will be “changing state”.
For Step2, the status will be “ON”.

If there are several compressors are switch on for heating request, only when the heating demands steps number< FS55, domestic hot water production can start.
In case of the domestic hot water production function is active any heating demands that<= the number of steps defined on FS55 is neglected. Otherwise, if heating demands > FS55 and FS02=1(temperature control has higher priority), domestic hot water will stop, normal temperature regulation will start.

Ending sequence

Once the set-point FS03 has been reached, the production of domestic hot water will cease and the heat pump working mode will be restored, managed in the following sequence:

Step1: Manage water pump and valves

- Activate domestic hot water valve 2.
- After the delay FS10, deactivate domestic hot water valve 1.
- After the delay FS27, deactivate domestic hot water pump. (if FS28=1, skip this operation)

Step2: Domestic hot water production end

If there is a request from temperature regulator, the compressors activate normally.

In the keyboard:
For Step1, the status will be “changing state”.
For Step2, the status will be “No request”.

Note:
In this situation, PA01 must >0, and there are relays configured as **Evaporator main pump or support pump** (DO type=2/3). Otherwise, the ending phase can’t finish.

In the case of air-water unit, ventilation is managed normally depending on the evaporation pressure.

45.9.2 Domestic hot water in chiller mode (only units with CF02=3)

Starting sequence

When there is a request for the production of domestic hot water in chiller mode, it will operates as below:
Step1: Reverse the cycle

- Force compressors switched-off
- After the delay FS51, the status of the 4-way valve (DO type=10…13) is inverted to active.
- After the delay FS51, the compressors can switch on depending on cooling demand.
- Wait for delay FS11.

Step2: Manage water pump and valves

- Activate Domestic hot water pump, wait for delay FS26. (if FS28=1, skip this operation)
- Activate domestic hot water valve 1, wait for delay FS10.
- Deactivate domestic hot water valve 2.

Step3: Domestic hot water production running

Compressors and heaters will be regulated as chapters mentioned above.

For Step1 and Step2, they are exist for getting ready for domestic hot water production. In this period, the status “changing state” will shown in the keyboard.
For Step3, the status will be “ON”.

If FS02=1, and there are several compressors are switch on for cooling request, only when the cooling demands steps number >= FS54, domestic hot water production can start. If FS02=0, this rule will not used.
In case of the domestic hot water production function is active, any cooling demand that <= the number of steps defined on FS54 is neglected. Otherwise, if cooling demands > FS54 and FS02=1(temperature control has higher priority), domestic hot water will stop, normal temperature regulation will start.

Ending sequence
Once the set-point FS03 has been reached, the production of domestic hot water will cease and the chiller working mode will be restored, managed in the following sequence:

Step1: Manage water pump and valves
- Activate domestic hot water valve 2.
- After the delay FS10, deactivate domestic hot water valve 1.
- After the delay FS27, deactivate domestic hot water pump. (if FS28=1, skip this operation)

Step2: Reverse the cycle
- Wait for all compressors switch off.
- After the delay FS51, the status of the 4-way valve (DO type=10…13) is inverted to deactivate.
- Wait for delay FS51.

Step3: Domestic hot water production end
If there is a request from temperature regulator, the compressors activate normally.

In the keyboard:
For Step1 and Step2, they are implemented simultaneously, the status is “changing state”.
For Step3, the status is “No request”.

45.9.3 Defrost of the air-water units (only with CF02=2 or CF02=3)

Defrost has priority over the production of domestic hot water.
If the controller determines the necessity to perform a defrost cycle for any circuit while the production of domestic hot water is active, the following steps are taken:
Step1: Stop domestic hot water production
- Activate Domestic hot water valve 2, after the delay FS10, deactivate Domestic hot water valve 1.
- After a delay FS27, deactivate Domestic hot water pump. (if FS28=1, skip this operation)

Step2: Do defrost
- Execution of the defrost cycle following the normal procedure respecting the typical times of this cycle.

In the keyboard, step1 status is “changing state”, step2 status is “doing dF”.

On conclusion of the defrost cycle:
- If the production of domestic hot water is requested, it will start again with the **Start sequence** introduced above. If the unit is working in heat pump mode, the start sequence will be a little different. It needs to add a delay FS11 in the beginning.
- If the production of domestic hot water is not requested, the controller will perform normal temperature control.

•

45.10 WHOLE PROCESS FOR DOMESTIC HOT WATER PRODUCTION IN DEDICATED RETURN MODE

If FS01=2, domestic hot water is produced with dedicated return. User and domestic hot water heat exchanger and water piping are physically separated.

45.10.1 Domestic hot water during working in heat pump mode

It is the same as that with common return mode.

45.10.2 Production of domestic hot water during working in chiller mode (only units with CF02 =3)

FS41	Condensation fan forced ON during the production of domestic water 0 = function is disabled 1 = during the FS26 time, the ventilation modulates according to the condensing temperature/pressure 2 = during the FS26 time, the ventilation is forced to operate at the night function speed	0	2		
FS42	Low condensing temperature/pressure threshold to by-pass the ON time of the domestic water pump before the commutation of the valves. If the condensing pressure/temperature drops below the FS42 level during outdoor fans forced activation the same is disabled	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	dec int dec int
FS43	Low evaporating pressure threshold to bypass the ON time of the domestic water pump before the commutation of the valves. If the evaporating pressure/temperature drops below the FS42 level during outdoor fans forced activation the same is disabled	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	dec int dec int

Different from the other modes, priority check (FS02) is not required in this mode.

- In case of no cooling demand, domestic hot water production can start whenever there is a request.
- In case of demand of both domestic hot water and cooling:
  - If cooling regulation request less than FS54 steps, cooling demand is **ignored**. Domestic hot water production can start when there is a request.
  - If cooling regulation demand steps >= FS54, the unit is forced to work for FS53 in cooling mode only to ensure enough refrigerant is stored in the condenser. After FS53 time, domestic hot water production is able to start when there is a request.

Start sequence

Once domestic hot water production is started, it will follow the sequence below:

Step1: Reverse the cycle (If compressor steps already run >= FS54, skip this step)

- Switch-off compressors and wait for delay FS51 (If no compressor is active, skip this operation.)
- The status of the 4-way valve (DO type=10…13) is inverted to active.
- Wait for delay FS51.
- Wait for delay FS11.

Step2: Manage water pump and valves

- Activate Domestic hot water pump, wait for delay FS26. (if FS28=1 or cooling demands<FS54, skip this operation)
- Activate domestic hot water valve 1, wait for delay FS10. (If FS48=1, do not turn valves. Skip this operation). (If FS41>0, among all the configured circuits, if any condensation temp./press. < FS42 or any evaporator temp./press < FS43, skip the delay FS26.)
- Deactivate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)

Step3: Domestic hot water production running

Compressors and heaters will be regulated as chapters mentioned above.

For Step1 and Step2, they are exist for getting ready for domestic hot water production. In this period, the status “changing state” will shown in the keyboard.

For Step3, the status will be “ON”.

End sequence

If set point is reached or probe goes into error, domestic hot water production will stop.

Step1: Manage water pump and valves

- Activate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)
- After the delay FS10, deactivate domestic hot water valve 1, wait for delay FS27. (If FS48=1, do not turn valves. Skip this operation)

- Deactivate domestic hot water pump. (if FS28=1, skip this operation)

Step2: Reverse the cycle (If cycle reversing didn't happen when start, skip this step.)

- Wait for all compressors switch off.
- After the delay FS51, the status of the 4-way valve (DO type=10…13) is inverted to deactivate.
- Wait for delay FS51.

Step3: Domestic hot water production end

If there is a request from temperature regulator, the compressors activate normally.

In the keyboard:
For Step1 and Step2, they are implemented simultaneously, the status is "changing state".
For Step3, the status is "No request".

<u>During working</u>

During domestic hot water working, the following cases should be discriminated:

Case 1:

When domestic hot water is working with no cycle inversed, if the cooling control temperature reaches the set-point ST01, no compressor need to run for cooling demand. At this moment, in order to produce hot water, cycle inverse is necessary:

Step1: Manage water pump and valves (the circulation pump for the domestic hot water is always on)

- Activate domestic hot water valve 2.
- After the delay FS10, deactivate domestic hot water valve 1.

Step2: Reverse the cycle

- Switched-off compressors and wait for delay FS51 (If no compressor is active, skip this operation.)
- The status of the 4-way valve (DO type=10…13) is inverted to active.
- After the delay FS51, the compressors can switched back on depending on cooling demand.
- Wait for delay FS11.

Step3: Manage water pump and valves

- After the delay FS26, activate domestic hot water valve 1. (If FS48=1, do not turn valves. Skip this operation).
- After the delay FS10, deactivate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)

Step4: Domestic hot water production running

Compressors and heaters will be regulated as chapters mentioned above.

Case 2:

When domestic hot water is working with cycle inversed, but cooling request steps increased above FS54. At this moment, cycle inverse becomes not necessary, the inverse valve will change back:

If FS53=0:

Step1: Manage water pump and valves (the circulation pump for the domestic hot water is always on)

- Activate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)
- After the delay FS10, deactivate domestic hot water valve 1, wait for delay FS27. (If FS48=1, do not turn valves. Skip this operation)

Step2: Reverse the cycle

- Wait for all compressors switch off.
- After the delay FS51, the status of the 4-way valve (DO type=10…13) is inverted to deactivate.
- Wait for delay FS51.

Step3: Manage water pump and valves

- After the delay FS11, activate domestic hot water valve 1. (If FS48=1, do not turn valves. Skip this operation).
- After the delay FS10, deactivate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)

Step4: Domestic hot water production running

NOTE:

For Step1 and Step2, they are implemented simultaneously.

If FS53>0:

Step1: Manage water pump and valves

- Activate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)
- After the delay FS10, deactivate domestic hot water valve 1, wait for delay FS27. (If FS48=1, do not turn valves. Skip this operation)

Step2: Reverse the cycle

- Wait for all compressors switch off.
- After the delay FS51, the status of the 4-way valve (DO type=10…13) is inverted to deactivate.
- Wait for delay FS51.

Step3: Work for cooling for FS53 time.
Step4: Manage water pump and valves
- Activate Domestic hot water pump, wait for delay FS26. (if FS28=1, skip this operation)
- Activate domestic hot water valve 1, wait for delay FS10. (If FS48=1, do not turn valves. Skip this operation).
- Deactivate domestic hot water valve 2. (If FS48=1, do not turn valves. Skip this operation)

Step5: Domestic hot water production running
NOTE:
For Step1 and Step2, they are implemented simultaneously.

For Step 1/2/3/4, in the keyboard, the status will be "changing state".

45.10.3 Defrost of the air-water units (only with CF02=2 or CF02=3)

Defrost has priority over the production of domestic hot water.
If the controller determines the necessity to perform a defrost cycle for any circuit while the production of domestic hot water is active, the following steps are taken:
Step1: stop domestic hot water production with the **End sequence** introduced above.
Step2: Do defrost.
Execution of the defrost cycle following the normal procedure respecting the typical times of this cycle.
In the keyboard, step1 status is "changing state", step2 status is "doing dF".

On conclusion of the defrost cycle:
- If the production of domestic hot water is requested, it will start again with the **Start sequence** introduced above. If the unit is working in heat pump mode, the start sequence will be a little different. It needs to add a delay FS11 in the beginning.
- If the production of domestic hot water is not requested, the controller will perform normal temperature control.

In the case of a single circuit unit, the production of domestic hot water is in progress. At this time, if the temperature of the water to the utilities drops below the threshold (FS45) and simultaneously the external temperature is lower than the threshold (FS47), the production of domestic hot water is suspended. When the temperature of the water to the utilities goes back above the threshold (FS45) plus the offset FS46, the production of domestic hot water will be started again. This is to prevent any defrost from making the temperature of the water to the utilities drop below the anti-freeze limit, thus blocking the unit.

In the pluri-circuit units for the same purpose, the circuits that are not defrost are forced to produce hot water for the utilities.

45.10.4 Management of the refrigerant load in the case of domestic hot water production in the chiller cycle

FS32	Overheating set point to activate the charge modulating valve. After activation of the cooling + sanitary water function the circuit charge modulating valve is activated if the superheating is higher than FS32	-50.0 -58	110 230	°C °F	dec int
FS33	Overheating band for the charge modulating valve	0.1 1	25.0 45	°C °F	dec int
FS34	Maximum charge modulating valve time	1	250	min	10 min
FS35	Water set point to change activation setting and band of the charge modulating valve	-50.0 -58	110 230	°C °F	dec int
FS36	Water band to change activation setting and band of the charge modulating valve	0.1 1	25.0 45	°C °F	dec int
FS37	New overheating set point	-50.0 -58	110 230	°C °F	dec int
FS38	New overheating band	0.1 1	25.0 45	°C °F	dec int
FS39	Charge modulating valve ON time	1	250	sec	
FS40	Charge modulating valve OFF time	1	250	sec	

FS41	Condensation fan forced ON during the production of domestic water 0 = function is disabled 1 = during the FS26 time, the ventilation modulates according to the condensing temperature/pressure 2 = during the FS26 time, the ventilation is forced to operate at the night function speed	0	2		
FS42	Low condensing temperature/pressure threshold to by-pass the ON time of the domestic water pump before the commutation of the valves. If the condensing pressure/temperature drops below the FS42 level during outdoor fans forced activation the same is disabled	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	dec int dec int
FS43	Low evaporating pressure threshold to bypass the ON time of the domestic water pump before the commutation of the valves. If the evaporating pressure/temperature drops below the FS42 level during outdoor fans forced activation the same is disabled	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	dec int dec int

For domestic hot water production with dedicated return (FS01=2) in chiller mode, if there is a domestic hot water production request, in order to prevent situations of excess refrigerant “trapped” in the condensing coil, a solenoid valve can be managed (Charge modulating valve circuit 1…4 (DO type=148-151) – one per circuit), which allows to recover part of the refrigerant trapped until excellent working conditions are restored. This valve is piloted, depending on over-heating, with the following procedure:

1. At the time of the domestic hot water production request, during FS26 time, simultaneously with the activation of the relative pump, the condensation fans are forced to night function speed (or are kept active at the speed implemented by the condensation pressure according to settings of parameter FS41). This allows to “store” the largest amount of refrigerant possible in the condensing coil. If, during this period, the condensing pressure drops below the threshold FS42 or the evaporation pressure drops below the threshold FS43, the procedure is suspended and the changeover of valves 1 and 2 is immediately started for the production of domestic hot water.
2. Once the delay has been concluded on the activation of the domestic hot water production function, the fans are switched-off and valves 1 and 2 change over.
3. Part of the refrigerant present in the coil is put back into circulation for a period of time that can be set (par FS34) by opening and closing the load modulating valve according to ON and OFF intervals (can be set via parameters FS39 and FS40). The valve is activated according to this procedure until the over-heating does not descend below the set FS32 less the band FS33.
4. If the temperature of the chilled water produced is higher than a set-point set at parameter FS35, the set FS32 with band FS33 are replaced by set FS37 and band FS38.
5. Once the maximum modulation time FS34 has expired, the transitory is considered concluded and the modulation valve is deactivated.

Night function speed

If FS41 = 2, during the FS26 time, the ventilation is forced to operate at the night function speed FA16(Refer to condensation fans regulation chapter).

To enable this night function, some other preconditions must be satisfired:

- Unit is working in chiller mode and at least one compressor is running. The **cycle inversion valve circuit1** (DO type=10) is deactivate.
- FS01 = 2 (with dedicated return).
- FS28 = 0 (Domestic water pump operation on demand).
- FS26 time is in progress. It means: **Domestic hot water pump** (DO type=75) is active while **Domestic hot water valve 1** (DO type=68) is not active.

46. FREE COOLING

46.1 RESOURCES TO BE CONFIGURED

FC 1	Activation of free cooling 0 = Disabled 1 = enabled fan control with condensing priority 2 = enabled fan control priority with free cooling priority 3 = enabled with external free cooling ventilation 4 = enabled in water/water unit	0	4		

46.1.1 Analogue Inputs

If par FC01>0 and ≠4, probes must be configured for detect external air temperature, system water inlet temperature and evaporator output temperature.

<u>External air temperature</u>

There are 2 probes available. And the first one has high priority. If it is not configured, use the second one instead.

1. External air temperature NTC temperature probe (free-cooling) (AI type=34)
2. Dynamic/boiler function/change over set-point external air temperature NTC temperature probe (AI type=35)

<u>System water inlet temperature</u>

There are 2 probes available. And the first one has high priority. If it is not configured, use the second one instead.

1. System water inlet NTC temperature probe (free-cooling) (AI type=33)
2. Evaporator common input NTC temperature probe (AI type=17)

<u>Evaporator output temperature</u>

If one or more probes configured as below, use their minimum value as evaporator output temperature.

1. Evaporator 1 output NTC temperature probe (AI type=18)
2. Evaporator 2 output NTC temperature probe (AI type=19)
3. Evaporator 3 output NTC temperature probe (AI type= 20)
4. Evaporator 4 output NTC temperature probe (AI type=21)
5. Evaporator common outlet NTC temperature probe (AI type=22)

If par FC01=4, probe must be configured for detect external air temperature, system water inlet temperature and condenser water temperature.

<u>External air temperature</u>

Dynamic/boiler function/change over set-point external air temperature NTC temperature probe (AI type=35)

<u>System water inlet temperature</u>

System water inlet NTC temperature probe (free-cooling) (AI type=33)

<u>Condenser water temperature</u>

External air temperature NTC temperature probe (free-cooling) (AI type=34)

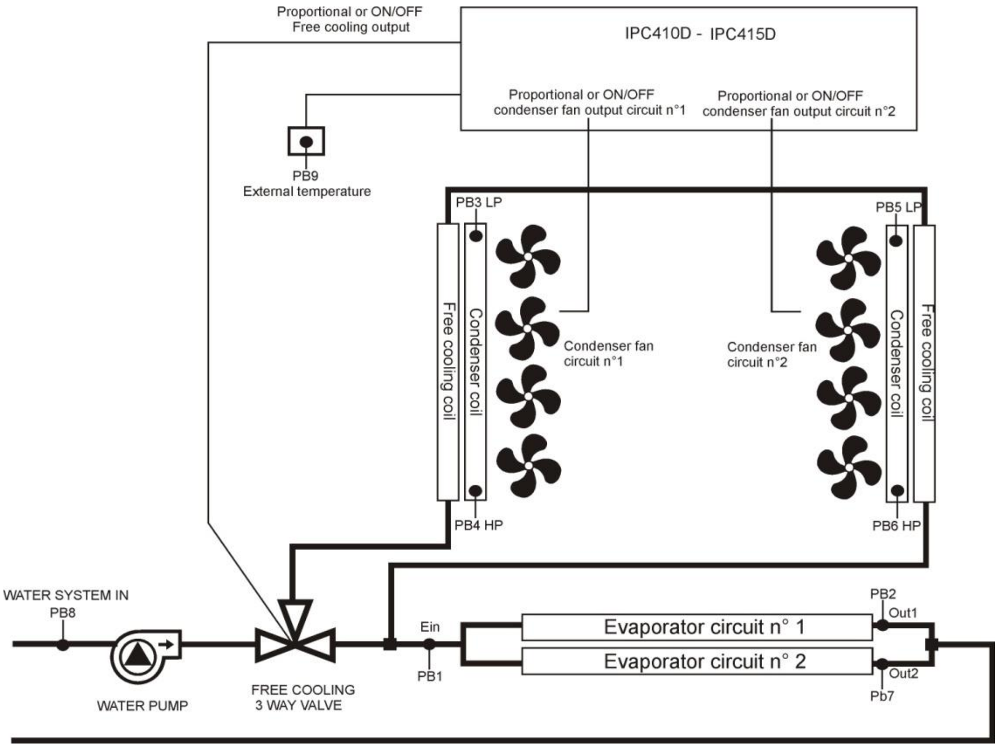
46.1.2 Digital Outputs

Relay output configured as **Free-cooling ON/OFF valve** (DO type=38)
Relay outputs configured as **Free-cooling ON/OFF fan** (DO type=39)

46.1.3 Analogue Outputs

0÷10V dampers control proportional output / free-cooling mixer valve (AO type=5)
0÷10V hot water three-way valve control 0÷10V proportional output (AO type=6)

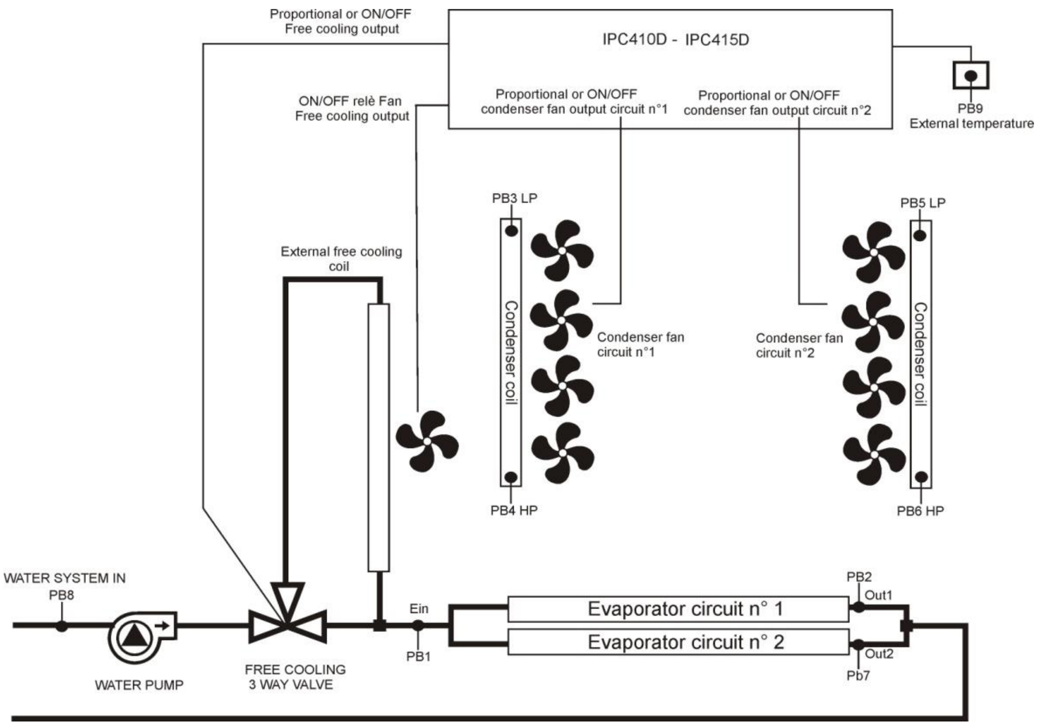
46.2 FREE-COOLING WITH INTERNAL FAN LAYOUT



46.3 FREE-COOLING WITH EXTERNAL VENTILATION LAYOUT

Relay output configured as external free-cooling goes into ON when:

- the free-cooling ON/OFF relay output is ON
- the free-cooling mixer valve analogue output is in regulation mode



46.4 WORKING

FC 1	Activation of free cooling 0 = Disabled 1 = enabled fan control with condensing priority 2 = enabled fan control priority with free cooling priority 3 = enabled with external free cooling ventilation 4 = enabled in water/water unit	0	4		
FC 2	Free cooling mode input/output differential The FC function is enabled if the external temperature drops at least FC02 below the evaporator inlet water temperature for at least FC03	0.1 1	25.0 45	°C °F	Dec int
FC 3	Free cooling input/output delay	0	250	sec	10 sec
FC 4	Damper closing/3-way water valve differential/free cooling ON-OFF relay with temperature control being satisfired	0.1 1	25.0 45	°C °F	Dec int
FC 5	Band regulation steps/ventilation modulating output in free cooling mode	0.1 1	25.0 45	°C °F	Dec int
FC 7	Anti-freeze prevention setting with unit in free cooling mode	-50.0 -58	110 230	°C °F	Dec int
FC 8	Free cooling anti-freeze alarm prevention differential	0.1 1	25.0 45	°C °F	Dec int
FC30	Time to force the Free Cooling starting after start-up (0=function disabled)	0	250	sec	10 sec
FC31	Set temperature external air to force the Free Cooling status during the start up	-50.0 -58	ST01	°C °F	Dec int

46.4.1 FC01≠4

To enable the free-cooling function, all the following 4 conditions need to be satisfied.
1. The unit is switch on and working in chiller mode.
2. FC01 >0 (Free-cooling is not disabled)
3. Free-cooling is enabled by keyboard (Press key in Free Cooling screen).
4. Probes for detect external air temperature and system water inlet temperature are not in error status.

After these conditions are satisfied, first check external air temperature and system water inlet temperature, then check evaporator output temperature and finally determine if free-cooling can be enabled.

1. Check external air temperature and system water inlet temperature.

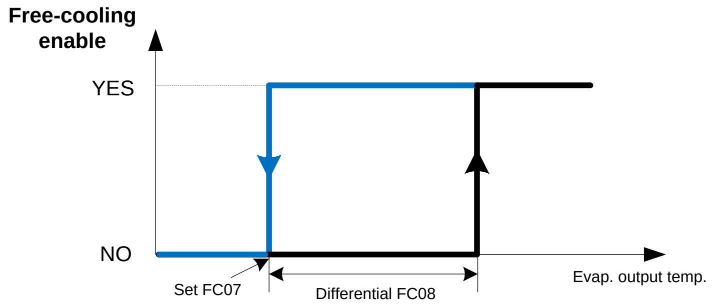
- If system water inlet temperature - external air temperature >= FC02 (Free cooling mode input/output differential) for time FC03 (Free cooling input/output delay), free-cooling is possible to be enabled.
- If system water inlet temperature - external air temperature < FC02, free-cooling is disabled.
  In this situation, the output will be:

Relay **Free-cooling ON/OFF valve** (DO type=38) is switch off;
Relay **Free-cooling ON/OFF fan** (DO type=39) is switch off.
Analog output **0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5) will output the minimum percentage set by par FC27
Analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will output the percentage 100%-FC27.

2. Then check evaporator output temperature. If it is too low, free-cooling can't be started.

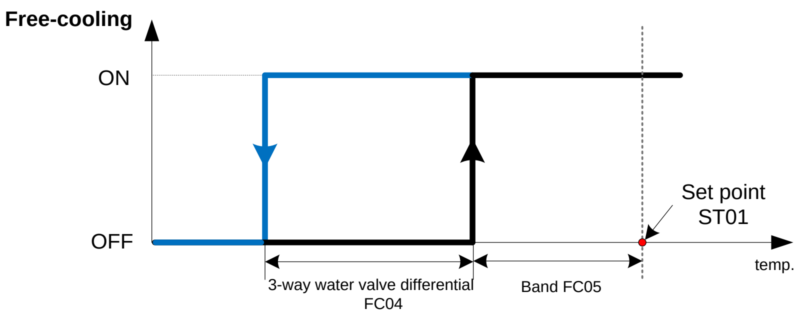
- If evaporator output temperature >= set FC07 + differential FC08, free-cooling is possible to be enabled.
- If evaporator output temperature <= set FC07, free-cooling is disabled.
  In this situation, the output will be:
  Relay **Free-cooling ON/OFF valve** (DO type=38) is switch off;
  Relay **Free-cooling ON/OFF fan** (DO type=39) is switch off.
  Analog output **0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5) will output the minimum percentage set by par FC27
  Analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will output the percentage 100%-FC27.

See graph below:

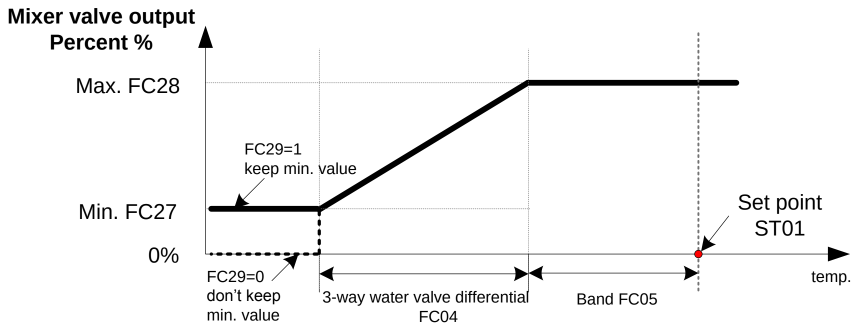


Moreover, evaporator output temperature checking may skiped for special cases:
If FC01=1, when external air temperature <= FC31, after unit start-up for FC30 time, the free-cooling will be enabled regardless evaporator output temperature.

After all of these checking, if free-cooling is still enabled, it will regulate according to the system temperature probe which is selected by par ST09.
If system temperature >= setpoint ST01- FC05, free-cooling is activated, switch on relay **Free-cooling ON/OFF valve**.
If system temperature <= setpoint ST01- FC05-FC04, free-cooling is deactivated, switch off relay **Free-cooling ON/OFF valve**.
Note: If energy-saving or dynamic-set point is active, it is need to calculate the new set point based on ST01.
See graph below:



In the same way, the analogue output (**0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5)) will assume a value from 0 to 10V depending on the temperature detected by the probe selected by ST09. See graph below.
Another analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will output the percentage of **100%- free-cooling mixer valve**.



