MAXA AIR CONDITIONING

Chiller and Inverter Air/Water heat pumps with axial fans

Controller Manual

Model

i-290 0240
i-290 0250

00	10-2023	M.S.	A.B.	First emission
Rev	**Date**	**Compiled**	**Approved**	**Note**
Code				**Serie**
MCO02070120000_00				**Chillers and inverter Air/Water heat pumps with axial fans**

Contents

1. PURPOSE AND CONTENT OF THE MANUAL

The purpose of the control manual for i-290 0240-0250 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 reccomended 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 tecnological improvements to the product and it is not obliged to update manual of previous versions. Besides, the Company declines all responsability 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 USED

- 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 expressaly 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 reccomended to mantein 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.

	**IS PROHIBITED:**
	To remove and/or to manipulating any safety device.
	Unauthorised access to the electrical panel.
	To touch the systems if not autorised to do so.
	To performe any cleaning operation when the master switch in 'ON'.
	To pull, detach or twist the appliance's electric cable.
	To step on, sit down on and/or place any type of object on the appliance.
	To spary or pour water directly on the appliance.
	To touch the appliance when barefoot or part of the body are wet or damp.
	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.
	**CAUTION:**
	Refer to the user-installer manual included with the unit before procedeeing.
	Do not place your hands or insert screwdrivers, spanners or other tools on moving parts.
	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.
	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.
	Not all the configurations described can be activated and/or modified at the same time.
	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.

	**Only authorised personell may access the electric panel. Connection to the terminal block must only be made by qualified personnel.**
	All ordinary and/or extraordinary maintenance operations must be carried out with the machine stationary and without electrical power.
	Before performing any operations on the electric panel, IT IS MANDATORY: **-To switch off the unit from the control panel ("OFF" displayed).** **-Set the main switch above the unit to "OFF".** **-Wait 15 seconds before accessing the electrical panel.** **-Ensure the effective grounding.** **-To remain well isolated from the ground, with dry hands and feet, or using insulated platforms and gloves.** **-To keep foreign materials away from the systems.**

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.

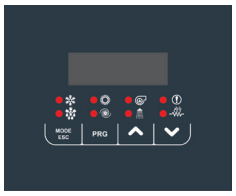
3.4 REFRIGERANT SAFETY DATA SHEET

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

MODE ESC	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) During parameter settig has the function of the back key.
PRG	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, is on if the compressor is active.
	Sanitary LED: flashes if sanitary production is in progress, it is on COOL+SAN or HEAT+SAN mode is selected and sanitary.
	Led KA electrical heaters: is on if the antfreeze electrical heaters 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	**Set**	User	Not accessible if connected at Hi-T2V415
Password	**PSS**	User	---
Alarms	**Err**	User	Only if active alarms
Probes	**tP**	Installer	---
Digital inputs	**Id**	Installer	---
Parameters	**Par**	Installer	---
Hours of operation	**oHr**	Installer	---
Alarm log	**Hist**	Installer	Only if the log contains data
Firmware version	**Fir**	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
Coo	First summer setpoint	7.0	5 ÷ Coo2	°C
Hea	First winter setpoint	45.0	Hea2 ÷ 80	°C
***San**	Sanitary setpoint	48.0	25 ÷ 80	°C
rCoo	Mixing valve setpoint in cooling	15.0°C	-50.0÷80.0	°C
rHea	Mixing valve setpoint in heating	30.0°C	-50.0÷80.0	°C
***San2**	Second sanitary setpoint	45.0	25 ÷ 80	°C
Coo2	Second Summer setpoint	18.0	Coo ÷ 25	°C
Hea2	Second Winter setpoint	30.0	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. The access level expires after one hour.

4.5 ALARMS MENU [Err]

This menu allows you to see all active alarms, if any . For more details see par. "Utility block alarm table".

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.

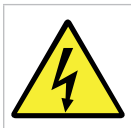
tP	DESCRIPTION	UNIT
t01	Water inlet temperature	°C
t02	Water outlet temperature	°C
t03	Compressor suction temperature	°C
t04	Compressor discharge temperature 1	°C
t05	Outside air temperature	°C
t06	Compressor discharge temperature 2	°C
t08	System remote probe temperature / sanitary (if enabled)	°C
t09	Low pressure	bar
t10	High pressure	bar

The number of visible probes depends on the presence or absence of expansion GI3 module.

Particular situations:
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 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
CnF	Configuration	H--
ALL	Alarms	A--
CP	Compressor	C--
rE	Regulation	b--
PUP	Pump	P--
Fro	Electrical heaters	r--
dFr	Defrosting	d--
LbH	Minimum Hz	L--
rEC	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), and the number of compressor starts (cC1).
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.
Exxx Alarm Label Display. Pressing the Up and Down buttons navigates through the menu displaying the sequence of events stored. Pressing the Prog key enters the time reference display (after how many minutes the error appeared, compared to when the unit was switched on). At this stage, if the 'ESC' key is pressed for 3 seconds, the entire alarm history is deleted and the completely exit the menus.

4.11 FIRWARE VERSION MENU [Fir]

Entering with the installer password, this menu displays 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 main 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 main 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.

4.12.3 EXPORT PARAMETERS AND ALARM HISTORY [ESP]

Allows you to export the alarm log and machine parameters. Pressing on the menu item results in:

- Generation of a parameter file named "V415EXP.BIN".
- Generation of an alarm history file named "ALLV415.BIN".

The number of events and the machine serial number are saved on the first line.
On the subsequent lines, the alarm and its timestamp are saved.
At the end of the procedure one returns to the "ESP" message.
The operations to be performed are:
1. Set the unit to OFF from the keypad and switch off the power supply by setting the main switch to OFF;
2. Insert the memory stick into the USB port of the control;
3. Power up the unit, setting the main switch to the ON state;
4. Access the USB menu and start the procedure via the following sequence: PRG -> PSS -> PRG -> (enter installer password) -> PRG -> USB -> ESP-> PRG;
5. A countdown advances on the display, at the end of which the export is finished;
6. Switch off the unit by setting the main switch to OFF;
7. Remove the stick from the USB port.

4.13 SMART GRID READY

This menu item is enabled if digital inputs SG1 and SG2 are configured.
Accessing this menu shows the status of the Smart Grid Ready setting:

Control status SG Ready	External signal	ID1 (SG1)	ID2 (SG2)
SG10	1:0	Closed	Open
SG00	0:0	Open	Open
SG01	0:1	Open	Closed
SG11	1:1	Closed	Closed

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	Param-eter	Terminal block	Default configuration		Configuration settable by installer		Description
			Valur	Function	Value	Function	
ST8	H19	XC-10.1 XC-10.2	0	-	6	DHW temperature	Analogue input configurable as DHW temperature (NTC-10kΩ probe at 25°C β 3435). If SG Ready is present, enable this probe in the expansion.
DI2	H46	XC-6.1 XC-6.2	0	-	3	Summer/winter mode change	Voltage free digital input Configurable as summer/winter mode change. See pararagraph 13.2.
					22	Smart Grid Ready 1	Voltage free digital input. Configurable as SG Ready 1. See section 13.4
					26	Secondary set-point	Voltage-free digital input. Configurable as second set-point. See par. 20
DI3	H47	XC-5.1 XC-5.2	2	ON/OFF remoto	-	-	Voltage-free digital input. Con-figured as remote ON/OFF.Active function by default. See par. 13.1.
DI9	H53	XC-10.1 XC-10.2	0	-	23	Smart Grid Ready 2	Voltage-free digital input. Configurable as SG Ready 2. See section 13.4

Resource	Param-eter	Terminal block	Default configuration		Configuration settable by installer		Description
			Valur	Function	Value	Function	
ST11	H22	XC-13.1 (GND) XC-13.2 (voltage input) XC-13.3 (+5V) XC-13.1 (GND) XC-13.2 (voltage input) XC-13.3 (+5V)	0	-	40	Modification of set-point from analogue input	Analogue input 0-10V / ratiometric
DO7	H85	XP-10.1 (N) XP-10.2 (phase)	0	-	6	DHW valve	Voltage output configurable as DHW valve 230Vac, 50Hz, 2A. See paragraph 12.
Modbus RTU RS485	--	XGND (GND) XR- (R-) XR+ (R+)	-	-			Factory enabled with CM accessory

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

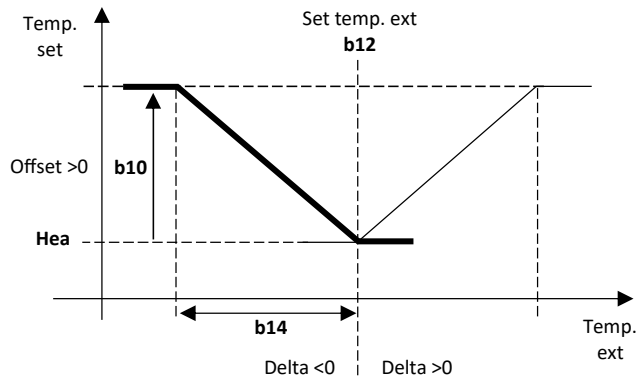
6. EDITING DYNAMIC SET-POINT

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:

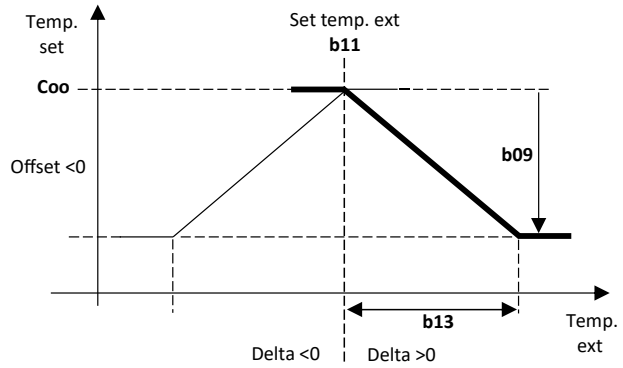
- **b08 = 1** to enable the dynamic set-point / **b08 = 0** to disable the dynamic set-point (default)
- **b09** = maximum cooling offset
- **b10** = maximum heating offset
- **b11** = Cooling outdoor temperature setting
- **b12** = Heating outdoor temperature setting
- **b13** = Cooling temperature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

Edit the setpoint depending on the outdoor temperature:

HEATING



COOLING



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:

