



Chillers and Inverter Air/Water heat pumps with axial fan

# Controller Manual

## Model

i-32V5C MIDI 0121	i-32V5H MIDI 0121
i-32V5C MIDI 0126	i-32V5H MIDI 0126
i-32V5C MIDI 0128	i-32V5H MIDI 0128
i-32V5C MIDI 0132	i-32V5H MIDI 0132



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02	08-2022	MS	AB	Update chapter partial recovery with desuperheater
01	07-2021	MS	AB	Update cap. 24
00	01-2021	EM	AR	First emission
Rev	Date	Compiled	Approved	Note
Code				Serie
MCO01040120001.02				Chillers and inverter Air/water heat pumps with axial fans

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## 1. PURPOSE AND CONTENT OF THE MANUAL

The purpose of the control manual for i-32 MIDI units is to provide the essential information necessary for the correct use of all the functions of the machine, in particular, it provides the essential information for the setup of unit control. The informations contained in this manual are written for the installer and for the user who uses the machine: the user, even if he does not have specific information, will find in these pages the indications that will allow him to use it effectively. It is recommended that the user carefully follows the instructions given in this manual, especially the safety instructions and routine maintenance. The manual describes the machine at the time it was commercialised; the Company reserves the right to make changes and technological improvements to the product and it is not obliged to update manual of previous versions. Besides, the Company declines all responsibility for any errors contained in the manual, if due to printing or transcription errors. Be sure to use the manual, in case of updates or doubts contact the company.

### 1.1 HOW TO KEEP THE MANUAL

The manual has to always be kept together with the unit it refers to. It has to be stored in a safe place, protected from dust and moisture and easily accessible to the operator who must consult it any time he is in doubt on how to operate the equipment. Any updates sent to the customer must be kept in an attachment to this manual. The company is available to give any detailed information about this manual and to give information regarding the use and the maintenance of the units.

### 1.2 GRAPHIC SYMBOLS USED IN THE MANUAL

	Indicates prohibited operations.
	Indicates operations that can be dangerous for people and/or for the correct operation of the machine.
	Indicates operations where there is a risk of electrocution due to dangerous electrical voltage.
	Indicates important information that the operator has to follow in order to guarantee the correct operation of the unit in complete safety. Also indicates some general information.

## 2. PERMITTED USE

- The company excludes all contractual and extra-contractual liability for damage caused to persons, animals or things, due to installation, adjustment and maintenance errors, improper use or partial or superficial reading of the information contained in this manual.
- These units are built for the heating and/or cooling of water. Any other use not expressly authorised by the manufacturer is considered improper and therefore not allowed.
- Modification of the operating logic and/or control parameters must be executed by experienced and qualified personnel. Access to the electrical panel and the connection of external devices are only permitted to qualified personnel.
- This appliance is intended to be used by experienced or trained operators in shops, light industry and on farms, or for commercial use by non-experted personnel.
- The appliance may be used by children at least 8 years old and by persons with reduced physical, sensory or mental capabilities or without experience or the necessary knowledge as long as they are supervised or after they themselves have received instructions on the safe use of the appliance and understand the relevant dangers. Children must not play with the appliance. The cleaning and maintenance which the user is expected to carry out on the unit cannot be done by children without supervision.
- Direct interaction with the unit by personnel with electrically controlled medical devices, such as pacemakers, is prohibited, because it may cause harmful interference. It is recommended to maintain an appropriate distance from the installation site of the unit, as indicated by the medical system used.

## 3. GENERAL SAFETY GUIDELINES

Before starting any type of operation on the unit, every user and operator must have perfect knowledge of operation of the machine and of its controls and have read all of the information in this manual and in the user-installer manual.

	<p><b>IS PROHIBITED:</b></p> <p>To remove and/or to manipulating any safety device.</p> <p>Unauthorised access to the electrical panel.</p> <p>To touch the systems if not autorised to do so.</p> <p>To performe any cleaning operation when the master switch in 'ON'.</p> <p>To pull, detach or twist the appliance's electric cable.</p> <p>To step on, sit down on and/or place any type of object on the appliance.</p> <p>To spary or pour water directly on the appliance.</p> <p>To touch the appliance when barefoot or part of the body are wet or damp.</p> <p>Tamper with or replace parts of the machine without express authorisation from the manufacturer. Such interventions release the manufacturer from any civil or criminal responsibility.</p>
	<p><b>CAUTION:</b></p> <p>Refer to the user-installer manual included with the unit before procedeeing.</p> <p>Do not place your hands or insert screwdrivers, spanners or other tools on moving parts.</p> <p>The person in charge of the machine and the maintenance man must receive appropriate training and instruction to carry out their duties in a safe situation.</p> <p>The operator's workplace has to be kept clean, tidy and clear of objects that may restrict free movement. The workplace must be adequately illuminated for the operations planned.</p> <p>Not all the configurations described can be activated and/or modified at the same time.</p> <p>Different values from the default values can compromise the correct operation of the unit, in case of doubt on the value to set contact the company.</p>
	<p>Only authorised personell may access the electric panel. Connection to the terminal block must only be made by qualified personnel.</p> <p>All ordinary and/or extraordinary maintenance operations must be carried out with the machine stationary and without electrical power.</p> <p>Before performing any operations on the electric panel, IT IS MANDATORY:</p> <ul style="list-style-type: none"> <li>-To switch off the unit from the control panel ("OFF" displayed).</li> <li>-Set the main switch above the unit to "OFF".</li> <li>-Wait 15 seconds before accessing the electrical panel.</li> <li>-Ensure the effective grounding.</li> <li>-To remain well isolated from the ground, with dry hands and feet, or using insulated platforms and gloves.</li> <li>-To keep foreign materials away from the systems.</li> </ul>

### 3.1 PERSONAL PROTECTIVE EQUIPMENT

Refer to the user-installer manual included with the unit.

### 3.2 WORKERS' HEALTH AND SAFETY

Refer to the user-installer manual included with the unit.

### 3.3 SAFETY SIGNALS

Refer to the user-installer manual included with the unit.

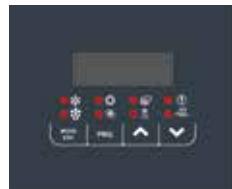
### 3.4 REFRIGERANT SAFETY DATA SHEET

Refer to the user-installer manual included with the unit.

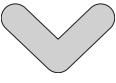
## 4. USER INTERFACE - CONTROLLER

The unit has a 4-digit display with integrated keypad, the main functions and menu navigation are described below. Normally, if the unit is switched on, the display shows the water outlet temperature in degrees Celsius or the alarm code, if active.

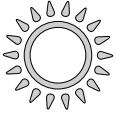
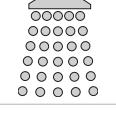
## 4.1 DISPLAY



### 4.1.1 KEYS

<b>MODE</b>	Select the operating mode and manually reset any alarms. Each time you press the key you have the following sequence: OFF -> COOL -> COOL+SAN* -> HEAT -> HEAT+SAN* -> OFF (*= if sanitary is enabled)
<b>PRG</b>	Allows to enter the selected menu to view the sub-folders or to set a value (e.g. summer, winter and domestic set-points or various parameters).
	UP key allows to move to a higher menu or to increase the parameter value.
	DOWN key allows to move to a lower menu or to decrease the parameter value.

### 4.1.2 LED

	Cooling mode LED: is on if COOL or COOL+SAN mode is selected.
	Heating mode LED: is on if HEAT or HEAT+SAN mode is selected.
	Pump Led: is on if the pump is active.
	Alarm Led: is on if there are active alarms.
	Defrosting Led: flashes to enter defrosting mode, it is on when defrosting is in progress.
	Compressor Led: flashes if the compressor is starting up, it is on if the compressor is active.
	Sanitary led: flashes if sanitary production is in progress, it is on if COOL+SAN or HEAT+SAN mode is selected and sanitary production is not in progress.
	Led KA resistors: is on if the antifreeze resistors are active.

## 4.2 MENU

The items controlled by the main menu are listed below. Some of this are only visible to the installer, who must access to the PSS menu to enter the password and enable higher privilege access.

MENU	LABEL	LEVEL	OTHER CONDITIONS
Setpoint	<b>Set</b>	User	Not accessible if connected at Hi-T2
Password	<b>PSS</b>	User	---
Alarms	<b>Err</b>	User	Only if active alarms
Probes	<b>tP</b>	Installer	---
Digital inputs	<b>Id</b>	Installer	---
Parameters	<b>Par</b>	Installer	---
Hours of operation	<b>oHr</b>	Installer	---
Alarm log	<b>Hist</b>	Installer	Only if the log contains data
Firmware Version	<b>Fir</b>	Installer	---
USB	Usb	Installer	Only with USB key with update files is present



**CAUTION: All operations with INSTALLER visibility must be carried out by QUALIFIED PERSONNEL.**

## 4.3 SETPOINT MENU [Set]

In this menu, it is possible to display and modify the various set-points.

Set	DESCRIPTION	DEFAULT	RANGE	UNIT
<b>Coo</b>	First Summer setpoint	7.0	5 ÷ Coo2	°C
<b>Hea</b>	First Winter setpoint	45.0	Hea2 ÷ 60	°C
<b>*San</b>	Sanitary setpoint	48.0	25 ÷ 60	°C
<b>Coo2</b>	Second Summer setpoint	18.0	Coo ÷ 25	°C
<b>Hea2</b>	Second Winter setpoint	35.0	25 ÷ Hea	°C

(\*) If sanitary function is enabled, see par. 12.

## 4.4 PASSWORD MENU [PSS]

Enter the password for the desired access level. Confirming the value with the PRG key automatically activates the access level and the menu items enabled by that level will appear. Once you have exited the menus completely, the password privilege is lost and must be entered again.

## 4.5 ALARMS MENU [Err]

This menu allows you to see all active alarms, if any. For more details see par. 9.

## 4.6 PROBES MENU [tP]

Entering with the installer password, the values of the present temperature and pressure sensors can be read in this menu.

tP	DESCRIPTION	UNIT
<b>t01</b>	Water inlet temperature	°C
<b>t02</b>	Water outlet temperature	°C
<b>t03</b>	Compressor suction temperature	°C
<b>t04</b>	Compressor discharge temperature	°C
<b>t05</b>	Outside air temperature	°C
<b>t06</b>	Domestic hot water temperature (if enabled)	°C
<b>t07</b>	System remote probe temperature (if enabled)	°C
<b>t09</b>	Low pressure	bar
<b>t10</b>	High pressure	bar

The number of visible probes depends on the presence or absence of expansion modules.

Particular situation:

Err: probe faulty

--- = probe not used (no function associated to that probe)

## 4.7 DIGITAL INPUTS MENU [Id]

Entering with the installer password, the status of the digital inputs can be view in this menu:

0 = input disabled

1 = input enabled

--- = input not configured



**It is strictly PROHIBITED to disable the digital input ID1, corresponding to the flow switch.**

## 4.8 PARAMETERS MENU [Par]

Entering with installer password, in this menu you can modify the the main parameters of the unit. The parameters are collected in groups, each group is identified by a three-digit code, while the index of each parameter is preceded by a letter.

Par	DESCRIPTION	INDEX OF THE PARAMETER
<b>CnF</b>	Configuration	H--
<b>ALL</b>	Alarms	A--
<b>CP</b>	Compressor	C--
<b>rE</b>	Regulation	b--
<b>PUP</b>	Pump	P--
<b>Fro</b>	Electrical resistances	r--
<b>dFr</b>	Defrosting	d--
<b>LbH</b>	Minimum Hz	L--
<b>rEC</b>	Desuperheater	rE

## 4.9 OPERATING HOURS MENU [oHr]

Entering with the installer password this menu displays the operating hours of the compressor (oH1) and of the circulator (oHP1). It is possible to reset the displayed count by pressing the ESC key for 3 seconds.

## 4.10 LOG MENU [HiSt]

This menu appears, after entering the installer password, only if there is data in the alarm log.

## 4.11 FIRMWARE VERSION MENU [Fir]

Entering with the installer password, in this menu you can read firmware version (uEr), revision (rEu) and sub-revision (SUb).