46.4.2 FC01=4

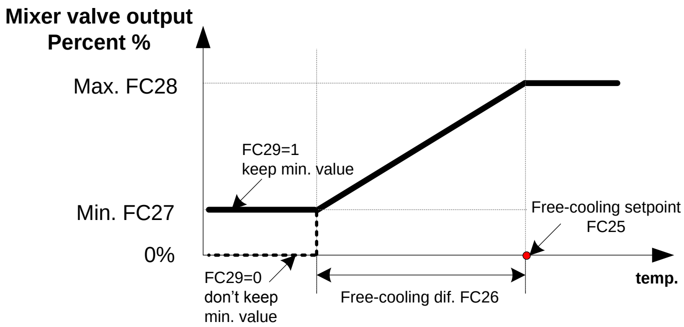
FC17	Outside Set point temperature air for free cooling enable	-50.0 -58	110 230	°C °F	Dec int
FC18	Condenser water temperature set point for activation free cooling FC	-50.0 -58	110 230	°C °F	Dec int
FC19	Delayed activation of the water probe condenser FC free cooling	0	250	sec	
FC20	Delay switching on / off valves free cooling	0	250	sec	
FC21	Free cooling set point	-50.0 -58	110 230	°C °F	Dec int
FC22	Free cooling differential	0.1 1	25.0 45	°C °F	Dec int
FC23	Free cooling delay for the end	0	250	sec	
FC24	Delay for the activation of preventing frost free cooling	0	250	sec	
FC25	Free cooling set point valve in chillers	-50.0 -58	110 230	°C °F	Dec int
FC26	Differential valve free cooling in chiller	0.1 1	25.0 45	°C °F	Dec int
FC27	Free cooling valve regulation minimum percentage	0	FC28	%	
FC28	Free cooling valve regulation maximum percentage	FC27	100	%	
FC29	Maintaining minimum valve opening 0 = no 1 = yes	0	1		

To enable the free-cooling function, all the following 3 conditions need to be satisfaired.
1. The unit is switch on and working in chiller mode.
2. Free-cooling is enabled by keyboard (Press key in Free Cooling screen).
3. All the following 3 probes all not in error status.
   System water inlet NTC temperature probe (free-cooling) (AI type=33)
   External air temperature NTC temperature probe (free-cooling) (AI type=34)
   Dynamic/boiler function/change over set-point external air temperature NTC temperature probe (AI type=35)

<u>When the free-cooling is not working:</u>

- Relay **Free-cooling ON/OFF valve** (DO type=38) is switch off;
  Relay **Free-cooling ON/OFF fan** (DO type=39) is switch on.
- Analog output will follow proportional regulation according to probe **External air temperature NTC temperature probe (free-cooling)** (AI type=34).

  See below the graph for analog output **0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5).
  Another analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will output the percentage of **100%- free-cooling mixer valve**.



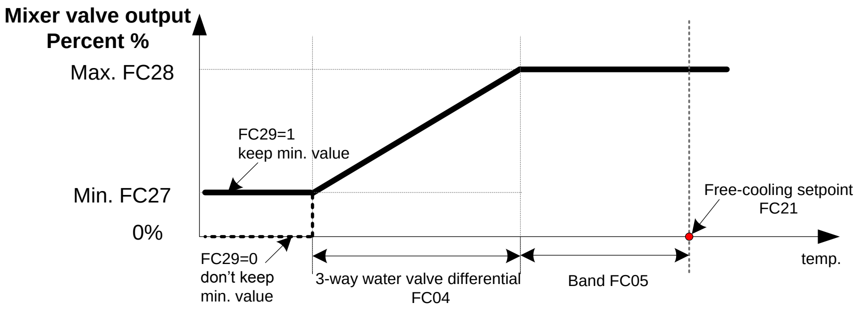
<u>Check situation to start free-cooling:</u>
When free-cooling is not working, check external air temperature (Probe:Dynamic/boiler function/change over set-point external air temperature NTC temperature probe (AI type=35)). If it keeps lower than FC17 for time FC03, free-cooling is enabled.
Once free-cooling is enabled, compressors are forced to switch off, and the analog output will be:

1. Analog output **0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5) will output at maximum percentage FC28.
2. Analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will output the percentage of **100%- FC28**.

In this situation, wait condenser water temperature to drop below par FC18.
It is detected by probe **External air temperature NTC temperature probe (free-cooling)** (AI type=34). If its temperature keeps lower than FC18 for time FC19, free-cooling is activated.

<u>When the free-cooling is working:</u>
After free-cooling is just activated, do valve commutation firstly.
It means switch on relay **Free-cooling ON/OFF valve** (DO type=38) and wait for time set in FC20. When time expires, switch off relay **Free-cooling ON/OFF fan** (DO type=39).

At this moment, the free-cooling will start take effect actually.
The analogue output (**0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5)) will assume a value from 0 to 10V depending on the temperature detected by the probe **System water inlet NTC temperature probe (free-cooling)** (AI type=33). See graph below.
Another analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will output the percentage of **100%- free-cooling mixer valve**.



<u>Check situation to stop free-cooling:</u>
When free-cooling is working, if probe **System water inlet NTC temperature probe (free-cooling)** (AI type=33) >= setpoint FC21+differencial FC22 for time set in FC23, free-cooling need to stop.

In this situation, do valve commutation firstly.
It means switch on relay **Free-cooling ON/OFF fan** (DO type=39) and wait for time set in FC20.
When time expires, switch off relay **Free-cooling ON/OFF valve** (DO type=38) .
At this moment, free-cooling stop working. And compressors are allowed to swicth on.

Note:
Most important of all, no matter the free-cooling is working or not, it always need to prevent the evaporator temperature goes too low. If this bad situation really happen or During anti-freeze working, things must be done as below.
Check probe **External air temperature NTC temperature probe (free-cooling)** (AI type=34).

- If this temperature >= set FC07 + differential FC08, free-cooling can work normally.

- If this temperature <= set FC07 for FC24 times:
  1. Analog output **0÷10V dampers control proportional output / free-cooling mixer valve** (AO type=5) will forced to output the minimum percentage set by par FC27.
  2. Analog output **0÷10V hot water three-way valve control 0÷10V proportional output** (AO type=6) will forced to output the percentage 100%-FC27.
  3. Condensation fans are forced to switch off.

46.5 FREE-COOLING WORKING IN HEAT PUMP MODE

In heat pump working mode the digital output configured as free cooling ON/OFF valve will always be off, while the analogue output configured as free cooling modulating valve will always be at 0V.

46.6 FREE-COOLING VENTILATION WORKING MODE

FC 6	Regulation steps/ventilation modulating output in free cooling mode 0 = 100% on demand 1 = with step/proportional regulation	0	1		
FC 9	Minimum operation speed of the fans in free cooling mode	0	100	%	
FC10	Maximum operation speed of the fans in free cooling mode	0	100	%	
FC11	Peak time at maximum speed after switch-on	0	250	sec	

In some case, free-cooling may take effect on ventilations.

46.6.1 FC01=4- Water/Water Unit

To make condenser fan work, water pump must be configured. It means:

- Set PA01 and PA17 not equal to 0
- Configure relays as Evaporator main/support pump (DO type =2 or 3)
- Configure relays as Heat recovery condenser main/support pump (DO type=8 or 9)

When free-cooling is not working

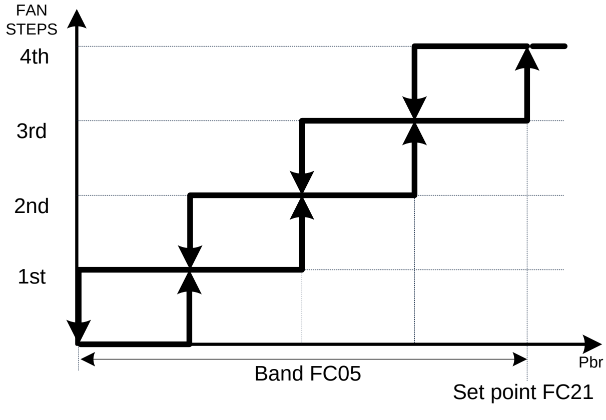
If free-cooling is enabled but not take effect actually (still wait for condenser water temperature to drop or wait for valve commutation) and no compressor is working now, condensation fan will work at maximum capacity. If FA1=2/3 (step type fan), all the configured fan steps will switch on; if FA1=4 (proportional speed fan), fan will work at speed of 100% .

When free-cooling is working

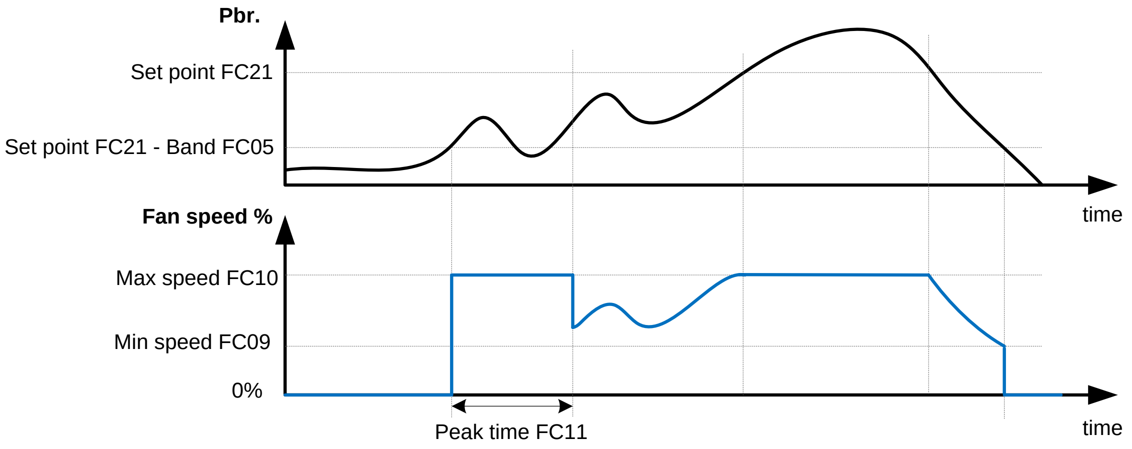
Condensation fans are forced to work according to FC06 setting.
If **FC06=0** (100% on demand)
When free-cooling regulation probe (**System water inlet NTC temperature probe (free-cooling)** (AI type=33)) >= set point FC21, condensation fan will forced to work at maximum capacity.
When this probe < set point FC21, condensation fan will forced to switch off.

If **FC06=1** (with step/proportional regulation)
Condensation fan will be regulated according to probe **System water inlet NTC temperature probe (free-cooling)** (AI type=33), see graph below.

Steps regulation:



Propotional regulation



46.6.2 FC01=1- With Condensing Priority

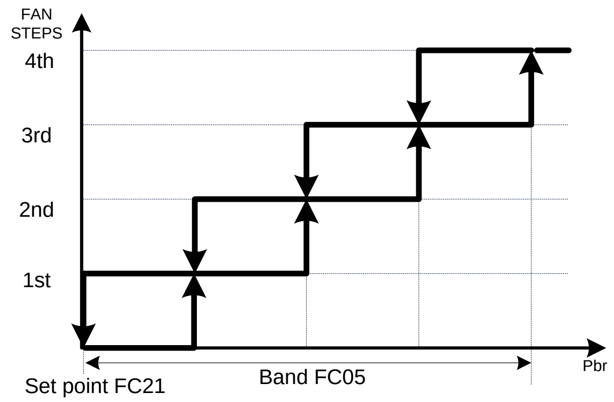
In this situation, if the unit type is Air/air (CF01=0), fan will works with condensing priority when free-cooling is working.

- If FA06=1/2 (Separated/Circuit couple unique condensation) and at least one compressor is running in the unit, for circuits with no compressor running, all of its fans will switch-on, and fan speed is forced to maximum value FA09.
- If the unit type is Air/air (CF01=0) and FA06=0 (unique condensation), fan will work normally according to FA parameters setting.

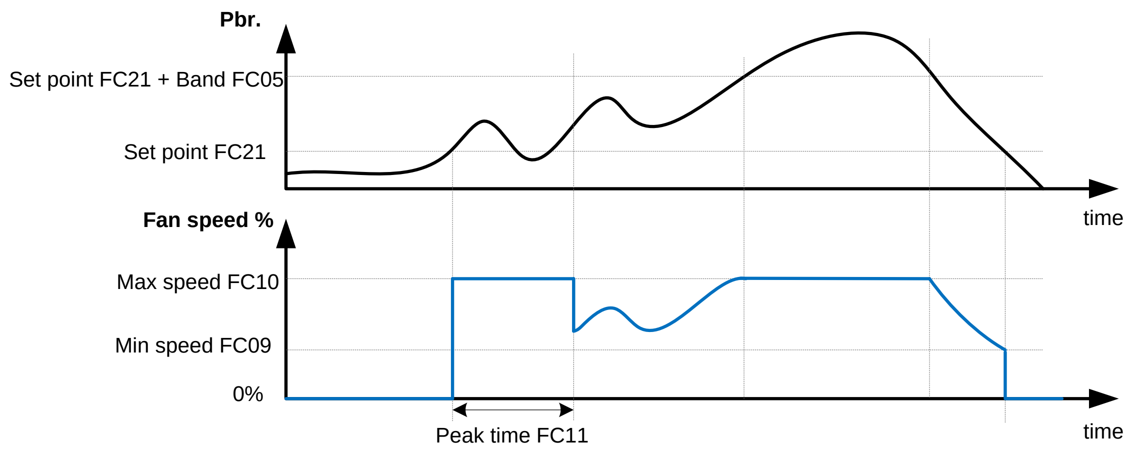
If the unit type is not Air/air (CF01≠0), condensation fans are forced to work according to FC06 setting when free-cooling is working.
If **FC06=0** (100% on demand)
When free-cooling regulation probe (**System water inlet NTC temperature probe (free-cooling)** (AI type=33)) >= set point FC21, condensation fan will forced to work at maximum capacity.
When this probe < set point FC21, condensation fan will forced to switch off.

If **FC06=1** (with step/proportional regulation)
Condensation fan will be regulated according to probe **System water inlet NTC temperature probe (free-cooling)** (AI type=33), see graph below.

Steps regulation:



Propotional regulation



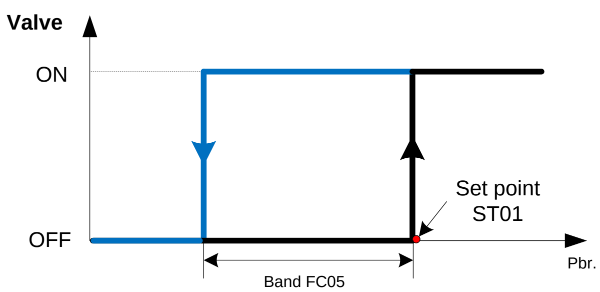
46.6.3 FC01=2- With Free-Cooling Priority

Condensation fans are forced to work according to FC06 setting when free-cooling is working.
If **FC06=0** (100% on demand)
When free-cooling regulation probe (**System water inlet NTC temperature probe (free-cooling)** (AI type=33)) >= set point FC21, condensation fan will forced to work at maximum capacity.
When this probe < set point FC21, condensation fan will forced to switch off.

If **FC06=1** (with step/proportional regulation)
Condensation fan will be regulated according to probe **System water inlet NTC temperature probe (free-cooling)** (AI type=33). It can also be expressed by graph above.

46.6.4 FC01=3- With External Free-Cooling Ventilation

When free-cooling is working, relay **Free-cooling ON/OFF fan** (DO type=39) is switch on to activate external ventilation according to the probe value selected by par ST09.



Note: If energy-saving or dynamic-set point is active, it is need to calculate the new set point based on ST01.

46.7 FRACTIONED BATTERY

FC12	Circuit 1 - 2 - 3 - 4 1st step split coil setting	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FC13	Circuit 1 - 2 - 3 - 4 1st step split coil differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FC14	Circuit 1 - 2 - 3 - 4 2nd step split coil setting	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
FC15	Circuit 1 - 2 - 3 - 4 2nd step split coil differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
FC16	Delay for valve exchange of the split coils	0	250	sec	

Fractioned battery regulation manages digital output configured as (each circuit has 2 step split coil valves):
Circuit 1 1st step split coil (DO type=40)
Circuit 1 2ndstep split coil (DO type=41)
Circuit 2 1st step split coil (DO type=42)
Circuit 2 2ndstep split coil (DO type=43)
Circuit 3 1st step split coil (DO type=44)
Circuit 3 2ndstep split coil (DO type=45)
Circuit 4 1st step split coil (DO type=46)
Circuit 4 2ndstep split coil (DO type=47)

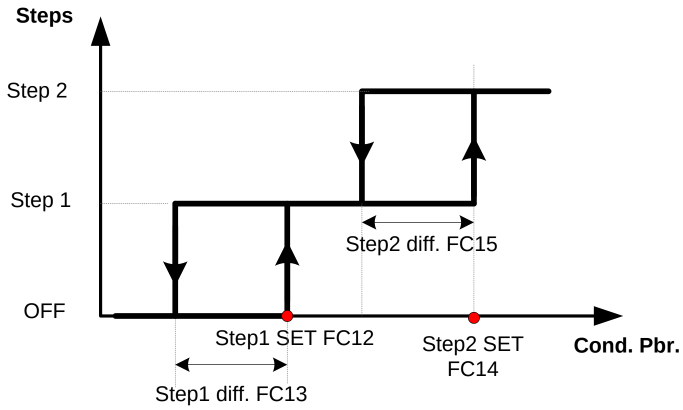
Preconditions to enable fractioned battery regulation in a circuit:

- Unit is ON and working in chiller mode.
- In this circuit, at least one compressor is running.
- In this circuit, probes for condensation temperature/pressure is configured.

If any condition is not satisfired, fractioned battery regulation is disabled. And the 1st / 2nd step split coil are all forced to activated.

If all preconditions are all satisfired, the 1st / 2nd step split coil are mananged as the graph below according to condensation temperature/pressure. All the 4 circuits are regulated independently with the same logic.
In the graph:
When **Steps** = **OFF**:
1st step split coil relay = active
2ndstep split coil relay = deactive
When **Steps** = **Step 1**:
1st step split coil relay = deactive
2ndstep split coil relay = active
When **Steps** = **Step 2**:
1st step split coil relay = active
2ndstep split coil relay = active

If the **Steps** switch between **OFF** and **Step 1**, valve exchange of the split coils will take place after a delay set by FC16.



47. AUXILIARY RELAY FUNCTION

Four relays can be configured as auxiliary outputs. In this case, these relays are released from normal unit controlling. They only managed by user setting in parameter family **US**.
Set relays as:
Auxiliary output n° 1 (DO type=48)
Auxiliary output n° 2 (DO type=49)
Auxiliary output n° 3 (DO type=50)
Auxiliary output n° 4 (DO type=51)

Take auxiliary output1 for example.

US 1	Auxiliary relay 1 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 2	Analogue input configuration for control of the auxiliary relay 1	1	66		
US 3	Set point of auxiliary relay 1	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US 4	Auxiliary relay 1 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

Auxiliary relay 1 operation mode is set by par US01.
US01=0, auxiliary relay 1 is disabled.

US01=1, auxiliary relay 1 is always enabled with direct action no matter the unit is ON (cooling/heating) or OFF (Stand-by/Remote-off).

US01=2, auxiliary relay 1 is only enabled with direct action when the unit is ON (cooling/heating). If the unit is OFF (Stand-by/Remote-off), this auxiliary relay will be disabled.

US01=3, auxiliary relay 1 is always enabled with inverse action no matter the unit is ON (cooling/heating) or OFF (Stand-by/Remote-off).

US01=4, auxiliary relay 1 is only enabled with inverse action when the unit is ON (cooling/heating). If the unit is OFF (Stand-by/Remote-off), this auxiliary relay will be disabled.

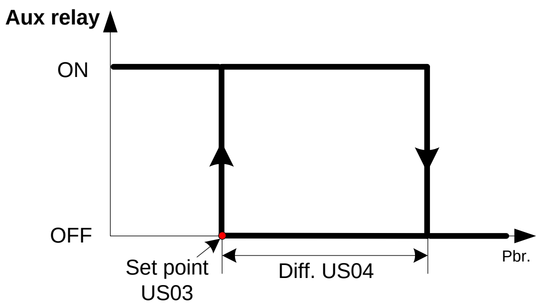
If US01$\neq$0, Auxiliary relay 1 operation is enabled. It will be regulated depending on probe selected by par US02. Please configure one probe’s type as US02 request.

Direct action
Pbr <= set US03, activates the relay
Pbr >= set US03+ differential US04, deactivates the relay
Set US03 < Pbr < set US03+ differential US04, maintain the previous status

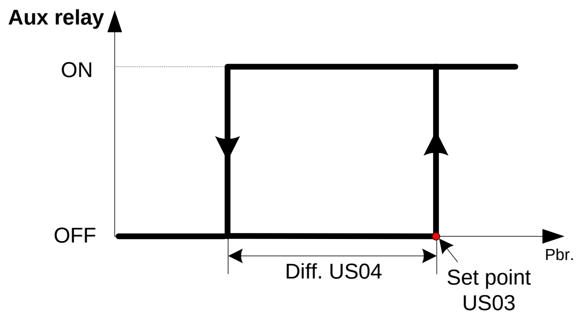
Inverse action
Pbr >= set US03, activates the relay
Pbr <= set US03 - differential US04, deactivates the relay
Set US03 - differential US04 < Pbr < set US03, maintain the previous status

See graph below to find the difference between direct action and inverse action.

Direct Action



Inverse Action



As to the other 3 auxiliary outputs, they are controlled in the same methord but with different parameters.

- For auxiliary relay 2 controlling, use parameters US05-US08
- For auxiliary relay 3 controlling, use parameters US09-US12
- For auxiliary relay 4 controlling, use parameters US13-US16

Auxiliary relay n° 2					
US 5	Auxiliary relay 2 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US 6	Analogue input configuration for control of the auxiliary relay 2	1	66		
US 7	Set point of auxiliary relay 2	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US 8	Auxiliary relay 2 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
Auxiliary relay n° 3					
US 9	Auxiliary relay 3 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US10	Analogue input configuration for control of the auxiliary relay 3	1	66		
US11	Set point of auxiliary relay 3	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US12	Auxiliary relay 3 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
Auxiliary relay n° 4					
US13	Auxiliary relay 4 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US14	Analogue input configuration for control of the auxiliary relay 4	1	66		
US15	Set point of auxiliary relay 4	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US16	Auxiliary relay 4 differential	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int

48. WORKING OF THE AUXILIARY ANALOGUE OUTPUTS (0÷10 VOLT)

Four analog outputs can be configured as auxiliary analog outputs. In this situation, these AO are released from normal unit controlling. They only managed by user setting in parameter family **US**.
Set analog outputs as:
0÷10V auxiliary output n° 1 (AO type=7)
0÷10V auxiliary output n° 2 (AO type=8)
0÷10V auxiliary output n° 3 (AO type=9)
0÷10V auxiliary output n° 4 (AO type=10)

Take auxiliary analog output1 for example.

US17	Proportional auxiliary output 1 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US18	Analogue input configuration for control of the proportional auxiliary relay 1	1	66		
US19	Set point of proportional auxiliary output 1	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US20	Differential of proportional auxiliary output 1	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
US21	Minimum value for 0-10V analogue 1 output	0	US22	%	
US22	Maximum value for 0-10V 1 analogue 1 output	US21	100	%	
US23	Analog output 1 maintaining minimum value 0 = no 1 = yes	0	1		

Auxiliary analog output 1 operation mode is set by par US17.
US17=0, auxiliary analog output 1 is disabled.

US17=1, auxiliary analog output 1 is always enabled with direct action no matter the unit is ON (cooling/heating) or OFF (Stand-by/Remote-off).

US17=2, auxiliary analog output 1 is only enabled with direct action when the unit is ON (cooling/heating). If the unit is OFF (Stand-by/Remote-off), this auxiliary analog output will be disabled.

US17=3, auxiliary analog output 1 is always enabled with inverse action no matter the unit is ON (cooling/heating) or OFF (Stand-by/Remote-off).

US17=4, auxiliary analog output 1 is only enabled with inverse action when the unit is ON (cooling/heating). If the unit is OFF (Stand-by/Remote-off), this auxiliary analog output will be disabled.

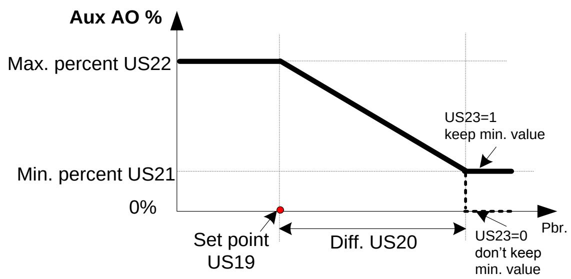
If US17≠0, Auxiliary analog output 1 operation is enabled. It will be regulated depending on probe selected by par US18. Please configure one probe’s type as US18 request.

<u>Direct action</u>
Pbr <= set US19, auxiliary analog output 1 = maximum percent US22
Pbr >= set US19+ differential US20,
    If US23= 0, don’t keep minimum value. Auxiliary analog output 1 = 0%.
    If US23= 1, keep minimum value. Auxiliary analog output 1 = minimum percent US21.
Set US19 < Pbr < set US19+ differential US20, auxiliary analog output 1 modulates between US21 and US22

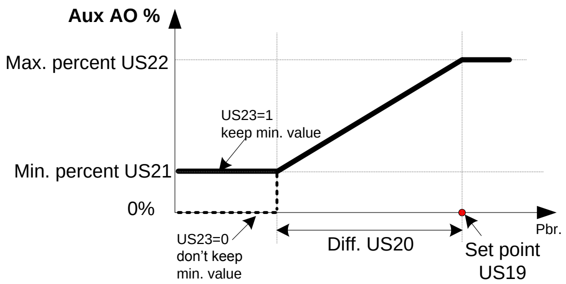
<u>Inverse action</u>
Pbr >= set US19, auxiliary analog output 1 = maximum percent US22
Pbr <= set US19 - differential US20,
    If US23= 0, don’t keep minimum value. Auxiliary analog output 1 = 0%.
    If US23= 1, keep minimum value. Auxiliary analog output 1 = minimum percent US21.
Set US19 - differential US20 < Pbr < set US19, auxiliary analog output 1 modulates between US21 and US22

See graph below to find the difference between direct action and inverse action.

Direct Action



Inverse Action



As to the other 3 auxiliary analog outputs, they are controlled in the same method but with different parameters.

- For auxiliary analog output 2 controlling, use parameters US24-US30
- For auxiliary analog output 3 controlling, use parameters US31-US37
- For auxiliary analog output 4 controlling, use parameters US38-US44

	Auxiliary proportional output n°2 (0÷10V DC)				
US24	Proportional auxiliary output 2 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US25	Analogue input configuration for control of the proportional auxiliary relay 2	1	66		
US26	Set point of proportional auxiliary output 2	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US27	Differential of proportional auxiliary output 2	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
US28	Minimum value for 0-10V analogue 2 output	0	US29	%	
US29	Maximum value for 0-10V 1 analogue 2 output	US28	100	%	
US30	Analog output 2 maintaining minimum value 0 = no 1 = yes	0	1		
	Auxiliary proportional output n°3 (0÷10V DC)				
US31	Proportional auxiliary output 3 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US32	Analogue input configuration for control of the proportional auxiliary relay 3	1	66		
US33	Set point of proportional auxiliary output 3	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US34	Differential of proportional auxiliary output 3	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
US35	Minimum value for 0-10V analogue 3 output	0	US36	%	
US36	Maximum value for 0-10V 1 analogue 3 output	US35	100	%	
US37	Analog output 3 maintaining minimum value 0 = no 1 = yes	0	1		
	Auxiliary proportional output n°4 (0÷10V DC)				
US38	Proportional auxiliary output 4 operation 0 = not enabled 1 = always enabled with direct action 2 = enabled with direct action only with the unit ON 3 = always enabled with inverse action 4 = enabled with inverse action only with the unit ON	0	4		
US39	Analogue input configuration for control of the proportional auxiliary relay 4	1	66		

US40	Set point of proportional auxiliary output 4	-50.0 -58 0.0 0	110 230 50.0 725	°C °F Bar Psi	Dec int Dec int
US41	Differential of proportional auxiliary output 4	0.1 1 0.1 1	25.0 45 14.0 203	°C °F Bar Psi	Dec int Dec int
US42	Minimum value for 0-10V analogue 4 output	0	US43	%	
US43	Maximum value for 0-10V 1 analogue 4 output	US42	100	%	
US44	Analog output 4 maintaining minimum value 0 = no 1 = yes	0	1		

49. ELECTRONIC EXPANSION VALVE (EEV)

The parameters ET4 allows to configure automatically main configuration parameters the of the valve.
WARNING !
The unique and valid reference for the valve data has to be considered the datasheet made by valve manufacturer.
The Manufacter cannot be considered responsible in case of valve damaging due to wrong settings!!!!!!
Please compare the valve data in this user manual with the data declared on the last data sheet of the selected valve.

Driver Termostatica elettronica					
Parametri	**Descrizione**	**min**	**max**	**udm**	**Risoluzione**
Et 1	Configuration of probes Pb1 and Pb2 connected to the driver 0 = NTC temperature 1 = PTC temperature 2 = PT1000 temperature	0	2		
Et 2	Configuration of probes Pb3 and Pb4 connected to the driver 0 = NTC temperature 1 = PTC temperature 2 = PT1000 temperature 3 = pressure 4÷20mA 4 = pressure 0÷5V 5 = not present (low pressure defined transducers are used)	0	5		
Et 3	Type of valve: 1 = Unipolar 2 = Bipolar	1	2		
Et 4	Selection of the bipolar valve body connected to the driver (**WARNING the unique and valid reference has to be considered the datasheet made by valve manufacturer)** 0 = Custom 1 = Alco EX4 – EX5 – EX6 2 = Alco EX7 3 = Alco EX8 4 = Carel E2V* 5 = Carel E2V*P 6 = Danfoss ETS – 25/50 7 = Danfoss ETS – 100 8 = Danfoss ETS – 250/400 9 = Sporlan SEI 0.5 – 11 10 = Sporlan SEI 30 11 = Sporlan SEH 50/100/175	0	11		
Et 5	Selection of the unipolar valve body connected to the driver 0 = Custom	0	0		
Et 6	Valve driving 0 = drives both valves 1 = drives only valve 1	0	1		
Et 7	Valve 1 output operation mode 0 = chiller 1 = heat pump 2 = chiller and heat pump 3 = not used 4 = not used 5 = not used	0	5		

Et 8	Valve 2 output operation mode 0 = chiller 1 = heat pump 2 = chiller and heat pump 3 = not used 4 = not used 5 = not used	0	5		
Et 9	Selection of output circuit valve 1 driver 1 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 10	Selection of output circuit valve 2 driver 1 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 11	Selection of output circuit valve 1 driver 2 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 12	Selection of output circuit valve 2 driver 2 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 13	Selection of output circuit valve 1 driver 3 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 14	Selection of output circuit valve 2 driver 3 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 15	Selection of output circuit valve 1 driver 4 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 16	Selection of output circuit valve 2 driver 4 0 = Not present 1 = Circuit 1 2 = Circuit 2 3 = Circuit 3 4 = Circuit 4	0	4		
Et 17	Number of additional steps to achieve complete closure. When a closing request is received, the valve starts from the current number of steps and moves to 0, then closes for the set number of steps	0	250		
Et 18	Number of return steps in opening mode after the valve has been closed completely. These decompress any closing spring inside the valve or to prevent sealing the circuit	0	250		
Et 19	Maximum number of adjusting steps of the valve	Et20	8000		
Et 20	Minimum number of adjusting steps of the valve	0	Et19		
Et 21	Maximum current value per phase of the stepper motor	0	100	mA	x10 mA
Et 22	Current stand-by value	0	100	mA	x10 mA
Et 23	Maximum number of steps per second of the valve	0	600	Hz	
Et 24	Indicates the number of steps the valve has to move before compressor start-up. 0 = function is disabled	0	Et19		
Et 25	Sets valve manual operation mode 0= Automatic 1= Manual	0	1		
Et 26	Absolute number of steps the valve has to move in manual mode	0	Et19		
Et 27	Low pressure alarm activation delay (LOP)	0	250	Sec	
Et 28	High pressure alarm activation delay (MOP)	0	250	Sec	

Parameters from ET1 to ET28 = valve general parameters used to select:

1. Configurable temperature/pressure sensors
2. The EEV model
3. The EEV working mode (Chiller or heat pump or both)
4. The circuits using the EEV

Et 4: Selection of the bipolar valve body connected to the driver
If Et 4 = 0, the bipolar valve will be configured by Et 17, Et 19, Et 20, Et 21, Et 22 and Et 23.