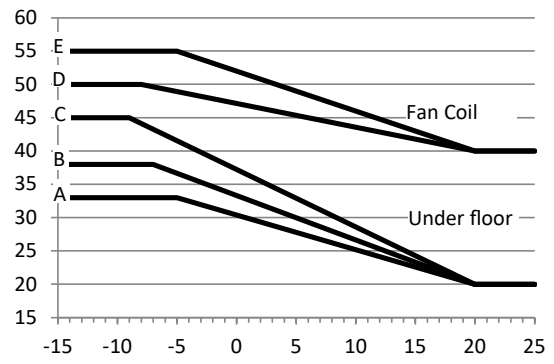
- set-point of 12°C with external temperature of 25°C
- set-point of 7°C with external temperature of 35°C

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

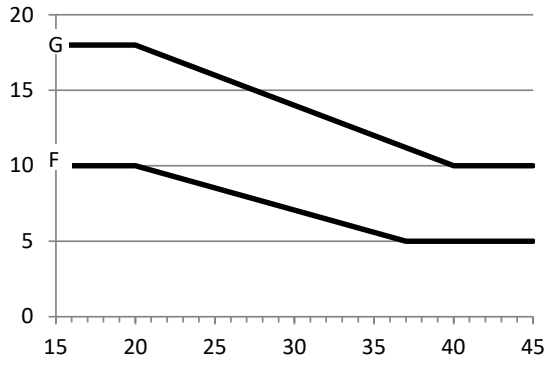
- b09 = 7 – 12 = -5
- b11 = 25
- b13 = 35 – 25 = 10

6.1 SETTINGS FOR STANDARD CLIMATIC CURVES

HEATING



COOLING



CURVE	Setpoint Heat	Setpoint Cool	b08	B09	b10	B11	b12	B13	b14
A	20°C	--	1	--	13°C	--	20°C	--	-25°C
B	20°C	--	1	--	18°C	--	20°C	--	-27°C
C	20°C	--	1	--	25°C	--	20°C	--	-29°C
D	40°C	--	1	--	10°C	--	20°C	--	-28°C
E	40°C	--	1	--	15°C	--	20°C	--	-25°C
F	--	5°C	1	5°C	--	37°C		-17°C	--
G	--	10°C	1	8°C	--	40°C		-20°C	--

7. SET-POINT MODIFICATION FROM ANALOGUE INPUT

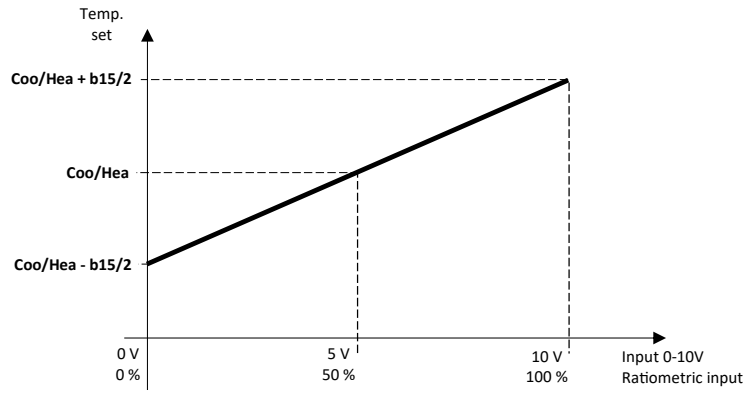
Another type of regulation allows the set-point to be modified by adding (or subtracting) a value according to the voltage input ST11. To enable this function it is necessary to connect the signal between the terminals indicated in chapter 5 and set the parameter **H22 = 40**. To use this function, change the values of the following control parameters:
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, the signal must be connected between the terminals indicated in Chapter 5 'System Resources':
XC-13.1 (GND)
XC-13.2 (Voltage input)
XC-13.3 (+5V) XC-13.1 (GND)
and set 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

SETPOINT FROM ANALOGUE INPUT



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 electrical heaters (4°C).

8. CIRCULATOR

The circulator of the heat pump can be set in the following operating modes:

- operation on call by temperature controller;
- operating on call by temperature controller with periodic activation;
- continuous operation (default);

The circulator is switched off immediately if:

- There is a manual reset pump block alarm, including the flow switch alarm;
- With remote input in standby or off, the pump (if running) is always switched off with a delay equal to **P02** in tenths of a minute (default P02=2)

The circulator can be configured with **P03** to operate independently from the compressor or on call.
0= continuous operation in heating/cooling mode(default P03=0)
1= operating on call by temperature controller
Note: with active no-flow alarm in automatic reset, the circulator is on even if the compressor is off. The circulator is always on when the antifreeze heaters are running and if operation of the hydraulic pump in antifreeze is enabled. Antifreeze operation is enabled if the regulation temperature drops below P04°C (default 5°C), and disables if the regulation temperature rises above P04+P05°C (Default value P05=2,0°C).
Note: It is possible to change the maximum and minimum speed of the circulator by adjusting parameters P07 and P08 respectively.

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 electrical heaters are operating or if the anti-freeze hydraulic pump operation is activated.

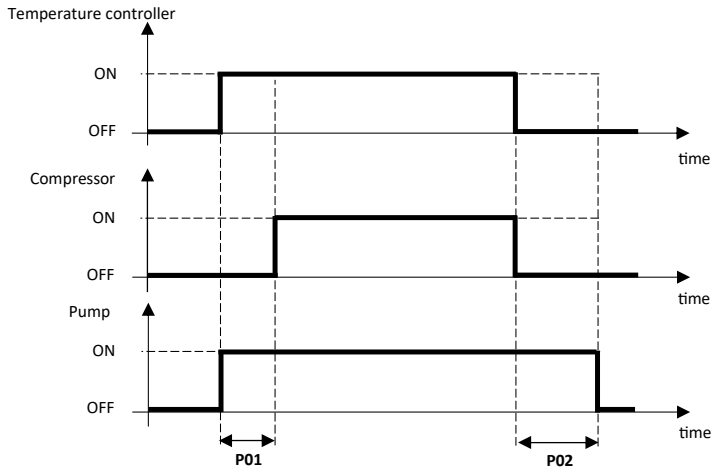
8.1 CONTINUOUS OPERATION

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.

OPERATION ON CALL FROM TEMPERATURE CONTROLLER



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 ELECTRICAL HEATER ACTIVE

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

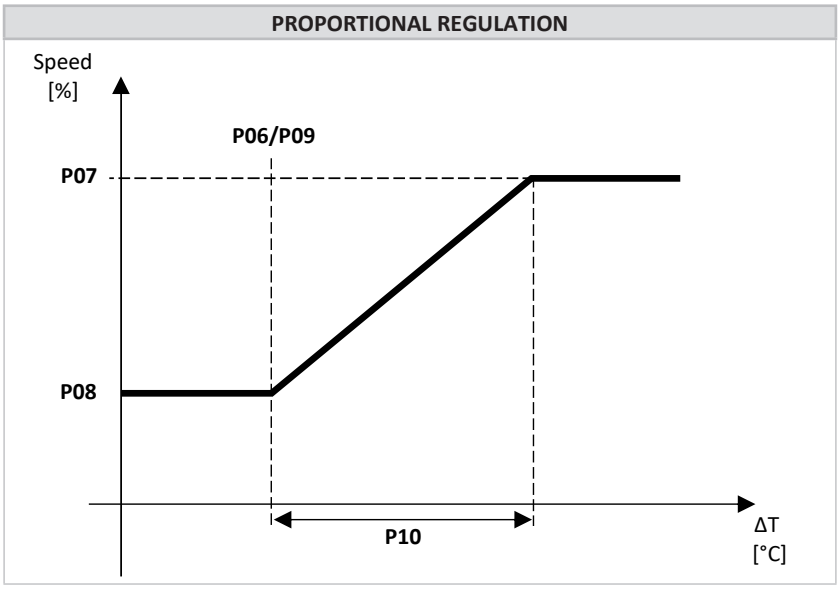
8.5 ANTIFREEZE HYDRAULIC PUMP OPERATION

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 ΔT water inlet/outlet in heating mode (default P06 = 4,0°C)
- **P07** = Maximum speed (100%)
- **P08** = Minimum speed
- **P09** = Set ΔT 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°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.

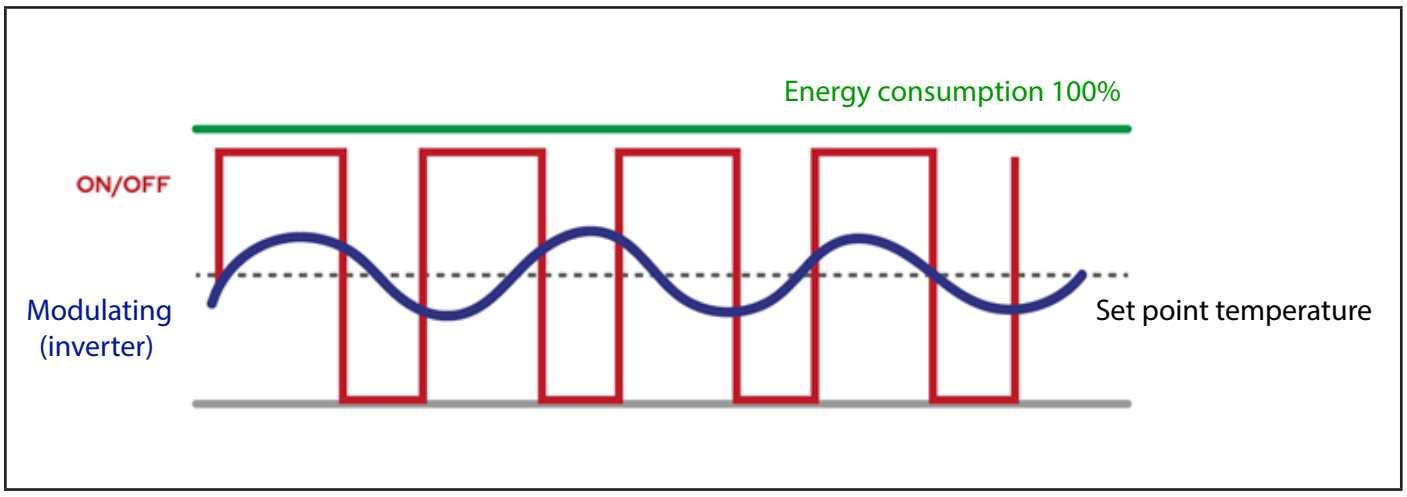
It is possible to exit the system venting cycle manually by pressing the **MODE/ESC**, button,or by pressing **UP** and **DOWN** keys simultaneously for 3 seconds.