## 4.12 USB MENU [USB]

This menu appears, after entering the installer password, only if a USB key containing the relevant update files is connected to the card. The available functions are described below.



**CAUTION: The access to the electrical panel is only allowed to QUALIFIED PERSONNEL.**

### 4.12.1 FIRMWARE UPDATE [UPdF]

In case of firmware update, the following steps are necessary:

1. Copy the upgrade files into the main directory of a USB pen;
2. Set the unit to OFF on the keypad and remove power by setting the main switch to OFF;
3. Insert the flash drive into the USB port on the control;
4. Power up the unit, setting the mains switch to the ON position;
5. Access the firmware update menu and start the procedure through the following sequence: PRG -> PSS -> PRG -> (enter installer password) -> PRG -> USB -> UPdF -> PRG
6. A countdown advances on the display, at the end of the procedure the word "boot" appears and the 4 LEDs light up in sequence;
7. Switch off the unit, positioning the main switch on the OFF status;
8. Remove the drive from the USB port;
9. Switch the unit on by turning the main switch to the ON position.

### 4.12.2 PARAMETERS UPDATE [UPPA]

In case of parameters update, the following steps are necessary:

1. Copy the upgrades files into the main directory of a USB pen;
2. Set the unit to OFF on the keypad and remove power by setting the main switch to OFF;
3. Insert the flash drive into the USB port on the control;

4. Power up the unit, setting the mains switch to the ON position;
5. Access the firmware update menu and start the procedure through the following sequence: PRG -> PSS -> PRG -> (enter installer password) -> PRG -> USB -> UPPA -> PRG
6. A countdown advances on the display, at the end of the procedure the word "boot" appears and the 4 LEDs light up in sequence;
7. Remove the drive from the USB port;
8. Switch the unit on by turning the main switch to the ON position.

## 5. SYSTEM RESOURCES

The inputs and outputs (I/O) that can be set to activate the control functions are listed below. To configure the I/O, use the installer password to access the configuration parameters: PRG -> PSS -> PRG -> (enter installer password) -> PRG -> **PAr** -> PRG -> **CnF**.

Resource	Parameter	Terminal block	Factory configuration		Description
			Default value	Function	
ST6	<b>H17</b>	XC-12.1 XC-12.2	0	Not set	Analogue input configurable with an NTC-10KΩ probe at 25°C β 3435
ST7	<b>H18</b>	XC-13.1 XC-13.2	0	Not set	Analogue input configurable with an NTC-10KΩ probe at 25°C β 3435
ST11	<b>H22</b>	XC-19.1 (GND) XC-19.2 (+) XC-20.1 (5V)	0	Voltage input	0-10 Vdc input (XC-19.1/2) Ratiometric / PWM input
DI2	<b>H46</b>	XC-4.1 XC-4.2	0	Remote summer/winter mode change	Voltage free digital input. To activate the function see par.13.2
DI3	<b>H47</b>	XC-3.1 XC-3.2	2	Remote on/off	Voltage free digital input. Active function by default (par. 13.1).
DI9	<b>H53</b>	XC-14.1 XC-14.2	0	Not set	Voltage free digital input
DO3	<b>H81</b>	XP-4.1 (N) XP-4.2 (fase)	22	System integration heater command	Voltage output 230Vac, 50Hz, 2A (AC1) (see paragraph 18.1)
DO6	<b>H84</b>	XP-7.1 (N) XP-7.2 (fase)	6	HDW valve control	Voltage output 230Vac, 50Hz, 2A (AC1) (see paragraph 12)
DO7	<b>H85</b>	XP-8.1 (N) XP-8.2 (fase)	25	Double setpoint valve control	Voltage output 230Vac, 50Hz, 2A (AC1) (see paragraph 15)
Modbus RTU RS485	--	XC-1.1 (GND) XC-2.1 (R-) XC-2.2 (R+)	--	--	Factory enabled with CM accessory

For a detailed description of the terminal block, please refer to the user/installer manual.

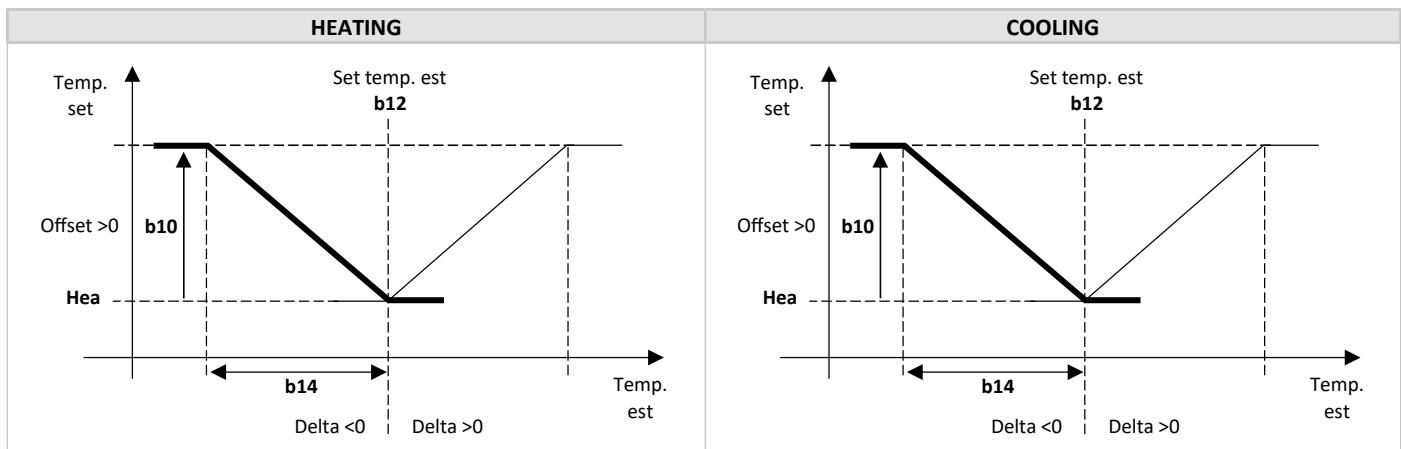
## 6. EDITING DYNAMIC SET-POINT

The regulation control allows you to modify the set-point by adding an offset value depending on the outside air temperature. To use this function, modify the values of the regulation parameters, from b08 to b14, following the information in this paragraph. PRG -> PSS -> PRG -> (enter installer password) -> PRG -> **PAr** -> PRG -> **rE**

Parameters of regulator:

- **b08 = 1** to enable the dynamic set-point / **b08 = 0** to disable the dynamic set-point (default)
- **b09** = maximum cooling offset
- **b10** = maximum heating offset
- **b11** = Cooling outdoor temperature setting
- **b12** = Heating outdoor temperature setting
- **b13** = Cooling temperature delta
- **b14** = Heating temperature delta

Edit the setpoint depending on the outdoor temperature:



EXAMPLE: consider that we want to obtain the following conditions in heating mode:

- set-point of 28°C with external temperature of 18°C
- set-point of 45°C with external temperature of 2°C

Set Hea = 28 e b08 = 1, while the other parameters will be calculated as follows:

- b10 = 45 – 28 = 17
- b12 = 18
- b14 = 2 – 18 = -16

EXAMPLE: consider that we want to obtain the following conditions in cooling mode:

- set-point of 12°C with external temperature of 25°C
- set-point of 7°C with external temperature of 35°C

Set Coo = 12 e b08 = 1, while the other parameters will be calculated as follows:

- b09 = 7 – 12 = -5
- b11 = 25
- b13 = 35 – 25 = 10

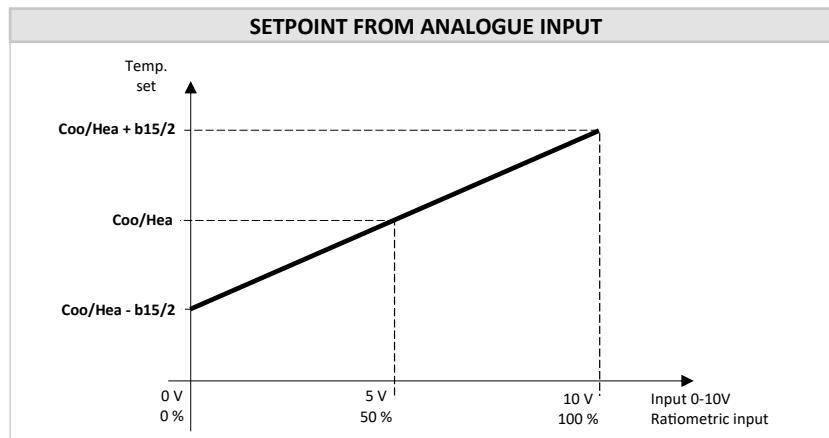
## 7. SET-POINT MODIFICATION FROM ANALOGUE INPUT

Another type of regulation allows the set-point to be modified by adding (or subtracting) a value according to the voltage input ST11. To enable this function it is necessary to connect the signal between the terminals indicated in chapter 5 and set the parameter H22 = 40. To use this function, change the values of the following control parameters:

- **b15** = Maximum decalibration value
- **b20 = 0** for input type 0-10 V (default)
- **b20 = 1** for ratiometric input

Correction calculation with input 0-10 V (b20=0):

- With input at 0 Volt the current set-point will be: set (Coo/Hea) – b15/2
- With 5 Volt input the set-point will be the one set (Coo/Hea)
- With an input at 10 Volt the current set-point will be: set (Coo/Hea) + b15/2



Correction calculation with ratiometric input (b20=1):

- With input at 0% the current set-point will be: set (Coo/Hea) – b15/2
- With input at 50% the set-point will be that set (Coo/Hea)
- With input at 100% the current set-point will be: adjusted set (Coo/Hea) + b15/2



**NOTE:** In cooling mode, considering the default set-point set at 7°C, parameter b15 must not assume a value equal to or greater than 6 to prevent the new set-point from assuming values lower than the activation threshold of the antifreeze resistors (4°C).

## 8. CIRCULATOR

The circulator of the unit can be set in the following operating modes. To configure the circulator is necessary to access the relevant parameter. PRG -> PSS -> PRG -> (insert installer password) -> PRG -> **PAr** -> PRG -> **PUP**

The circulator can be configured to operate independently of the compressor or on call:

- **P03 = 0** for continuous operation (default)
- **P03 = 1** for operation on thermoregulator call

**NOTE:**

The circulator switches off immediately in case of a pump blockage alarm, including a manual reset flow switch alarm.

The circulator remains on with automatic reset flow switch alarm even if the compressor is switched off.

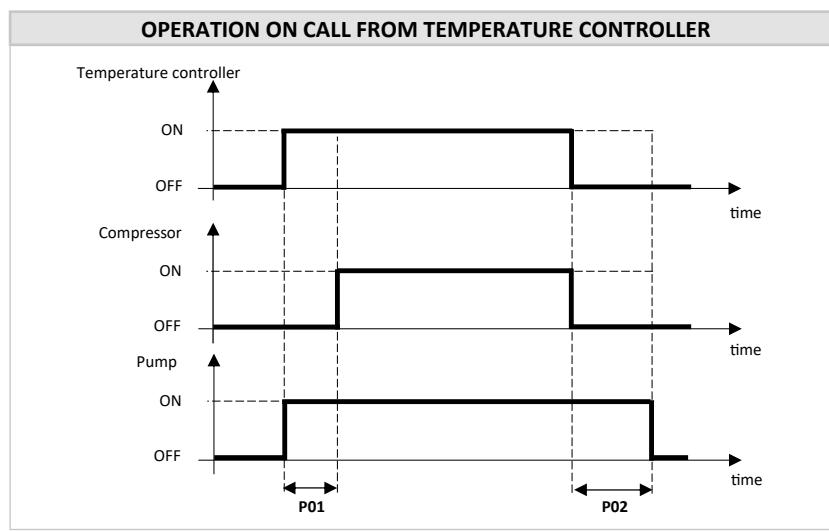
The circulator is always switched on if the anti-freeze resistors are operating or if the anti-freeze hydraulic pump operation is activated.