Et 29	High overheating alarm activation delay	0	250	Sec	10 Sec

ET 29 = If after this time the overheating does not became < Et36 the valve will be opened as per parameter Et43. Et29 is valid for both Chiller and Heat Pump mode.

Et 30	Low overheating alarm activation delay	0	250	Sec	10 Sec

ET 30 = If after this time the overheating does not became > Et37 the valve will be opened as per parameter Et44. Et30 is valid for both Chiller and Heat Pump mode.

Chiller mode parameters settings

PID control in Chiller mode					
Et 31	PID proportional constant in chiller mode	0.0	50.0	°C	Dec
Et 32	PID integral time in chiller mode	0	500	Sec	
Et 33	PID derivative constant in chiller mode	0	250	Sec	

ET 31 = PID (Kp) proportional band:

- With Et31 = 0 the Auto adaptive function is active. (the auto adaptive function self calculate the P, I, and D coefficients of the PID)
- With Et > 0 the PID use the Et31, Et32 and Et33 values
- With small values of Et31 the algorithm is more reactive
- With high values of Et31 the algorithm is less reactive

Et31 value selection is based on process dynamic

ET 31 (Kp)	Stability	Response time
Increase	Higher	Slower
Decrease	Lower	Faster

ET 32 = PID (Ti) integral time:

- With small values of Et32 the algorithm is faster to reach the set point
- With high values of Et32 the algorithm is slower to reach the set point

The integral part of the PID contribute to reduce the offset between set point and overheating in stable conditions

ET 32 (Ti)	Stability	Response time
Increase	Higher	Slower
Decrease	Lower	Faster

ET 33 = PID (Td) derivative time:

- With small values of Et33 the algorithm is faster to reach the set point
- With high values of Et33 the algorithm is slower to reach the set point

The derivative part of the PID contribute to react to fast overheating variations

ET 33 (Td)	Stability	Response time
Increase	Higher	Slower
Decrease	Lower	Faster

Et 34	Overheating regulation set point during chiller mode	0.0	25.0	°C	Dec

ET 34 = Overheating regulation set point during chiller mode

Et 35	Overheating regulation dead band in chiller mode	0.0	5.0	°C	Dec

ET 35 = When the overheating value is within this band the PID control is suspended.

Et 36	High overheating threshold. The alarm status is signaled after the high overheating alarm activation delay	Et34	80.0	°C	Dec
Et 37	Low overheating threshold. The alarm status is signaled after the low overheating alarm activation delay	0.0	Et34	°C	Dec

ET 36 =

- when the overheating is higher than Et36 the STEP RATE function is activated and the PID is suspended (#1), the alarm XX is displayed after the high overheating alarm activation delay Etxx
- if after Et29 second s the overheating is still higher than Et36 then the valve is opened at Et42 %
- then when the overheating is lower than Et36 - 1K the PID control is reactivated and the valve % is the one selected when the PID was suspended (#1)

ET 37 =

- when the overheating is lower than Et37 the STEP RATE function is activated and the PID is suspended (#2), the alarm XX is displayed after the low overheating alarm activation delay Etxx
- if after Et30 seconds the overheating is still lower than Et37 then the valve is closed at Et43 %
- then when the overheating is higher than Et37 + 1K the PID control is reactivated and the valve % is the one selected when the PID was suspended (#2)

Et 38	PID proportional constant in defrost	0.0	50.0	°C	Dec

Et 39	MOP Protection activation threshold. High evaporating temperature threshold. The alarm status is signaled after the high evaporating temperature alarm activation delay	0.0	50.0	°C	Dec
Et 40	STEP RATE during MOP or LOP protection (number of steps every second)	0	ET19		
Et 41	LOP Protection activation threshold. Low evaporating temperature threshold. The alarm status is signaled after the low evaporating temperature alarm activation delay	-50.0	50.0	°C	Dec

ET 39 = MOP Protection activation threshold, over this threshold the valve is closed every second Et40 steps up to Et43 steps

ET40 = STEP RATE during MOP or LOP protection (number of closing/opening steps every second).

ET41 = LOP Protection activation threshold, under this threshold the valve is opened every second Et40 steps down to Et42 steps

Et 42	Max Valve Opening in CH mode (percentage)	0	100	%	
Et 43	Min Valve Opening in CH mode (percentage)	0	100	%	

ET 42 = Max Valve Opening in CH mode (percentage)
<
ET 43 = Min Valve Opening in CH mode (percentage)

Et 44	Pressure measure Filter in CH mode	1	250	Sec	

Et 45	Interval of updating the valve output in CH mode	0	250	Sec	
Et 46	Delay of alarm in case of probe error in CH mode	0	250	Sec	
Et 47	% of valve during the ET46 time in CH mode	0	100	%	

ET 45 = Interval of updating the valve output

ET 46 = Delay of alarm in case of probe error

ET 47 = % of valve during the ET46 time

Heat Pump mode parameters settings

PID control in HP mode					
Et 48	PID proportional constant in HP mode	0.0	50.0	°C	Dec
Et 49	PID integral time in HP mode	0	500	Sec	
Et 50	PID derivative constant in HP mode	0	250	Sec	

ET 48 = PID (Kp) proportional band:

- With Et48 = 0 the Auto adaptive function is active. (the auto adaptive function self calculate the P, I, and D coefficients of the PID)
- With Et > 0 the PID use the Et48, Et49 and Et50 values
- With small values of Et48 the algorithm is more reactive
- With high values of Et48 the algorithm is less reactive

Et48 value selection is based on process dynamic

ET 48 (Kp)	Stability	Response time
Increase	Higher	Slower
Decrease	Lower	Faster

ET 49 = PID (Ti) integral time:

- With small values of Et49 the algorithm is faster to reach the set point
- With high values of Et49 the algorithm is slower to reach the set point

The integral part of the PID contribute to reduce the offset between set point and overheating in stable conditions

ET 49 (Ti)	Stability	Response time

Increase	Higher	Slower
Decrease	Lower	Faster

ET 50 = PID (Td) derivative time:

- With small values of Et50 the algorithm is faster to reach the set point
- With high values of Et50 the algorithm is slower to reach the set point

The derivative part of the PID contribute to react to fast overheating variations

ET 50 (Td)	Stability	Response time
Increase	Higher	Slower
Decrease	Lower	Faster

Et 51	Overheating regulation set point during HP mode	0.0	25.0	°C	Dec

ET 51 = Overheating regulation set point during HP mode

Et 52	Overheating regulation dead band in HP mode	0.0	5.0	°C	Dec

ET 52 = When the overheating value is within this band the PID control is suspended.

Et 53	High overheating threshold. The alarm status is signaled after the high overheating alarm activation delay	Et54	80.0	°C	Dec
Et 54	Low overheating threshold. The alarm status is signaled after the low overheating alarm activation delay	0.0	Et53	°C	Dec

ET 53 =

- when the overheating is higher than Et53 the STEP RATE function is activated and the PID is suspended (#1), the alarm XX is displayed after the high overheating alarm activation delay Etxx
- if after Et29 second s the overheating is still higher than Et53 then the valve is opened at Et59 %
- then when the overheating is lower than Et53 - 1K the PID control is reactivated and the valve % is the one selected when the PID was suspended (#1)

ET 54 =

- when the overheating is lower than Et54 the STEP RATE function is activated and the PID is suspended (#2), the alarm XX is displayed after the low overheating alarm activation delay Etxx
- if after Et30 second s the overheating is still lower than Et54 then the valve is closed at Et60 %
- then when the overheating is higher than Et54 + 1K the PID control is reactivated and the valve % is the one selected when the PID was suspended (#2)

Et 55	Not used	0.0	50.0	°C	Dec

ET 55 = Sembra NOT USED

Et 56	MOP Protection activation threshold. High evaporating temperature threshold. The alarm status is signaled after the high evaporating temperature alarm activation delay	0.0	50.0	°C	Dec
Et 57	STEP RATE during MOP or LOP protection (number of steps every second)	0	100		
Et 58	LOP Protection activation threshold. Low evaporating temperature threshold. The alarm status is signaled after the low evaporating temperature alarm activation delay	-50.0	50.0	°C	Dec

ET 56 = MOP Protection activation threshold, over this threshold the valve is closed every second Et40 steps up to Et59 steps

ET57 = STEP RATE during MOP or LOP protection (number of closing/opening steps every second).

ET58 = LOP Protection activation threshold, under this threshold the valve is opened every second Et40 steps down to Et60 steps

Et 59	Max Valve Opening in HP mode (percentage)	0	100	%	
Et 60	Min Valve Opening in HP mode (percentage)	0	100	%	

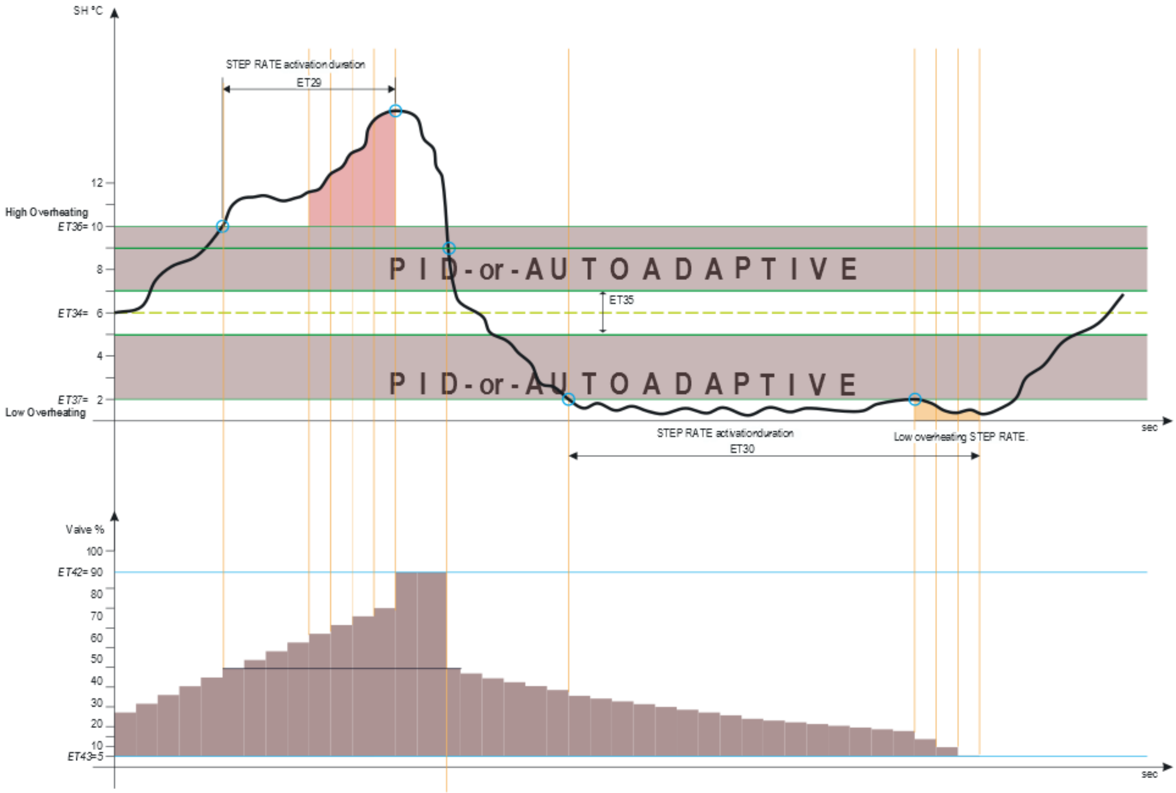
ET 59 = Max Valve Opening in HP mode (percentage)

ET 60 = Min Valve Opening in HP mode (percentage)

Et 61	Pressure measure Filter in HP mode	1	250	Sec	
Et 62	Interval of updating the valve output in HP mode	0	250	Sec	
Et 63	Delay of alarm in case of probe error in HP mode	0	250	Sec	
Et 64	% of valve during the ET46 time in HP mode	0	100	%	

ET 62 = Update time of the valve, which takes into account the binomial cause / effect applied to 'opening or closing of the thermostatic valve. Of course then define an update time that takes into account the inertia of the system in doing the actions.
ET 63 = Delay of alarm in case of probe error

ET 64 = % of valve during the ET63 time



50. ALARMS

The alarm codes and signals are made up from letters and numbers that identify the different types.
Types of alarm:

- Letter **A** = unit alarm
- Letter **B** = circuit alarm
- Letter **C** = compressor alarm

50.1 PROBE BREAKDOWN

Alarm code	**AP1** …**AP54** (probe1 alarm -... probe54 alarm)
Display in keyboard	**Pb AL1 ... Pb AL10** (probe1-...probe10 alarm) **Pb1 AL e1** …**Pb7 AL e1** (Expansion1 probe1...probe7 alarm) **Pb1 AL e2** …**Pb7 AL e2** (Expansion2 probe1...probe7 alarm) **Pb1 AL e3** …**Pb7 AL e3** (Expansion3 probe1...probe7 alarm) **Pb1 AL e4** …**Pb7 AL e4** (Expansion4 probe1...probe7 alarm) **Pb1 AL V1... Pb4 AL V1** (XEV20D 1 probe1... XEV20D 1 probe4) **Pb1 AL V2... Pb4 AL V2** (XEV20D 2 probe1... XEV20D 2 probe4) **Pb1 AL V3... Pb4 AL V3** (XEV20D 3 probe1... XEV20D 3 probe4) **Pb1 AL V4... Pb4 AL V4** (XEV20D 4 probe1... XEV20D 4 probe4)
Cause of activation	Probe is configured and converted value out of range
Reset	Probe is not configured or converted value within range
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	It follows its regulation
Recovery valve	It follows its regulation
Free-cooling on/off valve	It follows its regulation
Auxiliary relay	It follows its regulation
0÷10V auxiliary outputs	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	*Off
Support	*Off
boiler/anti-freeze	*With Ar09 = 1 on if at least 1 probe is configured for control
Pump/and water evaporator and condenser	*It follows/they follow its/their regulation
Compressors	*Off
Pump down solenoid valve	*Off

WARNING:
Symbol “*” means that the component is only forced to switch-off when the broken probe is a regulation probe. If the alarm comes from a display probe, the unit continues to follow normal regulation.

50.2 HIGH PRESSURE PRESSURE SWITCH ALARM

Alarm code	**b1HP-…b4HP** (circuit n° 1…4 high pressure pressure switch alarm)
Display in keyboard	**Hi press circ1-… Hi press circ4**
Cause of activation	With unit in ON and circuit high pressure pressure switch input active **Circuit1:** DI High pressure switch circuit 1(DI type=10) active **Circuit2:** DI High pressure switch circuit 2(DI type=11) active **Circuit3:** DI High pressure switch circuit 3(DI type=12) active **Circuit4:** DI High pressure switch circuit 4(DI type=13) active
Reset	Input not activated
Reset	Reset is always manual if AL11 = 0 Reset is always automatic if AL11 = 60 Reset passes from automatic to manual if AL11 goes from 1 to 59 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay (DO type=154…157) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
0÷10V proportional output	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	If the Par. FA02= 0, fan working mode dependent on the compressor. With alarm active the fans are forced to maximum speed for 60 seconds before switching-off If the Par. FA02= 1, fan working mode independent from the compressor. With alarm active the fans are forced to maximum speed for 60 seconds and then follow their regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Affected circuits compressors	Off
Unaffected circuits compressors	They follow its regulation
Unaffected circuits pump down solenoid valves	They follow its regulation
Affected circuits pump down solenoid valves	Off

50.3 COMPRESSOR HIGH DISCHARGE THERMOSTAT ALARM FROM DIGITAL INPUT

Alarm code	**C1dt…C16dt** (compressor 1…16 high discharge thermostat alarm)
Display in keyboard	**Hi temp C1-…Hi temp C16**
Cause of activation	With unit in ON and compressor discharge thermostat digital input active. From DI: Compressor 1…16 discharge thermostat (DI type=18…33)
Reset	Input deactivation
Reset	Reset is always manual if AL11 = 0 Reset is always automatic if AL11 =60 Reset passes from automatic to manual if AL11 goes from 1 to 59 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
0÷10V proportional output	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressor affected	Off
Compressor not affected	It follows its regulation
Pump down solenoid valve	It switches-off if there is only 1 compressor per circuit, otherwise it follows its regulation

50.4 LOW PRESSURE PRESSURE SWITCH ALARM

AL 1	Low pressure alarm delay from a digital/analogue input	0	250	Sec	
AL 2	Defines low pressure alarm operation with pump-down enabled 0 = independent from the pump down 1 = blocks the compressors until the pressure switch is disabled 2 = lets the compressors reach peak values	0	2		
AL 5	Maximum number of interventions per hour of the low pressure alarm from a digital/analogue input. If the number exceeds AL05 the alarm becomes manual reset. Reset is always manual if AL05 = 0 Reset is always automatic if AL05 = 60 Reset moves from automatic to manual if AL05 moves from 1 to 59	0	60		
AL 6	Low temperature / pressure alarm in defrost mode 0 = not enabled 1 = enabled	0	1		
AL 7	Low temperature / pressure alarm delay in defrost mode Delay time between alarm condition occurrence and reaction by device	0	250	Sec	
AL 8	Low temperature/pressure alarm with the unit in remote OFF or Stand-by mode 0 = alarm detection disabled 1 = alarm detection enabled	0	1		

Alarm code	**b1LP-…b4LP** (circuit n° 1…4 low pressure pressure switch alarm)
Display in keyboard	**Low press circ1-… Low press circ4**
Cause of activation	• With circuit low pressure pressure switch active. From DI Low pressure switch circuit 1…4 (DI type=14…17) • If AL08=1, also with unit in stand-by or OFF remote, if circuit low pressure pressure switch input active • In defrost if AL06=1 if compressor low pressure pressure switch input active The alarm is not signalled: 1. in defrost for time AL07 in correspondence with activation of the reverse valve cycle 2. On compressor switch-on for the time AL01 3. AL02 = 0 the low pressure alarm is inhibited during compressor stopping in pump down mode and with compressor at a standstill 4. AL02 ≠ 0 the low pressure alarm is inhibited during compressor stopping in pump down mode and with compressor at a standstill for the time set
Reset	Input deactivation
Reset	Automatic – it becomes manual after AL05 interventions/hour (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay(DO type=158…161) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
0÷10V proportional output	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	Off
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	Off
Pump down solenoid valve	off

50.5 OIL FLOAT/PRESSURE SWITCH ALARM

Alarm code	**OPC1-…OPC16** (compressor n°1…16 oil pressure switch alarm)
Display in keyboard	**AL oil C1-…AL oil C16**
Cause of activation	DI configured as Oil pressure/level switch compressor 1 (DI type=69…84) activated. The alarm is not signalled: on compressor switch-on for the time AL12. After time AL12 it is not signalled with unit in normal working conditions for time AL13. If AL15 = 0 the alarm is not detected with the compressor off
Reset	Input deactivation
Reset	Automatic – it becomes manual after AL14 interventions/hour (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated

Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
0÷10V proportional output	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Flow ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/water evaporator and condenser	It follows its regulation
Compressors affected	Off
Compressor not affected	It follows its regulation
Pump down solenoid valve	It switches-off if there is only 1 compressor per circuit, otherwise it follows its regulation

OIL ALARM WORKING DUE TO PRESSURE SWITCH OR FLOAT (SCREW)

It is possible that both safety systems can exist together in certain applications. The delay, the active input duration and the number of interventions per hour are used to correctly manage the two safety devices.

Par. **AL12**

Oil alarm delay due to compressor activation.

Allows to set a delay in recognising the alarm of the pressure switch and the float from compressor start-up.

Par. **AL13**

Float pressure switch input active duration in normal working conditions.

Allows to set a time during which the oil alarm must remain active in normal working conditions. The alarm is signalled after this time. The count starts after the **AL13** time. It allows to filter any pressure or oil level drops that may occur for brief moments, e.g. with the activation of a compressor unloader step.

Par. **AL14**

Maximum number of oil alarm interventions per hour.

It determines a maximum number of oil alarm interventions per hour. When these are exceeded the alarm passes from automatic to manual reset.

Par. **AL15**

Oil float/pressure switch alarm with compressor in OFF if a differential oil pressure switch is used.

0 = alarm detection not enabled

1= alarm detection enabled

50.6 CONDENSATION HIGH TEMPERATURE/ PRESSURE ALARM

Alarm code	**b1hp-…b4hp** (circuit n° 1…4 condensation high temperature/pressure alarm)
Display in keyboard	**Hi t/p.cond.circ1…Hi t/p.cond.circ4**
Cause of activation	With unit working in chiller or heat pump mode, if the condensation control probe value >= AL09 set. The condensation control probes' AI type can be 48…55, depending on SP01.
Reset	If the condensation control probe value <= AL09 set – AL10 differential
Reset	Reset is always manual if AL11 = 0 Reset is always automatic if AL11 =60 Reset passes from automatic to manual if AL11 goes from 1 to 59 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	If the Par. FA02= 0 fan working mode dependent on the compressor. With alarm active the fans are forced to maximum speed for 60 seconds before switching-off If the Par. FA02= 1 fan working mode independent from the compressor. With alarm active the fans are forced to maximum speed for 60 seconds and then follow their regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Affected circuits compressors	Off
Unaffected circuits compressors	It follows its regulation
Unaffected circuits pump down solenoid valve	It follows its regulation
Affected circuits pump down solenoid valve	off

50.7 LOW CONDENSATION TEMPERATURE/PRESSURE ALARM (IF THE EVAPORATOR PRESSURE PROBES ARE NOT CONFIGURED)

Alarm code	**b1lp-…b4lp** (circuit n° 1-…circuit n° 4 condensation low temp/pressure alarm)
Display in keyboard	**Low press circuit1-…Low press circuit4**
Cause of activation	The alarm is activated when the probe configures as condensation control probes (AI type=48…55) < AL03 set in the following conditions. And evaporator pressure probes (AI type=56…59) are not configured. • working in cooling or heating mode • stand-by or OFF-remote if AL08 = 1 ▪ In defrost if AL06=1 The alarm is not signalled: • in defrost for time AL07 in correspondence with valve inversion • on compressor switch-on for the time AL01
Reset	If the condensation control probe's temperature/pressure > AL03 + differential AL04
Reset	Automatic – it becomes manual after AL05 interventions/hour (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	Off
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	Off
Pump down solenoid valve	off

50.8 LOW EVAPORATION PRESSURE ALARM (IF THE EVAPORATOR PRESSURE PROBES ARE CONFIGURED)

Alarm code	**b1lp-…b4lP** (circuit n° 1-…circuit n° 4 evaporator low pressure alarm)
Display in keyboard	**Low press circuit1-…Low press circuit4**
Cause of activation	The alarm is activated when the probe configures as the evaporator pressure (AI type=56…59) < AL03 set in the following conditions. • working in cooling or heating mode • stand-by or OFF-remote if AL08 = 1 ▪ In defrost if AL06=1 The alarm is not signalled: • in defrost for time AL07 in correspondence with valve inversion • on compressor switch-on for the time AL01
Reset	If the evaporation control probe measures a temperature > of the AL03 set + differential AL04
Reset	Automatic – it becomes manual after AL05 interventions/hour (reset procedure in functions menu)
Icon	⚠ flashing
Action	Relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	Off
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Affected circuits compressors	Off
Unaffected circuits compressors	It follows its regulation
Unaffected circuits pump down solenoid valve	It follows its regulation
Affected circuits pump down solenoid valve	off

50.9 AIR/AIR UNIT LOW TEMPERATURE ALARM & ANTI-FREEZE ALARM IN CHILLER MODE

Alarm code	**b1AC-…b4AC** (Low temperature/anti-freeze alarm in circuit n° 1..4 chiller mode)
Display in keyboard	From DI: **Antif/lo temp.C1 (DI - CH)-…Antif/lo temp.C4 (DI - CH)** From AI: **Antif/lo temp.C1 (AI - CH)-…Antif/lo temp.C4 (AI - CH)**
Cause of activation	In air/air unit, the low temperature alarm is detected. In other types of unit, antifreeze alarm is detected. It is detected both in chiller working mode and stand-by/OFF-remote mode. And the circuit must be configured with compressors. From DI: Antifreeze alarm circuit 1…4 (DI type=6…9). If only one DI configured, it will be used for all the 4 circuits. From AI: Select probes between evaporator probes(AI type=17…22) by par AL47 and check: • If the unit is working in chiller mode, when the selected probes value <= AL34 set for AL36 time, alarm occur. • If the unit is in stand-by/OFF-remote mode, chose the highest value between AL34 and AL41 as SET, when the selected probes value <= SET set for AL36/AL44 time, alarm occur.
Reset	From DI: DI deactivate From AI: • Unit ON: Regulation probe for Pbr anti-freeze temperature >= AL34 set + AL35 differential. • Unit OFF: Regulation probe for Pbr anti-freeze temperature >= (AL34/AL41) set + (AL35/AL42) differential.
Reset	Automatic – becomes manual after certain number of interventions/hour (reset procedure in functions menu) This number can be: • Chiller: AL37 • Unit OFF: the minimum between AL37 and AL45
Icon	⚠ flashing
Action	If AL38 = 0 only the compressors are switched off. The label alarm is signalled by the alarm relay, buzzer and the heaters are not activated If AL38 = 1 the compressors are switched off. The label alarm is signalled and the alarm relay + buzzer are activated. If the anti-freeze alarm comes from DI the anti-freeze heaters are also activated. Alarm relay DO type=184…187
Regulators	
Alarm	If AL38 = 1 Relay + buzzer activated + anti-freeze heaters
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	If air/air unit off
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	If air/air unit off otherwise follows its regulation
Support/boiler/anti-freeze	With DI alarm activated
Pump/and water evaporator and condenser	They follow their regulation
Compressors	Off
Pump down solenoid valve	Off

50.10 AIR/AIR UNIT LOW TEMPERATURE ALARM & ANTI-FREEZE ALARM IN HEAT PUMP MODE

Alarm code	**b1AH-…b4AH** (anti-freeze alarm in circuit n° 1..4 heat pump mode)
Display in keyboard	From DI: **Antif/lo temp.C1 (DI - HP)-…Antif/lo temp.C4 (DI - HP)** From AI: **Antif/lo temp.C1 (AI - HP)-…Antif/lo temp.C4 (AI - HP)**
Cause of activation	In air/air unit, the low temperature alarm is detected. In other types of unit, antifreeze alarm is detected. It is detected both in heat pump working mode and stand-by/OFF-remote mode. And the circuit must be configured with compressors. When unit just switch on, this alarm is detected only after AL43 delay past. From DI: Antifreeze alarm circuit 1…4 (DI type=6…9). If only one DI configured, it will be used for all the 4 circuits. From AI: Select probes between evaporator probes(AI type=17…22) by par AL48 and check: • If the unit is working in heat pump mode, when the selected probes value <= AL41 set for AL44 time, alarm occur. • If the unit is in stand-by/OFF-remote mode, chose the highest value between AL34 and AL41 as SET, when the selected probes value <= SET set for AL36/AL44 time, alarm occur.
Reset	From DI: DI deactivate From AI: • Unit ON: Regulation probe for anti-freeze temperature >= A41 set + AL42 differential. • Unit OFF: Regulation probe for anti-freeze temperature >= (AL34/AL41) set + (AL35/AL42) differential.
Reset	Automatic – becomes manual after certain number of interventions/hour (reset procedure in functions menu) This number can be: • Heat pump: AL45 • Unit OFF: the minimum between AL37 and AL45
Icon	⚠ flashing
Action	If AL46=0 only the compressors are switched off. The label alarm is signalled by the alarm relay, buzzer and the heaters are not activated If AL46=1 the compressors are switched off. The label alarm is signalled and the alarm relay + buzzer are activated. If the anti-freeze alarm comes from DI the anti-freeze heaters are also activated
Regulators	
Alarm	If AL46 = 1 Relay + buzzer activated + anti-freeze heaters
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	If air/air unit off
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	If air/air unit off otherwise follows its regulation
Support/boiler/anti-freeze	With DI alarm activated
Pump/and water evaporator and condenser	It follows its regulation
Compressors	Off
Pump down solenoid valve	off

WARNING

Par. AL43 anti-freeze alarm delay (air/air unit low outlet air temperature) on unit start-up in heating working mode.

If in stand-by/OFF remote working, the unit has an anti-freeze alarm and the time set in the Par. AL43 is different to zero; by selecting working in heating mode from the key or digital input the anti-freeze situation is reset and the compressors can be switched-on for the time set in the Par. AL35 as the unit heats the water or the air. On expiry of the AL43 delay time, if the Pbr anti-freeze regulation probe still measures a temperature <= AL41 set for at least AL44 seconds, the unit is blocked and an anti-freeze alarm is generated.