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 water temperature. It is based on calculation of **ΔT,set** which is the difference between outlet water temperatures and inlet water temperatures, detected while the compressor for thermoregulation is turning off.

By thermoregulation we mean the temperature control performed by the generator in order to guarantee the temperature strictly necessary to the system, reducing electricity consumption and achieving better indoor comfort.
The heat pump is supplied with a modulating control system based on the fluid outlet temperature, variable-speed compressors are able to adapt to the load variation, and reduce the fluctuations that would occur with an on/off system.



Modulating control systems can be:

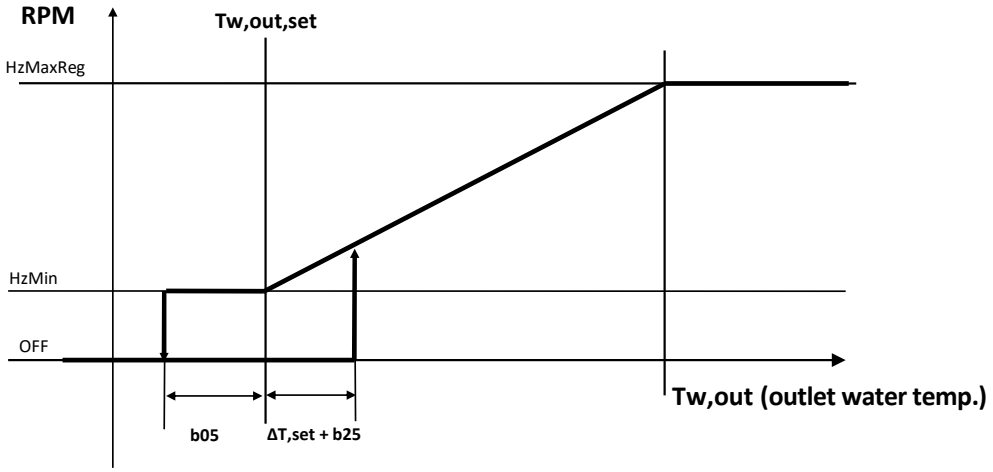
- proportional
- proportional integrals

Proportional method - P:
is the least complex control mode because it adjusts the capacity based on the difference between the actual control temperature and the target temperature (set point).
The temperature range within which the variation is activated to achieve the comfort temperature is defined as the 'proportional band' and represents the working range of the heat pump.
Parameters b01 and b02 are defined:

Parameter	Description
b01	band in chiller/cooling mode
b02	heat pump/heating band

9.1 REGULATION IN COOLING MODE

- **Tw,out,set** = setpoint in cooling mode
- **ΔT,set** = Tw,out,set – Tw,in,set
- **b24** = cut-on hysteresis limitation = 7°C (default);
- **b25** = delta cut-on compressor regulation set = 3°C
- **b05** = delta cut-off compressor regulation set = 0°C (default)

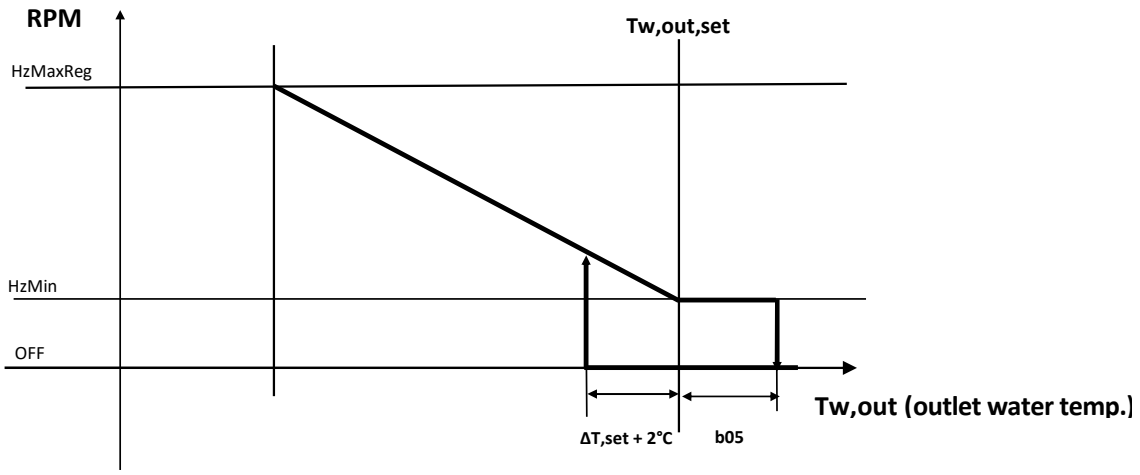


- The compressor shutdown when **Tw,out < Tw,out,set - b05**
- The compressor restart when **Tw,out > (Tw,out,set + ΔT,set + b25)**

EXCEPTION: if **ΔT,set > b24**, the compressors restart when the discharge probe temperature is lower than the setpoint 10°C: **Tw,out > (Tw,out,set + 10°C).**

9.2 REGULATION IN HEAT MODE

- **Tw,out,set** = setting setpoint in heat mode
- **ΔT,set** = Tw,out,set – Tw,in,set
- **b24** = cut-on hysteresis limitation = 7°C (default);
- **b25** = compressor regulation delta cut-on = 2°C
- **b05** = compressor regulation delta cut-off = 0°C (default)



- The compressor shutdown when **Tw,out > Tw,out,set + b05.**
- The compressor restart when **Tw,out < (Tw,out,set - ΔTset – b25)**
- **EXCEPTION**: if **ΔT,set > b24**, the compressors restart when the discharge probe temperature is lower than the setpoint 10°C: **Tw,out < (Tw,out,set - 10°C)**

As can be deduced from the graphs above, the higher the band (higher b01 or b02 values, dotted lines in the graph), the lower the frequency at the same water outlet temperature (Hz1>Hz2).
The variables for deciding the correct proportional band value are:

- water content dedicated to the unit only
- type of terminals.

It is recommended to vary these values during start-up by considering a minimum value of 1 and a maximum of 4°C.

Proportional Integral Method - PI:

With a value of b07≠0 (Integral Time), this type of adjustment is much more accurate than the proportional one because it enables further reduce oscillations through continuous evaluation of the deviation.

The PI control provides a value from 0 to 100 % corresponding to the minimum and maximum possible frequency thanks to a constant scan that photographs the deviation between the actual measured temperature and the target temperature.

The error in cooling and heating mode will be calculated in this way, respectively:

- εf = Tmis - Set point (Error in cold or chiller mode)
- εc = Set point- Tmis (Error in heat or heat pump mode)

If the measured error is positive then there will be a variation otherwise, if negative, the frequency will not vary.

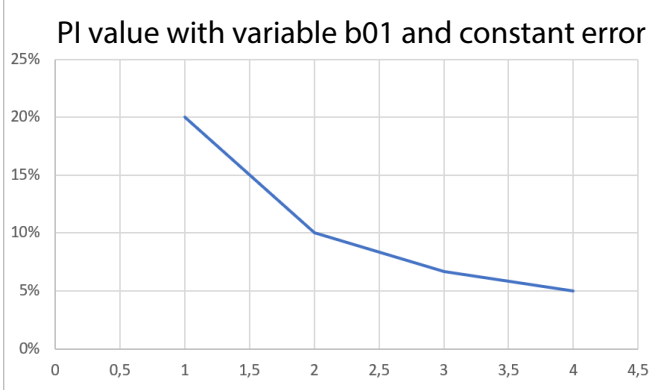
The two components (PI) work in synergy:

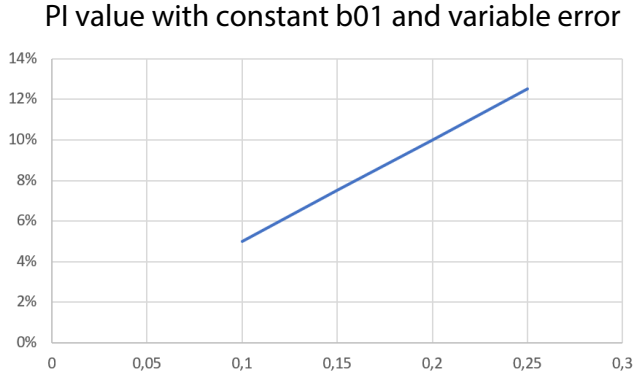
- ε unchanged: no change in power
- ε increasing: power increases due to the proportional component
- ε decreasing: power decreases due to the effect of the proportional component

The contribution of this component is directly proportional to the calculated error and inversely proportional to the value of the control band. For the same calculated error, the higher the set band, the lower the percentage of action, while for the same band, the higher the calculated error, the higher the percentage of action.

The calculated error, the higher the percentage of action.

For a better understanding of what is described, see the graphs below.





The contribution of this component is added to the power demand at each scan as a function of the integral time inversely proportional to the integral time b07:

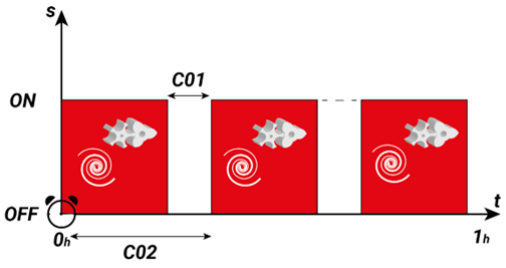
Set-point set	**35**	**35**	**35**	**35**
b02	**2**	**2**	**2**	**2**
Tmis	**34**	**34,5**	**34**	**34,5**
εc	**1**	**0,5**	**1**	**0,5**
b07	**50**	**50**	**100**	**100**
integral contribution	**10**	**5**	**5**	**2,5**

N.B. if the power required is 100% or 0% there is no additional contribution or decrease.