## 8.1 CONTINUOUS OPERATION

The factory configuration of the unit is for continuous operation (P03 = 0). In this mode, the circulator is only switched off with the unit in OFF, in all other cases it is on. When the unit goes into stand-by, the circulator is switched off with a delay that can be set by parameter P02 in tenths of a minute (default P02 = 20, i.e. 2 minutes).

## 8.2 OPERATION ON CALL BY TEMPERATURE CONTROLLER

Subsequently, the compressor is also switched on, after a delay time of P01 seconds (default P01 = 30) since the pump was switched on. In the switch-off phase, the pump is switched off with a delay time of P02 minutes (default P02 = 2) from the switch-off of the compressor.



## 8.3 OPERATING ON CALL BY TEMPERATURE CONTROLLER WITH PERIODIC ACTIVATION

With P03 = 1, you can also configure the circulator to run periodically according to the following parameters:

- **P16** = Periodic activation time interval (in minutes)
- **P17** = Pump activation time (in seconds)

In practice, when the pump is turned off for satisfied thermoregulation, the countdown defined by parameter P16 begins and at each interval of time P16 the circulator is turned on for a time equal to P17 seconds.

The function is disabled with P17 = 0 (default). The periodic function is suspended in the case of antifreeze mode intervention.

## 8.4 OPERATION WITH INTEGRATION RESISTOR ACTIVE

If parameter r33 > 0, the circulator can also be switched on when the system and/or sanitary heating element is activated.

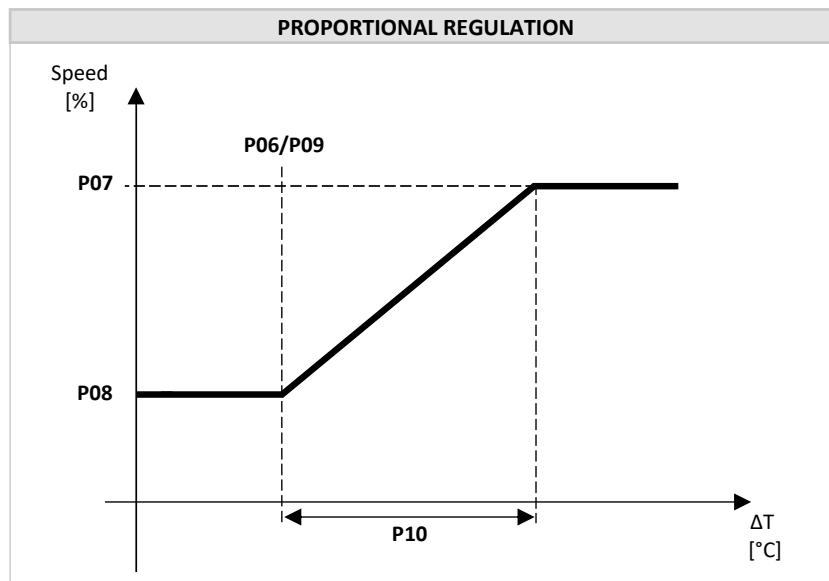
## 8.5 ANTIFREEZE HYDRAULIC PUMP OPERATION

In this mode, the circulator is always on. Antifreeze operation is enabled if the control temperature falls below P04 (default P04 = 5.0°C), it is disabled if the control temperature rises above P04 + P05 °C (default P05 = 2.0°C).

### 8.5.1 PROPORTIONAL REGULATION

In cooling or heating mode, the speed of circulator changes depending on the temperature difference between the inlet water and outlet water of the heat exchanger according to the diagram below, where:

- **P06** = Set  $\Delta T$  water inlet/outlet in heating mode (default P06 = 4,0°C)
- **P07** = Maximum speed (100%)
- **P08** = Minimum speed
- **P09** = Set  $\Delta T$  water inlet/outlet in cooling mode (default P09 = 2,0°C)
- **P10** = Modulating pump Delta (default P10 = 3,0°C)



In practice, in cooling mode, if the temperature difference between the inlet and outlet is greater than  $P09 + P10$ , the circulator runs at maximum speed, but if the difference is less than  $P09 - 0.2^\circ\text{C}$ , it runs at minimum speed; in the remaining cases, the pump modulates the speed proportionally. In heating mode, the same considerations apply, replacing parameter P06 with parameter P09. In sanitary production the circulator always runs at maximum speed.

## 8.6 SYSTEM VENTING

The control allows the use of a manual system venting function with the circulator at maximum speed.

To enable the function the operations to follow are:

- Set unit to OFF
- Access with maintenance privilege PRG -> PSS -> PRG -> (enter installer password) -> PRG
- Press **UP** and **DOWN** simultaneously for 3 seconds.

It is possible to exit the system venting cycle manually by pressing the **MODE/ESC** button, or by pressing **UP** and **DOWN** keys simultaneously for 3 seconds.



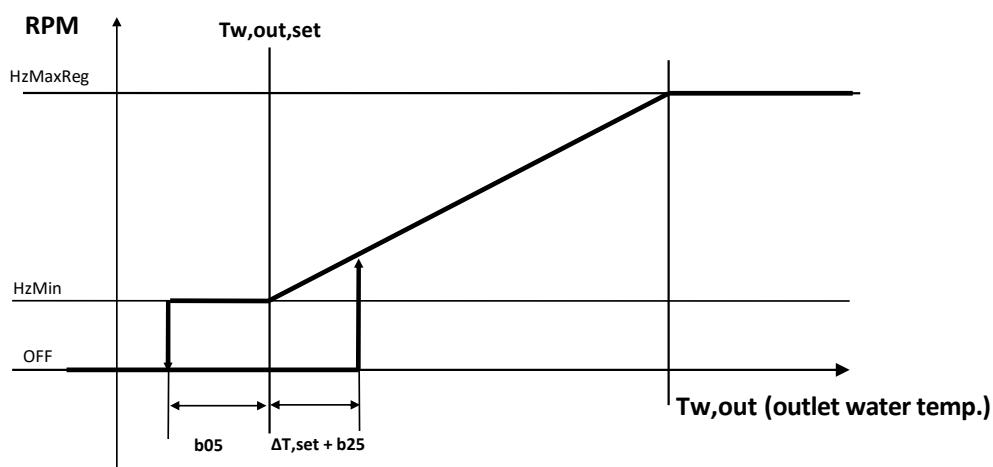
**CAUTION:** During this function the flow switch alarm is disabled, the maintenance technician must guarantee that there is water inside the system.

## 9. COMPRESSOR ON/OFF LOGIC

The restart of compressors is in operation of a set point referred to the inlet and outlet water temperature. It is based on calculation of  $\Delta T, set$  that is the difference between outlet and inlet water temperatures, detected while the compressor for thermoregulation is turning off.

### 9.1 REGULATION IN COOLING MODE

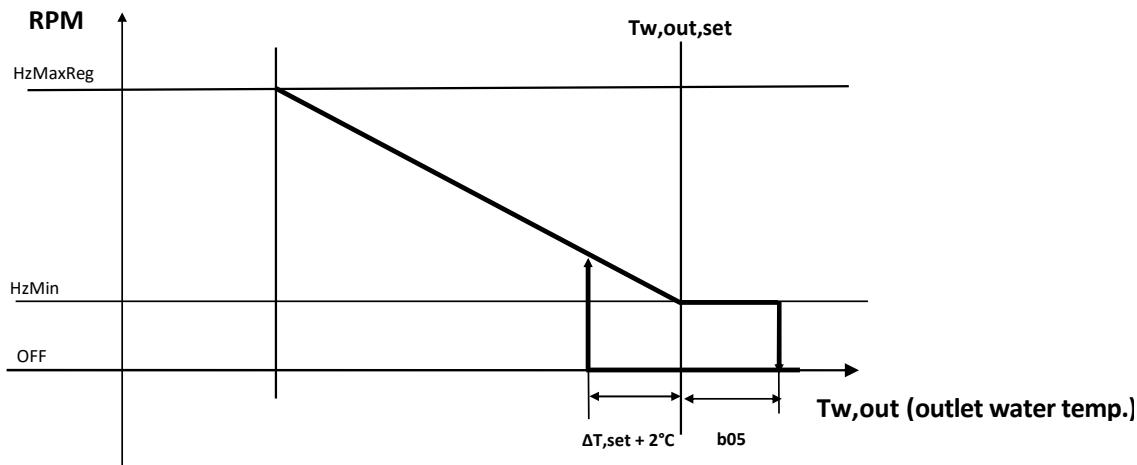
- $Tw,out,set$  = setpoint in cooling mode
- $\Delta T, set = Tw,out,set - Tw,in,set$
- $b05$  = compressor delta cut-off set =  $0,2^\circ\text{C}$  (default)
- $b25$  = delta cut-on regulation compressor set =  $2^\circ\text{C}$



- The compressor shutdown is set by the parameter b05: the compressor shutdown when  $T_{w,out} < T_{w,out, set} - b05$
- The compressor restart when  $T_{w,out} > (T_{w,out, set} + \Delta T_{set} + b25)$  **EXCEPTION:** se  $\Delta T_{set} > 8^\circ\text{C}$ , the compressors restart when the discharge probe temperature is lower than the setpoint  $10^\circ\text{C}$ :  $T_{w,out} > (T_{w,out, set} + 10^\circ\text{C})$

## 9.2 REGULATION IN HEAT MODE

- $T_{w,out, set}$  = setting setpoint in heat mode
- $\Delta T_{set}$  =  $T_{w,out, set} - T_{w,in, set}$
- $b05$  = compressor regulation delta cut-off =  $0,2^\circ\text{C}$  (default)
- $b25$  = compressor regulation delta cut-on =  $2^\circ\text{C}$



- The compressor shutdown is regulated by parameter b05: the compressor shutdown when  $T_{w,out} > T_{w,out, set} + b05$
- The compressor restart when  $T_{w,out} < (T_{w,out, set} - \Delta T_{set} - b25)$

**EXCEPTION:** if  $\Delta T_{set} > 8^\circ\text{C}$ , the compressors restart when the discharge probe temperature is lower than the setpoint  $10^\circ\text{C}$ :  $T_{w,out} < (T_{w,out, set} - 10^\circ\text{C})$

## 10. FAN

The unit's fan is controlled depending on the operation of the compressor. Ventilation is controlled according to the condensing pressure in cooling mode or according to the evaporating pressure in heating mode. Pre-ventilation takes place every time the compressor is switched on and off.

### 10.1 SILENCED VENTILATION

Configuring a digital input DI9 with parameter H53=25 it is possible to manage the function of silent ventilation management.

Parameter	Value	Function
H53	0 (default)	Function disabled
	25	Open contact -> standard mode Close contact -> silenced mode

With the function active, the noise, output and power of the unit are limited, for additional information see the installer user manual.

## 11. COMPRESSOR CRANKCASE RESISTENCE

The crankcase resistance is activated if the compressor has been off for at least 30 minutes and if the temperature measured by the discharge probe is below  $20^\circ\text{C}$  (with a hysteresis of  $2.0^\circ\text{C}$ ). When the compressor restarts, the crankcase resistance is disabled.

## 12. ENABLING DOMESTIC HOT WATER PRODUCTION

To enable the production of domestic hot water it is necessary to connect a probe to the analogue input ST6 to be positioned inside the tank (the relative terminals are indicated in chapter 5 or on the electrical diagram). Once the DHW temperature probe has been positioned and connected, it must be enabled by setting parameter **H17 = 6**.

The DHW valve must be connected to digital output DO6 (see Chapter 5), and the relative control must also be enabled with parameter **H84 = 6** (default).

The domestic hot water (DHW) function is controlled through parameter **H10**:

Parameter	Value	Function
H17	6	DHW temperature probe
H84	6	DHW valve control

Parameter	Value	Function
H10	0 (default)	Function disabled
	1	Function active in heating and cooling mode. The remote on/off function does not disable DHW production.
	2	Function active in heating and cooling mode. The remote on/off function disables DHW production.
	3	Function active only in heating mode The remote on/off function disable DHW production.
	4	Function active only in heating mode The remote on/off function disable DHW production
	5	Function active only in cooling mode The remote on/off function not disable DHW production
	6	Function active only in cooling mode The remote on/off not disable DHW production

If the DHW temperature is lower than the DHW set (set to 48°C by default), the machine activates the DHW valve and the compressor is set to the maximum frequency, starting the modulation one degree before the set and switching off one degree after the set. Once the set point has been reached, the valve returns to rest mode and the compressor starts to regulate normally. Switching from winter operation to domestic hot water operation, the compressor does not switch off, while switching from summer operation to domestic hot water operation the compressor is switched off to wait for the safety time.