50.11 AIR/AIR UNIT LOW TEMPERATURE ALARM & ANTI-FREEZE ALARM

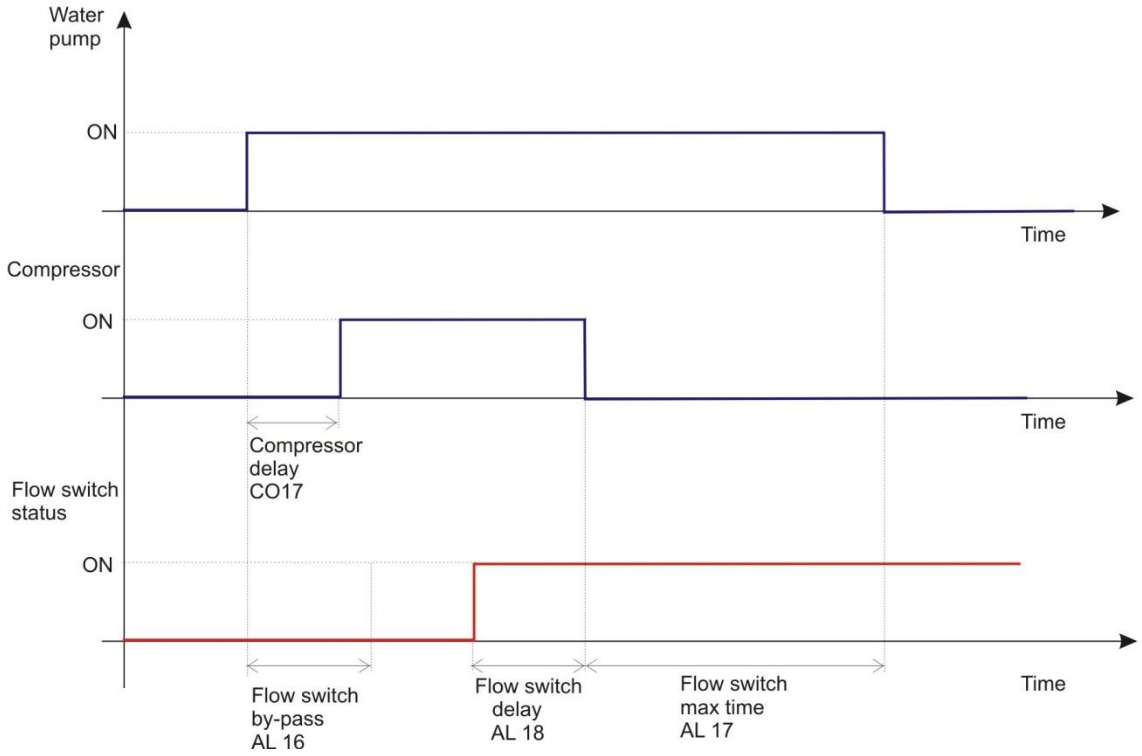
Alarm code	**b1A-…b4A** (Low temperature/anti-freeze alarm in circuit n° 1..4)
Display in keyboard	**Antif/lo temp.C1 (AI)-…Antif/lo temp.C4 (AI)**
Cause of activation	In air/air unit, the low temperature alarm is detected. In other types of unit, antifreeze alarm is detected. It is detected both in heat pump working mode and stand-by/OFF-remote mode. And the circuit must be configured with compressors. (For heat pump mode, when unit just switch on, this alarm is detected only after AL43 delay past.) Select probes between condenser probes(AI type=23…32) by par AL49 and check: • If the unit is working in chiller mode, when the selected probes value <= AL34 set for AL36 time, alarm occur. • If the unit is working in heat pump mode, when the selected probes value <= AL41 set for AL44 time, alarm occur. • If the unit is in stand-by/OFF-remote mode, chose the highest value between AL34 and AL41 as SET, when the selected probes value <= SET set for AL36/AL44 time, alarm occur.
Reset	• Unit ON in chiller mode: Regulation probe for Pbr anti-freeze temperature >= AL34 set + AL35 differential. • Unit ON in heat pump mode: Regulation probe for anti-freeze temperature >= A41 set + AL42 differential. • Unit OFF: Regulation probe for anti-freeze temperature >= (AL34/AL41) set + (AL35/AL42) differential.
Reset	Automatic – becomes manual after certain number of interventions/hour (reset procedure in functions menu) This number can be: • Chiller: AL37 • Heat pump: AL45 • Unit OFF: the minimum between AL37 and AL45
Icon	⚠ flashing
Action	If AL38 = 0 only the compressors are switched off. The label alarm is signalled by the alarm relay, buzzer and the heaters are not activated If AL38 = 1 the compressors are switched off. The label alarm is signalled and the alarm relay + buzzer are activated. If the anti-freeze alarm comes from DI the anti-freeze heaters are also activated
Regulators	
Alarm	If AL38 = 1 Relay + buzzer activated + anti-freeze heaters
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows/they follow its/their regulation
Idle running valve	It follows its regulation
Supply ventilation	If air/air unit off
Condensation ventilation	It follows its regulation

Support/boiler/anti-freeze	If air/air unit off otherwise follows its regulation
Support/boiler/anti-freeze	With DI alarm activated
Pump/and water evaporator and condenser	They follow their regulation
Compressors	Off
Pump down solenoid valve	Off

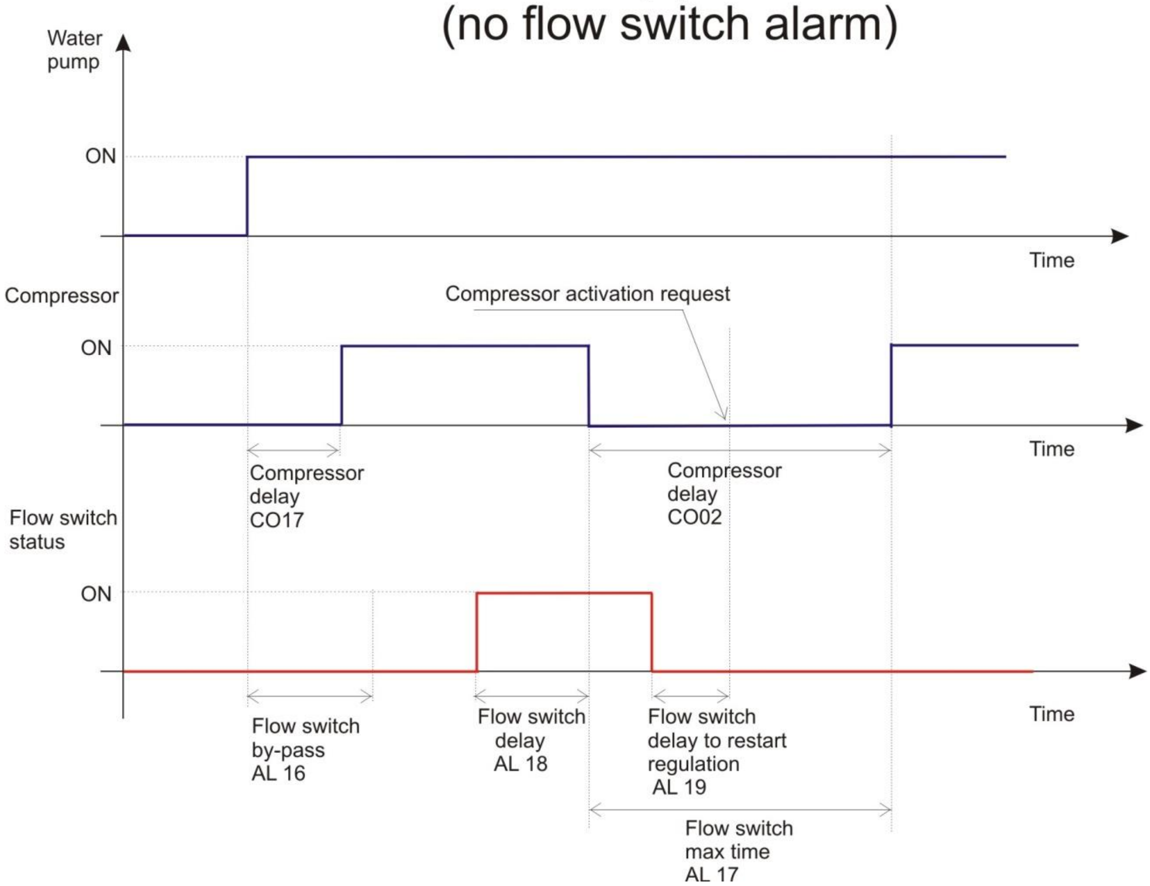
50.12 EVAPORATOR SIDE FLOW SWITCH ALARM (DIFFERENTIAL PRESSURE SWITCH)

Alarm code	**AEFL** (Evaporator side flow switch alarm)
Display in keyboard	**Plant side flow AL**
Cause of activation	Detect DI configured as Evaporator flow switch (DI type=3). If pumps are not managed (PA01=0), when DI active, alarm occur. If pumps are managed and polarity check not required (AL20=1), after a delay of AL16 from pump start-up, if DI keeps active for AL18, alarm occur. If pumps are managed and polarity check required (AL20≠1), after a delay of AL16 from pump start-up, if DI still keeps the same status as that when pump not working for AL18, alarm occur.
Reset	DI not active. If pumps are managed, wait for time AL19 after DI deactivate.
Reset	Automatic – it becomes manual if this alarm active for time AL17 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm (DO type=162) + buzzer relays only activated if the flow switch alarm is activated in normal working phase
Regulators	
Alarm	Relay + buzzer only activated if the flow switch alarm is activated in normal working phase
Reverse valve	It follows its regulation
Recovery valve	It follows its regulation
Free-cooling on/off valve	It follows its regulation
Anti-freeze/Support/boiler	Off
Auxiliary relay	It follows its regulation
Supply ventilation	Off
Condensation ventilation	It follows its regulation
Evaporator water pump	With PA1=1 always on; off when the alarm becomes manual reset
Evaporator water pump	With PA1=2 follows its regulation; off when the alarm becomes manual reset
Condenser water pump	It follows its regulation
Compressors	Off
Pump down solenoid valve	Off

Flow Switch Alarm



Air in the pipe (no flow switch alarm)



50.13 HOT SIDE FLOW SWITCH ALARM (DIFFERENTIAL PRESSURE SWITCH)

Alarm code	**ACFL** (Condenser side flow switch alarm)
Display in keyboard	**Source side flow AL**
Cause of activation	Not in air/air unit (CF01≠0). Detect DI configured as Condenser flow switch (DI type=4): If pumps are not managed (PA17=0), when DI active, alarm occur. If pumps are managed and polarity check not required (AL26=1), after a delay of AL22 from pump start-up, if DI keeps active for AL24, alarm occur. If pumps are managed and polarity check required (AL26≠1), after a delay of AL22 from pump start-up, if DI still keeps the same status as that when pump not working for AL24, alarm occur. **Note:** When pumps are managed, check AL21 to determine if alarm detection is available in chiller mode or heat pump mode. Alarm only enabled in chiller mode if AL21=1 Alarm only enabled in heat pump mode if AL21=2 Alarm enabled in chiller and heat pump mode if AL21=3
Reset	DI not active. If pumps are managed, wait for time AL25 after DI deactivate.
Reset	Automatic – it becomes manual if this alarm active for time AL23 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Relay(DO type=163) + buzzer only activated if the flow switch alarm is activated in normal working phase
Regulators	
Alarm	Relay + buzzer only activated if the flow switch alarm is activated in normal working phase
Reverse valve	It follows its regulation
Recovery valve	It follows its regulation
Free-cooling on/off valve	It follows its regulation
Anti-freeze/Support/boiler	Off
Auxiliary relay	It follows its regulation
Supply ventilation	Off
Condensation ventilation	It follows its regulation
Condenser water pump	With PA17=1 always on; off when the alarm becomes manual reset
Condenser water pump	With PA17=2 follows its regulation; off when the alarm becomes manual reset
Evaporator water pump	It follows its regulation
Compressors	Off
Pump down solenoid valve	Off

WARNING
Relay + buzzer are only activated if the flow switch alarm is activated in normal working phase.

50.14 SUPPLY FAN OVERLOAD ALARM

Alarm code	**AtSF** (Supply fan overload alarm)
Display in keyboard	**Overl supply fan**
Cause of activation	If CF01 = 0 (air/air unit), with DI Evaporator main pump / Supply fan Overload (DI type=56) active. On fan start-up, the alarm is ignored for time AL16
Reset	DI not active
Reset	Always manual
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	it follows its regulation
Idle running valve	it follows its regulation
Supply ventilation	off
Condensation ventilation	off
Support/boiler/anti-freeze	Off
Evaporator and condenser water pump	Off
Compressors	Off
Pump down solenoid valve	Off

50.15 DOMESTIC HOT WATER PUMP FLOW SWITCH ALARM

Alarm code	**AHFL** (domestic hot water pump flow switch alarm)
Display in keyboard	**Sanitary water flow AL**
Cause of activation	**(the flow switch alarm is only active with FS01 ≠ 0)** Check DI configured as Sanitary water flow switch (DI type=5). If polarity check not required (AL20=1), after domestic hot water pump active for AL16 time, if DI active for AL18 time, alarm occur. If polarity check required (AL20≠1), after domestic hot water pump active for AL16 time, if DI still keeps the same status as that when domestic hot water pump is not working for AL18 time, alarm occur.
Reset	DI not active for the time AL19
Reset	Automatic – it becomes manual if this alarm active for time AL17 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm (DO type=164) + buzzer relays only activated if the flow switch alarm is activated in normal working phase
Regulators	
Alarm	Relay + buzzer only activated if the flow switch alarm is activated in normal working phase
Domestic hot water pump	Off when the alarm becomes with manual reset
Production of domestic hot water function	Off
Other loads	They follow their regulation

50.16 SOLAR PANELS WATER PUMP FLOW SWITCH ALARM

Alarm code	**APFL** (solar panels pump flow switch alarm)
Display in keyboard	**Solar panel flow AL**
Cause of activation	**(the flow switch alarm is only active with FS01 ≠ 0)** Check DI configured as Solar panels flow switch (DI type=112). If polarity check not required (AL20=1), after solar panel pump active for AL16 time, if DI active for AL18 time, alarm occur. If polarity check required (AL20≠1), after domestic hot water pump active for AL16 time, if DI still keeps the same status as that when solar panel pump is not working for AL18 time, alarm occur.
Reset	DI not active for the time AL19
Reset	Automatic – it becomes manual if this alarm active for time AL17 (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm (DO type=165) + buzzer relays only activated if the flow switch alarm is activated in normal working phase
Regulators	
Alarm	Relay + buzzer only activated if the flow switch alarm is activated in normal working phase
Solar panels water pump	Off when the alarm becomes with manual reset
Solar coil on/off valve	Active
Other loads	They follow their regulation

50.17 COMPRESSOR OVERLOAD ALARM

Alarm code	**C1tr** (compressor n° 1 overload alarm) -…**C16tr** (compressor n° 16 overload alarm)
Display in keyboard	**C1 overl …C16 overl**
Cause of activation	The alarm is detected after AL27 delay from compressor switch-on. If AL30=1, the detection also enabled when compressor is off. With DI configured as Compressor 1…16 thermal overload (DI type=34…49) active, alarm occur.
Reset	If DI not active
Reset	Always manual. If more than AL28 compressor interventions occur per hour, password is request to do reset operation. The password is set in par AL31.
Icon	⚠ flashing
Action	Alarm relay (DO type=168…183) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows/they follow its/their regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressor affected	Always off

Compressors not affected	If Par. AL29 = 0 following their regulation If Par. AL29 = 1 off
Pump down solenoid valve	It switches-off if there is only 1 compressor per circuit, otherwise it follows its regulation

50.18 COMPRESSOR HIGH DISCHARGE TEMPERATURE ALARM FROM ANALOGUE INPUT

Alarm code	**C1dt**…**C16dt** (compressor n° 1…16 high discharge temperature alarm)
Display in keyboard	**Hi Disch temp.C1…Hi Disch temp.C16**
Cause of activation	The temperature measured by the probe configured as Compressor 1…16 PTC discharge temperature probe (AI type=1…16) >= AL50 set
Reset	The temperature measured by the probe configured as Compressor 1…16 PTC discharge temperature probe (AI type=1…16) <= AL50 set – AL51 differential
Reset	Automatic - Manual. If more than AL52 interventions per hour occur. Enter the functions menu to reset the alarm
Icon	⚠ flashing
Action	Alarm relay (DO type=1)+ buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows/they follow its/their regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressor affected	Off
Compressor not affected	It follows its regulation
Pump down solenoid valve	It switches-off if there is only 1 compressor per circuit, otherwise it follows its regulation
Liquid injection solenoid valve	Off with compressor in OFF

50.19 EVAPORATOR WATER INLET HIGH TEMPERATURE ALARM

Alarm code	**AEht** (evaporator water inlet high temperature alarm)
Display in keyboard	**Hi temp.evap.water inlet**
Cause of activation	The alarm only detect when CF01>0 (not in air/air unit) and unit is working in chiller mode. After compressors start-up for AL61 time, detect the probe selected by AL64. If the temperature measured by this probe >= AL62 set, alarm occur.
Reset	The temperature measured by the probe configured in AL64 < AL62 set – AL63 differential
Reset	Automatic - Manual Reset is always manual if AL60 = 0 Reset is always automatic if AL60 = 60 Reset passes from automatic to manual if AL60 goes from 1 to 59
Icon	⚠ flashing

Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Compressors	Off
Other loads	It follows its regulation

WARNING:
The alarm only appears if the unit is running with compressor on after time **AL61**.
The alarm remains in stand-by, OFF remote or with compressor off due to temperature control only if it was present before and with MANUAL reset.

50.20 CONDENSATION FAN OVERLOAD ALARM

Alarm code	**b1tF…b4tF**(circuit n° 1…4 condensation fan overload alarm)
Display in keyboard	**Cond.fan overl circ1…Cond.fan overl circ4**
Cause of activation	**b1tF**: FA06=1, DI Fan Overload Circuit 1(DI type=50) active. Or FA06=2, DI Fan Overload Circuit 1/2 (DI type=54) active. **b2tF**: FA06=1, DI Fan Overload Circuit 2(DI type=51) active. Or FA06=2, DI Fan Overload Circuit 3/4 (DI type=55) active. **b3tF**: FA06=1, DI Fan Overload Circuit 3(DI type=52) active. **b4tF**: FA06=1, DI Fan Overload Circuit 4(DI type=53) active.
Reset	With DI not active
Reset	Manual
Icon	⚠ flashing
Action	Alarm relay(DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	it follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	it follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	Off
Condensation ventilation	Off
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	Off
Pump down solenoid valve	Off

50.21 DEFROST ALARM

Alarm code	**b1dF…b4dF** (circuit n° 1…4 defrost alarm)
Display in keyboard	**dF AL circ1…dF AL circ4**
Cause of activation	In defrost only, if dF01 = 1/3, defrost should end for temperature/pressure or external contact. But actually, the defrost ends for dF05 time expired.
Reset	▪ If switch to chiller mode or stand-by/ON-OFF remote mode. ▪ At the next defrost cycle, the ending takes place due to temperature/pressure.
Reset	Automatic if at the next defrost cycle the ending takes place due to temperature/pressure. Manual if at the next defrost cycle the ending still takes place due dF05 time expired. (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm + buzzer relays **NOT** activated
Regulators	
Alarm	Relay + buzzer NOT activated
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	It follows its regulation
Pump down solenoid valve	It follows its regulation

50.22 UNLOADING ALARM DUE TO HIGH CONDENSATION TEMPERATURE/PRESSURE IN COOLING WORKING MODE

(Not available)

Alarm code	**b1Cu…b4Cu** (circuit n° 1…4 unloading condenser high temperature/pressure alarm)
Display in keyboard	**Unload high t/p circ1…Unload high t/p circ4**
Cause of activation	When working, if the probe configured as condensation temperature or pressure control measures a value > Un11 set
Reset	▪ of the condensation pressure or temperature measures a value < Un11–Un12 differential ▪ By unloading function inserted after the time set Par. Un15
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay + buzzer NOT activated
Regulators	
Alarm	Relay + buzzer NOT activated
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation

Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	It follows its regulation
Pump down solenoid valve	It follows its regulation

50.23 HEAT RECOVERY DISABLING SIGNAL DUE TO HIGH CONDENSATION TEMPERATURE/PRESSURE IN COOLING WORKING MODE

Alarm code	**b1rC…b4rC** (circuit n° 1…4 recovery disabling alarm)
Display in keyboard	**Recovery dis.hi t/p C1…Recovery dis.hi t/p C4**
Cause of activation	RC01=3, if the probe for disable heat recovery (configured as condensation temperature or pressure) measures a value >= rC07 set, alarm occur.
Reset	▪ The condensation pressure or temperature probe measures a value <= rc07 set – rC08 differential ▪ Heat recovery disabling function is intervened due to Par. rC09 time expired.
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay + buzzer NOT activated
Regulators	
Alarm	Relay + buzzer NOT activated
Reverse valve	It follows its regulation
Recovery valve	Off
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	It follows its regulation
Pump down solenoid valve	It follows its regulation

50.24 UNLOADING SIGNAL DUE TO LOW EVAPORATION PRESSURE IN HEATING WORKING MODE

(Not available)

Display label meaning	**b1Eu** (circuit n° 1 unloading from condenser coil signal) **b2Eu** (circuit n° 2 unloading from condenser coil signal) **b3Eu** (circuit n° 3 unloading from condenser coil signal) **b4Eu** (circuit n° 4 unloading from condenser coil signal)
Display in keyboard	**Unload lo press.circ1…Unload lo press.circ4**
Cause of activation	When working, if the probe configured as condensation temperature, configured as pressure control or as evaporation pressure, measures a value < Un13 set
Reset	▪ if the condensation pressure/temperature or the evaporation pressure measures a value > Un13 + Un14 ▪ With unloading function inserted after the time set Par. Un15
Reset	Automatic
Icon	⚠ flashing

Action	Alarm relay + buzzer NOT activated
Regulators	
Alarm	Relay + buzzer NOT activated
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	It follows its regulation
Pump down solenoid valve	It follows its regulation

50.25 UNLOADING SIGNAL DUE TO EVAPORATOR WATER INLET HIGH TEMPERATURE

(Not available)

Alarm code	**AEun** (unloading signal from evaporator)
Display in keyboard	**Unload notify (evap.)**
Cause of activation	In working mode if the evaporator water inlet temperature measured > Un1 set for the time set in the Par. Un3
Reset	▪ if the water temperature measured < Un1 set – Un2 differential ▪ By unloading function inserted after the time set Par. Un4
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay + buzzer NOT activated
Regulators	
Alarm	Relay + buzzer NOT activated
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	It follows its regulation
Pump down solenoid valve	It follows its regulation

50.26 PUMP DOWN ALARM WITH LOW PRESSURE PRESSURE SWITCH/TRANSDUCER IN STOPPING

Alarm code	**b1PH…b4PH** (pump-down alarm in circuit n° 1…4 in stopping)
Display in keyboard	**Pump down at stop circ1…Pump down at stop circ4**
Cause of activation	With **Pd1 ≠ 0**, pump-down when compressor stopping: ▪ **Pressure switch DI configured**: with DI configured as Circuit 1…4 pump down pressure switch (DI type = 85-88) or Low pressure switch circuit 1…4 (DI type = 14-17) not active and the pump-down ends by time Pd4. ▪ **Transducer configured**: the probe configured as Circuit 1…4 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type = 56-59) measures the value >= set Pd02 + Pd03 differential and the pump-down ends by time Pd04.
Reset	The circuit has compressor running. User push RESET key from the keyboard.
Reset	Always manual reset
Icon	⚠ flashing
Action	Alarm relay + buzzer activated only when the alarm becomes manual reset
Regulators	
Alarm	Relay + buzzer activated only when the alarm becomes manual reset
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	Off with manual reset alarm
Pump down solenoid valve	It follows its regulation

50.27 PUMP DOWN ALARM WITH LOW PRESSURE TRANSDUCER IN START-UP

Alarm code	**b1PL…b4PL** (pump-down alarm in circuit n° 1…4 in start-up)
Display in keyboard	**Pump down at start circ1…Pump down at start circ4**
Cause of activation	With **Pd1 ≠ 0,** pump-down when compressor start-up: ▪ **Pressure switch DI configured**: with DI configured as Circuit 1…4 pump down pressure switch (DI type = 85-88) or Low pressure switch circuit 1…4 (DI type = 14-17) keeps active and the pump-down ends by time Pd4. ▪ **Transducer configured:** the probe configured as Circuit 1…4 evaporating pressure probe (4÷20 mA / 0÷ 5 Volt) (AI type = 56-59) measures the value <= set Pd02 and the pump-down ends by time Pd04.
Reset	DI deactivate or probe value > set Pd02
Reset	Automatic/becomes manual after Pd8 interventions per hour if Pd9 =1 (reset procedure in functions menu) If Pd9 = 0 it remains with automatic reset. It is recorded in the historical alarms only with manual reset
Icon	⚠ flashing
Action	Alarm relay + buzzer activated only when the alarm becomes manual reset
Regulators	
Alarm	Relay + buzzer activated only when the alarm becomes manual reset

Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	It follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	It follows its regulation
Condensation ventilation	It follows its regulation
Support/boiler/anti-freeze	It follows its regulation
Pump/and water evaporator and condenser	It follows its regulation
Compressors	Off with manual reset alarm
Pump down solenoid valve	It follows its regulation

50.28 EVAPORATOR WATER PUMP OVERLOAD ALARM

Alarm code	**AtE1** (evaporator n° 1 water pump overload alarm) **AtE2** (evaporator support n° 2 water pump overload alarm)
Display in keyboard	**Evap.pump 1 overl** **Evap.pump 2 overl**
Cause of activation	DI configured as Evaporator main pump / Supply fan Overload (DI type=56) active and par CF01$\neq$0. DI configured as Evaporator support pump Overload (DI type=57) active.
Reset	With DI not active
Reset	Manual. (reset procedure in functions menu)
Icon	⚠ flashing
Action	Alarm relay (DO type=1)+ buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	it follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	Off if no pump is available
Condensation ventilation	Off if no pump is available
Support/boiler/anti-freeze	It follows its regulation
Evaporator water pump	Off if pump is available
Condenser water pump	It follows its regulation
Compressors	Off if pump is available
Pump down solenoid valve	Off if pump is available

50.29 CONDENSER WATER PUMPING OVERLOAD ALARM

Alarm code	**AtC1** (condenser n° 1 water pump overload alarm) **AtC2** (condenser support n° 2 water pump overload alarm)
Display in keyboard	**Cond.pump 1 overl** **Cond.pump 2 overl**
Cause of activation	DI configured as Condenser main pump Overload (DI type=58) active. DI configured as Condenser support pump Overload (DI type=59) active.
Reset	With DI not active
Reset	Manual.
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Reverse valve	It follows its regulation
Recovery valve	it follows its regulation
Free-cooling on/off valve	it follows its regulation
Auxiliary relay	it follows its regulation
Idle running valve	It follows its regulation
Supply ventilation	Off if no pump is available
Condensation ventilation	Off if no pump is available
Support/boiler/anti-freeze	It follows its regulation
Evaporator water pump	It follows its regulation
Condenser water pump	Off if no pump is available
Compressors	Off if no pump is available
Pump down solenoid valve	Off if no pump is available

50.30 GENERIC ALARM 1

Alarm code	**ALc1** (Generic alarm 1)
Display in keyboard	**Generic AL1**
Cause of activation	DI configured as Generic alarm 1 digital input (DI type=89) active for the time set in the Par AL54
Reset	DI configured as Generic alarm 1 digital input (DI type=89) not active for the time set in the Par AL55
Reset	Automatic – becomes manual after AL53 interventions/hour. It is recorded in the historical alarms only with manual reset
Icon	⚠ flashing
Action	Alarm relay (DO type=166) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.31 GENERIC ALARM 2

Alarm code	**ALc2** (Generic alarm 2)
Display in keyboard	**Generic AL2**
Cause of activation	DI configured as Generic alarm 2 digital input (DI type=90) active for the time set in the Par AL58
Reset	DI configured as Generic alarm 2 digital input (DI type=90) not active for the time set in the Par AL59
Reset	If AL56=0, always automatic. If AL56=1, automatic-manual. It becomes manual after AL57 interventions/hour.
Icon	⚠ flashing
Action	Alarm relay (DO type=167) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.32 COMPRESSORS MAINTENANCE ALARM

Alarm code	**C1Mn** …**C16Mn** (compresser n° 1…16 maintenance request)
Display in keyboard	**C1 maint req. …C16 maint req.**
Cause of activation	Compressor is configured and its working hours > timer set by CO53
Reset	Reset working hours (from keyboard)
Reset	Automatic (after the hours reset)
Icon	⚠ flashing
Action	Alarm relay + buzzer activated
Regulators	
Alarm	Relay(DO type=1) + buzzer activated
Other loads	They follow their regulation

50.33 EVAPORATOR FAN/ PUMPS MAINTENANCE ALARM

Alarm code	**AEP1** (evaporator n° 1 water pump maintenance request) **AEP2** (evaporator support n° 2 water pump maintenance request)
Display in keyboard	**Evap.pump 1 maint** **Evap.pump 2 maint**
Cause of activation	Water/fan pump working hours >= timer set PA13 Water support pump working hours >= timer set PA14
Reset	Reset working hours (From keyboard)
Reset	Automatic (after the hours reset)
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	They follow their regulation

50.34 CONDENSER PUMPS MAINTENANCE ALARM

Alarm code	**ACP1** (condenser n° 1 water pump maintenance request) **ACP2** (condenser n° 2 water pump maintenance request)
Display in keyboard	**Cond.pump 1 maint** **Cond.pump 2 maint**
Cause of activation	Condenser water pump 1 working hours >= timer set PA29 Condenser water pump 2 working hours >= timer set PA30
Reset	Reset working hours (in functions menu)
Reset	Automatic (after the hours reset)
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	They follow their regulation