The use of this regulation can be advantageous if the load variation is progressive without sudden variations because it would deliver more accurately the actual output of the heat pump in relation to the actual demand, whereas a only proportional component (b07=0) would be recommended for systems where the power demand variation is for a short period of time.
During commissioning, it must be considered whether it is more effective to work with a P or PI control in operation:

- water content dedicated to the unit only
- type of terminals
- of the load variation during start-up

The choice of regulation is fundamental to optimise the efficiency of the system and to reduce the number of starts/hour in order to achieve the correct thermodynamic balance and the correct lubrication of the mechanical parts in the compressor, it is recommended to choose them in order to have a continuous operation of the heat pump of at least 10 minutes.
The heat pump control regulates the maximum number of starts per hour via parameter C02 (which cannot be changed and is fixed by the manufacturer) in order to preserve the integrity of the compressor over time, but if necessary during the commissioning phase you can choose to delay the next start-up using parameter C01:



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.

11. COMPRESSOR CRANKCASE ELECTRICAL HEATER

The crankcase electrical heater 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 °C (with a hysteresis of 2.0 °C). When the compressor restarts, the crankcase resisitence 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 ST8 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 H19 **= 6**.
The DHW valve must be connected to digital output DO6 (see Chapter 5), and the relative control must also be enabled with parameter H85 **= 6** (default).
The domestic hot water (DHW) function is controlled through parameter **H10**:

Parameter	VALUE	Function
H19	6	DHW temperature probe
H85	6	DHW valve control
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.

12.2.1 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 detected by the probe located inside the sanitary tank; once the sanitary cycle is over, the water outlet temperature is displayed again. In heating mode, when the DHW probe requests thermoregulation in DHW, 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).

12.2.2 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 electrical heater also act as integration electrical heater on the system side.

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 and cooling mode. The function can be set on digital input is settable D12 via parameter **H46**:

Parameter	VALUE	Function
H46	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 ENABLE FROM DIGITAL INPUT

If DHW operation is enabled and parameter H53 = 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.

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, hydronically 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 ENABLING SG READY FUNCTION

The SG Ready function can be activated if the electricity grid to which the unit is connected is set up as Smart Grid Ready.
To activate the SG Ready function, the SG Ready cables from the electricity grid supplier must be placed and connected to terminals ID2, C (SG Ready 1 digital input reference) and terminals AI8, C (SG Ready 2 digital input reference).
Operation is relative to Heat or Heat+San states only.
OFF, ON and forced ON operating states can be set by the grid supplier for a maximum time of 2 hours, after which the unit reverts to normal control.
The following parameters must be configured to enable the function:
The following table summarises the four operating states, relating to the status of the two digital inputs configured with the SG Ready function:

External signal	ID2 (SG1)	ID9 (SG2)	Description
1:0	Closed	Open	OFF command The heat pump remains forced to a shutdown condition, with the only exception of defrosting in progress; in this case, it waits until defrosting is complete before activating the function. The control board, in this phase, performs as if the thermoregulation status was satisfied.
0:0	Open	Open	Normal operation
0:1	Open	Closed	ON command In this state, the heat pump increases the set-point by an offset defined by parameters b31, b32. The logic differs in two cases, with or without configuration of the 'room call' device (with enabling of a related digital input, Room Thermostat). a. Configuration without 'room call' device When the external input 0:1 occurs and the compressor is on, the control logic instantaneously applies the offset; When the external input 0:1 occurs and the compressor is off the control logic does not instantaneously apply the offset but waits for the compressor to activate the offset. Configuration with 'room call' device: b. When external input 0:1 occurs and there is an active 'room call', the control logic instantaneously applies the offset; when external input 0:1 occurs and there is no active 'room call', the control logic does not instantaneously apply the offset but waits for the 'room call' to be activated and only then applies the offset.
1:1	Closed	Closed	Force ON command Compared to the previous case, the heat pump forces ON immediately by increasing the set-point of an offset defined by parameters b31, b32, with the distinction of the following two cases: a. Configuration without 'room call' device When the external 1:1 input occurs, the control logic instantly applies heat offsets and/or san offsets, whether the compressor is on or off; b. Configuration with 'room call' device When the external 1:1 input occurs, the control logic instantaneously applies heat offsets and/or sanitary offsets, whether there is an active room call or not; this means that the control logic immediately forces the set point to increase by a value equal to the offset, regardless of the room call status or regardless of the compressor status.

The following control logic applies to both conditions 'Command ON-external input 0:1' and 'Command FORCE ON-external input 1:1':

a. If both offsets are enabled (Heating offset + Sanitary offset), the control logic does not apply the offset on the sanitary set instantaneously but

only when the heating operation mode is satisfied.

b. If the pdc is operating in DHW mode, the DHW offset is not applied instantaneously but the DHW set-point is satisfied first. It then returns to heating mode by applying the heating set-point+offset and only then applies the offset on the DHW set-point (DHW set-point+offset).

c. If the machine is thermoregulating using the "second set-point" function the offset on the system set-point is not applied.

13.5 SYSTEM WATER REMOTE PROBE

As an alternative to the HOT SANITARY WATER PRODUCTION function, it is possible 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 H19 = 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. 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 model
	7	Function always active

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

16. MAXIMUM HZ FUNCTIONS

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

17. KA2 ACCESSORY - TANK ELECTRICAL HEATER MANAGEMENT

Inside the tank there is an armored electrical heater with control and probe for switching on and off.
The purpose of the electrical heater is to prevent the temperature of the water inside the tank from dropping too low.
The electrical heater is active when the probe inside the tank falls below 4°C and remains active until 8°C is reached.
Depending on the version of the unit and the vector fluid, set the temperature values for switching on and off from the control on the electrical heater.

Set parameters SEt1 and SEt2:

1. Press the "set" button once.
2. Use the arrows to scroll through the various parameters (in this case there are only 2, displayed in orange).
3. Once the desired parameter is selected press the set button again, the parameter will start to flash.
4. Use the arrows to modify the value (displayed in green).
5. Once the value is chosen press set to confirm, the parameter will stop flashing and the new value will then be set.
6. Press the fnc button to return to the starting menu. (You can also wait, the device will automatically retutn to the starting menu after a few second).

For setting all the other parameters:

1. Press the set button for 5 seconds.
2. Use the same method shown above for set the other parameters.

N.B. Each time you finish to modifying the parameters, switch the device off and on again to ensure that the data is saved correctly.

Factory setting, pure water. Electrical heater active at +4°C. Electrical heater off at +8°C.

Parameter	VALUE
HC1	H
HC2	H
dF1	0.1
dF2	4.0
SEt1	1.0
SEt2	8.0

Glycol 10%. Electrical heater active at +1°C. Electrical heater off at +5°C.

Parameter	VALUE
HC1	H
HC2	H
dF1	0.1
dF2	4.0
SEt1	-7.0
SEt2	0.1

Glycol 20% Electrical heater active at -4°C. Electrical heater off at 0°C.

Parameter	VALUE
HC1	H
HC2	H
dF1	0.1
dF2	4.0
SEt1	-7.0
SEt2	0.1

Glycol 30%. Electrical heater active at -8°C. Electrical heater off at -4°C.

Parameter	VALUE
HC1	H
HC2	H
dF1	0.1
dF2	4.0
SEt1	-7.0
SEt2	-4.0

18. SECOND SET-POINT

This function introduces a second working set-point on the plant side, both in cooling, heating and sanitary 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 DI2 with parameter H46 = 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
H46	26	Call for second set-point
H85	25	3-way valve for radiant panels
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

18.1 SILENCED VENTILATION

Configuring a digital input DI9E with parameter H63=25 it is possible to manage the function of silent ventilation management.

Parameter	VALUE	Function
H63	0 (default)	Function disbled
	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.

19. AUXILIARY ELECTRICAL HEATERS

As an alternative to the alarm/block and defrost functions, it is possible to activate integration devices.
In some system solutions, it may be necessary to use an integration electrical heater for the system and/or the domestic hot water system. This is an additional resource for heating in case the compressor cannot meet the set in a reasonable time. The electrical heater controller only operates in heating mode and if r10 = 1.
To define how the integration electrical heaters are to be activated, parameter r24 must be set:

- r24 = 0 for integration resisitors not used;
- r24 = 1 for use of system integration electrical heater;
- r24 = 2 for use of sanitary integration electrical heater;
- r24 = 3 for use of both the system integration electrical heater and the sanitary integration electrical heater.

19.1 SYSTEM ELECTRICAL HEATER

The system electrical heater must be connected to the digital output DO2E and can be configured by setting parameter H87 = 22.
If the regulation temperature remains lower than the hot water set-point Hea – r11 (°C) the integration electrical heater is activated according to the operation of the machine in the combined or replacement bands.
The electrical heater 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 electrical heater is activated without waiting for the time defined by r12.
The electrical heater switches off when the set-point is reached (also taking into account any offset set with parameters r29 or r30).

Parameter	VALUE	Function
H87	22	System integration electrical heater
r10	1	Enabling of system electrical heaters
r11	5 (default)	Delta electrical heaters in system integration (in tenths of °C)
r12	10 (default)	System integration activation delay (in minutes)
r21	1	Enabling electrical heaters during defrosting
r24	1/3	Type of use electrical heaters

19.2 SANITARY ELECTRICAL HEATER

This function can be activated as an alternative to the system integration electrical heater. The DHW electrical heater must be connected to digital output DO3 and can be configured by setting parameter H88 = 26, in addition the DHW function must be active.
The electrical heater 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
H88	26	DHW integration electrical heater
r15	1	Enabling of DHW electrical heaters
r16	10 (default)	Sanitary integration activation delay (in minutes)
r24	2/3	Type of use of electrical heater

19.3 INDIVIDUAL SYSTEM/HEALTH INTEGRATION ELECTRICAL HEATER

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

19.4 INTEGRATION ELECTRICAL HEATER SELECTION MODE

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

- r14 = 1 for electrical heater 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 electrical heater is activated only if the thermoregulation on the sanitary side is satisfied).

19.5 CIRCULATOR MANAGEMENT WITH ACTIVE ELECTRICAL HEATER

The circulator of the heat pump can be activated when the plant and/or DHW integrations electrical heaters 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 electrical heater active.
- r33 = 2 for activation with sanitary element active.
- r33 = 3 for activation with system or sanitary electrical heater active.