If **H10** = 1/2/3, switching the unit off remotely (remote on/off, see paragraph 13.1) does not affect the DHW operation.

If **H10** = 2/4/6, the remote on/off function disables domestic hot water production and operation of the unit in heating or cooling mode.



**NOTE: defrosting during winter operation is always performed on the user side, never on the domestic hot water tank.**

## 12.1.1 MEMORISING THE PROBE IN HEATING MODE

When switching from the system to DHW, the reference probe changes from "water outlet probe" to "DHW probe". The display on the machine shows the temperature read by the probe located inside the DHW tank; once the DHW cycle is over, the display returns to show the water outlet temperature. In heating mode, before entering DHW mode, the last value read by the flow probe of the heat pump is memorised. Once the DHW temperature control is satisfied, the reference temperature on the system side returns to the previously memorised one. The memory function is interrupted:

- when the temperature read by the probe becomes lower than the stored value;
- or a time equal to **b06** seconds has elapsed (default **b06** = 45).

## 12.1.2 HEATING MODE ON DHW STORAGE TANK

If parameter **H130** = 1, the machine also uses the DHW storage tank for heating on the system side. Under these conditions, the DHW valve output is also active during hot operation. The valve is deactivated during defrosting and in cold mode. In this mode (**H130** = 1) it is possible to make the domestic hot water integration resistor also act as integration resistor on the plant side.

## 12.1.3 INSUFFICIENT HEAT EXCHANGE IN A DHW SYSTEM

During DHW production, if the heat pump flow probe detects a temperature higher than 60°C, the DHW valve output is de-energised (DO6), and the value of the DHW probe at this time is recorded (Ts<sub>an, set</sub>).

- if the operation is San or Cool+San the compressor is stopped.
- if the operation is Heat+San, the system evaluates for **b06** seconds whether there is a demand for heating from the system. If the system requires it, the compressor continues to work on the system, otherwise it is switched off.
- if the DHW resistor is present (e.g. DO3, H81=26), r15 = 0 or 1 and r24=2 or 3 it is activated until the DHW setpoint detected by the DHW probe is met (and any offset).

The compressor restarts when the flow temperature of the heat pump falls below 60°C again and the temperature measured by the DHW probe is lower than Ts<sub>an, set</sub> - 4°C.

## 13. REMOTE FUNCTION

The terminal block has digital inputs to control the unit via an external consent (see chapter "5. SYSTEM RESOURCES").

### 13.1 ON/OFF

The function is enabled by default on digital input DI3 (parameter **H47** = 2), to activate it, the electrical bridge must be removed from the terminal block. With the contact open, the unit will be in stand-by mode, in this state the message E00 will appear on the display on the machine. When the contact is closed, the machine comes out of stand-by and the circulator is activated for 2 minutes.

The function is disabled by reinserting the electrical bridge or setting parameter **H47** = 0.



**NOTE: If the remote off command is activated during defrosting, the unit finishes defrosting and then switches to OFF mode.**

## 13.2 SUMMER/WINTER MODE CHANGE

The control offers the possibility to remotely manage the operating mode of the machine in heating or cooling mode. The function can be set on digital input is settable DI2 via parameter **H46**:

Parameter	Value	Function
<b>H46</b>	0 (default)	Function disabled
	3	Open contact -> cooling mode Closed contact -> heating mode

The polarity of the digital input DI2 can be reversed by setting H75 = 2.

## 13.3 DHW CALL FROM DIGITAL INPUT

If DHW operation is enabled and parameter **H51 = 28**, is set, as an alternative to using the DHW temperature probe (H17 = 0), the DHW function can be activated by closing/opening digital input DI7. The unit goes into DHW mode when the contact closes and exits DHW production when the contact opens.

The polarity of digital input ID7 can be inverted by setting H75 = 64.



**NOTE:** this function is not activated if the double set-point management is used.

This function is recommended when using two or more heat pumps in cascade, hydraulically connected to the same domestic hot water storage tank. In this case, the activation of the domestic hot water function can be set on the first machine via the DHW probe of the tank, while the other machines are automatically enabled thanks to the consent given by the digital input.



**CAUTION:** The SAN setpoint of the heat pump is not considered; management of this setpoint is delegated to the designer, who must take into account the DHW protection and the configuration of the entire system.

## 13.4 SYSTEM WATER REMOTE PROBE

In some system solutions (e.g.: heat pump in parallel with the boiler on the same hydronic circuit and exclusion diverter valve) it may be necessary to enable a temperature probe of the system so that the on-board control can process the management correctly. The system remote probe is activated by setting parameter **H18 = 41**.

The system remote probe thermoregulates the heat pump only during the compressor start-up phase, the switch-off is managed by the probe on the heat pump delivery.

In heating mode, the call is active if the following conditions are verified:

- Flow probe temperature < **Hea - 2°C**;
- Temperature of the system remote probe < **Hea - b22** (default b22 = 5,0°C).

In cooling mode the call is active if the following conditions occur

- Flow probe temperature > **Coo + 2°C**;
- Temperature of the system remote probe > **Coo + b22** (default b22 = 5,0°C).

## 14. DEFROSTING CYCLE

The defrost cycle is a function active only in heat pump mode and is used to prevent the formation of ice on the surface of the finned coil. The formation of ice on the evaporator, which occurs more frequently at very low external ambient temperatures, not only considerably reduces the thermodynamic efficiency of the machine, but also leads to the risk of damage to the machine itself.



**NOTE:** if the remote off command is activated during defrosting, the unit finishes defrosting and then switches to OFF mode.

## 15. DOUBLE SET-POINT

This function introduces a second working set-point on the plant side, both in cooling and heating mode.

The user terminal board allows a consent to be connected to switch from the first to the second set-point and configured at digital input DI9 with parameter **H53 = 26**. The valve, on the other hand, is connected in the terminal board to digital output DO7 and is configured via parameter **H85**.

Parameter	Value	Function
<b>H53</b>	26	Call for second set-point
<b>H85</b>	25	3-way valve for radiant panels

Parameter	Value	Function
H129	0	Function disabled
	1	Function configured but not active
	2	Enabled only in cooling mode
	3	Enabled only in heating mode
	4	Enabled in cooling and heating mode

## 16. MINIMUM HZ FUNCTIONS

Configuring parameter L02=1 and L03≠0 reduces the nominal operating Hz of the compressor.

Parameter	Value	Function
L02	0	Function not active
	1	Enable Hz minimum
L03	0	Function not active
	1	Function active only in cooling mode
	2	Function active only in heating mode
	3	Function active only in sanitary mode
	4	Function active in cooling and sanitary mode
	5	Function active in heating and sanitary mode
	6	Function in cooling and heating mode
	7	Function always active

With the function active, the output and power of the unit are limited, for additional information see the technical bulletin in chapter 2.

## 17. MAXIMUM HZ FUNCTIONS

When the function is activated, the power of the unit is increased, for information contact the company.

## 18. AUXILIARY RESISTANCES

In some system solutions it may be necessary to use an integration heater for the system and/or for the sanitary area. This is an additional resource for heating in case the compressor cannot meet the set in a reasonable time. The resistor controller only operates in heating mode and if **r10 = 1**.

To define how the integration resistors are to operate, parameter **r24** must be set:

- **r24 = 0** for integration resistors not used;
- **r24 = 1** for use of system integration resistor;
- **r24 = 2** for use of sanitary integration resistance;
- **r24 = 3** for use of both the system integration resistor and the sanitary integration resistor.

### 18.1 SYSTEM RESISTANCE

The system resistance must be connected to the digital output DO3 and can be configured by setting parameter **H81 = 22**.

If the regulation temperature remains lower than the hot water set-point **Hea - r11** (°C) for a time equal to **r12** the integration resistor is activated according to the operation of the machine in the combined or replacement bands.

The resistor is also activated if the control temperature remains below the water set-point **Hea - r11** (°C) and the machine is in lockout due to the intervention of an alarm. It switches off when the machine exits the alarm block.

Setting **r21 = 1**, during the defrost cycle, if required (temperature lower than **Hea - r11**), the system resistor is activated without waiting for the time defined by **r12**.

The resistor switches off when the set-point is reached (also taking into account any offset set with parameters **r29** or **r30**).

Parameter	Value	Function
<b>H81</b>	22	System integration resistance
<b>r10</b>	1	Enabling of system resistors
<b>r11</b>	5 (default)	Delta resistances in system integration (in tenths of °C)
<b>r12</b>	10 (default)	System integration activation delay (in minutes)
<b>r21</b>	1	Enabling resistors during defrosting
<b>r24</b>	1/3	Type of use resistors

### 18.2 SANITARY RESISTANCE

This function can be activated as an alternative to the system integration resistance. The DHW resistance must be connected to digital output DO3 and can be configured by setting parameter **H81 = 26**, in addition the DHW function must be active.

The resistance is activated if the production of domestic hot water lasts longer than **r16** (minutes) or if the machine goes into lockout due to the intervention of an alarm. It switches off when the machine finishes DHW production (also taking into account any offset on the set-point set with parameter **r31**).

Parameter	Value	Function
<b>H81</b>	26	DHW integration resistor
<b>r15</b>	1	Enabling of DHW resistors
<b>r16</b>	10 (default)	Sanitary integration activation delay (in minutes)
<b>r24</b>	2/3	Type of use of resistance

## 18.3 INDIVIDUAL SYSTEM/HEALTH INTEGRATION RESISTENCE

Configuring the DHW resistance it is also possible to use it as a system resistor, by setting the parameter **r15 = 2** and **r24 = 3**. In this way, in the event of a request for system integration, the resistance declared as DHW integration is activated, thus making it possible to have a single integration resistance for the system, DHW and defrosting.

## 18.4 INTEGRATION RESISTANCE SELECTION MODE

The resistors can be activated simultaneously if **r14 = 0** (default), otherwise the priority of the order of activation of the system-side and DHW-side integration resistors can be set, in particular the configurations are:

- **r14 = 1** for resistance activation in exclusion of each other;
- **r20 = 0** for system priority (the domestic heating element is activated only if the system-side thermoregulation is satisfied);
- **r20 = 1** sanitary priority (the system resistor is activated only if the thermoregulation on the sanitary side is satisfied).

## 18.5 CIRCULATOR MANAGEMENT WITH ACTIVE RESISTANCE

The circulator of the heat pump can be activated when the plant and/or DHW integrations resistances are active with the compressors not running (by substitution, by alarm or by integration in bracket II or III):

- **r33 = 0** for activation on request of the compressors or for any boiler request.
- **r33 = 1** for activation with system resistance active.
- **r33 = 2** for activation with sanitary heating element active.
- **r33 = 3** for activation with system or sanitary resistor active.

The circulator switched off after post-pumping (P02).

## 18.6 BOILER ENABLING

Function which can be activated instead of managing the double setpoint.

This is an additional resource to enable the boiler in integration or substitution of the heat pump.

The relative digital output for enabling the boiler is DO7, it can be configured by setting parameter **H85 = 29**.

Define the mode of use by setting parameter **r23**:

- **r23 = 0** (default) for boiler not used (priority of resistor intervention);
- **r23 = 1** for boiler use on system only (priority of resistor intervention);
- **r23 = 2** for boiler use only in DHW mode (priority intervention of the heaters);
- **r23 = 3** per utilizzo caldaia sia in sanitario sia su impianto (priorità di intervento delle resistenze);
- **r23 = 4** for boiler use in DHW and on system (priority intervention of resistors);
- **r23 = 5** for boiler use only in DHW mode with priority;
- **r23 = 6** for boiler use in DHW mode and on system with priority;

Define the boiler equipment by setting parameter **r32**:

- **r32 = 0** for boiler without circulator with thermoregulation charged to the heat pump;
- **r32 = 1** for boiler with autonomous circulator with thermoregulation charged to the heat pump;
- **r32 = 2** for boiler without circulator with autonomous thermoregulation;
- **r32 = 3** for boiler equipped with circulator with autonomous thermoregulation.