50.35 POWER SUPPLY FREQUENCY ALARM

Alarm code	**AFr** (power supply frequency alarm)
Display in keyboard	**Power supply freq.AL**
Cause of activation	If AO Circuit N° 1 external phase-cut command PWM signal = TF 1 (AO type=16) and Circuit N° 2 external phase-cut command PWM signal = TF 2 (AO type=17) all not configured, this alarm will never occur. Otherwise, if SP13 $\neq$ 2 and power supply frequency is different from that configured in the Par SP13, alarm occurs.
Reset	SP13 = 2, frequency control disabled. Or power supply frequency is the same as that configured in the Par SP13.
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.36 XEV20D NOT CONNECT ALARM

Alarm code	**AET1** …**AET4** (XEV20D 1... XEV20D 4 not connect alarm)
Display in keyboard	**V1 discon...V4 discon**
Cause of activation	**AET1:** Et09+Et10>0, XEV20D 1 lose communication by can bus. **AET2:** Et11+Et12>0, XEV20D 2 lose communication by can bus. **AET3:** Et13+Et14>0, XEV20D 3 lose communication by can bus. **AET4:** Et15+Et16>0, XEV20D 4 lose communication by can bus.
Reset	Et09...Et16=0 or XEV20D communication is recovered.
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Compressors	Off

50.37 EXPANSION MOUDLE NOT CONNECT ALARM

Alarm code	**AEM1** …**AEM4** (IPROEX60D 1... IPROEX60D 4 not connect alarm)
Display in keyboard	**E1 discon...E4 discon**
Cause of activation	The expansion IPROEX60D IO (AI/DI/AO/DO) is used and lose communication by can bus.
Reset	IPROEX60D IO is disabled or communication is recovered.
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.38 PHASES SEQUENCE ALARM

Alarm code	**APS** (Phases sequence alarm)
Display in keyboard	**Phases sequ AL**
Cause of activation	Digital input **Phase sequence relay** (DI type=113) active.
Reset	Digital input **Phase sequence relay** deactivate.
Reset	Manual
Icon	⚠ flashing
Action	Alarm relay (DO type=153) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.39 ANTI-FREEZE ALARM IN FREE-COOLING

Alarm code	**AFFC** (Anti-freeze alarm in free-cooling)
Display in keyboard	**Antif AL FC**
Cause of activation	FC01 = 4, During free-cooling working if **External air temperature NTC temperature probe (free-cooling)** (AI type=34) value <= set FC07 for FC24 times. AFFC alarm will be signal after a delay of AL67.
Reset	**External air temperature** >= set FC07 + differential FC08.
Reset	Automatic – becomes manual after AL68 interventions/hour.
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Follow their regulation

50.40 BOILER OVERLOAD ALARM

Alarm code	**Atrb** (Boiler overload alarm)
Display in keyboard	**Boiler overl AL**
Cause of activation	Digital input **Thermal heaters** (DI type=114) active.
Reset	Digital input Thermal heaters deactivate.
Reset	Automatic – becomes manual after AL70 interventions/hour.
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	

Alarm	Relay + buzzer activated
Auxiliary heaters	Off
Compressor	If AH01=1, compressor working should affected by auxiliary heating request. But when this Atrb alarm occur and AL69=1, compressor will not be affected.
Other loads	Follow their regulation

50.41 BOILER LOCK ALARM

Alarm code	**ALcb** (Boiler lock alarm)
Display in keyboard	**Boiler lock AL**
Cause of activation	Digital input **Block heaters** (DI type=115) active.
Reset	Digital input Block heaters deactivate.
Reset	Automatic – becomes manual after AL71 interventions/hour.
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Auxiliary heaters	Off
Compressor	If AH01=1, compressor working should affected by auxiliary heating request. But when this Atrb alarm occur and AL69=1, compressor will not be affected.
Other loads	Follow their regulation

50.42 UNIT CONFIGURATION

Alarm code	**ACF1** If defrost is enabled (dF01$\neq$0) • dF26=0 (0=Defrosting cycle start in unit independently) and dF27$\neq$0 (0=Defrosting cycle end in unit independently). • dF26=2 (2 = if at least one has reached the request for defrosting to start) and dF27$\neq$1 (1=if both have reached the defrost end status). • If more than one circuit is configured, FA06=0 and dF33=0 and dF26/dF27=0. Set par AH16=1(1=Enable the auxiliary heater in defrost) and dF32=1 (1= Supply fan doesn't work during defrost). **ACF2** • Unit configured as ON/OFF or proportional control of the condensation fan (FA01=2/3/4), but the relevant probes and circuits are not configured. (It should has: FA06=1(separate condensation), 1 probe per circuit. FA06=0 (unique condensation), at least 1 probe. FA06=2 (Circuit couple unique condensation), at least 1 probe and 1 circuit per couple.) • In case of fan with step regulation (FA01=2/3), any one of the following rules is not respected: FA10 < FA11 < FA25 < FA26. FA19 < FA20 < FA29 < FA30. FA35 < FA36 < FA41 < FA42. In addition, make sure the step band <= step n set point – setp n-1 set point. For example: FA12 <= FA11-FA10. • In the case of proportional regulation (FA01=4) with chiller enabled (CF02 =1/3), at least one of the following rules is not respected: FA10 + FA12 + FA13 < FA11 FA13 < FA14 • In the case of proportional regulation (FA01=4) with heating enabled (CF02=2/3) at least one of the following rules is not respected: FA19 + FA22 + FA21 < FA20 FA22 < FA23 • In the case of proportional regulation (FA01=4) with heating enabled (CF02=2/3) and dF33=2 at least one of the following rules is not respected: FA35 + FA38 + FA37 < FA36 FA38 < FA39 • If heat pump is enabled (CF02=2/3) and defrost enabled (dF>0), but the relevant condensating/evaporating probes are not configured. • If PWM regulation is enabled (OUT5 and/or OUT6 configured as PWM output) continuous power supply has been selected (SP13 = 2) **ACF3** • Two digital/analogue inputs configured with the same function. • If a compressor is configured, but relative compressor relays (Compressor 1…16 Direct start-up relay) are not configured. • If a compressor is not configured, but configured relative resources. Such as Discharge PTC probe and DI Compressor discharge thermostat and DI Compressor thermal overload and DI Oil pressure/level switch compressor. • If a circuit is not configured, but configured relative resources. For example, for circuit1, configured probes which AI types are 36, 48, 52 and 56. Configured DI which DI types are 6, 10, 14 and 85. • If FA06=0 (Unique condensation), configure redundant DI for fan overload (DI type=51-55). • If FA06=1 (Separate condensation), configure redundant DI for fan overload (DI type=54/55). If FA06=2 (Circuit couple unique condensation), configure redundant DI for fan overload (DI type=50-53).

ACF4

- SP09 = 1 and DI Remote cooling/heating (DI type=2) not configured or SP09 = 2 and no NTC probe configured as external air temperature (AI type=35)
- CF04 ≠ 0, but no condensing unit digital input (DI type=93…111) configured.
- CF04 ≠ 0, besides DI Cooling/Heating demand digital input (DI type=93), also configured one DI as Cooling demand digital input (DI type=94) or Heating demand digital input (DI type=95).
- CF04 ≠ 0 and DI cooling/heating capacity request (DI type=96…111) configured incongruently with the configuration of the compressors/unloaders steps (see par CF05-CF12).

ACF5

For circuits n° 2/3/4, if a circuit is not configured, but relative resources have been configured (pump down relay, heaters, outdoor fans)

- If Pd01>0 and relays are configured as Circuit 1…4 pump down solenoid valve (DO type=30…33)
- Anti-freeze heaters enabled and relays are configured as Antifreeze heaters / support / boiler 1…4 step (DO type=4…7)
- FA01=4, FA06=1, and AO is configured as 0÷10V/4÷20mA proportional output for circuit n° 1 fan speed control (AO type=1…4 or 18…21)
- FA01>0, FA06=1, and relays are configured as fan steps (DO type=14…29).

ACF6

- If SL01=0 and the total number of compressor power steps in the 4 circuits (set by CF05…CF12) is > 40.
- Compressor 9…16 is configured with more than 1 steps (CF09…CF12>0).

ACF7

If the pump down function is enabled (Pd01>0), but in at least one configured circuit:

- The relevant solenoid valve relay (DO type=30…33) is not configured.
- Pump down pressure switch (DI type=85…88) and circuit evaporating pressure transducer (AI type=56…59) are all not configured, and if the pump down is enabled also at start (Pd01=2/4) even the low pressure pressure switch (DI type=14…17) is configured

If at least one pump-down solenoid valve has been configured, but the pump-down solenoid valve does not correspond with the circuits configuration. For example, if circuit 2 is configured, but pump-down solenoid valve 2 does not exist.

	ACF8 One or more compressors have been configured using parameters CF05 and CF08 but the relevant main relays are not configured: For compressor 1 to 8: • Intermittent valve relay (DO type=52…59) not configured when enabled by ON/OFF times (CO10 and CO11) ≠ 0 or vice versa (relay configured but function is not enabled). • No unloader (e.g. for comp. 1, DO type=79) and no gas by-pass (e.g. for comp.1, DO type=83) configured when by-pass time (CO15) is ≠ 0 or vice versa (relay configured but function is not enabled). • If CO12=0, compressor in direct start mode, but configured part-winding/star-delta start-up relays (e.g. for comp.1, DO type=77, 78). • If CO12=1, compressor in part winding start mode, but relay for part winding start-up is not configured. (e.g. for comp.1, DO type=77). Or configured redundant relay as star-delta (e.g. for comp.1, DO type=78). • If CO12=2, compressor in Star-delta start mode, but relevant relays are not configured (e.g. for comp.1, DO type=77, 78). • No full match between relays configuration and unloaders defined on parameters CF09 – CF12. For compressor 9 to 16: No direct start-up relays configured (e.g. for comp.9, DO type=140). For auxiliary heating, if it is disabled (AH01=0), but relevant resource are configured or vice versa (resource not configured but function is enabled). Such as DI for heater (DI type=114/115), relay Auxiliary heating 1…4 step (DO type=188…191), AO modulating auxiliary heating (AO type=15/32). **ACF9** evaporator pumps • defined (PA01 ≠ 0) but no relay (DO type=2 and 3) is configured • not defined (PA01 = 0) but a relay is configured condenser pump • defined (PA17 ≠ 0) but no relay (DO type=8 and 9) is configured • not defined (PA17 = ≠ 0) but a relay is configured Pump rotation • PA05>=3, rotation at working hours, but hours set point PA07=0. • PA21>=3, rotation at working hours, but hours set point PA23=0. Evaporator pump for anti-freeze configuration alarm • if PA09 = 2 and PA10 = 0 • if PA09 = 2 and PA10 ≠ 0, but no probes selected by PA10 are configured for managing the function Condenser pump for anti-freeze configuration alarm • if PA25 = 2 and PA26 = 0 • if PA25 = 2 and PA26 ≠ 0, but no probes selected by PA26 are configured for managing **ACF10** If CF04=0 (not condensation unit), no temperature control probe (in chiller mode ST09, in heat pump mode ST10) is configured correctly (it does not exist or is not NTC).

	ACF11 Heat recovery enabled but • Not all resources needed are defined in a circuit (condensing probe, heat recovery request d.i. heat recovery relay). If rC01=3, condensing probe not configured (AI type=48…55). If rC01≠3, DI heat recovery request not configured (DI type=60…63). • Free cooling or domestic hot water is enabled (FC01≠0 or FS01≠0). **ACF12** At least one inverter exist in the unit: • Unit configured as Moto-condensing unit (CF04=1) or not using proportional temperature regulation (ST11≠0). • For the compressor with inverter, no relevant resource configured. Such as compressor modulating output (AO type=11…14 or 28…31), compressor direct start-up relay (e.g. for comp1, DO type=76). For relay Management VI valve 14 (DO type=193) and Management VI valve 16 (DO type=195), one relay is configured while another one is not configured. **ACF13** One of 16 compressors weight is different to 0. Parameters CO19…CO34 are not all set to 0. **ACF14** The temperature control has been configured on two circuits (ST12 = 1) but: • the second circuit is not configured or circuits 3 or 4 are configured • free cooling or recovery or domestic hot water are enabled (FC01≠0 or rC01≠0 or FS01≠0) **ACF15** Free cooling enabled but: If FC01=1/2/3: • the on/off valve (DO type=38) and the damper proportional output (AO type=5 and 22) are not defined • the evaporator water inlet (AI type=17) not configured • if CF01≠0, system water inlet temperature probe not configured (AI type=33) • 2 external air temperature probes are all not configured (AI type=34 and 35) If FC01=4, any resource below is not configured: • system water inlet temperature probe (AI type=33) • external air temperature probe (AI type=34) • external air temperature probe (AI type=35) • on/off valve (DO type=38) and ON/OFF fan (DO type=39) • free-cooling mixer valve (AO type=5 or 22) **ACF16** Production of domestic hot water enabled (FS01≠0) but: • the unit is configured as air/air (CF01 = 0) • the domestic hot water pump outlet relay (DO type=75) or domestic hot water valve 1(DO type=68) are not defined • the domestic hot water regulation probe 1(AI type=44) is not defined • FS01=2 and PA01=2 and FS49=0

	ACF17 • one or more pressure probes defined on a XEV20D module which is not configured by parameters Et09 – Et16 • when SP01 <=1 and Et02≠3 or when SP01>=2 and Et02≠4, configured XEV20D probes as pressure type. **ACF18** If stepless compressor is enabled (SL01≠0): • SL06>=SL07*10 • ST11 ≠ 2 (2=neutral zone regulation) • In one circuit, more than one compressor is configured (CF05…CF08> 1) • compressor is configured but relevant relay Compressor 1…4 intermittent valve is not configured (DO type=52…55). **ACF19** Probe selected by Un05 is not configured. Probe selected by Un10 is not configured.
Display in keyboard	**Conf AL1…Conf AL19**
Cause of activation	Incorrect programming
Reset	Correct programming
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated
Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.43 FUNCTION NOT AVAILABLE ALARM

Alarm code	**AfnA** (Function not available alarm)
Display in keyboard	**Func.not available**

Cause of activation	Incorrect parameter configuration, enabled some function that not available yet.
	• Set ST11 >2
	• Set DP05-DP08 value >0
	• Set SP02 =6
	• Set SP12=1
	• Set CO19-CO34 value >0
	• If CO12=2 (Star-delta start-up), relay Star-delta relay is no configured on board, they are configured in expansion IO board.
	• If SL01≠0(stepless compressor enabled)
	  o CO09=1/3.
	  o No relays configured as Compressor 1…4 Unloader 1(DO type=79,87,95,103)
	  o Relays (Screw) Compressor 1…4 intermittent valve (DO type=52-55) are not configured on board, they are configured in expansion IO board.
	  o Relays Compressor 1…4 Unloader 2(DO type=80,88,96,104) are not configured on board, they are configured in expansion IO board.

Reset	Correct programming
Reset	Automatic
Icon	⚠ flashing
Action	Alarm relay (DO type=1) + buzzer activated

Regulators	
Alarm	Relay + buzzer activated
Other loads	Off

50.44 NOTE: ALARM RELAY AND BUZZER

The alarm relay working is enabled with at least one relay configured as alarm

Alarm relay/buzzer outlet

ON if…	1. In the presence of active alarms 2. In the presence of alarms not resettled
OFF if..	1. In absence of alarms 2. In stand-by or ON - remote OFF if AL65=1 3. (buzzer) pressing one of the keys even in the presence of non-resettable alarms

51. NO VOLTAGE

On restore:

1. the device goes to the status preceding the power cut.
2. If a defrost cycle is progress the cycle is rested.
3. All timings in progress are annulled and re-initialised.
4. If a manual reset alarm is present, the alarm status is maintained until the key is used to restore conditions.

52. AUTOMATIC TO MANUAL RESET ALARMS DIAGNOSTICS

N° OCCURRENCES PER HOUR

The observation interval is a time window. The length is one hour. It is divided into 60 intervals, 1 minute each. This time window is slidable, it always cover the latest hour. See graph below:

1°Int	2°Int	3°Int	4°Int	5°Int	6°Int	7°Int	8°Int	9°Int	10°Int	…	55°Int	56°Int	57°Int	58°Int	59°Int

During one interval (1 minute), if the alarm is active, this interval will be marked as "active". Then count all "active" intervals number of the latest hour.
If the total number does not exceeds the threshold set, it means this alarm is not frequently occur. Once it became not active, it will disappear immediately.
For example: See graph below (assume threshold set = 5. Active alarms are marked with ACT):
The total number of active intervals is 3. It is less than 5. So this alarm is automatic reset.

1°I	2°Int	3°Int	4°Int	5°Int	6°Int	7°Int	8°Int	9°Int	10°Int	…	55	56°Int	57°Int	58°Int	59°Int
	ACT	ACT	ACT												

If the total number exceeds the threshold set, it means this alarm occurs very frequent. There maybe some serious situation lies in the unit. So even when this alarm becomes not active, it does not disappear. It will becomes "Resettable". Only by pressing a "RST" key in the keyboard can cancel this alarm.
For example: See graph below (assume threshold set = 5. Active alarms are marked with ACT):
The total number of active intervals is 7. It exceeds 5. So this alarm becomes to manual reset.

1°I	2°Int	3°Int	4°Int	5°Int	6°Int	7°Int	8°Int	9°Int	10°Int	…	55	56°Int	57°Int	58°Int	59°Int
	ACT	ACT	ACT			ACT	ACT	ACT	ACT						

53. OUTPUTS BLOCK TABLE

The alarm codes and signals are made up from letters and numbers that identify the different types.

53.1 CIRCUIT "A" OUTPUTS ALARM BLOCK TABLE

Code Alarm	**Alarm description**	**Comp.**	**Heaters Anti-freeze boiler**	**Heaters support**	**Flow fan evap. pump**	**Cond. pump**	**Cond. ventil. Cir1 Cir2**	**Auxiliary relay**
AP1	PB1 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP2	PB2 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP3	PB3 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP4	PB4 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP5	PB5 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP6	PB6 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP7	PB7 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP8	PB8 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP9	PB9 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP10	PB10 probe	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP11	Expansion1 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP12	Expansion1 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP13	Expansion1 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP14	Expansion1 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP15	Expansion1 probe5	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP16	Expansion1 probe6	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP17	Expansion1 probe7	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP18	Expansion2 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP19	Expansion2 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP20	Expansion2 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP21	Expansion2 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP22	Expansion2 probe5	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP23	Expansion2 probe6	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP24	Expansion2 probe7	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP25	Expansion3 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP26	Expansion3 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP27	Expansion3 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP28	Expansion3 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP29	Expansion3 probe5	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP30	Expansion3 probe6	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP31	Expansion3 probe7	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP32	Expansion4 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP33	Expansion4 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP34	Expansion4 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP35	Expansion4 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP36	Expansion4 probe5	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP37	Expansion4 probe6	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP38	Expansion4 probe7	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP39	XEV20D 1 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP40	XEV20D 1 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP41	XEV20D 1 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP42	XEV20D 1 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP43	XEV20D 2 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP44	XEV20D 2 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP45	XEV20D 2 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP46	XEV20D 2 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP47	XEV20D 3 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP48	XEV20D 3 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**

AP49	XEV20D 3 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP50	XEV20D 3 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP51	XEV20D 4 probe1	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP52	XEV20D 4 probe2	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP53	XEV20D 4 probe3	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AP54	XEV20D 4 probe4	Yes	Yes **(1)**	Yes			Yes	Yes **(2)**
AEFL	Evaporator flow switch alarm	Yes	Yes (boiler)		Yes **(3)**		Yes	
ACFL	Condenser flow switch alarm	Yes				Yes **(3)**	Yes	
AtSF	Supply fan circuit breaker alarm	Yes		Yes	Yes		Yes	
AEUn	Evaporator unloading signalling							
AtE1	Evaporator n° 1 water pump circuit breaker	Yes **(4)**	Yes (boiler) **(5)**		Yes		Yes	
AtE2	Support evaporator n° 2 water pump circuit breaker	Yes **(4)**	Yes (boiler) **(5)**		Yes		Yes	
AtC1	Condenser n° 1 water pump circuit breaker	Yes **(4)**				Yes	Yes	
AtC2	Support condenser n° 2 water pump circuit breaker	Yes **(4)**				Yes	Yes	
AEP1	Evaporator n° 1 water pump maintenance							
AEP2	Support evaporator n° 2 water pump maintenance							
ACP1	Condenser n° 1 water pump maintenance							
ACP2	Support condenser n° 2 water pump maintenance							
AHFL	Domestic hot water pump flow switch alarm							
APFL	Solar panels pump flow switch alarm							
AEht	Evaporator water inlet high temperature alarm	Yes						
AET1	XEV20D 1 not connect alarm	Yes						
AET2	XEV20D 2 not connect alarm	Yes						
AET3	XEV20D 3 not connect alarm	Yes						
AET4	XEV20D 4 not connect alarm	Yes						
AEM1	IPROEX60D 1 not connect alarm	Yes						
AEM2	IPROEX60D 2 not connect alarm	Yes						
AEM3	IPROEX60D 3 not connect alarm	Yes						
AEM4	IPROEX60D 4 not connect alarm	Yes						
AFFC	Anti-freeze alarm in free-cooling							
Atrb	Boiler overload alarm	Yes		Yes				
ALcb	Boiler lock alarm	Yes		Yes				
AfnA	Function not available alarm	Yes			Yes	Yes	Yes	Yes

APS	Phases sequence alarm	Yes			Yes	Yes	Yes	Yes
AFr	Network frequency alarm	Yes			Yes	Yes	Yes	Yes
ALc1	Generic alarm 1	Yes			Yes	Yes	Yes	Yes
ALc2	Generic alarm 2	Yes			Yes	Yes	Yes	Yes
ACF1	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF2	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF3	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF4	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF5	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF6	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF7	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF8	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF9	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF10	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF11	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF12	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF13	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF14	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF15	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF16	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF17	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF18	Configuration alarm	Yes			Yes	Yes	Yes	Yes
ACF19	Configuration alarm	Yes			Yes	Yes	Yes	Yes

0= if configured as temperature control
1= If the probe configured for control of the anti-freeze **-** boiler and Ar10 = 0
2= If the probe configured for control of the auxiliary relay output
3= With manual reset alarm
4= Compressors off with just n° 1 water pump configured or with n° 2 water pumps configured and both with circuit breaker alarms
5= boiler heaters off only with n° 1 water pump configured or with n° 2 water pumps configured and both circuit breaker alarms (in this case the boiler heaters are only activated by the anti-freeze set protecting the evaporator)

53.2 CIRCUIT "B" OUTPUTS ALARM BLOCK TABLE

Code Alarm	Alarm description	Compressors Circuit (*n*)	Condensation Ventilation Circuit (*n*)
b(*n*)HP	Circuit high pressure pressure switch**(*n*)**	Yes	Yes after 60 secs.
b(*n*)LP	Circuit low pressure pressure switch**(*n*)**	Yes	Yes
b(*n*)AC	Anti-freeze in cooling circuit **(*n*)**	Yes	Yes
b(*n*)AH	Anti-freeze in heating circuit **(*n*)**	Yes	Yes
b(*n*)A	Low temperature/anti-freeze alarm in circuit **(n)**	Yes	Yes
b(*n*)hP	Condensation high pressure transducer circuit**(*n*)**	Yes	Yes after 60 secs.
b(*n*)lP	Circuit **(*n*)** low condensation/evaporator temperature NTC probe	Yes	Yes
b(*n*)tF	Circuit ventilation circuit breaker alarm **(*n*)**	Yes	Yes
b(*n*)dF	Circuit defrost alarm signal**(*n*)**		
b(*n*)Cu	Unloading signal due to circuit **(*n*)** condensation temp. press.		
b(*n*)Eu	Unloading signal due to circuit **(*n*)** evaporator low temp.		
b(*n*)rC	Circuit **(*n*)** heat recovery disabling signal		
b(*n*)PH	Circuit pump down stopping alarm **(*n*)**	Yes	Yes
b(*n*)PL	Circuit pump down start-up alarm **(*n*)**	Yes	Yes

Where the letter **(*n*)** identifies the circuit n° 1 or circuit n° 2

53.3 COMPRESSOR "C" ALARMS OUTPUTS BLOCK TABLE

Code Alarm	Alarm description	Compressor (*n*)	Circuit compressors not affected
C(*n*)HP	Compressor high pressure pressure switch**(*n*)**	Yes	
C(*n*)oP	Compressor **(*n*)** pressure switch/oil float	Yes	
C(*n*)tr	Compressor circuit breaker alarm **(*n*)** with AL47 = 0 - 1	Yes	
C(*n*)tr	Compressor circuit breaker alarm **(*n*)** with AL47 ≠ from 0	Yes	Yes
C(*n*)dt	Compressor high discharge temperature	Yes	
C(*n*)Mn	Compressor maintenance **(*n*)**		

Where the letter **(*n*)** identifies the compressor n° 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

54. APPENDIX A – COMPANY NOTES

New functions were introduced since we took the standard Iprochill FW and started working on it.
Indeed the version on stage INFO on display (see p.29, for how to reach), is refered to the company version. The starting code is always the last more recent iprochill firmware.
For simplify all the treatment, and also for compatibility with the label we introduced on the main screen, the working mode will be shorten as:

- CH means summer mode with the unit working for only satisfy the user cold water request
- HP means winter mode with the unit working for satisfy the user hot water request
- HW means either winter or summer mode with the unit working for only satisfy the sanitary hot water request
- WW (possible just if the FS01=2) means water to water behaviour, that is summer mode with the unit working for satisfy both chiller and sanitary water contemporary.

54.1 HI PARAMETERS FAMILY AND NEW IO

A new parameter family at the end of all the standard groups were introduced for managing all the new functions; or behaviours fix we believe with our experience.
Furthermore new AI, AO, DI, DO type have been added; that are virtual input/output not already present in the standard list

HI parameters

Label	Meaning
HI	This parameters family is divided into subsets. The subsets are easily recognizable with the starting description syllable. It refered to the main standard iprochill FW parameters family. So there are the subsets in order : ST, CF, SP, ES, CO, PA, UN, FA, FS, AL, TE. Every subset means that the parameters inside its, are inherent with the original family. Furthermore there are new families PI, HINV that are not linked to old families and will be explained.

It is important to know that a special company provided libraris is needed for Wizmate parameters managing. The library has a version like the firmware. And a firmware upgrade need also library update.
Wizmate 1.2.0.93 or later is necessary for manage this custom library.