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

19.6 BOILER ENABLING

This function can be activated as an alternative to the SANITARY ELECTRICAL HEATER function.
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 H88= 29.
Define the mode of use by setting parameter r23:

- r23 = 0 (default) for boiler not used (priority of electrical heater intervention);
- r23 = 1 for boiler use on system only (priority of electrical heater intervention);
- r23 = 2 for boiler use only in DHW mode (priority intervention of the heaters);
- r23 = 3 for boiler use in DHW and on system (priority intervention of electrical heaters); In the case of r31>0, when the DHW set point is reached, the DHW 3-way valve remains switched to DHW;
- r23 = 4 for boiler use only in system mode with priority; (no heater operating priority)
- r23 = 5 for boiler use only in DHW mode with priority; (no heater operating priority)
- r23 = 6 for boiler use in DHW mode and on system with priority; In the case of r31>0, when the DHW set point is reached, the DHW 3-way valve remains switched to DHW;
- **r23=7** boiler use in DHW and on the system (resistor intervention priority). In the case of r31>0, when the DHW set point is reached, the DHW 3-way valve remains switched to DHW;
- **r23=8** boiler use both in DHW and on the system with priority (no priority to resistor intervention). In the case of r31>0, when the DHW set point is reached, the DHW 3-way valve remains switched to DHW.

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
H88	29	Boiler enabling
r10	1	Enabling in system integration
r12	10 (default)	System integration activation delay (in minutes)
r15	1	Enabling of sanitary integration
r16	10 (default)	DHW integration activation delay (in minutes)
r23	1 ÷ 8	Type of boiler use
r32	1 ÷ 3	Boiler equipment

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

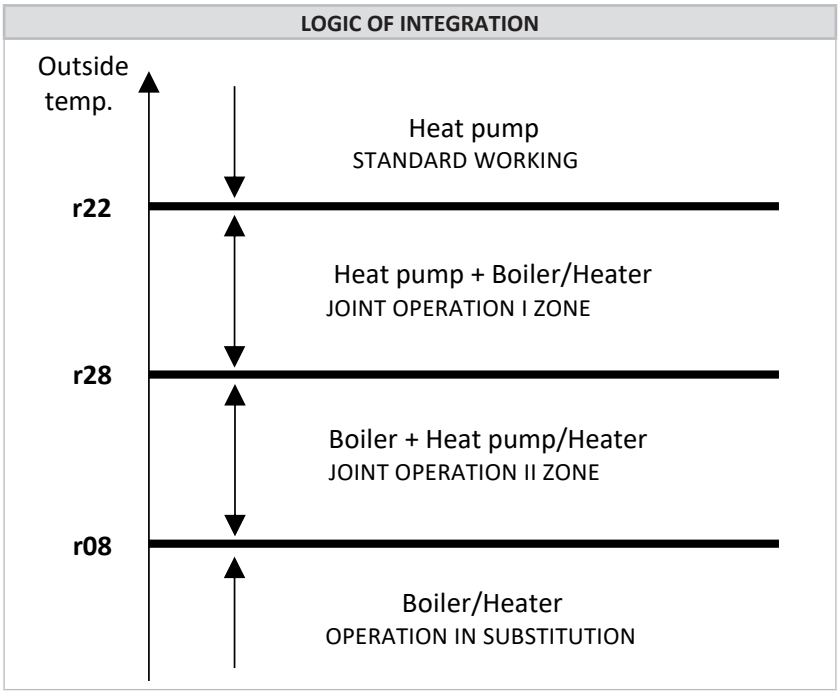
The auxiliary parts that can be used for joint or for operation in substitution are:

- boiler
- system integration electrical heater
- domestic hot water integration electrical heater

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 ≥ r28 ≥ 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°C, as this could impair the operation of the unit.

19.8 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.

19.9 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** °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.

19.10 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 side.
Operation returns to normal if the temperature rises above **r28 + 1,0** °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.

19.11 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 electrical heaters, 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 electrical heater 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 frost protection, the circulator is still activated (or kept active).

19.12 OPERATING BRACKETS

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

TABLE 1. NORMAL OPERATION IN HEAT PUMP MODE

INTEGRATIONS INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Plant integration heater	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 heater 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, plant integration heater	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	4/6	1/3
1) DHW integration heater	HEAT+SAN	SANITARY	Y	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 heater 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 heater	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	5/6	2/3
1) Plant/DHW integration heater	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) Plant/DHW integration heater 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, plant/DHW integration heater	HEAT / HEAT+SAN	HEAT/SANITARY	1	1	Set the minutes	Set the minutes	6	3

TABLE 2. JOINT OPERATION, BRACKET1

INTERVENTION ORDER	STATUS	OPERATION	r10	r15	r12	r16	r23	r24
1) Heat pump 2) After r12 minutes, plant integration heater	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, plant intgration heater 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, plant integration heater	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	4/6	1/3
1) Heat pump 2) After r16 minutes, DHW integration heater	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
1) Heat pump 2) After r16 minutes, DHW integration heater 3) After further r16 minutes, boiler	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	2/3	2/3

TABLE 2. JOINT OPERATION, BRACKET1								
INTERVENTION ORDER	**STATUS**	**OPERATION**	**r10**	**r15**	**r12**	**r16**	**r23**	**r24**
1) Heat pump 2) After r16 minutes, boiler 3) After further r16 minutes, DHW integration heater	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	5/6	2/3
1) Heat pump 2) After r12 minutes, plant/DHW integration heater	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, plant/DHW integration heater 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	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	6	3
3) After r12 minutes, plant/Dhw integration heater								

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, plant integration heater 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, plant integration heater	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set the minutes	/	4/6	1/3
1) Plant integration heater 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, DHW integration heater 3) After furher 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 further r16 minutes, DHW integration heater	HEAT+SAN	SANITARY	0/1	1	/	Set the minutes	5/6	2/3
1) DHW intetgration heater 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, plant/DHW integration heater 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, plant/DHW integration heater	HEAT / HEAT+SAN	HEAT / SANITARY	1	1	Set the minutes	Set the minutes	6	3
1) Plant/DHW integration heater 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, Plant integration heater	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set the minutes	/	4/6	1/3
1) Plant integration heater 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, DHW integration heater	HEAT+SAN	SANITARY	0/1	0/1/2	/	Set the minutes	5/6	2/3
1) DHW integration heater 2) After r12 minutes, boiler	HEAT+SAN	SANITARY	0/1	0/1/2	/	Set the minutes	2/3	2/3
1) Boiler 2) After r12 minutes, Plant/DHW integration heater	HEAT / HEAT+SAN	HEAT/SANITARY	0/1	0/1/2	Set the minutes	Set the minutes	6	3
1) Plant/DHW integration heater 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) Plant integration heater	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) DHW integration heater	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) Plant/DHW integration heater	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 integrations in COOL + SAN mode. In this case, the only integration that can be enabled is the DHW integration electrical heater and the subdivision into operating bands does not apply. The DHW integration electrical heater is activated when the set-point is satisfied after r16 minutes from compressor start-up or when the set-point is not satisfied with the machine in lockout or alarm.

TABLE 5. OPERATION IN COOL+SAN (DHW RUNNING)								
INTEGRATION INTERVENTION ORDER	**STATUS**	**OPERATION**	**r10**	**r15**	**r12**	**r16**	**r23**	**r24**
1) DHW integration heater	COOL+SAN	SANITARIO	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 HEATER**	**DHW INTEGRATION HEATER**
HEAT+SAN	HEAT	Works as indicated in TABLE 1,2,3 and 4.	DHW thermoregulation has priority over system thermoregulation, so if thermoregulation so requires, the machine switches to "DHW" operation and the DHW integration **electrical heater** behaves as indicated in TABLE 1, 2, 3 and 4.
HEAT+SAN	DHW	Only if all 3 of the following conditions are met: the output is configured for Plant integration, **r24 = 1/3**, plant water temperature remote ptobe present and configured. The plant integration heater is activated in the following situations: **r12** minutes after the start of its count activated in "HEAT" mode previously running (see previous line); if its count is not already activated in the previous "HEAT" mode, **r12** minutes after the temperature control demand. In SANITARY mode, with remote probe not configured, the plant integration heater is deactivated or any of its count are interrupted. With "remote on-off" contact open, the Plant integration heater is deactivated.	Works as indicated in TABLES 1,2,3 and 4.
COOL+SAN	DHW	Cannot be actived	Works as indicated in TABLE 5.
COOL+SAN	COOL	Cannot be active	Cannot be activated

19.13 AUXILIARY SYSTEMS OFFSET MANAGEMENT

Setting offsets, it is possible to establish that the boiler and/or integration electrical heaters (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 electrical heaters first set point (Hea);

- r30 = temperature offset for boiler and system electrical heaters 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 electrical heaters.

20. FUNCTIONS THAT CAN BE ACTIVATED WITH GI3 MODULE (OPTIONAL)

The GI3 module is an optional kit which allows you to manage the following functions:

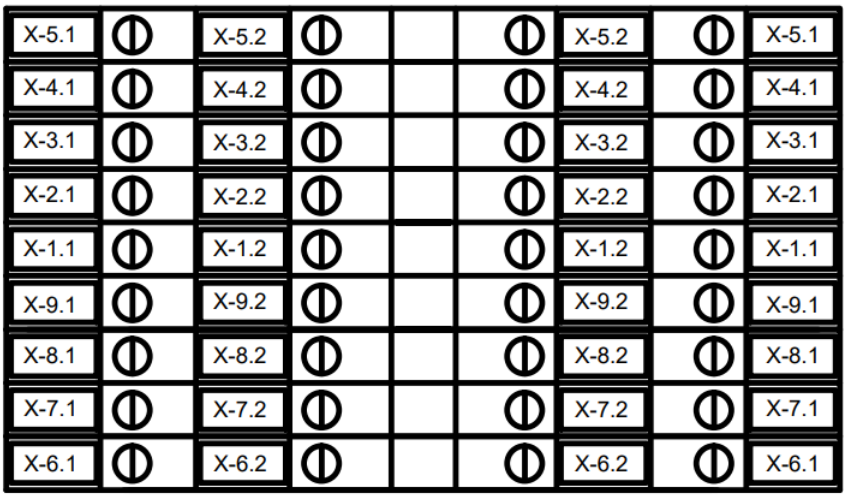
- Booster circulator management with the aid of two room thermostats (not supplied);
- Management of a plant side mixer valve both in heating and cooling mode;
- Solar – thermal integration management.

20.1 I/O RESOURCES OF THE CONTROLLER

The following is the list of I/O (inputs and outputs) that can be set to activate the functions of the controller.