Parameter	Value	Function
<b>H81</b>	29	Boiler enabling
<b>r10</b>	1	Enabling in system integration
<b>r12</b>	10 (default)	System integration activation delay (in minutes)
<b>r15</b>	1	Enabling of sanitary integration
<b>r16</b>	10 (default)	DHW integration activation delay (in minutes)
<b>r23</b>	1 ÷ 6	Type of boiler use
<b>r32</b>	1 ÷ 3	Boiler equipment

## 18.7 LOGIC OF INTEGRATION HEATERS AND/OR BOILER IN JOINT OPERATION OR IN SUBSTITUTION OF THE HEAT PUMP COMPRESSOR

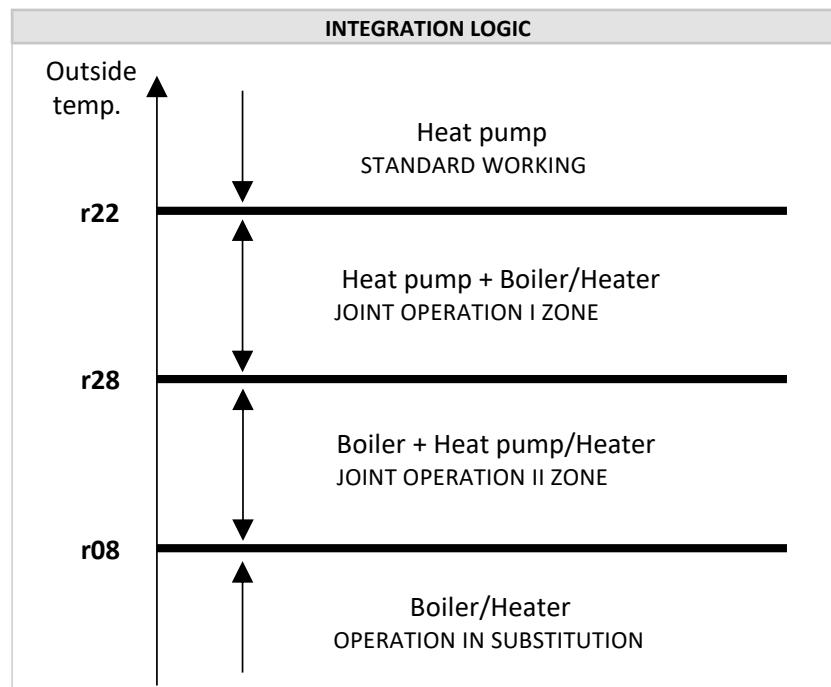
The auxiliary parts that can be used for joint or for operation in substitution are:

- boiler
- system integration resistor
- domestic hot water integration resistor

The parameters to be considered for adjusting this operating logic are:

- **r22** = set for joint operation with heat pump priority
- **r28** = set for joint operation with priority of auxiliary units
- **r08** = set for replacement operation

Considering the heating and/or DHW operating modes, there are 4 operating areas:



If it is necessary to change the values of the parameters, the formula  $r22 \geq r28 \geq r08$  must be followed.

Setting  $r22 = r28$  it is possible to eliminate the zone relative to joint operation 1st band; by setting  $r28 = r08$  it is possible to eliminate the zone relative to joint operation 2nd band; by setting  $r22 = r28 = r08$  it is possible to eliminate both bands relative to joint operation.

The intervention priorities of the auxiliary heaters are defined by parameters **r14**, **r20**, **r23**, **r24** (as described above).



**CAUTION:** Parameter **r08** must not be set to a value lower than  $-20^{\circ}\text{C}$ , as this could impair the operation of the unit.

## 18.8 OPERATION HEAT PUMP MODE

Normal operation of the heat pump in which the integration heaters and/or the boiler only intervene when a heat pump alarm is triggered.

## 18.9 JOINT OPERATION (I BRACKET)

If the outdoor temperature is between **r22** and **r28**, the compressor operates in synergy with the auxiliary heaters in winter or DHW mode. In this operating bracket, first the heat pump is activated and after **r12** minutes the plant side auxiliary heaters, or after **r16** minutes the sanitary side auxiliary heaters.

Operation returns to normal if the outside temperature is greater than  $r22 + 1,0^{\circ}\text{C}$ .

**Note:** In the joint operation band, the boiler is thermoregulated by the system water remote probe (if active), in particular if the temperature detected by the remote probe is lower than the **Hea** setpoint, the boiler is activated, and then deactivated when the temperature detected by the remote probe is higher than **Hea** setpoint. The heat pump is also thermoregulated by the system water remote probe (as described above). If the remote system water probe is not active, the boiler is controlled by the flow probe of the heat pump.

## 18.10 JOINT OPERATION (II BRACKET)

If the outside temperature is between **r28** and **r08**, the auxiliary heaters are enabled in combination with the heat pump in heating or DHW mode. In this operating range, the boiler is activated first, then the heat pump and auxiliary heaters are activated after a time defined by **r12** minutes for the system side or after **r16** minutes for the DHW sanitary.

Operation returns to normal if the temperature rises above  $r28 + 1,0^{\circ}\text{C}$ .

**Note:** In the joint operation band, the boiler is thermoregulated by the remote system water probe (if active), in particular if the temperature detected by the remote probe is lower than the **Hea** setpoint, the boiler is activated, and then deactivated when the temperature detected by the remote probe is higher than **Hea** setpoint. The heat pump is also thermoregulated by the system water remote probe (as described above). If the remote system water probe is not active, the boiler is controlled by the flow probe of the heat pump.

## 18.11 OPERATION IN SUBSTITUTION

If the outside temperature falls below **r08** the heat pump compressor is disabled and the auxiliary devices operate in place of it. The compressor is enabled again if the temperature rises above **r08 + r09** (default **r09 = 1.0 °C**).

If the auxiliary system consists of system and/or DHW resistors, they operate according to the times defined by parameters **r12** (minutes) for the system side and **r16** (minutes) for the DHW side. In the substitution operation band, it is not necessary to enable the integrations with **r10** or **r15** since the resistances must operate as a replacement for the heat pump (it is therefore sufficient to select the type of use from parameter **r24**).

If the auxiliary system is a boiler with autonomous thermoregulation (**r32 = 2 or 3**), it is enabled independently of the thermoregulation of the heat pump.

If the replacement auxiliary system is a boiler without a circulator (**r32 = 0 or 2**), the heat pump circulator is active when the boiler is enabled. If the auxiliary system is a boiler with its own circulator (**r32 = 1 or 3**), the heat pump circulator is switched off and after **P01** (default 30 seconds) the boiler is enabled.



**NOTE: in the event of water-side antifreeze protection, the circulator is still activated (or kept active).**

## 18.12 OPERATING BANDS

The possible configurations of the integration parameters are listed in tables 1,2,3 and 4 shown below, divided by operating brackets (In the boxes relating to the parameters **rXX** are indicated the possible values of the parameters for a given order of intervention of the integrations to occur in a given operation of the machine).

**TABLE 1. NORMAL OPERATING IN HEAT PUMP MODE**

INTEGRATIONS INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) System integration resistance	HEAT/ HEAT+SAN	HEAT	1	0/1/2	/	/	0/2/5	1/3
1) Boiler	HEAT/ HEAT+SAN	HEAT	0/1/2	0/1/2	/	/	1/3/4/6	0/2
1) Plant integration resistance 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	1/3	1/3
1) Boiler 2) After r12 minutes, system integration resistance	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	4/6	1/3
1) DHW integration resistance	HEAT+SAN	SANITARY	0/1	1	/	/	0/1/4	2/3
1) Boiler	HEAT+SAN/ COOL+SAN	SANITARY	0/1	0/1/2	/	/	2/3/5/6	0/1
1) DHW integration resistance 2) After r16 minutes, boiler	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	2/3	2/3
1) Boiler 2) After r16 minutes, DHW integration resistance	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	5/6	2/3
1) System/DHW integration resistance	HEAT / HEAT+SAN	HEAT/SANITARY	1	1	/	/	0	3
1) Boiler	HEAT / HEAT+SAN	HEAT/SANITARY	0/1	0/1/2	/	/	3/6	0
1) System/DHW integration resistance 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT/SANITARY	1	1	Set the minutes	Set the minutes	3	3
1) Boiler 2) After r12 minutes, system/DHW inte- gration resistance	HEAT / HEAT+SAN	HEAT/SANITARY	1	1	Set the minutes	Set the minutes	6	3

**TABLE 2. JOINT OPERATION, BRACKET 1**

INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Heat pump 2) After r12 minutes, system integration resistance	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	0/2/5	1/3
1) Heat pump 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	1/3/4/6	0/2
1) Heat pump 2) After r12 minutes, system integration resistance 3) After further r12 minutes, boiler	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	1/3	1/3
1) Heat pump 2) After r12 minutes, boiler 3) After further r12 minutes, system in- tegration resistance	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	4/6	1/3
1) Heat pump 2) After r16 minutes, system integration resistance	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	0/1/4	2/3
1) Heat pump 2) After r16 minutes, boiler	HEAT+SAN/	SANITARY	0/1	0/1/2	/	Set the minutes	2/3/5/6	2/3

**TABLE 2. JOINT OPERATION, BRACKET 1**

INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Heat pump 2) After r16 minutes, system integration resistance 3) After further r16 minutes, boiler	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	2/3	2/3
1) Heat pump 2) After r16 minutes, boiler 3) After further r16 minutes, system integration resistance	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	5/6	2/3
1) Heat pump 2) After r12 minutes, system/DHW integration resistance	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	0	3
1) Heat pump 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT / SANITARY	0/1	0/1/2	Set the minutes	Set the minutes	3/6	0
1) Heat pump 2) After r12 minutes, system/DHW integration resistance 3) After further r12 minutes, boiler	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	3	3
1) Heat pump 2) After r12 minutes, boiler 3) After further r12 minutes, system/DHW integration resistance	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	6	3

**TABLE 3. JOINT OPERATION, BRACKET 2**

INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Boiler 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	1/3/4/6	0/2
1) Boiler 2) After r12 minutes, system integration resistance 3) After further r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	1/3	1/3
1) Boiler 2) After r12 minutes, heat pump 3) After further r12 minutes, system integration resistance	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	4/6	1/3
1) System integration resistance 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	0/2/5	1/3
1) Boiler 2) After r16 minutes, heat pump	HEAT+SAN	SANITARY	0/1	0/1/2	/	Set the minutes	2/3/5/6	0/1
1) Boiler 2) After r16 minutes, system integration resistance 3) After further r16 minutes, heat pump	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	2/3	2/3
1) Boiler 2) After r16 minutes, heat pump 3) After r16 minutes, system integration resistance	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	5/6	2/3
1) System integration resistance 2) after r16 minutes, heat pump	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	0/1/4	2/3
1) Boiler 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	3/6	0
1) Boiler 2) After r12 minutes, system/DHW integration resistance 3) After further r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	3	3
1) Boiler 2) After r12 minutes, heat pump 3) After further r12 minutes, system/DHW integration resistance	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	6	3
1) system/DHW integration resistance 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	0	3

**TABLE 4. OPERATION IN SUBSTITUTION**

INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Boiler 2) After r12 minutes, system integration resistance	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	4/6	1/3
1) System integration resistance 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	1/3	1/3

**TABLE 4. OPERATION IN SUBSTITUTION**

INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Boiler 2) After r12 minutes, system integration resistance	HEAT+SAN	SANITARY	0/1	0/1/2	/	Set the minutes	5/6	2/3
1) Sanitary integration heater 2) After r12 minutes, boiler	HEAT+SAN	SANITARIO	0/1	0/1/2	/	Set the minutes	2/3	2/3
1) Boiler 2) After r12 minutes, system/ sanitary integration resistance	HEAT / HEAT+SAN	HEAT/SANITARY	0/1	0/1/2	Set the minutes	Set the minutes	6	3
1) System/ sanitary integration resistance 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT/SANITARY	0/1	0/1/2	Set the minutes	Set the minutes	3	3
1) Boiler	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	1/3/4/6	0/2
1) System integration resistance	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	0/2/5	1/3
1) Boiler	HEAT+SAN	SANITARY	0/1	0/1/2	/	Set the minutes	2/3/5/6	0/1
1) Sanitary integration resistance	HEAT+SAN	SANITARY	0/1	0/1/2	/	Set the minutes	0/1/4	2/3
1) Boiler	HEAT / HEAT+SAN	HEAT / SANITARY	0/1	0/1/2	Set the minutes	Set the minutes	3/6	0
1) System/DHW integration resistance	HEAT / HEAT+SAN	HEAT / SANITARY	0/1	0/1/2	Set the minutes	Set the minutes	0	3

Table 5 shows the settings to be configured to enable the integrations COOL + SAN mode.