HI parameter (ST subset)					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 1	ST - Company special discharge control 0 = OFF 1 = ON This enable a special thermoregulation on the Evaporator common output NTC, that is proportional in adding a resource, but is not proportional only, in removing a resource. Indeeed the common inlet water temperature is watched before to remove the steps. Discharge control is used in user side thermoregulation only. NB: ST9 = ST10 = 5 are also necessary condition to made this control ON	0	1		
HI 2	ST – Company special discharge control FCE In summer mode the lower this value the greater will be the discharge control action.	1	100		
HI 3	ST - Company special discharge control FCI In winter mode the greater this value the greater will be the discharge control action.	101	200		
HI 4	ST - Company special discharge control DSTE In summer mode if the Evaporator common output is below the set point minus this value, the resources are enabled to turn off	0.0	50.0	°C	Dec
HI 5	ST - Company special discharge control DSTI In winter mode if the Evaporator common output is below the set point minus this value, the resources are enabled to turn off	0.0	50.0	°C	Dec
HI parameter (CF subset)					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 13	CF - Expansion Configuration 0 = No Expansions 1 = Expansion Small 2 = Expansion Big 3 = Expansion Big and Expansion Small It is necessary specify which expansion to use, first to set up the relative IO parameters	0	3		

HI 14	CF - Enabling COP Optimizer - Energy Analyzer 0 = Functions Disabled 1 = Full COP Optimizer 2 = Only ElectroMeter	0	2		
	HI parameter (SP subset)				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 18	SP - Buzzer Operation 0 = ON in case of alarm 1 = ON in case of alarm; off after 30 seconds 2 = ON in case of alarm; off after 5 seconds 3 = Always OFF	0	3		
	HI parameter (ES subset)				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 20	ES - 2" Sanitary Set, Offset Activable by means of DI type=119	-5.0	110.0	°C	Dec
HI 21	ES - 2" Sanitary Set, Differential Activable by means of DI type=119	0.1	25.0	°C	Dec
	HI parameter (CO subset)				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 25	CO - BY-PASS YDFI, time in chiller	0	300	Sec	
HI 26	CO - BY-PASS YDFE, time in chiller	0	300	Sec	
HI 27	CO - BY-PASS YDFI, time in hp	0	300	Sec	
HI 28	CO - BY-PASS YDFE, time in hp	0	300	Sec	
HI 29	CO - Respects minimum time arrived in set/stand-by mode	0	3		
HI 30	CO - YBPS Manage 0 = By time delay 1 = By pressure	0	1		
HI 31	CO - YBPS Time delay	0	300	Sec	
HI 32	CO - YBPS pressure set	0.1	50.0	Bar	Dec
HI 33	CO - YBPS pressure band	0.1	10.0	Bar	Dec
	HI parameter (PA subset)				
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 35	PA - Pump management in sets 0 - OFF 1 - ON	0	1		
HI 36	PA - Pump Management in Set User: Set Point	-50.0 0.0 0.0	110.0 50.0 50.0	°C Bar l/sec	Dec Dec Dec
HI 37	PA - Pump Management in Set User: Differential	0.1 0.1 0.1	25.0 14.0 14.0	°C Bar l/sec	Dec Dec Dec
HI 38	PA - Pump Management in Set User: Minimum Value	0	HI39	%	
HI 39	PA - Pump Management in Set User: Maximum value	HI38	100	%	
HI 40	PA - Pump Management in Sanitary Set: Set Point	-50.0 0.0 0.0	110.0 50.0 50.0	°C Bar l/sec	Dec Dec Dec
HI 41	PA - Pump Management in Sanitary Set: Differential	0.1 0.1 0.1	25.0 14.0 14.0	°C Bar l/sec	Dec Dec Dec
HI 42	PA - Pump Management in Sanitary Set: Minimum Value	0	HI43	%	
HI 43	PA - Pump Management in Sanitary Set: Maximum Value	HI42	100	%	
HI 44	PA - Anti-freezing percentage (user side)	0	56	%	
HI 45	PA - Refresh User Pump 0 - OFF 1 - ON	0	1		
HI 46	PA - Refresh Pump User, OFF time	1	1000	Min	
HI 47	PA - Refresh Pump User, ON time	1	1000	10 Sec	
HI 48	PA - Refresh Sanitary pump 0 - OFF 1 - ON	0	1		
HI 49	PA - Sanitary pump Refresh, OFF time	1	1000	Min	
HI 50	PA - Sanitary pump Refresh, ON time	1	1000	10 Sec	
HI 51	PA - CH Antigelo in Chiller, set point (PA11 in CH)	-50.0	110.0	°C	Dec
HI 52	PA - CH Chiller antifreeze, differential (PA12 in CH)	0.1	25.0	°C	Dec

HI 53	PA - Sanitary pump always on in defrost 0 - OFF 1 - ON	0	1		
HI 54	PA - Refresh Pump Use also valid in Stand-by mode 0 - OFF 1 - ON	0	1		
HI 55	PA - Refresh Health Pump also valid in Stand-by mode 0 - OFF 1 - ON	0	1		
HI 56	PA - Anti-freezing HW percentage	0	56	%	
HI parameter (UN subset)					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 73	UN - Unloading* from ambient temperature 0 - OFF 1 - ON	0	1		
HI 74	UN - Unloading* from ambient temperature, set point	-25.0	50.0	°C	Dec
HI 75	UN - Unloading* from ambient temperature, differential	0.1	25.0	°C	Dec
HI 76	UN - Unloading*, when we are in CH 0 - OFF 1 - ON	0	1		
HI 77	UN - Unloading*, when we are in WW 0 - OFF 1 - ON	0	1		
HI 78	UN - Unloading*, when we are in HP 0 - OFF 1 - ON	0	1		
HI 79	UN - Unloading*, when we are in HW 0 - OFF 1 - ON	0	1		
HI 80	UN - Unloading power. Enabling 0 - OFF 1 - ON	0	1		
HI 81	UN - Unloading power. Set point	10	800	A	
HI 82	UN -Unloading power. Differential	1	400	A	
HI 83	UN - Unloading power. Max. steps to be removed	1	8		
HI parameter (FA subset)					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 92	FA - Enable 2° maximum value of condensing fans 0 - OFF 1 - ON	0	1		
HI 93	FA - Enable 2° maximum value of condensing fans, value	30	100	%	
HI 94	FA - COP optimizer, CH Min Fan set point	0	FA10	Bar	Dec
HI 95	FA - COP optimizer, CH Max Fan set point	FA11	50.0	Bar	Dec
HI 96	FA - COP optimizer, HP Min Fan set point	FA20	50.0	Bar	Dec
HI 97	FA - COP optimizer, HP Max Fan set point	0	FA19	Bar	Dec
HI 98	FA - COP optimizer, Updating Time	1	60	Min	
HI 99	FA - COP optimizer, Ramp UP/DOWN	0	5.0	Bar	Dec
HI 100	FA - Pre ventilation in heat pump mode before switching compressor ON	0	250	Sec	
HI parameter (FS subset)					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 112	FS - WW regulates according to the number of compressors required in use (FS56 by-pass) 0 - OFF 1 - ON	0	1		
HI 113	FS - HW+ Enabling 0 - OFF 1 - ON	0	1		
HI 114	FS - HW+ Time	1	60	Min	
HI 115	FS - HW+ Set point ambient Enabling temperature	-25.0	100.0	°C	Dec
HI 116	FS - HW+ Differential ambient enabling temperature	0.1	25.0	°C	Dec
HI 117	FS - HW+ Set of Health Security	-25.0	100.0	°C	Dec
HI 118	FS - The sanitary is waiting for all the differential 0 - OFF 1 - ON	0	1		

HI 119	FS - Steps called HW to activate WW	1	16		
HI 120	FS - HW* Enabling 0 - OFF 1 - ON	0	1		
HI 121	FS - HW* Time	1	60	Min	
HI 122	FS - HW* Set point External Enabling temperature	-20.0	60.0	°C	Dec
HI 123	FS - HW* Differential External enabling temperature	0.1	25.0	°C	Dec
HI 124	FS - HW* from digital input unloading 0 - OFF 1 - ON	0	1		
HI 125	FS - HW+ from digital input unloading 0 - OFF 1 - ON	0	1		
HI 126	FS - HW* from low pressure digital input 0 - OFF 1 - ON	0	1		
HI 127	FS - HW+ from low pressure digital input 0 - OFF 1 - ON	0	1		
HI 128	FS - CH* Enabling 0 – OFF 1 - ON, always on 2 - ON, with outdoor probe regulation	0	2		
HI 129	FS - CH* Set Point	-25.0	100.0	°C	Dec
HI 130	FS - CH* Differential	0.1	25.0	°C	Dec
HI parameter (AL subset)					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 153	AL - Flow switch from flowmeter 0 - OFF 1 - ON	0	1		
HI 154	AL - Alarm Set flow user flow meters	0.5	20.0	l/sec	Dec
HI 155	AL - Alarm Diff. flowmeter flow user	0.1	5.0	l/sec	Dec
HI 156	AL - Alarm Set sanitary flow meters	0.5	20.0	l/sec	Dec
HI 157	AL - Diff. Sanitary flow meter flow alarm	0.1	5.0	l/sec	Dec
HI 158	AL - Flowmeter flow switch with set point unit 0 - OFF 1 - ON	0	1		
HI 159	AL - Unit in set point. Set Alarm Set User flow meters flow alarm	0.5	20.0	l/sec	Dec
HI 160	AL - Unit in set point. Diff. Alarm User flow meter flow alarm	0.1	5.0	l/sec	Dec
HI 161	AL - Unit in set point. Set Alarm Set Sanitary flow meters	0.5	20.0	l/sec	Dec
HI 162	AL - Unit in set point. Diff. Sanitary flow meter flow alarm	0.1	5.0	l/sec	Dec
HI 163	AL - Flow meters sampling correction factors	100	150	%	
HI 164	AL - Thermal Automatic Reset Compressors 0 - OFF 1 - ON	0	1		
HI 165	AL - Low pressure relay, Waiting time	1	60	10 sec	
HI 166	AL - Low pressure relay, ON time	1	60	Sec	
HI 167	AL - Sanitary pump prevention function Anti-freeze, Set Point	-50.0	50.0	°C	Dec
HI 168	AL - Sanitary pump prevention function Anti-freeze, Differential	0.1	25.0	°C	Dec
HI 169	AL - Low Pressure Analog Alarm 2" set (on CH/WW)	-50.0	110.0	°C	Dec
HI 170	AL - Maximum number of Resettable Alarms	1	9999		
HI 171	AL - Termostatics alarm delay	0	300		
HI parameter (ET subset) The TE family is relative to thermostatics elettronic driver Modbus reading. See the relative chapter for more.					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 180	ET - Enabling the management of the CAREL thermostatic driver 0 - Dis 1 - 1Driver mono 2 - 1Driver Twin 3 - 1D. Twin + 1D. Mono 4 - 2D. Twin 5 - 2D. Twin + 1D. Mono 6 - 3D. Twin	0	4		
HI 181	ET/HINV - Login password	1	9999		

HI parameter (HINV subset) The HINV family is relative to inverter compressor. Please ask the company for more					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 191	HINV - Inverter Management 0 - Dis 1 - En SEC 2 - En PEC	0	2		
HI 192	HINV - Condensing fan during WW	0	1		
HI 193	HINV - Fixed power of the condenser fan in WW	0	100	%	
HI 194	HINV - Condensing fan during compressor shutdown	0	100	%	
HI 195	HINV - Minimum inverter operating value in defrosting mode	0	100	%	
HI 196	HINV - VSS Alarm Turns Inverter OFF	0	180	10 sec	
HI 197	HINV - Defrost alarm delay time	0	100	Sec	
HI 198	HINV - ONOFF Compressor Weight	10	90	%	
HI 199	HINV - SetPoint Update Time	10	120	Sec	
HI 200	HINV - Alarm Delay	5	300	Sec	

HI parameter (PI subset) The PI family is relative to inverter pumps management. See the relative chapter for more.					
Parameter	**Description**	**min**	**max**	**um**	**Resolution**
HI 220	PI - User modulating pump Process Probe 1	0	84		
HI 221	PI - User modulating pump Process Probe 2 (optional)	0	84		
HI 222	PI - User modulating pump Set Point	-50.0 0.0 0.0	110.0 50.0 50.0	°C Bar l/sec	Dec Dec Dec
HI 223	PI - User modulating pump Proportional Band	0.1 0.1 0.1	25.0 14.0 14.0	°C Bar l/sec	Dec Dec Dec
HI 224	PI - User modulating pump Minimum Speed	0	HI 225	%	
HI 225	PI - User modulating pump Maximum Speed	HI 224	100	%	
HI 226	PI - User modulating pump Integral constant (PID)	0	1000	Sec	
HI 227	PI - User modulating pump Derivative constant (PID)	0	800	Sec	
HI 228	PI - User modulating pump in HP mode: Revert Probes / Use 2nd set point 0 - OFF 1 - ON	0	1		
HI 229	PI - User modulating pump 2nd set point (in HP mode if HI228 is enabled)	-50.0	110.0	°C	Dec
HI 230	PI - HW modulating pump Process Probe 1	0	84		
HI 231	PI - HW modulating pump Process Probe 2 (optional)	0	84		
HI 232	PI - HW modulating pump Set Point	-50.0 0.0 0.0	110.0 50.0 50.0	°C Bar l/sec	Dec Dec Dec
HI 233	PI - HW modulating pump Proportional Band	0.1 0.1 0.1	25.0 14.0 14.0	°C Bar l/sec	Dec Dec Dec
HI 234	PI - HW modulating pump Minimum Speed	0	HI 234	%	
HI 235	PI - HW modulating pump Maximum Speed	HI 235	100	%	
HI 236	PI - HW modulating pump Integral constant (PID)	0	1000	Sec	
HI 237	PI - HW modulating pump Derivative constant (PID)	0	800	Sec	
HI 238	PI - Signal delay for inverter pump outlet (acts on 1%,3%,5% of control variable)	0	60	0.5 sec	
HI 239	PI - SOURCE: modulating pump Process Probe 1	0	84		
HI 240	PI - SOURCE: modulating pump Process Probe 2 (optional)	0	84		
HI 241	PI - SOURCE: modulating pump Set Point	-50.0 0.0 0.0	110.0 50.0 50.0	°C Bar l/sec	Dec Dec Dec
HI 242	PI - SOURCE: modulating pump Proportional Band	0.1 0.1 0.1	25.0 14.0 14.0	°C Bar l/sec	Dec Dec Dec
HI 243	PI - SOURCE: modulating pump Minimum Speed	0	HI 244	%	
HI 244	PI - SOURCE: modulating pump Maximum Speed	HI 243	100	%	
HI 245	PI - SOURCE: modulating pump Integral constant (PID)	0	1000	Sec	
HI 246	PI - SOURCE: modulating pump Derivative constant (PID)	0	800	Sec	

HI 247	PI - SOURCE: modulating pump in HP mode: Revert Probes / Use 2nd set point 0 - OFF 1 - ON	0	1		
HI 248	PI - SOURCE: modulating pump 2nd set point (in HP mode if HI247 is enabled)	-50.0	110.0	°C	Dec

Added IO

- ***VAI 67..82***
  For AI relative to PB1..PB10 on the main board and the subsequent analog inputs on expansions board, these more below virtual input kind are available:
  67. 2° PB Defrost C1
  68. 2° PB Defrost C2
  69. 2° Security Output Sanitary Water
  70. 1° User Flowmeter
  71. 2° User Flowmeter
  72. 3° User Flowmeter
  73. 4° User Flowmeter
  74. 5° User Flowmeter
  75. 1° Sanitary Flowmeter
  76. 2° Sanitary Flowmeter
  77. 3° Sanitary Flowmeter
  78. 4° Sanitary Flowmeter
  79. 5° Sanitary Flowmeter
  80. HW Dynamic set-point 4÷20 mA probe
  81. Auxiliary output n° 5 pressure probe (4÷20 mA)
  82. Auxiliary output n° 6 pressure probe (4÷20 mA)

  A new IO parameter is even added. It is IO144 and is usable just if the display mounted as HMI is the Visograp 2.
  This parameters permit to have a new NTC, whatever it is, in the total amount of AI. So we can select any VAI from 1 to 82 but it is not possible to configure it as 4-20mA otherwise a configuration alarm will occours.

- ***VAO 16..18 (0÷10V output signal)***
  For AO relative to AO1..AO4 on the main board and the subsequent analog outputs on expansions board, these more below virtual output kind are available:
  16. Inverter Pump
  17. Inverter HW Pump
  18. Inverter Source Pump

- ***VDI 116..125***
  For DI relative to DI1..DI20 on the main board and the subsequent digital inputs on expansions board, more below virtual input kind are available:
  116. Low Pressure Unloading Switch C1
  117. Low Pressure Unloading Switch C2
  118. OSA (Only Sanitary Hot Water)
  119. 2' Sanitary Set point (HW set point)
  120. Digital input Priority
  121. Thermostatic Elettronic Valve Alarm C1
  122. Thermostatic Elettronic Valve Alarm C2
  123. Inverter Alarm
  124. Domestic Hot Water Pump Overload
  125. Domestic Hot Water Support Pump Overload

- ***VDO 196..211***
  For DO relative to DO1..DO15 on the main board and the subsequent digital outputs on expansions board, more below virtual input kind are available:
  196. Rele Low Pressure Circuit1
  197. Rele Low Pressure Circuit2
  198. Defrost Status Circuit1
  199. Defrost Status Circuit2
  200. By Pass YDFI1
  201. By Pass YDFE1
  202. By Pass YDFI2
  203. By Pass YDFE2
  204. Antifreeze Sanitary Heater
  205. Winter Status
  206. Inverter VSS Alarm
  207. Sanitary Status
  208. Chiller Status
  209. D. Hot Water Support Pump
  210. YBPS1
  211. YBPS2

Remember that for digital inputs/outputs, it is possible to select polarity. In I/O configuration, use prefix “o” to indicate “open” polarity which means the DI/DO is activated when contact is open; use prefix “c” to indicate “close” polarity which means the DI/DO is activated when contact is closed.

54.2 INVERTER PUMPS MANAGEMENT & ELECTRONIC EXPANSION DRIVER READING

In this chapter the parameters PI subset and the ET subset are explained.

Inverter Pumps

An inverter pump is a variable speed pump, that is able to take 230 volts or 400 volts power input and change it to a variable voltage output.
Without the inverter drive, the pump will either be at full speed, or switched off.
A pump running at 80% speed uses only half the amount of power it would at full speed.
95% of the time, pumps don’t run as efficiently as they could do.
So the choise of this control makes the process very energy efficient and furthermore, as the pump is not working at full speed, there is reduced wear and tear.
Since r5.8 the firmware is able to manage this kind of pumps for user side, sanitary side, and plant side.

Condition necessary to add the user side inverter pump is to configure an AO type = 16.
Then the parameters involved in managing it are HI220 up to HI229.
Condition necessary to add the sanitary side inverter pump is to configure an AO type = 17.
Then the parameters involved in managing it are HI230 up to HI238.
Condition necessary to add the source side inverter pump is to configure an AO type = 18.
Then the parameters involved in managing it are HI239 up to HI248.

The first parameter of every subset (i.e. HI220, HI230, HI239) is very important to choose the **process variable** of this inverter control.
Furthermore the virtual AO output is the **control variable**, that is the one that changes its value in order to permit the process variable to reach the set point wanted.

So the process variable is the one that has to reach the configured set point, and the control variable the one that modify itself properly to permit this.

Three kind of process variable are available to be choose:
1. NTC probe
2. 4-20 mA pressure transducer

3. 4-20 mA flowmeters transduders
Regard the number 1 and 2 options, it is possible to add a second process variable.
If this will be done, the real process variable will become the difference between the two.
The parameters HI226-227-236-237 allows to add a PID regulation on the control variable.

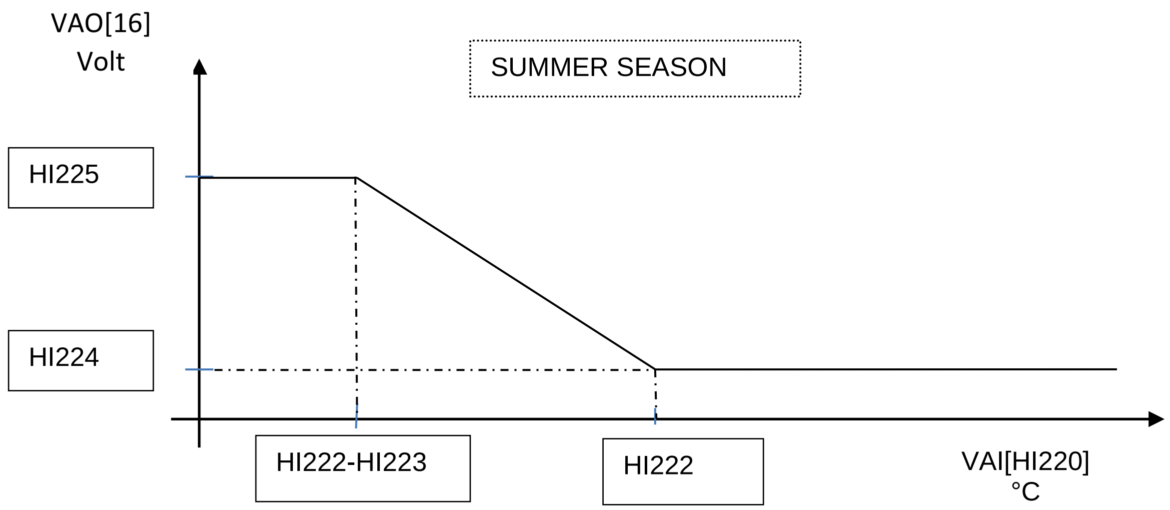
For the following of this treatment an user pump will be take as example, being the source and the sanitary inverter pump exactly the same. PID parameters will be left to 0 for simplicity.

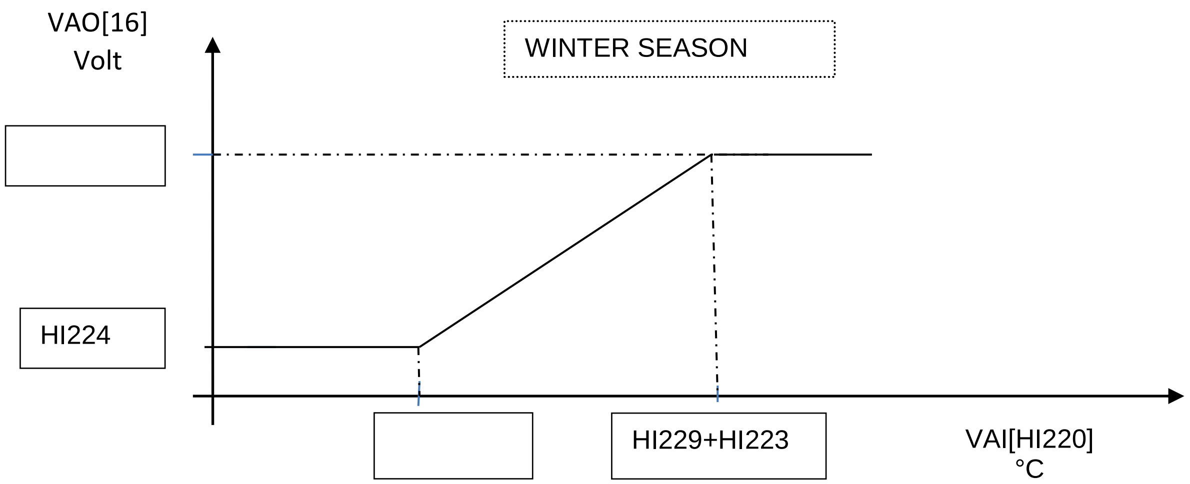
1. The Process Variable is: One NTC probe (a) / The difference between two NTC probes (b)

1a. Parameters Selection

HI220 = 22 – Common Evaporator Output	
HI221 = 0 - disable	
HI222= 10.0 °C	
HI223= 5.0 °C	
HI224=20%	(2 Volt)
HI225=70%	(7 Volt)
HI226=0	(no PID integral action)
HI227=0	(no PID derivative action)
HI228 = 1-ON	(To enable the set point selection and the trait reversed due to the season)
HI229=35.0 °C	(Set point in winter season. NB this is necessary only if HI228=1)

The graphs show how the pump is managed in this situation, for the relative season.



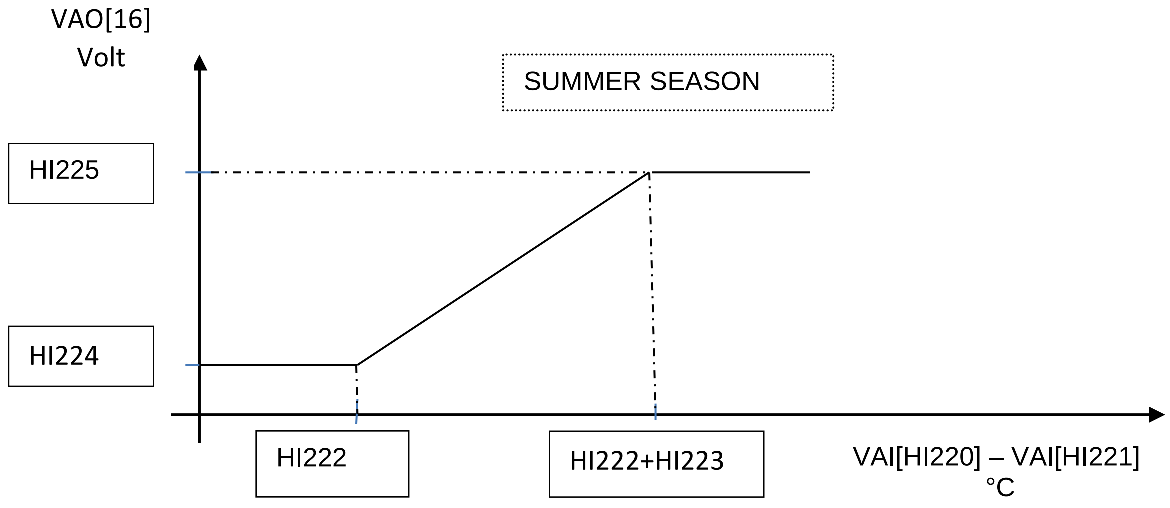


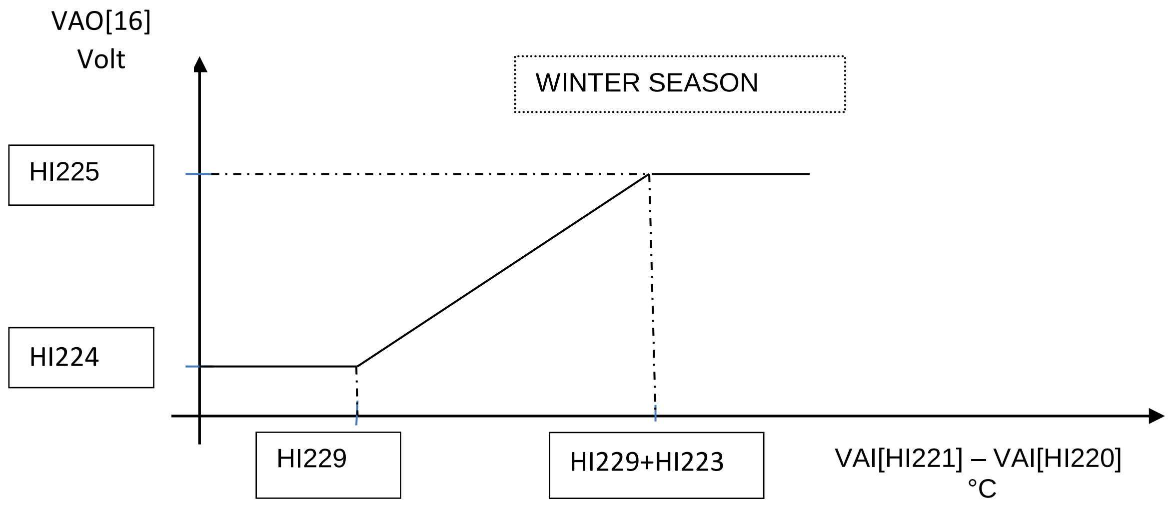
The reversing of the trait and the set point changing due to the season is a property enabled with the parameter HI228 setted to 1.

1b. Parameters Selection

HI220 = 17 – Common Evaporator Input	
HI221 = 22 – Common Evaporator Output	
HI222= 4.0 °C	
HI223= 2.0 °C	
HI224=10%	(1 Volt)
HI225=90%	(9 Volt)
HI226=0	(no PID integral action)
HI227=0	(no PID derivative action)
HI228 = 1-ON	(To enable the set point selection and the proces variables switching due to the season)
HI229=4.0 °C	(Set point in winter season. This is use only if HI228=1)

Notice that now the (two) set point is related for a difference between VAI[17] and VAI[22].
In this example it is not important to make the set point disegual in the two season, couse the delta-temperature we want is the same.
Since there are two variable process configured (i.e. HI221 > 0) HI228 equal to 1 in this case doesn't reverse the trait, but reverse the addend in the two season.
The graphs will help to understand.





See how the real process variable in summer is VP = VAI[HI220] – VAI[HI221]
and in winter season is VP = VAI[HI221] – VAI[HI220]

Note that in the parameters for sanitary side, the relative HI228 is missing. This is because no reverse of trait or addens is necessary, and neither the double set point due to the season. Indeed in every season we want the same regulation for sanitary (HW) side.

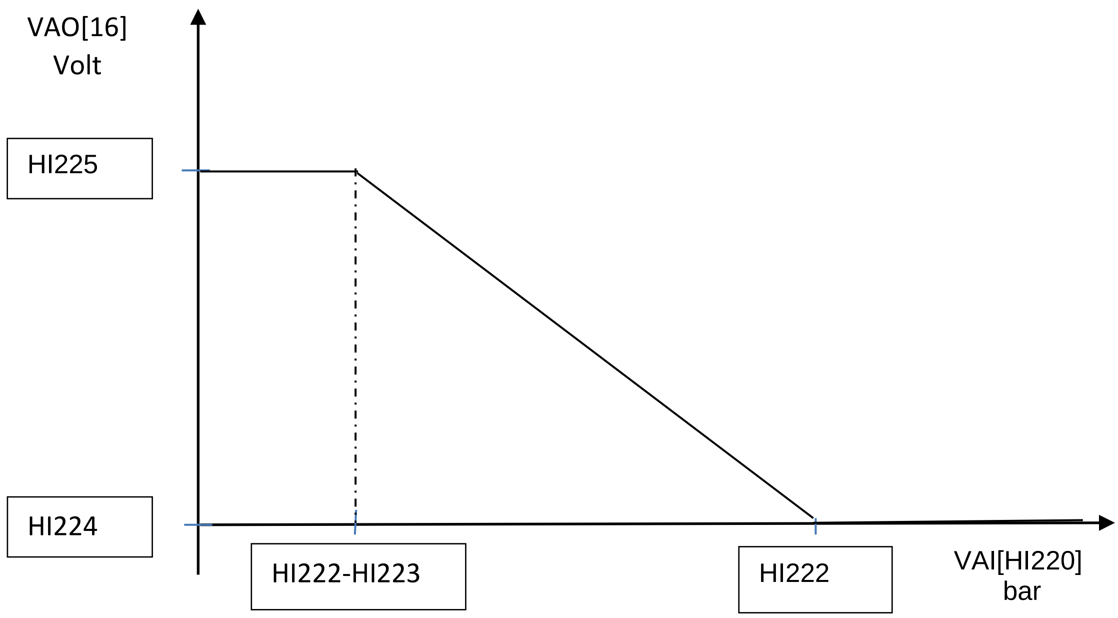
2. The Process Variable is: One 4-20 mA transducer (a) / The difference between two 4-20 mA transducers (b)

Remember to select existing analog inputs. For the pressure we can select AI type = 60..63, 81..82 tha are auxiliary pressure input.
Check also the relative RA parameters for set the work's range of any transducer.

2a. Parameters Selection

HI220 = 62 – Auxiliary pressure probe
HI221 = 0 - disable
HI222= 10.0 bar
HI223= 5.0 bar
HI224=0% (0 Volt)
HI225=100% (10 Volt)
HI226=0 (no PID integral action)
HI227=0 (no PID derivative action)
HI228 = 0-OFF
HI229=0.0 bar

The parameter HI228 and HI229 are not necessary in this regulation. So we leave equal to 0.