Resource	Parameter	Terminal block XGI	Factory configuration		Description
			Default value	Function	
ST 5E	H27	6.1 / 6.2	0	Not set	Analogue input configurable with an NTC-10kΩ probe at 25°C β 3435
ST 6E	H28	7.1 / 7.2	0	Not set	Analogue input configurable with an NTC-10kΩ probe at 25°C β 3435
ST 7E (activated if ID 8E is not active	H29	8.1 / 8.2	0	Not set	Analogue input configurable with an NTC-10kΩ probe at 25°C β 3435
ID 8E (activated if ST 7E is not active)	H62		0	Not set	Voltage-free digital input
ID 9E	H63	9.1 / 9.2	0	Not set	Voltage-free digital input
DO 1E	H86	1.1 (phase) 2.2 (neutral)	0	Not set	230Vac, 50Hz, 2A (AC1) single-phase live output.
DO 2E	H87	2.1 (phase) 2.2 (neutral)	0	Not set	230Vac, 50Hz, 2A (AC1) single-phase live output.
DO 3E	H88	3.1 (phase) 3.2 (neutral)	0	Not set	230Vac, 50Hz, 2A (AC1) single-phase live output.
DO 4E	H89	4.1 (phase) 4.2 (neutral)	0	Not set	230Vac, 50Hz, 2A (AC1) single-phase live output.
DO 5E	H90	5.1 (phase) 5.2 (neutral)	0	Not set	230Vac, 50Hz, 2A (AC1) single-phase live output.

GI3 terminal block



20.2 MANAGEMENT OF SECONDARY CIRCULATOR/RELAUNCH PUMP (WITH ROOM THERMOSTAT)

Allows the management of two secondary or booster circulators serving the system.
This allows up to 2 secondary circuits with independent calls, one of which can be low temperature (mixed).

Two digital inputs and outputs are managed.

Resource I/O - Parameter	Value	Function	X terminals
ID9E can be activated via H63	19	Room thermostat 1	9.1 / 9.2
ID8E can be activated via H62	32	Room thermostat 2	8.1 / 8.2

Resource I/O - Parameter	Value	Function	X terminals
DO5E can be activated via H90	43	Secondary circulator circuit 1	5.1 (phase) 5.2(neutral)
DO4E can be activated via H89	33	Secondary circulator circuit 2	4.1 (phase) 4.2(neutral)

The various scenarios with their configuration are shown below:

Configuration		T.A. 1	T.A. 2	Secondary circulator circuit 1	Secondary circulator circuit 2	Mixing valve configuration (see chapter 14.3 mixing valve mangement)	Description
1	Single high temperature circuit	DI=19	-	DO=43	-	i06=0 (not enabled)	A.T. contact 1 manages the one room call and consequently activates the booster pump
2	Two indipendent high temperature circuits	DI=19	DI=32	DO=43	DO=33	i06=0 (not enabled)	The A.T. contact 1 works in the same way as for configuration 1, while the TA2 contact works in call for the output DO=33, which is managed as a booster pump for the secondary circuit 2, which in this configuration is also high temperature like the first.
3	Single mixed circuit	DI=19 or DI=32	-	-	-	i06 > 0 DO=33 etc. (enabled)	Contact T.A.1 works on the low-temperature circuit which is appropriately configured via the parameters of the 'rAd' group. The output DO=33 acts as a booster pump for the mixed circuit.
4	Two independent circuits: first is of the high temperature and second is of the mixing circuit	DI=19	DI=32	DO=43	-	i06 > 0 DO=33 etc. (enabled)	Contact T.A. 1 manages the call for the first secondary circuit at high temperature, activating the relative booster pump. Contact T.A. 2 manages the call for the second secondary circuit at low temperature (activation of DO=33 and relative adjustment of the mixing valve).
5	A high temperature circuit and a mixed circuit	DI=19	-	DO=43	-	i06 > 0 DO=33 etc. (enabled)	The call is handled in parallel for both resources DO=33 and DO=43

With the heat pump in OFF position, the booster circulator will be switched off independently of the thermostat call.
If the machine is not equipped with either a remote plant sensor or a secondary circulator, the room thermostat thermoregulation is as follows:

Room call	Compressor thermoregulation	
	b30=0	b30=1
Active	Active	Active
Off (ambient satisfied)	Compressor start is inhibited for room thermoregulation (DHW and defrosting not affected by the lockout). If the compressor	Shutdown of active compressors for room thermoregulation is forced (DHW and defrosting not affected)

The secondary circulator is switched off with a delay given by P02 (post-pumping).

20.3 MIXER VALVE MANAGEMENT

The mixer valve is regulated by means of specific PID which strives to maintain the delivery temperature of the radiant panel at the set value.
The setpoint setting can be found in the 'Set' Menu:
rCoo = Mixer flow temperature setpoint in cooling mode = 15°C (default)
rHea = Mixer flow temperature setpoint in heating mode = 30°C (default)
The resources and the parameters to be setting are the following:

I/O resource - Parameter	Description	Value	Function	X terminals
ST 5E can be activated via H27	Analogue input	44	Mixer probe	1.1 / 1.2
ID9E can be activated via H63	Digital input	19 or 32	Room thermostat 1 or 2	4.1 / 4.2
DO1E can be activated via H86	Voltage output	34	Valve open command	5.1 (phase) / 6.2(neutral)
DO2E can be activated via H87	Voltage output	35	Valve close command	5.2 (phase)
DO3E can be activated vi H88	Voltage output	33	Mixer pump	7.1 / 7.2

I/O resource - Parameter	Description	Value	Function	X terminals
i01	Valve opening time	Recover the value from the technical data supplied installed		
i02	Interval between two interruptions	30 seconds[1]		
i03	PID proportional band	2°C[2]		
i04	PID integral time	300 seconds[3]		
i05	PID derivative time	0 [4]		
i06	Mixer management only active in heating mode	1		
	Mixer management only active in cooling mode	2		
	Mixer management only active in heating and cooling mode	3		
i07	mixing valve in all recirculation inactive, in absence of call	0		
	mixing valve in all recirculation active, in absence of call	1[5]		

[1]Recommended value. Time interval between one corretion and the next.
[2]Recommended value. Intervention area defined by the difference between the setpoint for the mixer flow and the temperature measured by mixing flow probe.
[3]Recommended value. Time taken by the mixing valve to switch from open to closed and vice versa, when the difference between setpoint set for the flow of the mixing valve and the value read by the mixing probe is greater than or equal to proportional band. The more larger this value, the slower the change in approach to the setpoint set for the mixing valve flow.
[4] Derivate component of regulation; use only if you have a good knowledge of regulator logic.
[5] i07=1: in the following cases the mixing valve closes completely:

- with the room thermostat of the low-temperature circuit active, when I change the operating mode of the PDC from Heat (or Cool) to OFF, the DO "Valve close command" is activated for i01 seconds.
- If I open the room thermostat contact of the low-temperature circuit, the DO 'Valve closing command' is activated for i[01] seconds.

20.3.1 Determination of setpoint

The setpoint on which to perform regulation is given by rCOO or rHEA respectively in cooling and heating mode. If dynamic compensation of the setpoint is enabled (b08=1), then the setpoint will be corrected the same way as the heat pump/chiller.
The maximum and minimum value reached by the compensation are not controlled. Therefore the parameters must be configured so that the setpoints are not brought to unwanted values outside of the allowed work ranges.

20.3.2 Mixing pump

The mixing pump (DO3E) switches on when there is a call from the digital input ambient thermostat (ID9E) and switches off with a delay of P02 from the instant the thermostat call ceases.

20.4 SOLAR INTEGRATION MANAGEMENT

To enable te function, set S01=1.

Parameter	Description	Value	Function	X terminals
ST6E can be activated via H28	Analogue input	39	Solar storage tank probe	7.1 / 7.2
ST7E can be activated via H29	Analogue input	38	Solar collector probe	8.1 / 8.2
DO3E can be activated via H88	Live output	30	Solar circulator	3.1 (phase) 3.2(neutral)
DO4E can be activated via H89	Live output	45	Solar exhaust valve	4.1 (phase) 4.2(neutral)

20.4.1 Activation of solar circulator

Solar management is also active with the unit off.
The solar circulator is active in both of the following conditions are met:

- The temperature of the solar collector is higher than that defined by parameter **S13** (default 40°C), the solar circulator is activated;
- The temperature difference between the solar collector and that of the solar storage tank is higher than the parameter **S02** (default 6°C).

20.4.2 Collector protection

If the temperature of the collector exceeds parameter **S04** (default 110°C), the solar circulator is periodically on intermittently with the times set in:

- **S05** = time ON (default 15 seconds);
- **S06** = time OFF (default 15 seconds).

As hysteresis to exit the protection condition use **S08** (default 2°C).
This protection is guaranteed even with the machine Off.

20.4.3 Collector overtemperature alarm

If the collector probe exceeds the value of parameter **S12** (default 130°C), there is an alarm condition **E10** which blocks the solar circulator. The hysteresis to return from the alarm condition is given by parameter **S08** (default 2°C).
If an alarm is triggered, operation of the heat pump is guaranteed.

20.4.4 DHW overtemperature alarm

If the temperature of the DHW storage tank exceeds the parameter **S10** (default 80°C), the alarm **E50** is triggered.
The hysteresis to return from the alarm condition is given by parameter **S11** (default 2°C).
If an alarm is triggered, operation of the heat pump is guaranteed.

20.4.5 Solar exhaust valve

If alarms **E10** and **E50** are triggered simultaneously, the solar exhaust valve will be activated.

It is recommended to connect the output of terminals 8.1 (phase) – 8.2 (neutral) to a timed relay to manage the flow of the exhaust valve. If any doubts arise, contact our headquarters.

20.4.6 Disposal of solar tank heat

The solar circulator runs to dissipate excess heat in the storage tank by exploiting the solar collector if both of the following conditions are met:
-The temperature of the DHW storage tank is higher than parameter S15 (default 60°C);
-The temperature of the solar collector is lower than 35°C (parameter S13 – parameter S14).

The solar collector is off when at least one of the following conditions is met:

-The temperature of the DHW storage tank is lower than parameter S15 (default 60°C).
-The temperature of the collector exceeds the parameter S13 (default 40°C), as conditions are no longer in place for proper dissipation of the heat.