In this case, the only integration that can be activated is the domestic hot water integration resistor and the division into operating bands does not apply. The DHW integration resistor is activated when the set-point is satisfied after **r16** minutes from the compressor start-up or when the set-point is not satisfied with the machine in lockout or alarm.

**TABLE 5.OPERATION IN COOL+SAN MODE (DHW RUNNING)**

INTEGRATION INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) DHW integration resistance	COOL+SAN	SANITARY	0/1	1	/	Set the minutes	0/1/2/3/4/5/6	2/3

Table 6 shows the behaviour of the plant and DHW integration heaters in all the operating modes of the unit.

**TABLE 6. INTEGRATION HEATERS OPERATION**

STATUS	OPERATION	PLANT INTEGRATION RESISTENCE	DHW INTEGRATION RESISTENCE
HEAT+SAN	HEAT	Works as indicated in TABLES 1, 2, 3 and 4.	DHW thermoregulation takes precedence over the system thermoregulation, so if the thermoregulation requires it, the machine switches to "DHW" operation and the DHW integration resistor behaves as indicated in TABLES 1, 2, 3 and 4.
HEAT+SAN	SANITARY	Only if all 3 of the following conditions are met: system heater output configured, <b>r24 = 1/3</b> , remote system water temperature probe present and configured. the system integration resistor is activated in the following cases: <ul style="list-style-type: none"> <li>• after <b>r12</b> minutes from the beginning of its previously activated count in "HEAT" mode (see previous line);</li> <li>• if not already activated its counting in the previous "HEAT" operating mode, after <b>r12</b> minutes from the thermoregulation request.</li> </ul> In HEAT mode, with remote probe not configured, the plant integration resistor is deactivated or its counting is interrupted. With open remote on-off contact, the plant integration resistor is deactivated.	Works as indicated in TABLES 1,2,3 and 4.
COOL+SAN	SANITARY	Not active	Works as indicated in TABLE 5.
COOL+SAN	COOL	Not active	Not active

## 18.13 AUXILIARY SYSTEMS OFFSET MANAGEMENT

Setting offsets, it is possible to establish that the boiler and/or integration resistors (depending on the selected resources and priorities) have a higher setpoint in heating or DHW mode than the heat pump:

- **r29** = temperature offset for boiler and system resistors first set point (**Hea**);

- **r30** = Temperature offset for boiler and system resistors second set point (**Hea2**);
- **r31** = temperature offset for boiler and domestic hot water heaters (**San**).

In this way the heat pump will stop at the set point and the thermal jump, according to the set offset, will be borne by the boiler and/or the integration resistors.

## 19. ANTIFREEZE PROTECTION RESISTANCES (IF KA ACCESSORY IS PRESENT)

In units with KA accessory, this function is active from the factory configuration. The kit consists of an antifreeze heater positioned on the exchanger on the system side and a heating cable placed on the base of the unit. The installer can modify the operation of the antifreeze resistors by accessing the relative parameter menu:

PRG -> PSS -> PRG -> (enter installer password) -> PRG -> **PAr** -> PRG -> **Fro**

In heating mode, the water antifreeze heater is activated when the flow water temperature falls below **r02** (default  $r02 = 4,0^{\circ}\text{C}$ ), it is switched off when the temperature measured by the outlet water probe exceeds **r02 + r06**  $^{\circ}\text{C}$ .

If the unit is in OFF or cooling mode, the water antifreeze heater is activated when the flow water temperature falls below **r03** (default  $r03 = 4,0^{\circ}\text{C}$ ), it switches off when the temperature measured by the outlet water probe exceeds **r03 + r06**  $^{\circ}\text{C}$ .

The crankcase heater, on the other hand, switches on when the outside air temperature falls below  $3^{\circ}\text{C}$  and switches off when the outside temperature exceeds  $5^{\circ}\text{C}$ .

## 20. PARTIAL RECOVERY WITH DESUPERHEATER (IF DS ACCESSORY IS PRESENT)

This option allows to produce free hot water through partial heat recovery by desuperheating the gas from the compressor outlet. Units with DS accessory are equipped with a control expansion board. It allows the connection of a recovery gas outlet temperature. To enable operation set the following parameters, connect the DS water temperature probe to terminal XC-12.1/12.2 and the recovery gas outlet temperature probe located in the gas pipe of the XCE-1.1-1.2 desuperheater:

Parameter	RESOURCE	VALUE	TERMINAL	Function
rE01	-	1	-	DS enabled
rE02	-	0/1	-	0= Recovery enabled in Cooling only 1= Recovery enabled in Cooling and Heating
rE13	-	$5^{\circ}\text{C}$	-	Offset set point recovery in cooling
rE14	-	$5^{\circ}\text{C}$	-	Offset set point recovery in heating
H17	ST8	6	XC-12.1/12.2	DHW temperature probe
H27	ST5E	28	XCE-1.1/1.2	Recovery gas outlet temperature probe

The utility of this function is for the maintenance of domestic hot water. It is not indicated for heating storage heating.

Recovery is enabled for operation if all the following conditions are met:

- Compressor in operation.
- Defrosting is not in progress and is not counting to enter defrost mode.
- There are no safety controls or restrictions active.

The DS call is activated if the temperature detected by the probe falls below the setpoint **San** –  $4,0^{\circ}\text{C}$  and is deactivated when the temperature exceeds the setpoint **San**.

For more information see the technical bulletin of the unit.



**NOTE:** The partial recovery function does not activate if a defrost is in progress or if the countdown to enter defrost is in progress.

## 21. LOGICS THAT CAN BE ACTIVATED WITH GI MODULE - SYSTEM MANAGEMENT (ACCESSORY)

If the System Management kit (optional) is present, a second control is located inside the electrical panel that acts as an I/O resource expansion module. With this second control it is possible to increase the number of logics that can be managed by the main control; in particular, these logics are used for system management and are listed below:

Parameter	VALUE	Function
H86	9	Compressor operation signalling
H87	24	Alarm signalling
H88	47	Machine block signalling
H89	31	*Plant season signalling
H90	21	*Defrosting in progress signalling

(\*) only for heat pump units

## 22. PERMITTED CONFIGURATION TABLES

Below is a table of user and installer parameters including all the permitted configurations. Not all the configurations listed can be selected at the same time. The values listed below may be subject to updates, in case of doubt please contact the company.



**CAUTION:**

- All operations with INSTALLER visibility must be carried out by **QUALIFIED PERSONNEL**.
- Values that differ from the default values may compromise the correct operation of the machine; if in doubt about the value to be set, contact the head office.
- The company excludes all contractual and extra-contractual liability for damage caused to persons, animals or things, due to installation, adjustment and maintenance errors, improper use or partial or superficial reading of the information contained in this manual.
- No responsibility is accepted for damage or malfunctions caused by changes to the factory parameters made by third parties who have not been expressly authorised to do so.

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:		Notes
						Description		
<b>Coo</b>	First cooling setpoint	°C	7.0	25÷Coo2	U			
<b>Hea</b>	First heating setpoint	°C	45.0	Hea2÷H01	U			
<b>San</b>	Sanitary setpoint	°C	48.0	25÷H01	U			If sanitary function active
<b>Coo2</b>	Second cooling setpoint	°C	18.0	Coo÷25	U			
<b>Hea2</b>	Second heating setpoint	°C	35.0	25÷Hea	U			
<b>H01</b>	Maximum value in heating setpoint	°C	60.0	-50÷80	I			
<b>H04</b>	Minimum value in cooling setpoint	°C	5.0	-50÷80	I			
<b>H10</b>	Sanitary function enabling	/	0	0÷6	I	See par. 12.		
<b>H17</b>	Analogue input configuration ST6	/	0	0÷49	I	0 = Input disabled 6 = Domestic hot water probe/DS		
<b>H18</b>	Analogue input configuration ST7	/	0	0÷49	I	0 = Input disabled 41 = Remote water temperature probe		
<b>H22</b>	Voltage input configuration 0-10V DC Analogue ST11	/	0	0÷30	I	0 = Input disabled 40 = System setpoint decalibration		
<b>H46</b>	Digital input configuration ID2	/	0	0÷30	I	0 = Input disabled 3 = Summer/winter change mode		
<b>H47</b>	Digital input configuration ID3	/	0	0÷30	I	0 = Input disabled 2 = Remote On / Off		
<b>H51</b>	Digital input configuration ID7	/	0	0÷30	I	0 = Input disabled 28 = DHW thermostat call		
<b>H53</b>	Digital input configuration ID9	/	0	0÷30	I	0 = Input disabled 25 = silenced ventilation 26 = double set-point call		
<b>H75</b>	Digital inputs polarity	/	0	0÷255	I	0 = Digital inputs N.A. 1 = ID1 polarity inverted 2 = ID2 polarity inverted 4 = ID3 polarity inverted 8 = ID4 polarity inverted 16 = ID5 polarity inverted 32 = ID6 polarity inverted 64 = ID7 polarity inverted 128 = ID8 polarity inverted		
<b>H76</b>	Digital inputs polarity	/	0	0÷255	I	0 = Digital inputs N.A. 1 = ID9 polarity inverted 2 = ID10 polarity inverted 4 = ID1E1 polarity inverted 8 = ID2E1 polarity inverted 16 = ID3E1 polarity inverted 32 = ID4E1 polarity inverted 64 = ID5E1 polarity inverted 128 = ID6E1 polarity inverted		
<b>H77</b>	Digital inputs polarity	/	0	0÷255	I	0 = Digital inputs N.A. 1 = ID7E1 polarity inverted 2 = ID8E1 polarity inverted 4 = ID9E1 polarity inverted 8 = ID10E1 polarity inverted		
<b>H83</b>	Output configuration In voltage DO5	/	22	0÷47	I	0 = Output disabled 25 = Double set-point valve 29 = Boiling enabling		
<b>H84</b>	Output configuration In voltage DO6	/	6	0÷47	I	0 = Output disabled 6 = Sanitary valve		
<b>H126</b>	Serial address	/	1	1÷200	I	In the cascade configuration, assign a different address to each control.		
<b>H129</b>	Enable second setpoint	/	0	0÷4	I	See par.15.		
<b>H130</b>	Heating with DHW storage tank	/	0	0÷1	I	0 = Normal operation 1 = In Heat, machine always turned towards DHW		
<b>A08</b>	Antifreeze alarm activation setting	°C	3	-127÷127	I			Different values can compromise the correct operation of the machine
<b>b04</b>	Radiant panels valve switching time	sec	30	0÷600	I			Different values may compromise the correct operation of the machine.
<b>b05</b>	Compressor cut-off hysteresis	°C	0.2	0÷255	I			
<b>b06</b>	Transient hot sanitary output	sec	45	0÷255	I			
<b>b07</b>	PI regulator integral time	sec	150	0÷255	I			