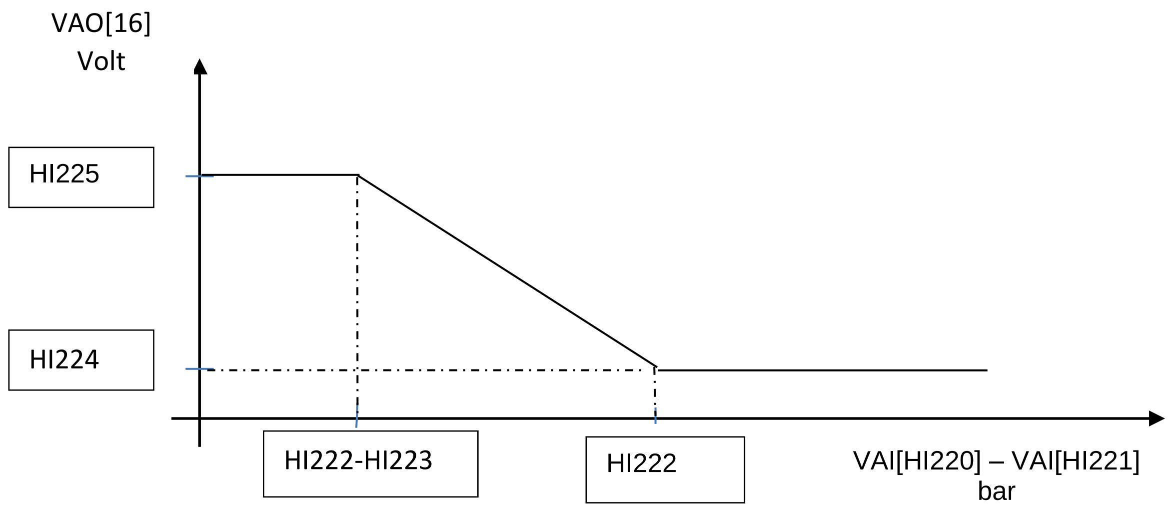
The range of the two transducer on the relatives IO are 0-30 bar

2b. Parameters Selection

HI220 = 62 - Auxiliary pressure probe

HI221 = 63 - Auxiliary pressure probe
HI222= 10.0 bar
HI223= 5.0 bar
HI224=20% (2 Volt)
HI225=85% (8.5 Volt)
HI226=0 (no PID integral action)
HI227=0 (no PID derivative action)
HI228 = 0-OFF
HI229=0.0 °C

In this case, as HI221 ≠ 0 the process variable become VP = VAI[HI220] – VAI[HI221]



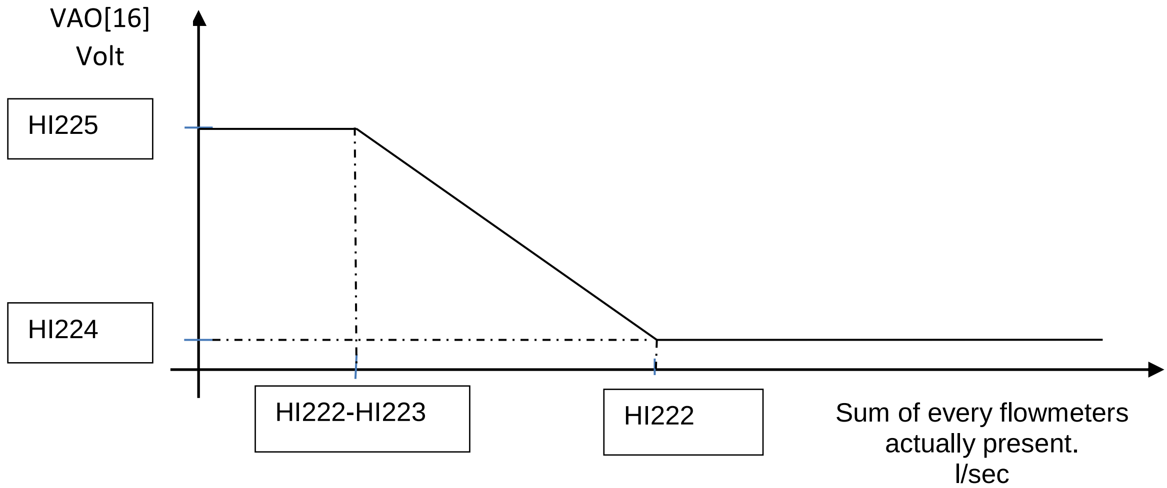
The ranges setted of the two transducer on the relatives IO are 0-30 bar

3. The Process Variable is due to one or more 4-20 mA flowmeters transducers

First we have to set one or more analog input like flowmeters, according to the total flow we need. For user side if we have two flowmeters, we have to configure one AI type=70 and another one AI type=71.
Since they are transducer, the range on the RA parameters has to be setted (like for pressure ones). Note that the unit of measure on the RA relative to these AI, has became liters per second.

About the selection of the process variable, we must select the sum of all the flows read from the flowmeters. If we slide the list we can found, at the end, a virtual kind of process variable selectable:
“ A - Sum of the whole user side flowmeters “. This is how it is necessary to set HI220. Parameter HI221 has to be 0 instead.

Parameters Selection
HI220 = A - Sum of the whole user side
HI221 = 0 - disable
HI222= 12.0 l/sec
HI223= 4.0 l/sec
HI224=10% (1 Volt)
HI225=90% (9 Volt)
HI226=0 (no PID integral action)
HI227=0 (no PID derivative action)
HI228 = 0-OFF
HI229=0.0 °C
The graph become for each season the following

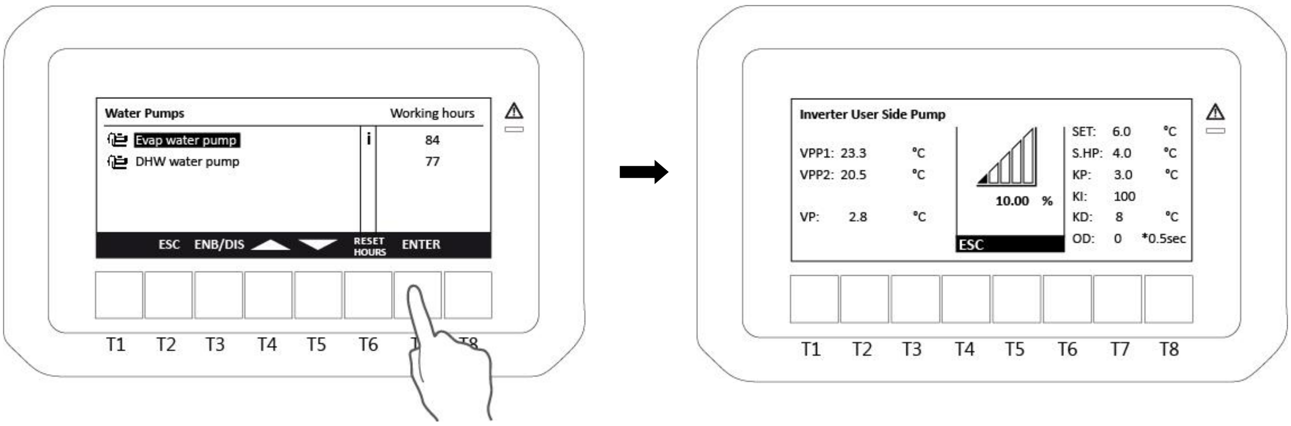


Just to be ready for any purpouse, it is possible also to manage the average of every flowmeters instead of the sum. Check HI220 list for more.

Regards the sanitary side, “B - Sum of the whole HW side flowmeters” has to be selected in the first process variable camp.

NB Every analog output is enabled if the equivalent pump’s digital output is on.
So for example for user side pump or the support user side pump, the rele setted as DO type = 2 (or = 3,), drives the power on or the power off of the relative inverter pump’s analog output. It means it has of course to be configured.

On the display it is possible to see the inverter pump details from the page of the pumps (service menu).
A small *i* appears near the pumps with the inverter function configured. Pushing T7 is possible to enter the internal stage for any info about the inveter pump.



All parameters for sanitary side and for source side have the same functions as decripted above for user side. Sanitary is missing the double set point and the season changing property.
But in the end there is a parameter that is involved in every inverter pump configured. It is HI238.
This parameter add a delay on the physic output, that could help in not stable systems. The reference measurement unit is 0.5 second.

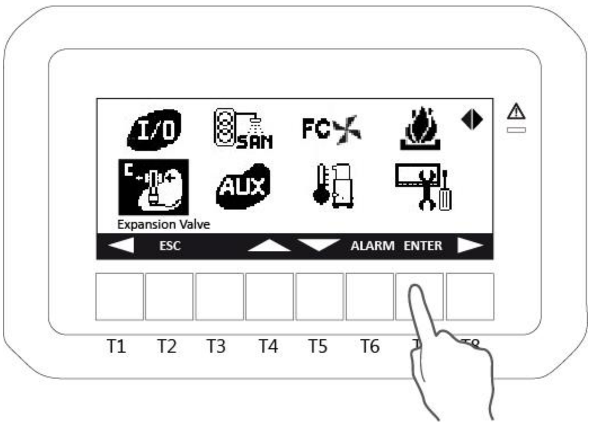
ELECTRONIC EXPANSION DRIVER READING

Two parameters are necessary to manage this function. HI180 it is the number of drivers to manage and HI181 it is the password for the writing menu.

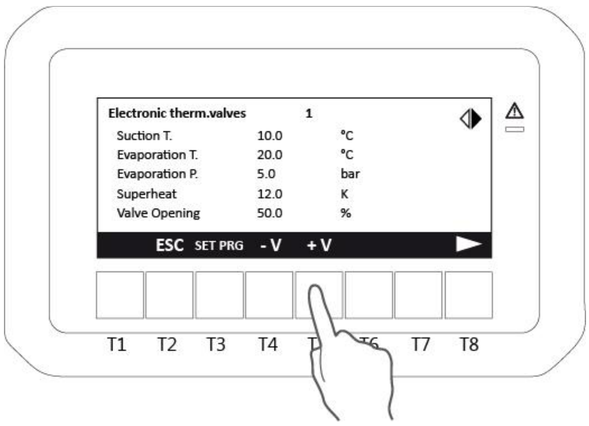
On units that mount one or more Electronic Expansion Driver Valve (Carel EVD evolution), it is possible to manage the reading/writing of the parameters inside them, easily by the ipro display.
The hardware connections is between the slave port of the driver and the master port of ipro. As usual for modbus networks, if more drivers are connected, a serial lines between devices has to be wired.

For enable this function it is necessary to select how many drivers are managed.
Each driver could be mono or twin. So for example to manage 4 expansion valve, two twin will be connected to ipro. So the parameter HI180 as to be: 4 - 2Drivers Twin
The maximum number are 3 valves for circuit configured, otherwise configuration alarm will occour.
Hiprochill FW will manage every appearance but one thing is necessary to do on each driver one time for all. That is to configure the Modbus address and the communication protocol.

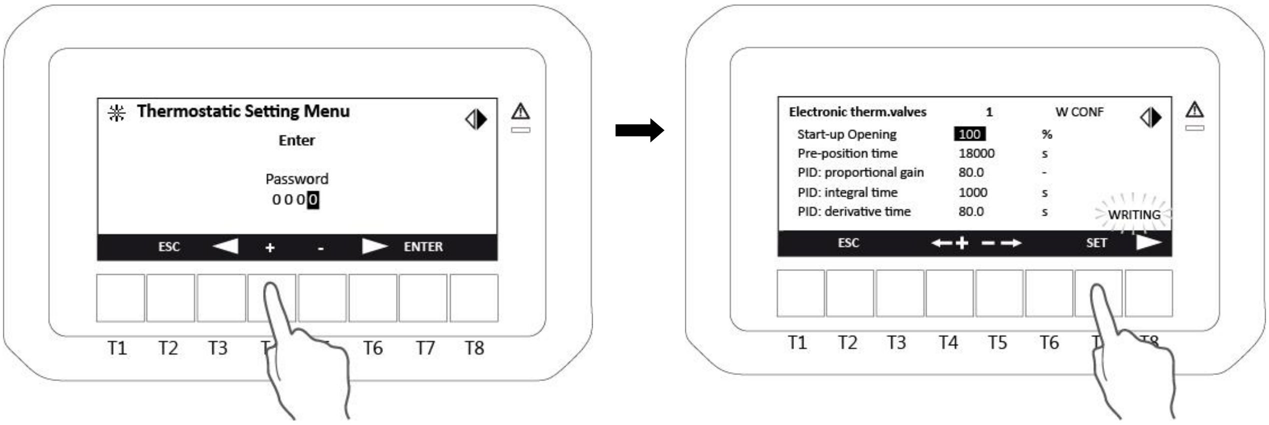
The protocol has to be setted as 9600,N,8,1 for every driver.
The address has to be from 9 to 11, as we could manage up to six expansion valve, by means of three twin drivers.
On the display will appear a small *C* in the Expansion Valve icon (service menu) as meaning of the function is active.



Then the reference menu is showed, and we can switch between the expansion valves pushing T4 and T5.



Near the menu title there is a number that means which expansion valve we are looking. Remember that they go two by two with the drivers.
Pushing T3 is possible to enter in the setting menu (with writing property). The password choosen in the parameter HI181 protects the access in this menu. It is very adviced to select a good password since the variables inside this menu are very delicate.

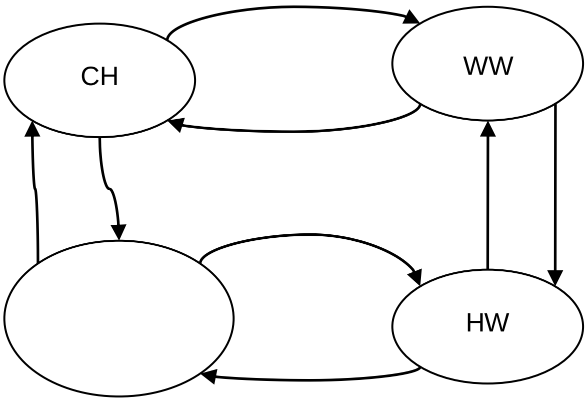


After entered the password, the setting menu relative the expansion valve selected is showed. Here every field are customizable. If we change a parameter, a *WRITING* blinking label will appears , for the seconds necessary to the update in the driver.
T1 and T8 buttons permit to move between the more pages.

54.3 HW STRATEGY & BY-PASS VALVES INTRODUCTION

In this chapter the HW special functions and a by-pass valves introduction will be explained.
Also the YBPD valve output will be descripted.
The firmware has three not standard modalities of working that involves only the sanitary dedicated return units in summer season.
Their names are: HW*, HW+, CH*
First to explain those, it is important to have clear the standard diagram of possible status in a 4 pipe unit when we are in summer, and also the exchanges between these important stable status.

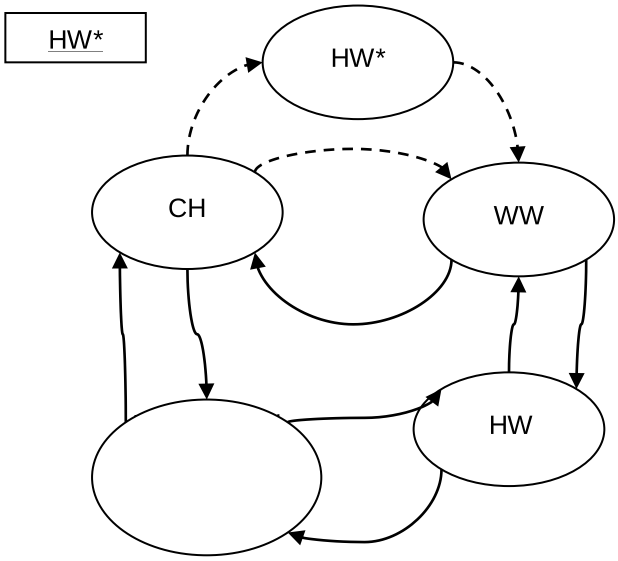
<u>4 pipes units status and exchanges in summer season</u>



Every possible working status is showed on the left. All arrows are all and only possible switching.
The connection rules between these cannot be avoided. This means that, for example, if we are with both user side and sanitary side on set (resources off), it is not possible for the unit to go direct in WW, but it is necessary to go first in either HW or CH.
We remember that the description of every acronym is done in the 54 chapter introduction.

<u>HW* description</u>

This function has to be enabled with parameter HI120 set as ON.
The goal of this is to recover gas first to go in WW when we come from CH. This is done going in HW for a certain amount of time, as the unit were a 2 pipes one. In this case HW become HW* to distinguish from the standard one.
Another parameter is HI121 that determines how much time the unit stays in HW*.
The follow diagram could clarify.

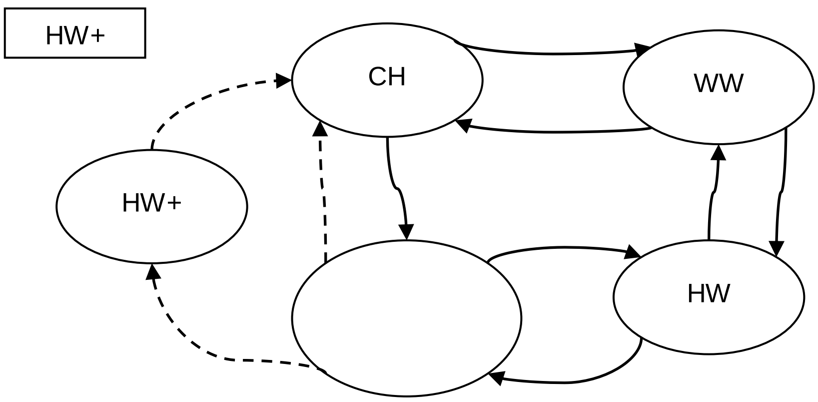


Notice that the connection between CH and WW is still present. It is because there is a condition to activate HW* instead of the standard switching.
The condition is by outdoor temperature: if this temperature goes below the HI122 parameter then the HW* switch will be performed, otherwise the normal one. Togheter with the set point HI122 there is a band HI123, just to consolidate the activation or no of this property.

After the external temperature condition, there are two other many conditions that could be choose for active the function. One is by means of DI type =116 or DI type =117. The second is by means of DI type= 14 or DI type = 15. Due to how many circuit have the unit. The parameters to select this are HI124 and HI126.

HW+ description

This function has to be enabled by means of HI113.
In critical condition could be not suitable to start the resource in CH mode if the previous state was in set point with all. It this case HW+ can help.
HW+ can be activate by temperature; or by DI type =116 or DI type =117; or by means of DI type= 14 or DI type = 15. All these options are managed with HI115, HI116, HI125, HI127.

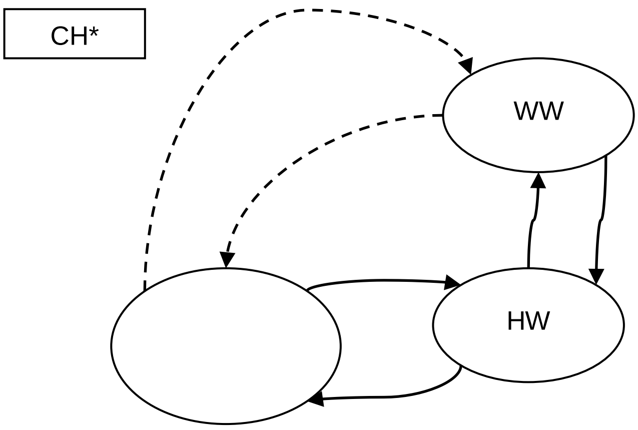


If the HW+ function is active instead of the standard switch, a sanitary majorate set point will be performed. (note that the unit is coming from a sleepy status) This set point is equal the max HW set point (FS6) plus 2.5 °C.

The selectable time for HW+ remain condition is the parameter HI114.
Thw HW+ has to be full performed in this time. Very important is that the unit has not to reach the HW+ majorate set point inside this time.

CH* description

The focus of this modality is to disable any possibility for the unit to works in CH mode. Pay attention, it is not the same to say it cannot do chilled water. Indeed more clearly it is as to say: the chilled water you will produce is energy recovered from the hot water side production only.
In this situation the unit will perform an exception in the exchanges between the status because the CH status is totally removed.



The parameter to enable this function is HI128. In this case it is possible to active everytime the function or to make a selection due to outdoor temperature value. If the second option is selected, two parameters for the set point and differential are HI129 and HI130.
As usual if the outdoor temperature goes below HI129 the CH* is performed.

The CH* modality cannot be activated toghether with HW+ or HW* modalities. Otherwise configuration alarm will occours.

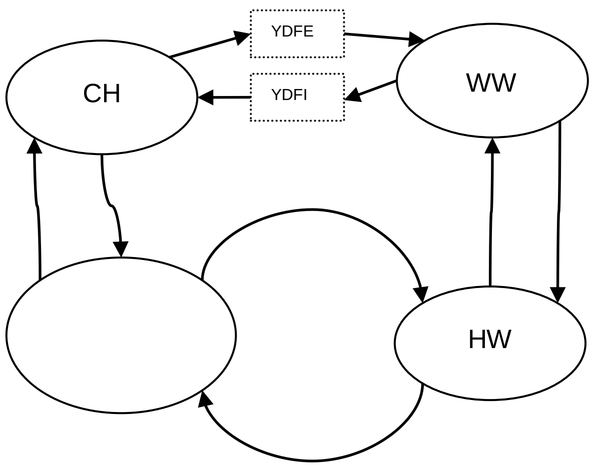
By-Pass valves introduction

This chapter would introduce what it happens during the exchanges in between the stable status.
Every switch occours when the temperature conditions detected from the probes, ask changes.
That is: set point reached, need resource for another status, ecc.

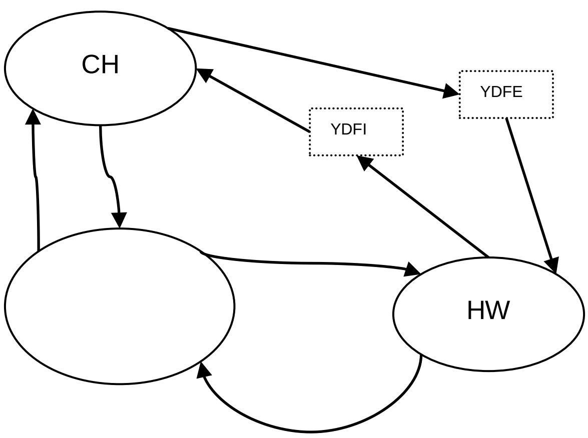
Every time it is necessary to move from a starting state to final state, the compressors are requested to turn off. In compliance with their own times they will perform this action.
When every compressors have turned off, next natural step would be to switch the 4 ways valve (DO type=10 and DO type=11) and perform the sanitary valves (DO type=68 and DO type=69) exchanges.
This operation often makes bad noise and also stress on the refrigerant circuits.
To avoid wear and noise due to delta pressure brutal equalizing, it is possible to manage by means of DO types=200, 202 (YDFI), DO types=201, 203 (YDFE), and times HI25..28, an intermediate action just after the stopping of all compressors and before the main valves switching. This is done in summer and in winter mode, for either 2 pipes and 4 pipes units.
There is little difference in manage the valves in air-water unit and in water-water unit.

1. Air / Water units by-pass valve

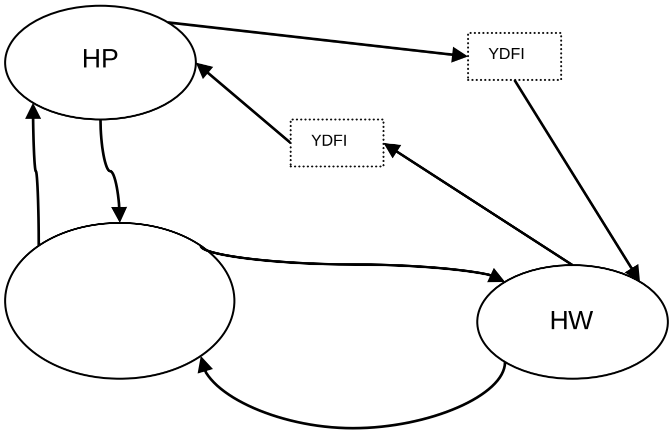
Summer season, 4 pipes units



Summer season, 2 pipes units



Winter season, 2 or 4 pipes units



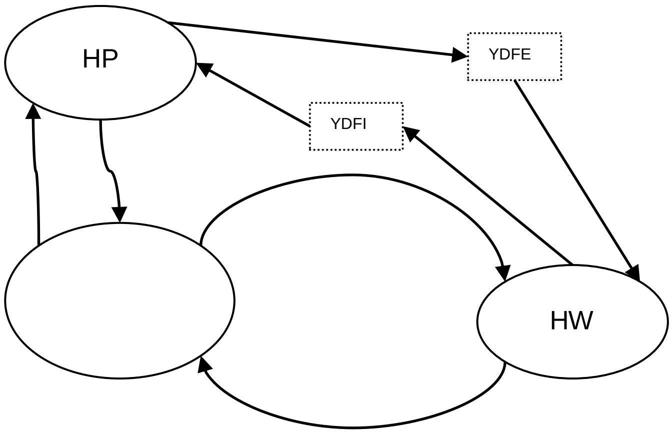
Here we use the same valve in winter mode.
Notice that the exchanges are the same in winter mode for both two pipes and four pipes units.

2. Water / Water units by-pass valve

In summer season there is no differences with the air / water status exchanges. So we can refer the above diagram.

In winter mode instead:

Winter season, 2 or 4 pipes units



Notice that the exchange from HP to HW use YDFE instead of YDFI. This is the difference between Air / Water and Water / Water units.

YBPS description

These valves are studied to recover the gas in 4 pipes splitted units when WW is performed.
They could be activate for a certain time with a fixed time (parameter HI31), or by pressure set point and band. In this second option, the AI for evaporator pressure (AI type=56-57) has to be configured for each circuit. The valve function will be enabled simply configured it on a selected DO. Each circuit has its own valve and need its own evaporator pressure transducer, otherwise a configuration alarm wil occours.

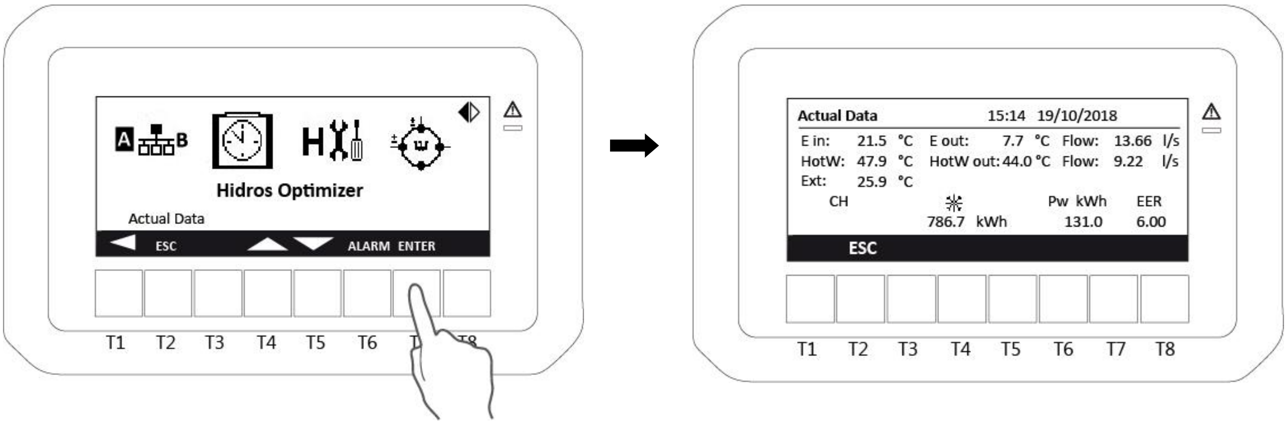
54.4 COP OPTIMIZER DESCRIPTION & INNOVATION

Go on with new functions that it is possible to enable, we found:
- COP optimizer solution
- Inverter compressor management
- Free heating
- Flow Control
- Pump Refresh

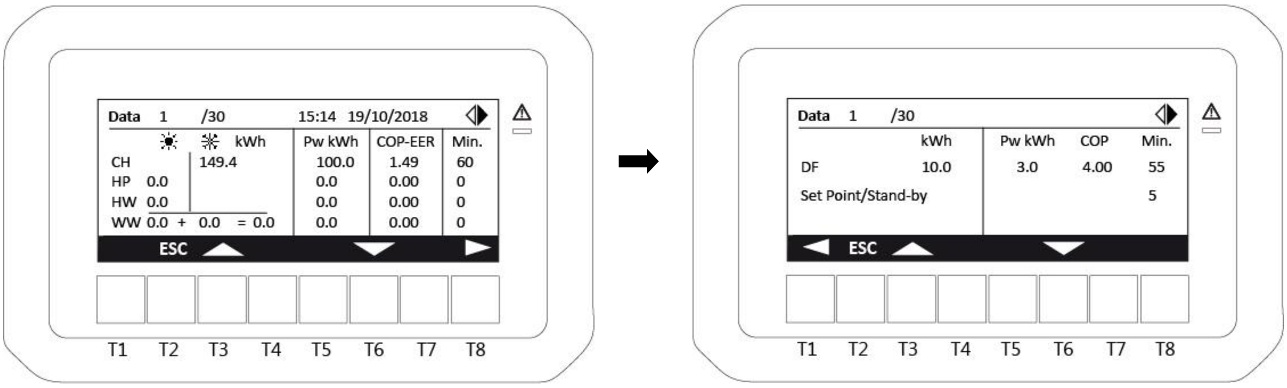
Will follow an introduction of these innovations.

COP optimizer

The Future calls for always more Information.
We want to know anything of our units, and of course how much positive they are running.
With COP optimizer solution we can see real time the power consumption, the thermal power, and the coefficient of performance exactly for all the working modality. This info are visible, on the display on the submenu A:

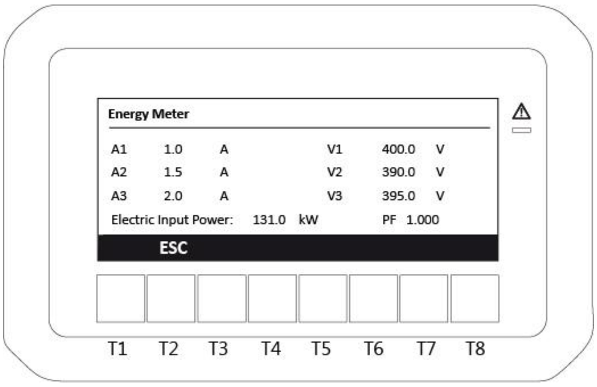


Furthermore an hystoric of averages of these values is saved in the permanent memory, and we could check the last month of these data. This info is visible on the display, on the submenu B:

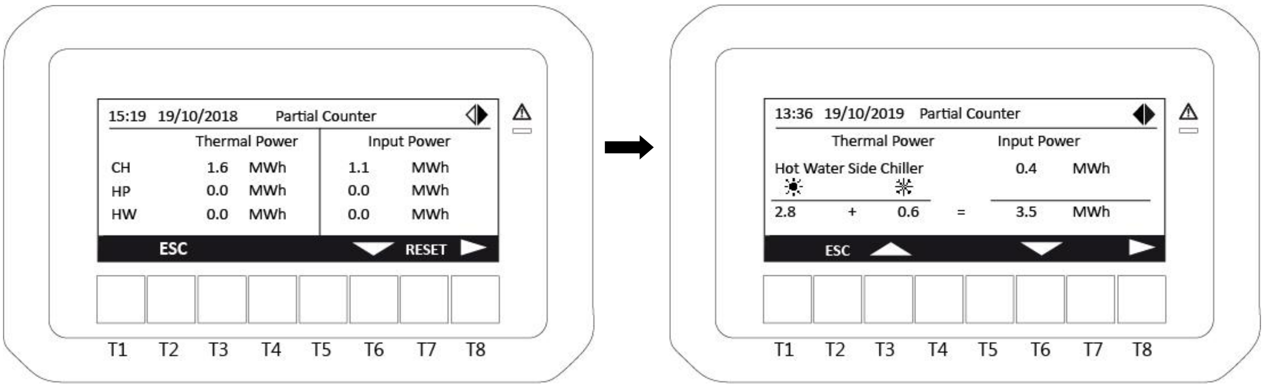


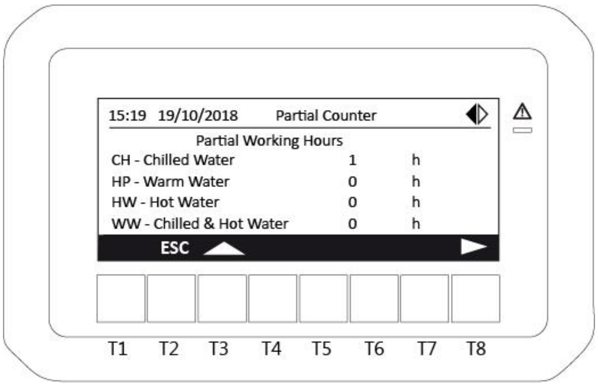
It is possible to select the proper values with buttons T3 and T6. The date is up in the screen and means which hour it is showed.