20.4.7 Antifreeze

Function active if the parameter **S01** = 1.
If the temperature of the solar collecor is lower than parameter **S07** (default 5°C), the solar circulator is activated in antifreeze mode.
This protection is only enabled with the machine Off.
The function is inhibited if the temperature of the DHW storage tank is lower than the value defined in parameter **S16** (default 20°C).
This regulator also works with the unit Off.
Setting the parameter **S01** = 2, the antifreeze function is never active (for example because the solar plant is supplied with glycol).
Be careful as enabling this function could damage the entire system.
Note:

- Solar integration is NOT managed if the controller of the unit is OFF.
- The remote digital input OFF has no effect on solar management.
- During first ignition, check that the probe of the solar collector measures a temperature lower than 160°C and that this temperature corresponds to that read on the controller of the internal unit.
- Solar circulator live output 230V ac, 50Hz, 2A (AC1).
- For higher absorptions, connect the output to the contactor coil.
- Factory-set parameters for solar management, any other configurations are the responsibility of the user and/or installer. The company excludes any contractual and extra contractual liability for damage caused to persons, animals or objects, by incorrect installation, setting and maintenance, improper use of the equipment, and the partial or superficial reading of the information contained in this manua

21. 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.

ATTENTION:

- **All the operations with INSTALLER visibility must be carried out by QUALIFIED PERSONNEL.**
- **Values other than the default values can jeopardise proper operation of the unit. If in doubt on which value to set, contact our headquarters.**
- **The company excludes any contractual and extra contractual liability for damage caused to persons, animals or objects, by incorrect installation, setting and maintenance, improper use of the equipment, and the partial or superficial reading of the information contained in this manual.**
- **No liability can be accepted in the event of breakages or malfunctionscaused by unauthorised canges to the factory parameters.**

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
Coo	First cooling setpoint	°C	7.0	25÷Coo2	U		
Hea	First heating setpoint	°C	45.0	Hea2÷H01	U		
San	Sanitary setpoint	°C	48.0	25÷H01	U		If sanitary function active
Coo2	Second colling setpoint	°C	18.0	Coo÷25	U		
Hea2	Second heating setpoint	°C	35.0	25÷Hea	U		
rCoo	Mixing valve setpoint in cooling	°C	15.0°C	-50.0÷80.0	U		If mixer valve management is active

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
rHea	Mixing valve setpoint in heating	°C	15.0°C	-50.0÷80.0	U		If mixer valve management is active
San2	Second sanitary setpoint	°C	48.0	25÷H01	U		
H01	Maximum value in heating setpoint	°C	78.0	-50÷80	I		
H04	Minimum valeu in cooling setpoint	°C	5.0	-50÷80	I		
H10	Sanitary function enabling	/	0	0÷6	I	See par. 12.	
H19	Input configuration Analogue ST6	/	0	0÷49	I	0 = Input disabled 6 = Domestic hot water probe/DS	
H22	0-10vDC live input configuration Analogue ST11	/	0	0÷49	I	0 = Input disabled 40 = Plant setpoint decalibration	
H27	Input configuration Analogue ST6E	/	0	0÷49	I	0 = Input disabled 44 = Mixer probe	Only if Gi3 accessory is present
H28	Input configuration Analogue ST6E	/	0	0÷49	I	0 = Input disabled 39 = Solar storage tank probe	Only if Gi3 accessory is present
H29	Input configuration Analogue ST7E	/	0	0÷49	I	0 = Input disabled 38 = Solar collector probe	Only if Gi3 accessory is present
H30	Input configuration Analogue ST8E	/	0	0÷49	I		Only if Gi3 accessory is present
H46	Input configuration Digital ID2	/	0	0÷32	I	0 = Input disabled	
H47	Input configuration Digital ID3	/	2	0÷32	I	0 = Input disabled 2 = Remote On / Off	
H53	Input configuration Digital ID9	/	0	0÷32	I	0 = Input disabled	
H60	Input configuration Digital ID6E	/	0	0÷32	I	0 = Input disabled	
H61	Input configuration Digital ID7E	/	0	0÷32	I	0 = Input disabled	
H62	Input configuration Digital ID8E	/	0	0÷32	I	0 = Input disabled	
H63	Input configuration Digital ID9E	/	0	0÷32	I	0 = Input disabled 19 = room thermostat	Only if Gi accessory present
H75	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	To reverse more than one polarity, do the sum of those you want to reverse
H76	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	To reverse more than one polarity, do the sum of those you want to reverse
H83	Output configuration In DO5 power	/	28	0÷49		0 = Output disabled	
H85	Output configuration In DO7 power	/	6	0÷49	I	0 = Output disabled 6 = Sanitary valve 25=3-way valve for radiant panels	
***H86**	Output configuration In voltage DO1E	/	0	0÷49	I	0= Output disabled 34= Valve opening command	Only if Gi3 accessory present
***H87**	Output configuration In voltage DO2E	/	0	0÷49	I	0= Output disabled 35= Valve closing command	Only if Gi3 accessory present
***H88**	Output configuration In voltage DO3E	/	0	0÷49	I	0 = Output disabled 30 = Solar circulator	Only if Gi3 accessory present
***H89**	Output configuration In voltage DO4E	/	0	0÷49	I	0 = Output disabled 45 = Solar exhaust valve	Only if Gi3 accessory present
***H90**	Output configuration In voltage DO5E	/	0	0÷49	I	0 = Output disabled 43 = Secondary circulator	Only if Gi3 accessory present

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
H100	Digital output polarity	/	2	0÷255	I	0 = Digital inputs N.O. 1 = Inverted polarity of DO1 2 = Reversed polarity of DO2 4 = Reversed polarity of DO3 8 = Reversed polarity of DO4 16 = Reversed polarity of DO5 32 = Reversed polarity of DO6 64 = Reversed polarity of DO7 128 = Reversed polarity of DOE1	To reverse more than one polarity, do the sum of those you want to invert
H101	Digital output polarity	/	0	0÷255	I	0 = Digital inputs N.A. 1 = Reversed polarity of DO2E 2 = Reversed polarity of DO3E 4 = Reversed polarity of DO4E 8 = Reversed polarity of DO5E 16 = Reversed polarity of DO6E 32 = Reversed polarity of DO7E	To reverse more than one polarity, do the sum of those you want to invert
H124	Serial baud rate	baud	1	0÷3	I	0=4800 baud 1=9600 baud 2=19200 baud 3=38400 baud	
H125	Serial parity	/	2	0÷3	I	0=none parity, 2 stop bits 1=odd parity, 1 stop bit 2=even parity, 1 stop bit 3=none parity, 1stop bit	
H126	Serial address	/	1	0÷120	I	In the cascade configuration, assign a different address to each controller.	
H129	Enable second setpoint	/	0	0÷4	I		
H130	Heating with DHW storage tank	/	0	0÷1	I	0 = Normal operation 1 = In Heating, machine always turned towards DHW	
H136	OFF state deactivation with ID presence ON/OFF remote	/	0	0÷1	I	0 = Normal operation 1 = If H47=2, the machine cannot be in the OFF state (at most it can be in system standby E00)	
H138	Enabling second set point for DHW	/	0	0÷3	I	0 = Function not configured 1 = Only enabled in summer 2 = Only enabled in winter 3 = Enabled summer and winter	
H141	Priority communication channels Modbus	/	1	0÷1	I	0 = Priority on channel 1 (CN14) 1 = Priority on channel 2 (CN12-N13)	
H142	MODBUS 2 serial baud rate (CN12 - CN13)	/	1	0÷3	I	0 = 4’800 Baud 1 = 9’600 Baud 2 = 19’200 Baud 3 = 38’400 Baud	
H143	Parity and Stop Bit serial MODBUS	/	2	0÷3	I	0 = No parity, 2 Stop bits 1 = ODD Parity, 1 Stop Bit 2 = EVEN parity, 1 Stop Bit 3 = No parity, 1 Stop Bit	
H144	Serial address for MODBUS	/	0	0÷127	I	0 = same address as Serial Mocbus 1 (H126)	
A08	Antifreeze alarm activation setting	°C	3	-127÷127	I		Different values can jeopardise proper operation of the unit
C01	Switch-off safety time	sec*10	30	0÷255	I		
b01	Band approaching set in Cool	°C	3.0	0.5÷5.0	I		
b02	Band approaching set in Heat	°C	3.0	0.5÷5.0	I		
b03	Offset on sanitary call	°C	4.0	0.0÷15.0	I		
b04	Valve switching time according to setpoint	sec	30	0÷600	I		Different values can jeopardise proper operation of the unit
b05	Compressor cut-off hysteresis	°C	0.0	0.0÷1.0	I		
b06	DHW to heating output transient	sec	45	0÷255	I		
b07	Integral PI controller time approaching set	sec	150	0÷255	I		
b08	Enable dynamic setting	/	0	0÷1	I	See par. 9	
b09	Maximum cooling offset	°C	3.0	-50.0÷80.0	I	See par. 9	
b10	Maximum heating offset	°C	-3.0	-50.0÷80.0	I	See par. 9	
b11	Outdoor temperature set dynamic in cool	°C	25	-127÷127	I	See par. 9	
b12	Outdoor temperature set dynamic in heat	°C	15	-127÷127	I	See par. 9	