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
<b>b08</b>	Enable dinamic setting	/	0	0÷1	I	See par. 6	
<b>b09</b>	Maximum cooling offset	°C	3.0	-50.0÷80.0	I	See par. 6	
<b>b10</b>	Maximum heating offset	°C	-3.0	-50.0÷80.0	I	See par. 6	
<b>b11</b>	Cooling outdoor temperature setting	°C	25	-127÷127	I	See par. 6	
<b>b12</b>	Heating outdoor temperature setting	°C	15	-127÷127	I	See par. 6	
<b>b13</b>	Cooling temperature delta	°C	-10.0	-50.0÷80.0	I	See par. 6	
<b>b14</b>	Heating temperature delta	°C	10.0	-50.0÷80.0	I	See par. 6	
<b>b15</b>	0-10V analogue input setting decalibration band	°C	5.0	0.0÷10.0	I	See par. 7	
<b>b20</b>	Input enabling 0-10V / ratiometric	/	0	0÷1	I	0 = Input 0-10V 1 = Ratiometric inut	
<b>b22</b>	Plant probe temperature control cut-off hysteresis	°C	5.0	0.0÷25.5	I		See par. 13.4
<b>b25</b>	Compressor cut-on hysteresis	°C	2.0	0.0÷25.5	C		
<b>P01</b>	Pump ON compressor OFF delay	sec	30	0÷255	I		
<b>P02</b>	Pump OFF compressor OFF delay	min	2.0	0÷25.5	I		
<b>P03</b>	Pump operating mode	/	0	0÷1	I	See par. 8	The pump is always on if the antifreeze resistances are active.
<b>P04</b>	Pump setting in antifreeze	°C	5	-15÷15	I	See par. 8.5	
<b>P05</b>	Pump hysteresis in antifreeze	°C	2.0	0.0÷15.0	I	See par. 8.5	
<b>P09</b>	Modulating pump inlet/outlet water delta T setting	°C	2.0	0÷15	I	See par. 8.5.1	
<b>P16</b>	Interval between 2 periodical activations of the pump	min	0	0÷600	I	See par. 8.3	
<b>P17</b>	Operating time of the pump in periodical mode	sec	0	0÷255	I	See par. 8.3	
<b>r02</b>	Antifreeze heaters setpoint in heating mode	°C	4	3÷6	I		Only change if glycol water is present. Contact company.
<b>r03</b>	Antifreeze heaters setpoint in cooling mode	°C	4	3÷6	I		Only change if glycol water is present. Contact company.
<b>r06</b>	Antifreeze heaters delta	°C	2.0	0.0÷25.5	I		Only change if glycol water is present. Contact company.
<b>r08</b>	Operation in substitution upper limit	°C	-20	-20÷50	I	Respect r22 ≥ r28 ≥ r08	
<b>r10</b>	System integration enabling	/	0	0÷1	I	0 = Function disabled 1 = Function enabled	See par. 18
<b>r11</b>	System integration heater delta	°C	0.5	0,0÷25.5	I	See par. 18.1	
<b>r12</b>	System/heat pump integration heater activation	min	10	0÷255	I	See par. 18.1	
<b>r14</b>	Exclusive resistor operation	/	0	0÷1	I	0 = Resistors that can be activated simultaneously 1 = Resistors that can be activated exclusively	
<b>r15</b>	Enabling sanitary integration	/	0	0÷2	I	0 = Function disabled 1 = Function enabled	See par. 18.2
<b>r16</b>	Heater activation delay DHW/heat pump integration	min	15	0÷255	I		
<b>r19</b>	Duration of activation of basin resistances from last defrost	min	10	0÷255	I	0= activation of defrosting-independent resistor.	
<b>r20</b>	Priority use of resistors	/	1	0÷1	I	0 = Plant side priority 1 = Sanitary side priority	This parameter only needs to be set if r14=1
<b>r21</b>	Enable system side mitigation with defrosting resistors	/	0	0÷1	I	0= Function disabled 1= Function enabled	

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
<b>r22</b>	Upper limit Joint function 1 band	°C	7	-16÷50	I	Respect $r22 \geq r28 \geq r08$	It is recommended not to change this value, as this could affect the operation of the unit
<b>r23</b>	Type of boiler use	/	6	0÷6	I	See par. 18.6	
<b>r24</b>	Type of use integration resistors	/	3	0÷3	I	See par.18	
<b>r28</b>	Upper limit for joint operation 2nd band	°C	-7	-16÷50	I	Respect $r22 \geq r28 \geq r08$	It is recommended not to change this value, as this could affect the operation of the unit
<b>r29</b>	Temperature offset for boiler and system resistors first set point (HEA)	°C	0	0÷100	I	See par.18.1	
<b>r30</b>	Temperature offset for boiler and system resistor first set point (HEA2)	°C	0	0÷100	I		
<b>r31</b>	Temperature offset for boiler and sanitary heating elements (SAN)	°C	0	0÷100	I		
<b>r32</b>	Boiler equipment	/	1	0÷3	I	See par. 18.6	
<b>r33</b>	Pump management with active resistors	/	3	0÷3	I		
<b>L02</b>	User enablement for minimum Hz	/	0	0÷1	I	0= function disabled 1= function enabled	
<b>L03</b>	Minimum active Hz	/	6	0÷6	I	See chapter "MINIMUM HZ FUNCTIONS".	
<b>rE01</b>	Enabling DS in chiller	/	0	0÷1		0= function disabled 1= function enabled	

## 23. ALARMS

Some of the alarms that may occur on the unit are described below. When the control is switched off, the alarms are reset and the counts of the relevant operations are also reset. If the alarms are still present when the machine is switched on again, contact technical assistance. The above information may be subject to updates, in case of doubt please contact the company.

### 23.1 [E006] FLOW SWITCH

The water-side flow switch is already installed inside the unit and must not be tampered with or bypassed in any way. The flow switch is bypassed by the control for a period of 10 seconds from the start of the machine, after the bypass time the status of the digital input is considered, if it is active the presence of flow is considered. If a lack of flow is diagnosed for a time of at least 5 seconds, the alarm is active and the circulator is activated for 120 seconds.

Once the flow of water is restored, the alarm is automatically reset, but if the alarm occurs more than 3 times per hour, the reset becomes manual.

The alarm is not active in the following conditions:

- during domestic hot water production;
- during the system venting function.

### 23.2 [E018] HIGH TEMPERATURE

If the water delivery probe detects a value higher than 65°C for longer than 50 seconds the alarm is active. It deactivates when the temperature returns below 62°C.

### 23.3 [E005] ANTIFREEZE

If the outlet water probe has a value lower than A08 (default A08 = 3,0°C), the alarm is active. The deactivation occurs if the temperature recorded by the same probe is higher than A08 + 3,0°C (default 6,0°C). The alarm is bypassed for 120 seconds after switching on in heating mode. This alarm is manual reset.

### 23.4 [E611÷E681] PROBE ALARMS OR PRESSOSTAT

The corresponding alarm is activated if any connected and enabled probe is short-circuited or interrupted. The alarm is also active if the upper limit of the probes (150C) or the lower limit (-50°C) is exceeded. A probe configured as a DHW probe does not give rise to an alarm if DHW production is not enabled.



#### NOTE:

- Error E641 also appears when the pressure switch on the machine detects a pressure higher than 42.8 ±1 bar. In this case the driver and compressor are immediately disconnected. The alarm is reset when the pressure drops below 34 ±1 bar.
- Error E651 also appears if the fan thermal protection is triggered.

## 23.5 [E691÷E701] TRANSDUCER ALARMS

The alarm is activated if the relevant pressure transducers are faulty or disconnected. This alarm is manual reset.

## 23.6 [E801] INVERTER TIMEOUT

When the on-board control does not communicate with the compressor driver board, a time-out alarm is activated to avoid losing control of the system.

## 23.7 [E851 ÷E971] INVERTER ALARMS

These alarms are related to the compressor driver, each model has its own list of alarms.

## 23.8 [E00] REMOTE ON/OFF SIGNALLING

This message appears on the display when the remote on/off contact is open.

## 23.9 [E001] HIGH PRESSURE

The alarm is activated when the pressure transducer on board the machine detects a pressure higher than **41.5 bar**, in which case the compressor is immediately blocked. The alarm is reset automatically when the pressure drops below **32.5 bar**; if it occurs more than 3 times per hour the alarm becomes a manual reset.

## 23.10 [E002] LOW PRESSURE

In chiller mode, the alarm is active if the pressure transducer on board the machine detects a pressure lower than **3.5 bar**. In heat pump mode, the alarm is active if the pressure transducer on board the machine detects a pressure of less than **1.3 bar**. Each time the compressor is activated, a bypass time of 60 seconds is counted. When the alarm is active, the circuit compressor is blocked. The alarm is automatically reset when the pressure rises **2.0 bar** above the intervention threshold; if the number of interventions in one hour is 3, the alarm becomes manual reset.

## 23.11 [E008] DRIVER LIMITATION

If the compressor does not reach the speed at the expected ramp value within 30 minutes, the alarm becomes active and the compressor is switched off for safety. If the number of alarm interventions in one hour is 3, the alarm becomes manual reset.

## 23.12 [E041] 4-WAY VALVE

This alarm identifies a malfunction of the 4-way valve for reversing and is manual reset. The alarm is not active for a bypass time of approximately 180 seconds from the start of the compressor.

In heating or DHW mode, after the bypass time has expired, the alarm is active when the water flow temperature is lower than the water return temperature - 1°C.

In cooling mode, after the bypass time has elapsed, the alarm is active when the water flow temperature is higher than the water return temperature + 1°C.

## 23.13 LACK OF VOLTAGE

If the power supply fails, when it is restored the unit goes back to the state before the power failure.



### NOTE:

- If a defrosting cycle is in progress, the procedure is cancelled.
- All the timings in progress are cancelled and reinitialised.

## 23.14 UTILITIES BLOCK ALARM TABLE

Alarm code	DESCRIPTION	block
<b>E00</b>	Remote off	Machine
<b>E001</b>	High pressure alarm	Machine
<b>E002</b>	Low pressure alarm	Machine
<b>E005</b>	Antifreeze alarm	Machine
<b>E006</b>	No flow alarm	Machine
<b>E008</b>	Compressor driver limitation alarm	Machine
<b>E009</b>	High discharge temperature alarm	Compressor
<b>E018</b>	High temperature in cooling mode alarm	Machine
<b>E041</b>	Incongruent temperature alarm	Machine
<b>E050</b>	High DHW tank temperature alarm	-
<b>E611</b>	Water inlet probe failure	Machine
<b>E621</b>	Water outlet probe failure	Machine
<b>E631</b>	Compressor suction probe failure	Machine
<b>E641</b>	Compressor discharge probe failure / high pressure switch intervention	Machine
<b>E651</b>	External air / fan thermal probe failure	Machine
<b>E661</b>	DHW probe failure (ST6)	Machine
<b>E671</b>	Fault in remote plant probe (ST7)	Machine

Alarm code	DESCRIPTION	block
<b>E691</b>	Low pressure transducer failure	Machine
<b>E701</b>	High pressure transducer failure	Machine
<b>E711</b>	Fault in voltage input 0-10V DC	Machine
<b>E801</b>	Inverter communication timeout	Compressor
<b>E851</b>	Inverter hardware problem	Compressor
<b>E861</b>	Motor current too high	Compressor
<b>E871</b>	High inverter heatsink temperature	Compressor
<b>E881</b>	Supply voltage out of limits (DC bus)	Compressor
<b>E891</b>	Compressor not connected	Compressor
<b>E901</b>	Wrong compressor model	Compressor
<b>E911</b>	Overload protection	Compressor
<b>E921</b>	PFC/POE overcurrent	Compressor
<b>E931</b>	Internal communication error	Compressor
<b>E941</b>	PFC fault	Compressor
<b>E951</b>	Heatsink and/or ambient temperature sensor fault	Compressor
<b>E961</b>	Abnormal condition	Compressor
<b>E971</b>	EEPROM error	Compressor

## 24. MODBUS VARIABLES

The control has the following modbus configuration by default:

BAUD RATE	9600
PARITY	EVEN
DATA BIT	8
STOP BIT	1
DEVICE ID	1

To configure the Modbus communication according to your requirements, you must modify the following logs:

H124 : BAUD RATE	
0	4800
1	9600
2	19200
3	38400
H125 : PARITY, STOP BIT	
0	NONE, 2 bit
1	ODD, 1 bit
2	EVEN, 1 bit
3	NONE, 1 bit
H126 : DEVICE ID	
1 ÷ 200	

Modbus commands:

READING	HOLDING REGISTER
WRITING	6-16

Register	Format	Bit	R/W	Range	Name	Description	Note
1	INT	-	R	-	Firmware information	Firmware versione	
2	INT	-	R	-		Firmware release	
3	BYTE (H)	-	R	-		Firmware sub-release	
	BYTE (L)	-	R	-		Firmware creation day	
4	BYTE (H)	-	R	-		Firmware creation month	
	BYTE (L)	-	R	-		Firmware creation year	
80 ÷ 97	ASCII	-	R	-	Serial number	Registration number	
444	INT	-	R	0 ÷ 800	Water flow rate		
1089	INT	-	R/W	1 ÷ 200	Serial address	Modbus serial ID	

Register	Format	Bit	R/W	Range	Name	Description	Note	
200	INT	-	R	-	Machine settings	(0) Stand by	Reading values of the machine status	
		-	R	-		(1) Cooling		
		-	R	-		(2) Heating		
		-	R	-		(4) Only sanitary mode <sup>1</sup>		
		-	R	-		(5) Cooling + Sanitary <sup>1</sup>		
		-	R	-		(6) Cooling + Sanitary <sup>1</sup>		
7201	BIT MASK	0	R/W	-	Machine settings	Enablement of writing the machine status remotely	Necessary for the operation of the reg. 7200.	
7200	INT	-	W	-		(0) Stand by	The writing values that are not allowed at this address can lead to unexpected operations, so keep only those values that are allowed in writing.	
		-	W	-		(1) Cooling		
		-	W	-		(2) Heating		
		-	W	-		(4) Only sanitary <sup>1</sup>		
		-	W	-		(5) Cooling + Sanitary <sup>1</sup>		
		-	W	-		(6) Heating + Sanitary <sup>1</sup>		
7201	BIT MASK	1	R/W	-	Setpoint	Enablement of writing the machine status remotely	Necessary for the operation of the reg. 7203/7208.	
7203	°C/10	-	R/W	5.0 ÷ 23.0		Cooling		
7204	°C/10	-	R/W	25.0 ÷ 55.0		Heating		
7205	°C/10	-	R/W	25.0 ÷ 55.0		Sanitary		
7206	°C/10	-	R/W	5.0 ÷ 23.0		Second cooling		
7207	°C/10	-	R/W	25.0 ÷ 55.0		Second heating		
7208	°C/10	-	R/W	0.0 ÷ 80.0	Second setpoint	DHW preparer		
7201	BIT MASK	2	R/W	-		Enabling the switching to the second setpoint	Necessary for the operation of bit 0 of reg. 7202.	
7202	BIT MASK	0	W	-		0=primary setpoints, 1=secondary setpoint	Writing value	
7217	BIT MASK	0	R	-		0=primary setpoints, 1=secondary setpoint	Reading value	
7201	BIT MASK	3	R/W	-	Room temperature call	Enablement of remote room call writing	Necessary for the operation of bit 1 of reg. 7202.	
7202	BIT MASK	1	R/W	-		Forced room temperature call remotely		
7201	BIT MASK	4	R/W	-	Sanitary call	Enablement of remote sanitary call writing	Necessary for the operation of bit 1 of reg. 7202.	
7202	BIT MASK	2	R/W	-		Forced remote sanitary mode call		
7201	BIT MASK	5	R/W	-	Anti-Legionella <sup>2</sup>	Enablement of anti-legionella cycle remotely	Necessary for the operation of bit 3 of reg. 7202.	
7202	BIT MASK	3	R/W	-		Remote anti-legionella cycle request activation	The bit must be 1 for the entire cycle period.	
7216	BIT MASK	5	R	-		Anti-legionella cycle in progress		
		6				Anti-legionella cycle failed or stopped	It remains at 1 until the next cycle, or it resets itself when the board is turned off.	
7202	BIT MASK	5	R/W	-	Plant air-vent	Forced plant air-vent	Only if the machine is in Stand By (0).	
7202	BIT MASK	6	R/W	-	Sanitary disablig	Sanitary call prohibition (without exiting from the actual mode + SAN function)	Active only if the setting of bit 3 is 7201 (when the room temp. call is also managed remotely).	
7202	BIT MASK	7	R/W	-	Defrosting	Forced defrosting	Only if the machine is in heating (2-6).	
7214	BIT MASK	13	R	-		Defrosting on call		
		14				Defrosting in progress		

# Controller for i-32V5 MIDI

Air/water inverter chillers and heat pumps with axial fans

Register	Format	Bit	R/W	Range	Name	Description	Note
305	ora	-	R	-	Operating hours	Compressor 1	
307	ora	-	R	-		Compressor 2	
309	ora	-	R	-		Compressor 3	
313	ora	-	R	-		Compressor 1 circuit 2	
315	ora	-	R	-		Compressor 2 circuit 2	
317	ora	-	R	-		Compressor 3 circuit 2	
253	°C/10	-	R	-	Temperature transducer	Evaporation	
254	°C/10	-	R	-		Condensation	
626	°C/10	-	R	-		Evaporation circuit 2	
627	°C/10	-	R	-		Condensation circuit2	
400	°C/10	-	R	-	Temperature <sup>3</sup>	Water inlet	
401	°C/10	-	R	-		Water outlet	
405	°C/10	-	R	-		DHW	
422	°C/10	-	R	-		Compressor inhalation	
428	°C/10	-	R	-		Outdoor	
433	°C/10	-	R	-		Compressor discharge 1	
434	°C/10	-	R	-		Compressor discharge 2	
435	°C/10	-	R	-		Compressor discharge 3	
437	°C/10	-	R	-		Solar collector	
438	°C/10	-	R	-		Solar accumulation	
440	°C/10	-	R	-		Plant remote	
443	°C/10	-	R	-		Radiant panels mixing delivery	
447	°C/10	-	R	-		DHW preparer recirculation	
20422	°C/10	-	R	-		Compressors inhalation (circuit 2)	
20433	°C/10	-	R	-		Compressor 1 discharge (circuit 2)	
20434	°C/10	-	R	-		Compressor 2 discharge (circuit 2)	
20435	°C/10	-	R	-		Compressor 3 discharge (circuit 2)	
406	bar/100	-	R	-	Pressions <sup>3</sup>	High pressure	
414	bar/100	-	R	-		Low pressure	
20406	bar/100	-	R	-		Circuit 2 high pressure	
20414	bar/100	-	R	-		Circuit 2 low pressure	
7000	%/10	-	R	-	Analogue output	Condensation fan	
7001	%/10	-	R	-		Circulating pump	
628	%/10	-	R	-		Condensation fan circuit 2	
950	BIT MASK	0	R	-	Alarms <sup>4 5</sup>	High pressure	E001
		1				Low pressure	E002
		2				Compressor thermal protection	E003
		3				Fan thermal protection	E004
		4				Frost	E005
		5				Lack of flow	E006
		6				DHW preparer low temperature	E007
		7				Lack of lubrication	E008
		8				High discharge temperature of Cp1	E009
		9				Solar collector at high temperature	E010
		12				Compressor 2 thermal protection	E013
		13				Fan 2 thermal protection	E014
		15				Pump thermal protection	E016
		1	R	-	Alarms <sup>4 5</sup>	High temperature	E018
		2				High discharge temperature of Cp2	E019
		3				Inverted pressure transducers	E020
		6				Compressor 3 thermal protection	E023
		7				Fan 3 thermal protection	E024
		9				Pump 2 thermal protection	E026
		11				Incongruent temperatures	E041
		12				Poor heat exchange DHW	E042
		13				DHW accumulation tank in high temperature	E050
		14				I/O module 1 disconnected	E101
		15				I/O module 2 disconnected	E102

Register	Format	Bit	R/W	Range	Name	Description	Note
952	BIT MASK	0	R	-	Alarms <sup>4 5</sup>	Probe 1 error	E611
		1				Probe 2 error	E621
		2				Probe 3 error	E631
		3				Probe 4 error	E641
		4				Probe 5 error	E651
		5				Probe 6 error	E661
		6				Probe 7 error	E671
		7				Probe 8 error	E681
		8				Probe 9 error	E691
		9				Probe 10 error	E701
		10				Probe 11 error	E711
		11				Module 1 probe 1 error	E612
		12				Module 1 probe 2 error	E622
		13				Module 1 probe 3 error	E632
		14				Module 1 probe 4 error	E642
		15				Module 1 probe 5 error	E652
953	BIT MASK	0	R	-	Alarms <sup>4 5</sup>	Module 1 probe 6 error	E662
		1				Module 1 probe 7 error	E672
		2				Module 1 probe 8 error	E682
		3				Module 1 probe 9 error	E692
		4				Module 1 probe 10 error	E702
		5				Module 1 probe 11 error	E712
		6				Module 2 probe 1 error	E613
		7				Module 2 probe 2 error	E623
		8				Module 2 probe 3 error	E633
		9				Module 2 probe 4 error	E643
		10				Module 2 probe 5 error	E653
		11				Module 2 probe 6 error	E663
		12				Module 2 probe 7 error	E673
		13				Module 2 probe 8 error	E683
		14				Module 2 probe 9 error	E693
		15				Module 2 probe 10 error	E703
954	BIT MASK	0	R	-	Alarms <sup>4 5</sup>	Module 2 probe 11 error	E713
		1				Link inverter 1	E801
		2				Link inverter 2	E802
		3				Link inverter 3	E803
		4				Hardware fault inverter 1	E851
		5				Hardware fault inverter 2	E852
		6				Hardware fault inverter 3	E853
		7				Overcurrent inverter 1	E861
		8				Overcurrent inverter 2	E862
		9				Overcurrent inverter 3	E863
		10				High temperature inverter 1	E871
		11				High temperature inverter 2	E872
		12				High temperature inverter 3	E873
		13				Bad voltage inverter 1	E881
		14				Bad voltage inverter 2	E882
		15				Bad voltage inverter 3	E883

Register	Format	Bit	R/W	Range	Name	Description	Note
955	BIT MASK	0	R	-	Alarms <sup>4 5</sup>	Phase sequence inverter 1	E891
		1				Phase sequence inverter 2	E892
		2				Phase sequence inverter 3	E893
		3				Model error inverter 1	E901
		4				Model error inverter 2	E902
		5				Model error inverter 3	E903
		6				Overload error inverter 1	E911
		7				Overload error inverter 2	E912
		8				Overload error inverter 3	E913
		9				Overcurrent PFC inverter 1	E921
		10				Overcurrent PFC inverter 2	E922
		11				Overcurrent PFC inverter 3	E923
		12				Internal communication error inverter 1	E931
		13				Internal communication error inverter 2	E932
		14				Internal communication error inverter 3	E933
		15				Fault PFC inverter 1	E941
956	BIT MASK	0	R	-	Alarms <sup>4 5</sup>	Fault PFC inverter 2	E942
		1				Fault PFC inverter 3	E943
		2				Probe error inverter 1	E951
		3				Probe error inverter 2	E952
		4				Probe error inverter 3	E953
		5				Abnormal condition inverter 1	E961
		6				Abnormal condition inverter 2	E962
		7				Abnormal condition inverter 3	E963
		8				Inverter 1 EEPROM error	E971
		9				Inverter 2 EEPROM error	E972
		10				Inverter 3 EEPROM error	E973
		11				High discharge temperature of Cp3	E029
		12				Anti-legionella performed correctly	E060
		13				Anti-legionella failed or stopped	E061

<sup>1)</sup> if enabled

<sup>2)</sup> the cycle is activated only if the DHW (4-5-6) status is terminated by the machine.

<sup>3)</sup> if the read value is equal to 32766 the probe is not configured, if 32767 the probe is faulty.

<sup>4)</sup> reset alarms, write the value 0 with the command 6 on any of the registers of the alarms area.

<sup>5)</sup> the alarms of circuit 2 are mapped in the same way with an offset of 20000 (e.g. 20950).



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