To enable this function, the parameter to modify is HI14. But it is not enough. Indeed some new hardware equipment on the unit is necessary. We must mount one or more flowmeters in the idraulic circuit to know the instantaneous flow generated by the pump. Furthermore an energy meter counter in the elettrical panel is installed. The ipro will read automatically all the information about the power consumption by Modbus thanks to it. About the energy meter, it has to be configurate once for all, with Modbus protocol 9600,N,8,1 and with Modbus address equal to 5. It is possible to watch easily the real time values read from it, on the page dedicated:



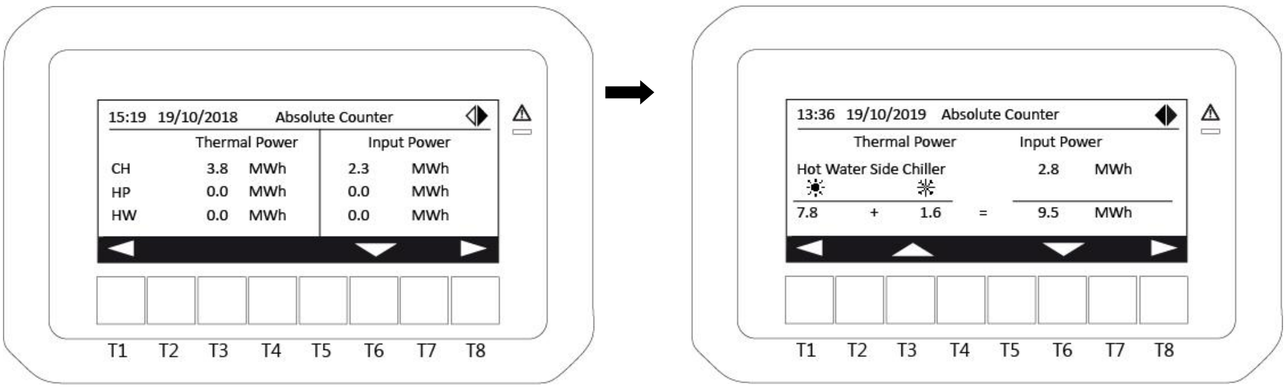
An other thing the COP optimizer function actives is the data logger. Indeed two energy counter start, one partial, and one global. The partial one is free resettable, the global one is protected. Like in a car.
The info that are present are incremental Thermal Power, incremental Power Input and incremental Working Hours, divided for every working mode the unit could have.

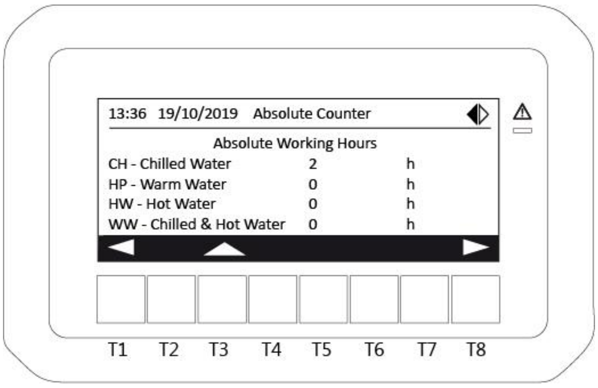




Pushing reset for 5 seconds it is possible to restart all the counters.

The absolute instead are not modifiable with normal access:

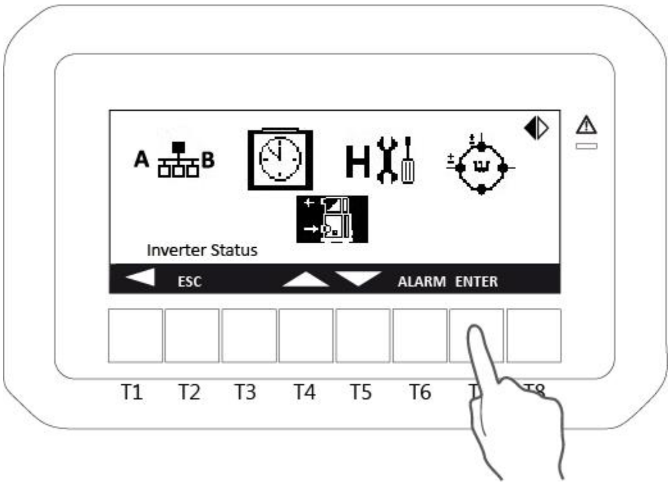




It includes always the partial information plus the info since the unit started the first time.

The company reserved its reset.

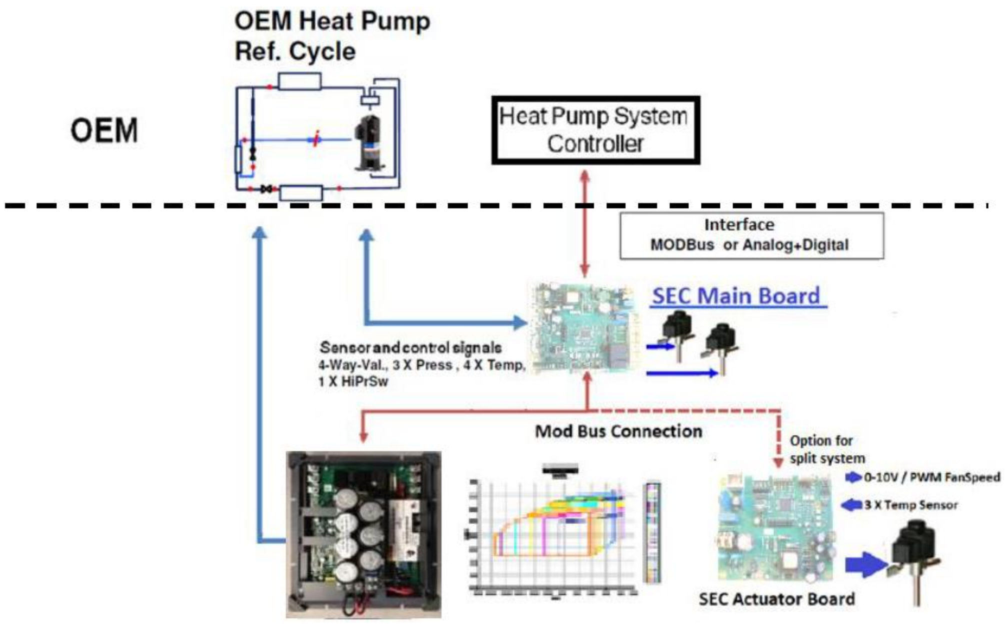
Inverter compressor management



An inverter compressor uses a drive to control the compressor motor speed to modulate cooling or heating capacity. The inverter models constantly monitor the temperature within the refrigerator and adjust the power and running speed of the compressor accordingly, resulting in an optimum and a quieter operation.

In modern applications the drive is managed by an elettrical actuator board in order to separate the whole unit regulation system from the power regulator drive.
The application inside the Ipro is able to converse with two of this kind of actuator boards.
It could be SEC (Superheat & Envelope Control), or PeC (Performance Controller).

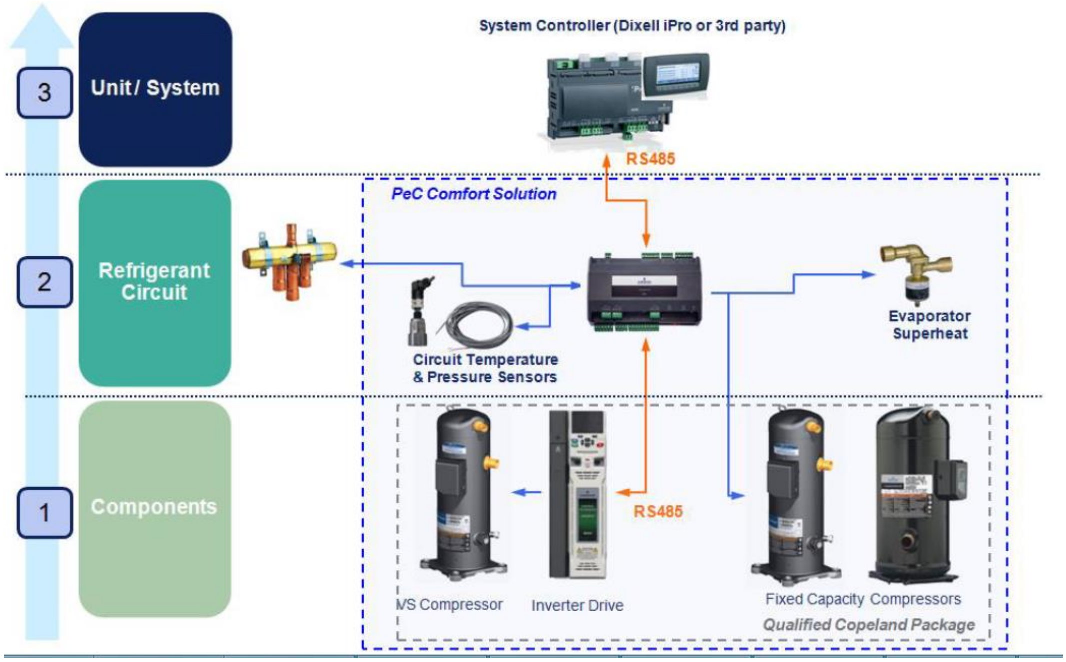
- **SEC**



This solution is for single inverter compressor management. Some of the advantages in using this solution are:

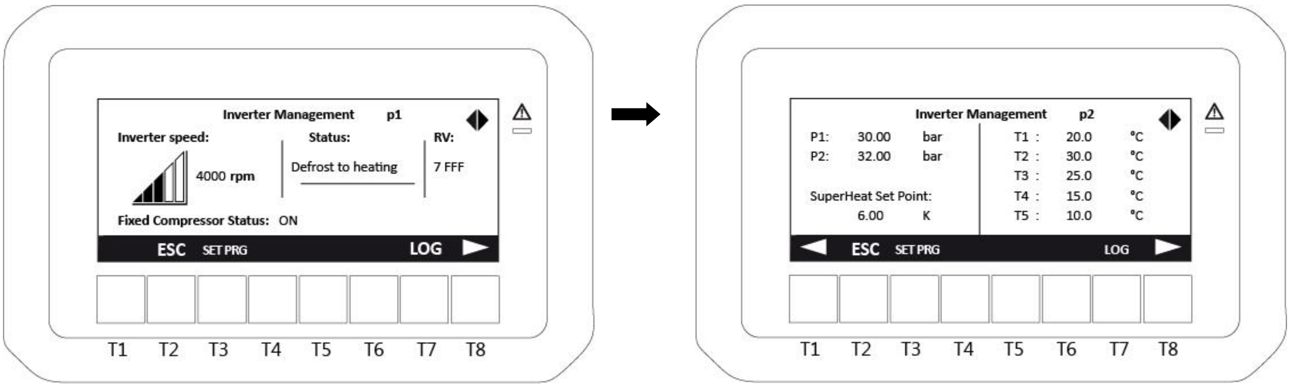
- ✓ Calculating operating-point to adjust drive speed & main valve opening to fit actual conditions and capacity demand if possible.
- ✓ If demand exceeds possible capacity then SEC is normalizing and limiting demand signal to actual possible capacity to get a better control quality in a self adapting way.
- ✓ Monitoring and controlling the operating point & compressor speed to respect the envelopes and protect the compressor, drive and prevent system failures.

- **PEC**



PEC board electronics is based on SEC controller hardware.
This solution is for fixed compressors and inverter compressor management on the same circuit.

Note that these boards are even able to manage the expansion valve in a smart way fully connected with the compressors and the refrigerant circuit, without external driver.
In both cases the application inside ipro orcherstrates the needed of resource, and exchanges data continuously. It also makes the operator able to monitor these information within the ipro display.



... The info will continue from page 1 up to page 7.

Furthermore it is possible to write some parameters, that otherwise it wouldn't be possible without a personal computer directly connected to the board and dedicated expert software.
There is also a display interface for the alarm log, dedicated for the actuator board; because an inverter compressor has more info to give compared with a on/off compressor.

The parameters writing is protected with password, that is parameter HI181. The others parameters in the wizmate map to manage this function are HI191 up to HI200.

Free Heating

It is possible to configure the Free Heating function instead of the Free Cooling, with FC01 param equal to 5.
In the following discussion, a knowledge about the Free Cooling function (fully discussed in a previous chapter) will be suppose. However some differences are present, even in the configuration.
The IO resources that it is necessary to configurate are:

- AI type = 33
- AI type = 34
- DO type = 38

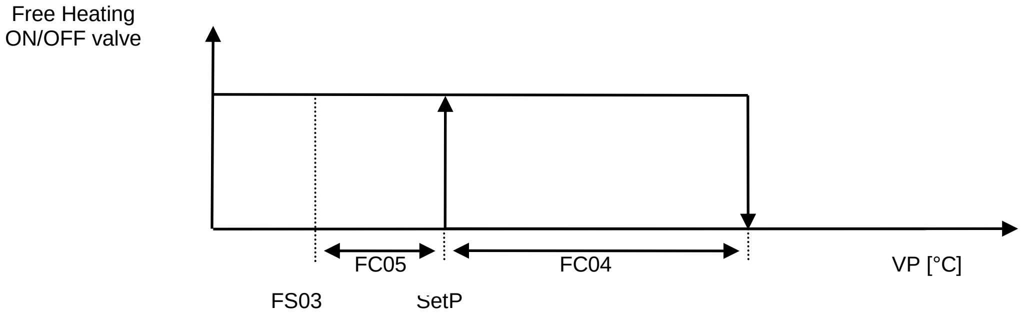
The IO optional resource is AO type=5.
The others parameters that participate are FC03 as delay for activate and deactivate the free heating and the FC02, FC04 and FC05 for the bands. The antifreeze function of course is no more active.

For enable the function the condition is due to the difference between External Air temperature and System Water inlet temperature.
The External Air temperature (TE) is always AI type=34.
The System Water inlet temperature (WI) is always AI type=33.
The condition so is that TE-WI >= FC02 for the time selected.

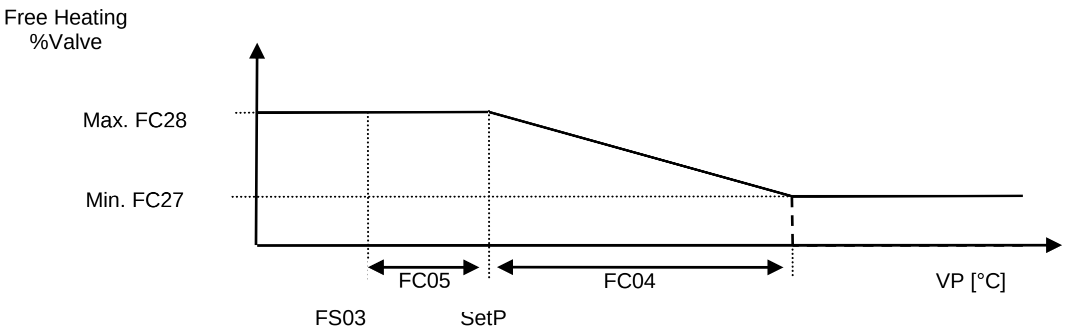
In the following the condition will assume satisfied and the free heating enable; of course the unit has to permit the working mode in heat pump (CF02>1), but there are two possibilities in the effective execution due to the sanitary selection mode.

1. **Sanitary water has dedicated return**

In this case the function is active in any season.
The set point becomes SetP = FS03+FC05.
The process variable (VP) is the AI type=44. The valve DO type = 38 is the ON/OFF free heating valve and works as in the graph below:

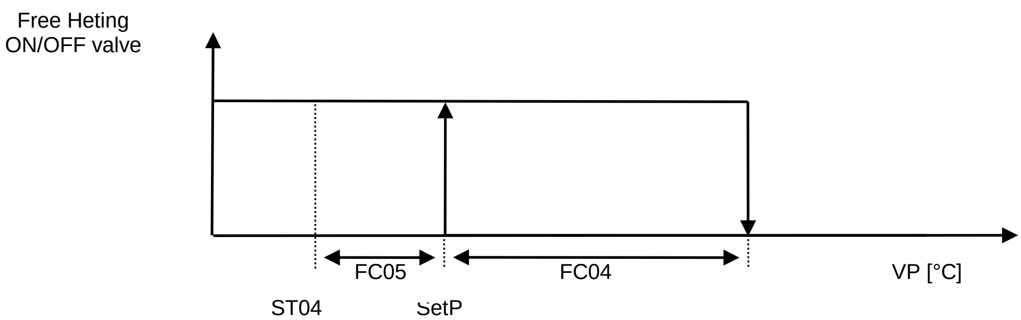


In the same way, the analogue output (0÷10V dampers control proportional output / free-cooling mixer valve (AO type=5)) will assume a value from 0 to 10V depending on the temperature detected by the process variable (AI type =44). See graph below.
Another analog output 0÷10V hot water three-way valve control 0÷10V proportional output (AO type=6) will output the percentage of 100%- free-cooling mixer valve.

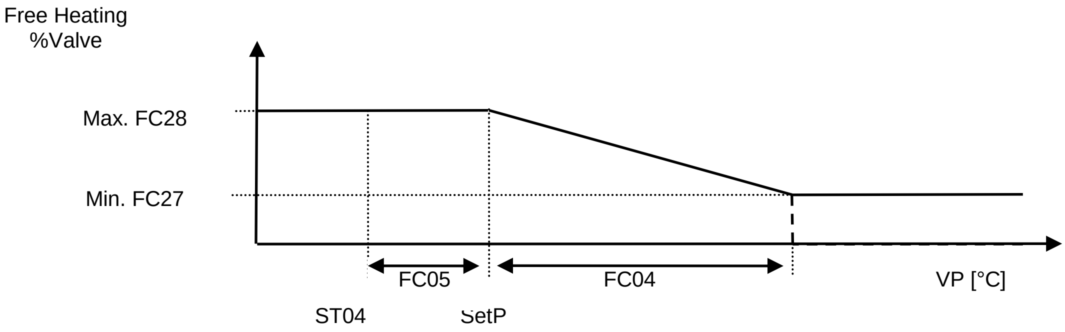


The retention in the minimum value is due to FS29 parameter.

2. Sanitary is not present or has common return.
In this case the function is active in winter season only.
The set point become SetP = ST04 + FC05.
The process variable (VP) is the AI selected for termoregulation in the parameter ST10. The valve DO type = 38 is the ON/OFF free heating valve and works as in the graph below:



In the same way, the analogue output (0÷10V dampers control proportional output / free-cooling mixer valve (AO type=5)) will assume a value from 0 to 10V depending on the temperature detected by the process variable. See graph below.
Another analog output 0÷10V hot water three-way valve control 0÷10V proportional output (AO type=6) will output the percentage of 100%- free-cooling mixer valve.



The retention in the minimum value is due to FS29 parameter.

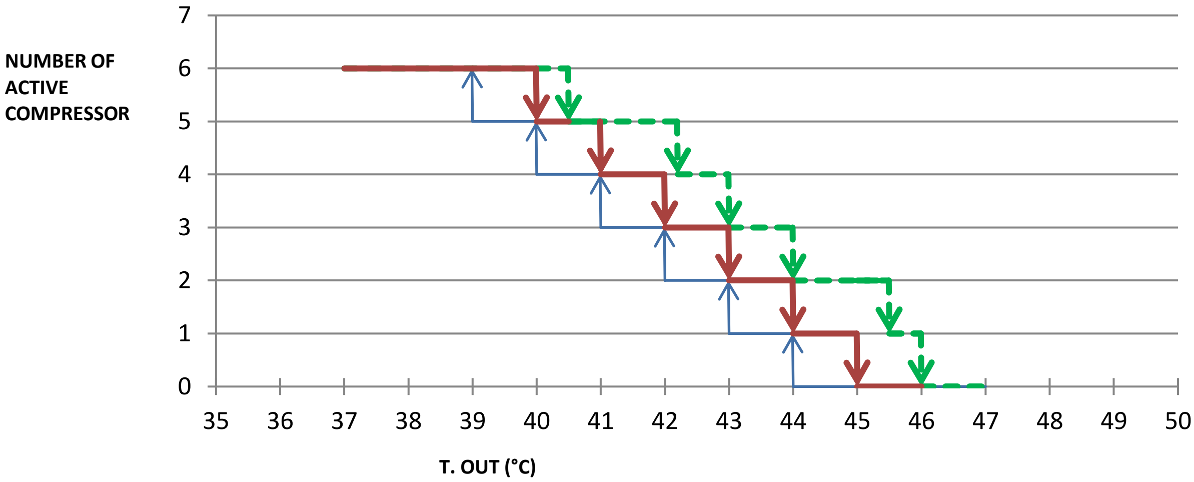
About the fans, if FC06=0 they are called 100% when the process variable is below SetP.
If the fans are proportional configurate and FC06=1 they follow the regulation symmetrically respect the free cooling.

Flow control

About the output control (in the user side), a special mode is possible to enable with parameter HI01. The other condition is that the parameter ST09 for summer season, and the parameter ST10 for winter season has to be equal to 5. The common return probe has to be configured on the IO as well.

The function activates the removing resources no more directly proportional as explained in the thermoregulation paragraph , but with a sophisticated formulas that delayed the turning off of the compressors, in order to keep the selected temperature in the flow control.

An example in HP mode is in the following graph:

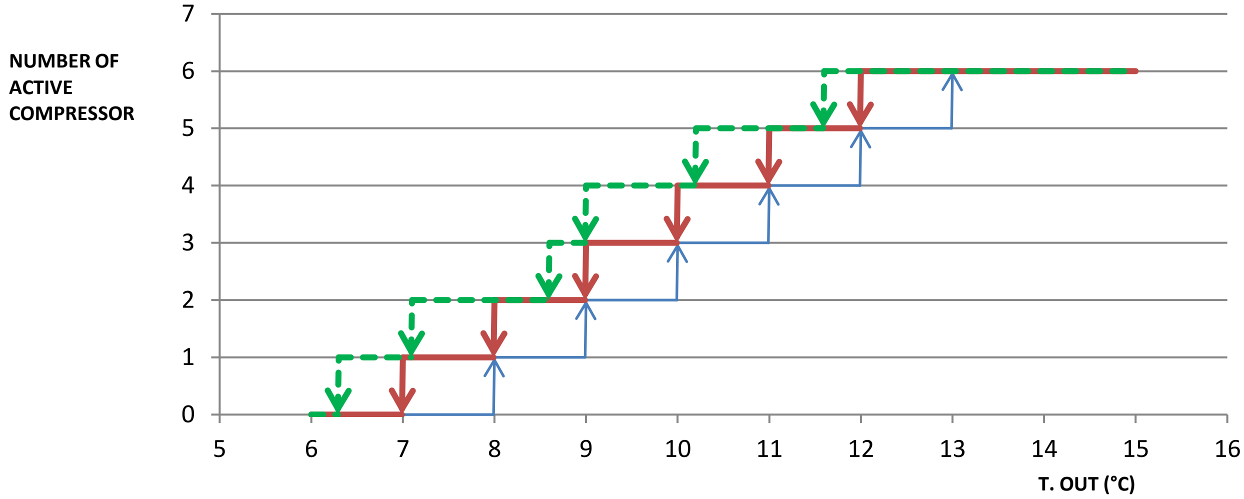


Supposed:
ST04 = 45.0 °C
ST08 = 6.0 °C
Compressor number=6

The dashed line shows the difference in turning off the compressors compared with the standard proportional flow control (continuous line). The formula fo the removing resources indeed looks not only the outlet temperature but even the inlet temperature. It chooses, in compliance with how it is far away from the set point, if the resource has to turn off or not.
A parameter, HI03, permit to manage how mach the formula is strong. It can have value 101 ÷ 200.
Lower it is the value, and stronger will be the formula , that it means the compressors turn off later.

An other parameter HI05 give an offset in the flow termperature, that is: if the temperature exceeds the set point selected plus HI05, then the compressor will leave to turn off. This last one is a security parameter.

For the CH mode the equivalent parameter is HI02 and permit to manage how mach the formula is strong. It can have value 1 ÷ 100. Lower it is the value, and stronger will be the formula , that it means the compressors turn off later. The equivalent security one is the HI04 and does not permit the flow temperature to go under the set point minus HI04. A possible graph in CH mode is:



Supposed:
ST01 = 7.0 °C
ST08 = 6.0 °C
Compressor number=6

The dashed line is the switching off compared with the standard one.

This function can help in case of recurring switching on and off of the compressors.

Pump Refresh

The pump refresh is a function that permit, in the case of thermoregulation satisfied, to turn on and off the pump for some minutes. This will be performed only in case of pump configured to work on demand.
The modality allows to have a refresh of temperatures on the pipes, and also (in very extreme conditions) to avoid any possibile blocks for ice on them.

The parameters are from HI44 to HI47 for user side pump, and are from HI48 to HI50 for HW side.
The meaning are self explained in the description of every single parameter.
It is possible to activate this function also with the unit in stand-by. The parameters that allow this are HI54 and HI55 respectively. Pay attention that in this case it works also with remote off.

54.5 CUSTOM ALARMS

New alarms that are not present in the standard firmware, as well as the new functions, are necessary to avoid configuration mistakes or wrong parametrization.
A list with the relative descriptions will follow.

Alarm code	**AHINV**
Display in keyboard	**HI Inv. All**
Cause of activation	DI configured as Inverter Alarm(DI type=123) is active
Reset	With DI not active

Alarm code	**ATECn**
Display in keyboard	**TEXV Circ. (n) alarm**
Cause of activation	DI configured as Elettronic Valve Al. (DI type=121-122) is active.
Reset	With DI not active

Alarm code	**ACFHINV**
Display in keyboard	**HI Inv. Conf. All.**
Cause of activation	If not HI191=1 and exists DI type=123. Inverter pump configuration mistake, that is if an inverter pump analog output is configured and: One of the process variable selected is a single flowmeter (AI type = 70÷79), indeed it has to be always the sum or average (A÷D). If the first process variable is a flowmeter sum or average and the second process variable is not zero (i.e. it has to be not configured); or if there are not present any flowmeter on AI type. One of the process variable does not exist on IO as AI type; or it is not configured the process variable number one. They are configured two process variables but the types are not congruent (e.g. the first is NTC and the second is 4÷20 mA)
Reset	Correct programming

Alarm code	**ACFCOP**
Display in keyboard	**HI Conf. 1 All.**
Cause of activation	If COP optimizer function is enabled and: There are not user flowmeters on AI type. The HW is common return but there are HW flowmeters configured. The HW is dedicated return but no HW flowmeters are present. If unloading power is active HI80=1, but HI14=0; or if the steps to be removed (HI83) are equal or more the total compressors number.
Reset	Correct programming

Alarm code	**APBHI**
Display in keyboard	**HI NTC Viso All.**
Cause of activation	Parameter IO144 is not configured as NTC. NTC on visograp 2 is broke down or disconnected.
Reset	Correct programming or checks the NTC probe wiring

Alarm code	**ACFET**
Display in keyboard	**HI Conf. 2 All.**
Cause of activation	Energy saving or dynamic set points enabled and parameters not consistent; that is with any of the offsets selected it could overcome minimum or maximum possible set points.
Reset	Correct programming

Alarm code	**ACFHW**
Display in keyboard	**HI Conf. 3 All.**
Cause of activation	HW* or HW+ or CH* enabled and sanitary is not with dedicated return. HI124 or HI125 enabled and not exist DI type 116-117. HI126 or HI127 enabled and not exist DI type 14-15. CH* enabled and HW+ or HW* enabled. CH* enabled and not exist AI type = 35.
Reset	Correct programming

Alarm code	**ATS1**

Display in keyboard	**HW.pump 1 overl**
Cause of activation	DI configured as HW pump overload 1 (DI type=124) is active
Reset	With DI not active

Alarm code	**ATS2**
Display in keyboard	**HW.pump 2 overl**
Cause of activation	DI configured as HW support pump overload 2 (DI type=125) is active
Reset	With DI not active

Alarm code	**ACFCONEU**
Display in keyboard	**HI Conf. 4 All.**
Cause of activation	If CO38 > 0 and: CO36 >0 and CO38>0 at the same time. CO38<CO01 CO38<CO02 CO38*(N.CompressorsForCircuit - 1) > CO03 If neutral zone is configured and CO36>0 or CO38>0
Reset	Correct programming

Alarm code	**AFHI5**
Display in keyboard	**HI Conf. 5 All.**
Cause of activation	HW is not with dedicated return and exist DO for YBPS valves (DO type=210-211). Two circuits are configured but only one valve. YBPS valves are configured as DO and does not exist the relative evaporator pressure transducer (AI type =56-57).
Reset	Correct programming.

Technical data shown in this booklet are not binding.
The Company shall have the right to introduce at any time whatever modifications necessary to the improvement of the product. The reference languages for the whole documentation is English. The other languages are to be considered only as guidelines.