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
b13	Delta outdoor temperature dynamic set in cool	°C	-10.0	-50.0÷80.0	I	See par. 9	
b14	Heating temperature delta	°C	10.0	-50.0÷80.0	I	See par. 9	
b15	0-10V analogue input setting decalibration band	°C	5.0	0.0÷10.0	I	See par. 7	
b20	0-10V ratiometric input enabling	/	0	0÷1	I	0 = 0-10V input 1 = Ratiometric input	
b21	Diverter valve switching time	/	0	0÷600	I		
b22	Plant probe temperature control cut-off hysteresis	°C	5.0	0.0÷25.5	I		See par 13.5
b24	Maximum compressor cut-on delta	°C	7.0	0.0÷15.0	I		
b25	Compressor cut-on delta	°C	3.0	2.0÷25.5	I		
b30	Compressor switch-off enable room call satisfied	flag	0	0÷1	I		
b31	System setpoint offset for SGReady function	°C	2.0	0.0÷5.0	I		
b32	DHW setpoint offset for SGReady function	°C	2.0	0.0÷5.0	I		
P01	Pre-pumping compressor start	sec	30	0÷255	I		
P02	Post-pumping	min	2.0	0÷25.5	I		
P03	Pump operation mode	/	0	0÷1	I	See par. 8	The pump is always on if the antifreeze heaters are active.
P04	Pump setting in antifreeze	°C	5	-127÷127	I	See par. 8	
P05	Pump hysteresis in antifreeze	°C	2.0	0.0÷25.5	I	See par. 8	
P06	Set delta T water pump in heat	°C	2.0	0.0÷25.5	I	Vedi par. 8	
P07	Max. pump speed	°C	100	50÷100	I		
P08	Minimum pump speed	°C	75	50÷100	I		
P09	Set delta T water pump in cool	°C	2.0	0÷25.5	I	See par. 8	
P16	Periodic cycle time	min	0	0÷600	I	See par. 8	
P17	Periodic ON pump time	sec	0	0÷255	I	See par. 8	
***r02**	Antifreeze heaters setpoint in heating mode	°C	4	3÷6	I		Only change if glycol water is present. Contat company.
***r03**	Antifreeze heaters setpoint in cooling mode	°C	4	3÷6	I		Only change if glycol water is present. Contact company.
***r06**	Antifreeze heater hysteresis	°C	2.0	0.0÷25.5	I		Only change if glycol water is present. Contact company.
***r08**	Heat pump blockage threshold	°C	-20	-127÷127	I	Respect r22 ≥ r28 ≥ r08	It is recommended not to change this value, as this could impair the operation of the unit
r09	Heat pump block hysteresis	°C	1.0	0.0÷10.0			
***r10**	Enabling resistors in system integration	/	0	0÷1	I	0 = Function disabled 1 = Function enabled	See par. 18
***r11**	Delta AUX in system integration	°C	0.5	0,0÷25.5	I	See par. 18.1	
***r12**	AUX activation delay system integration	min	8	0÷255	I	See par. 18.1	
***r13**	AUX switch-off enabling in delta r11		0	0÷3			
***r14**	Compressor exclusion on system with DHW heater active	/	0	0÷1	I	0 = electrical heaters that can be activated simultaneously 1 = electrical heaters that can be activated exclusively	
***r15**	Enabling sanitary integration	/	0	0÷2	I	0 = Function disabled 1 = Function enabled	See par. 18.2
***r16**	AUX activation delay sanitary integration	min	8	0÷255	I		
***r19**	Time for activation of tray heaters after defrost (0=always on)	min	0	0÷255	I	0= activation of defrosting-independent electrical heater.	

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
***r21**	Enabling of resistors in system integration during defrosting	/	0	0÷1	I	0=Function disabed 1=Function enabled	
***r22**	AUX activation threshold in synergy with PDC (PDC priority)	°C	7	-16÷50	I	Respect r22 ≥ r28 ≥ r08	It is recommended not to change this value, as this could compromise the operation of the unit.
***r23**	Type of boiler use	/	6	0÷6	I	See par. 18.6	
***r24**	Type of use electrical heaters	/	3	0÷3	I	See par.18	
r25	Disinfection setpoint	°C	80	0÷100	I		
r26	Disinfection duration	min	12	0÷255	I		
r27	Setpoint pompa di calore in disinfezione	°C	5555.0	-500÷800	I		
***r28**	PDC activation threshold in synergy with AUX (AUX priority)	°C	-7	-16÷50	I	Respect r22 ≥ r28 ≥ r08	It is recommended not to change this value, as this could compromise the operation of the unit.
***r29**	Setpoint offset for AUX with primary setpoint	°C	0	0÷100	I	See par.18.6	
***r30**	Setpoint offset for AUX with secondary setpoint	°C	0	0÷100	I		
***r31**	Setpoint offset for AUX with DHW setpoint	°C	0	0÷100	I		
***r32**	Boiler configuration	/	0	0÷3	I	See par. 18.6	
***r33**	Circulator management with active heating elements	/	3	0÷3	I		
***r34**	r34 Disinfection day (0=Dis; 1=Mon; 7=Sun)	/	0	0÷7	I	0=Dis 1=Monday ... 7=Sunday	
***r35**	Disinfection time (minute of the day)	/	0	0÷1439	I		
r36	Anti-loop time on DHW operation	min	0	0÷255	I		Control to prevent the machine from remaining in DHW production indefinitely because it does not reach the set point. Control active if parameter R36 is different from 0. In this case, r36 time is counted from when the compressor started working in DHW production. If the DHW production is not finished within r36 minutes, then a forced exit from DHW production takes place.
r37	Boiler operation in cool+san	/	1	0÷2	I	0 = Boiler not used 1 = Boiler used in integration 2 = Boiler does DHW and PDC does plant.	
d04	Defrost output pressure	bar	18.0	0.0÷80.0	I		
d08	Minimum time between defrost	min	50	0÷255	I		
L02	User enablement for minimum Hz	/	0	0÷1	I	0 = Function disabled 1 = Function enabled	
L03	Minimum Hz mode	/	7	0÷6	I	See chapter "16. FUNZIONALITÀ HZ MINIMI"	
***i01**	Valve opening time	sec	0	0÷600	I		
***i02**	Interval between two corrections	sec	0	0÷600	I		
***i03**	PID proportional band		0	0÷80.0	I		
***i04**	PID integral time	sec	0	0÷2000	I		
***i05**	PID derivative time	sec	0	0÷25.5	I		

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations:	
						Description	Notes
***i06**	Radiant panel configuration	/	0	0÷3	I		
***i07**	Mixing valve in all recirculation, when no call is made	/	0	0÷1	I		

(*) If a GI accessory is fitted
(**) if DS accessory is present

22. ALARMS

Some alarms that can occur on the unit are described below. By placing the controller in OFF mode, the alarms reset and the counts of the relative hour interventions are also reset. If the alarms are still triggered when switching the unit back on, contact technical assistance. The values indicated below could be subject to updates. If you have any doubts, contact our headquarters.

22.1 [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 does not trigger during the system venting function.

22.2 [E018] HIGH-TEMPERATURE

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

22.3 [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.

22.4 [E611÷E682] 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 46 ±1 bar. In this case the driver and compressor are immediately disconnected. The alarm is reset when the pressure drops below 36 ±1 bar.**
- **Error E651 also appears if the fan thermal protection is triggered.**

22.5 [E691÷E701] TRANSDUCER ALARMS

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

22.6 [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.

22.7 [E851 ÷E981] INVERTER ALARMS

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

22.8 [E00] REMOTE ON/OFF SIGNALLING

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

22.9 [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 31,5 bar; if it occurs more than 3 times per hour the alarm becomes a manual reset.

22.10 [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.

22.11 [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.

22.12 [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.

22.13 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.

22.14 UTILITIES BLOCK ALARM TABLE

Alarm code	DESCRIPTION	Block
E00	Remote off	Machine
E001	High pressure alarm	Machine
E002	Low pressure alarm	Machine
E005	Antifreeze alarm	Machine
E006	No flow alarm	Machine
E008	Compressor driver limitation alarm	Machine
E009	High discharge temperature alarm	Compressor
E018	High temperature in cooling mode alarm	Machine
E041	Incongruent temperature alarm	Machine
E611	Water inlet probe failure	Machine
E621	Water outlet probe failure	Machine
E631	Compressor suction probe failure	Machine
E641	Compressor discharge probe failure 1 / high pressure switch intervention	Machine
E651	External air / fan thermal probe failure	Machine
E661	Compressor discharge probe failure 2 / high pressure switch trip	Machine
E681	Sanitary/remote system probe failure	Machine
E691	Low pressure transducer failure	Machine
E701	High pressure transducer failure	Machine
E711	Fault in voltage input 0-10V DC	Machine
***E652**	Gas probe failure DS	DS
E801	Inverter communication timeout	Compressor
E851	Inverter hardware problem	Compressor
E861	Motor current too high	Compressor
E871	High inverter IPM module temperature	Compressor
E881	Supply voltage out of limits	Compressor
E891	Compressor not connected	Compressor
E911	Overload protection	Compressor
E921	PFC overcurrent	Compressor
E941	PFC fault	Compressor
E951	Sensor fault IPM	Compressor
E961	Abnormal condition	Compressor
E971	Errore EEPROM	Compressor
E981	High Pressure Inverter 1	Compressor

(*) if DS accessory is present

23. 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 comands:

READING	HOLDING REGISTER
WRITING	6-16

Register	Format	Bit	R/W	Range	Name	Description	Note
1	INT	-	R	-	Firmaware informa-tion	Firmaware versione	
2	INT	-	R	-		Firmware release	
3	BYTE (H)	-	R	-		Firmware sub-release	
	BYTE (L)	-	R	-		Firmware creation day	
4	BYTE (H)	-	R	-		Firmaware 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	
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[1]	
		-	R	-		(5) Cooling + Sanitary[1]	
		-	R	-		(6) Cooling + Sanitary[1]	
7201	BIT MASK	0	R/W	-		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[1]	
		-	W	-		(5) Cooling + Sanitary[1]	
		-	W	-		(6) Heating + Sanitary[1]	
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		Santary	
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		DHW preparer	
7201	BIT MASK	2	R/W	-	Second setpoint	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

Register	Format	Bit	R/W	Range	Name	Description	Note
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 [2]	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	-	Santary 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	
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	-		Evporation circuit 2	
627	°C/10	-	R	-		Condensation circuit2	
400	°C/10	-	R	-	Temperature [3]	Water inlet	
401	°C/10	-	R	-		Water outlet	
405	°C/10	-	R	-		DHW	
422	°C/10	-	R	-		Compressor inhlation	
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 [3]	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	

Register	Format	Bit	R/W	Range	Name	Description	Note
950	BIT MASK	0	R	-	Alarms [4] [5]	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
951	BIT MASK	1	R	-	Alarms [4] [5]	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
952	BIT MASK	0	R	-	Alarms [4] [5]	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 [4] [5]	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

Register	Format	Bit	R/W	Range	Name	Description	Note
954	BIT MASK	0	R	-	Alarms [4] [5]	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
955	BIT MASK	0	R	-	Alarms [4] [5]	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 [4] [5]	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

[1] if enabled
[2] the cycle is activated only if the DHW (4-5-6) status is terminated by the machine.
[3] if the read value is equal to 32766 the probe is not configured, if 32767 the probe is faulty.
[4] reset alarms, write the value 0 with the command 6 on any of the registers of the alarms area.
[5] the alarms of circuit 2 are mapped in the same way with an offset of 20000 (e.g. 20950).

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