



INDUSTRIAL INVERTER AIR/WATER HEAT PUMPS WITH AXIAL FANS

CONTROLLER MANUAL



Models

i-HP 0125 / i-HP-LT 0125

i-HP 0135 / i-HP-LT 0235

i-HP 0250F i-HP 0250 / i-HP-LT 0250

i-HP 0260

i-HP 0270



A91'

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Possible wasted electrical or electronic devices/products should not be located together with normal domestic waste, but disposed according to the current WEEE law in compliance with the European Directive 2012/19/UE and following modifications 2003/108/EC. Please inform yourself at your local Administration or at your reseller in case the product will be replaced with a similar one.



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1 CONSERVATION OF THE MANUAL

The manual has to be always kept for future reference. It has to be stored in a safe place, away from dusts and moisture. It has to be also available and accessible to all users who shall consult it any time they are in doubt on how to operate the equipment. The company reserves the right to modify its products and related manuals without necessarily updating previous versions of the reference material. It declines also any responsibility for possible inaccuracies in the manual if due to printing or transcription errors.

The customer shall store any updated copy of the manual or parts of it delivered by the manufacturer as 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 its own units.

1.1 Graphic symbols used in the manual

	<i>Indicates prohibited operations.</i>
	<i>Indicates operations that can be dangerous for people and/or disrupts the correct operation of the equipment.</i>
	<i>Hazardous electrical voltage - risk of electric shock</i>
	<i>Indicates important information that the operator has to follow in order to guarantee the correct operation of the equipment in complete safety. It indicates also general notes.</i>

2 PERMITTED USES





- The company excludes any contractual and extra contractual liabilities for damages 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.
- These units have been designed only for heating and/or cooling water. Any other use not expressly authorized by the manufacturer is considered improper and therefore not allowed.
- The execution of all works must be performed by skilled and qualified personnel and competent in the existing rules in the country in which the appliance will be installed.

3 GENERAL SAFETY GUIDELINES

Before beginning any operation on the units, every user and operator has to be perfectly knowledgeable about the operation of the equipment and its control functions and has to have read and understood the information listed in this manual.

3.1 Personal protection equipment

It's necessary to use the below personal protective equipment when operating and maintaining the i-HP/i-HP LT units,

	<i>Protective clothing: Service man or who operates on the plant systems should wear protective clothing that complies with the basic safety requirements currently in force. In case of slippery floors, users have to wear safety shoes with non-slip soles.</i>	
	<i>Gloves: Protection gloves should be used during maintenance or cleaning operations.</i>	
		<i>Mask and goggles: Respiratory protection (mask) and eye protection (goggles) should be used during cleaning and maintenance operations.</i>

3.2 Health and safety of workers

The European Community has adopted a number of directives on workplace's health and safety, which include **89/391/CEE**, **89/686/CEE**, **2009/104/CE**, **86/188/CEE** and **77/576/CEE** directives. Every employer shall implement such provisions and ensure that workers respect them:



It's forbidden:

- To remove and/or tamper with any safety device.
- The access to the electrical board by unauthorized persons
- To carry out any work on the equipment under voltage
- To touch the equipment if you are not allowed.
- The use of the appliance by children or unassisted disabled persons.
- To touch the appliance when barefoot or parts of the body are wet or damp
- To clean the unit when the power is 'ON'.
- To pull, remove or twist the electrical cables coming out from the unit.
- To step with your feet on the appliance, sit down and/or place any type of object.
- To spray or pour water directly on the unit.
- To dispose of, abandon or leave within reach of children packaging materials (cardboard, staples, plastic bags, etc.) as they may represent an environmental and health hazards.
- To tamper with or replace parts of the equipment without the specific consent of the manufacturer. The manufacturer shall have no whatsoever civilian or penal responsibility in case of unauthorized operations.



WARNING:

- Before proceeding, you should read the user's-installer manual accompanying appliance.
- All the operations described below must be carried out only by QUALIFIED PERSONNEL.
- The wiring to the terminal block must be performed by qualified personnel.
- Any routine and/or not-routine maintenance operation shall be carried out when the equipment has been shut down, disconnected from electric power supply.
- Do not put neither your hands nor insert screwdrivers, spanners or other tools into moving parts of the equipment
- The equipment's supervisor and the service man have to receive suitable training for performing their tasks in safety.
- The access to the electric panel is limited only for authorized personnel.
- Operators have to know how to use personal protective devices and have to know the accident-prevention guidelines contained in national and international laws and norms.
- The operator's workplace has to be kept clean, tidy and free from objects that may prevent free movements. Appropriate lighting of the work place shall be provided so as to allow the operator to carry out the required operations safely. Poor or too strong lighting can cause risks.
- Ensure that the work places are always adequately ventilated and that aspirators are working, in good condition and in compliance with the requirements of the laws in force.
- Not all the configurations can be simultaneously enabled and/or changed.
- Other values different than default ones can ensure the proper operation of the unit, in case of doubt about the value to be set contact please our office.
- The company excludes any contractual and extra contractual liabilities for damages 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 guide.



- The access to the electrical board by unauthorized persons is forbidden.
- It's forbidden to carry out any work on the equipment under voltage.
- It's forbidden to touch the equipment if you are not allowed.



Requirements before performing electrical work on the control panel:

- Turn off the unit from the control panel ("OFF" displayed).
- Put the "QF" general differential switch on OFF position
- wait for 15 seconds before getting access to the electric board
- Check the ground connection before beginning any operation.
- Be sure that you are well insulated from the ground, with dry hands and feet, or by using insulating platforms and gloves.
- Check that there is no foreign material near the system.

4 PURPOSES AND CONTENTS OF THE MANUAL

This manual provides basic information as for the configuration of the panel controller of i-HP/i-HP LT units.

It is addressed to the installer and the user of the unit: it allows you to operate this equipment efficiently, even if the user does not have any previous specific knowledge of it.

Not all the described functions can be individually and/or simultaneously selected. Please contact the technical office for any information.

This manual describes the characteristics of the equipment when it was being put on the market; therefore, it may not capture later technological improvements introduced by the company as part of its constant endeavour to enhance the performance, ergonomics, safety and functionality.

The company introduces also technological improvements and is not constrained to update the manuals for previous versions of appliances that could not be compatible. So make sure to use, for the installed unit, the supplied manual.

It's recommended that, the user must follow the instructions contained in this booklet, especially those concerning the safety and routine maintenance.

5 USER – CB MASTER CONTROLLER INTERFACE



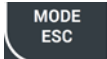
It is used to select the operating mode, and to reset the manual resetting alarms. The operating mode changes as per the sequence below each time you press the Mode button:

off → cool → heat → off

If the Domestic Hot Water (DHW) mode is enabled, the sequence is as follows:

off → cool → cool+san → heat → heat+san → off

During the parameters' setting, this button can be used to revert BACK to the previous level.



It allows you to enter into the setting menu parameters and to select the cool/summer, heat/winter and DHW set point value.

UP button: In the setting mode, this button allows you to move up to a higher menu or to increase the value of a parameter when you are in the "edit" mode.

DOWN button: In the setting mode, this button allows you to shift to a lower menu or to decrease the value of a parameter when you are in the "edit" mode.



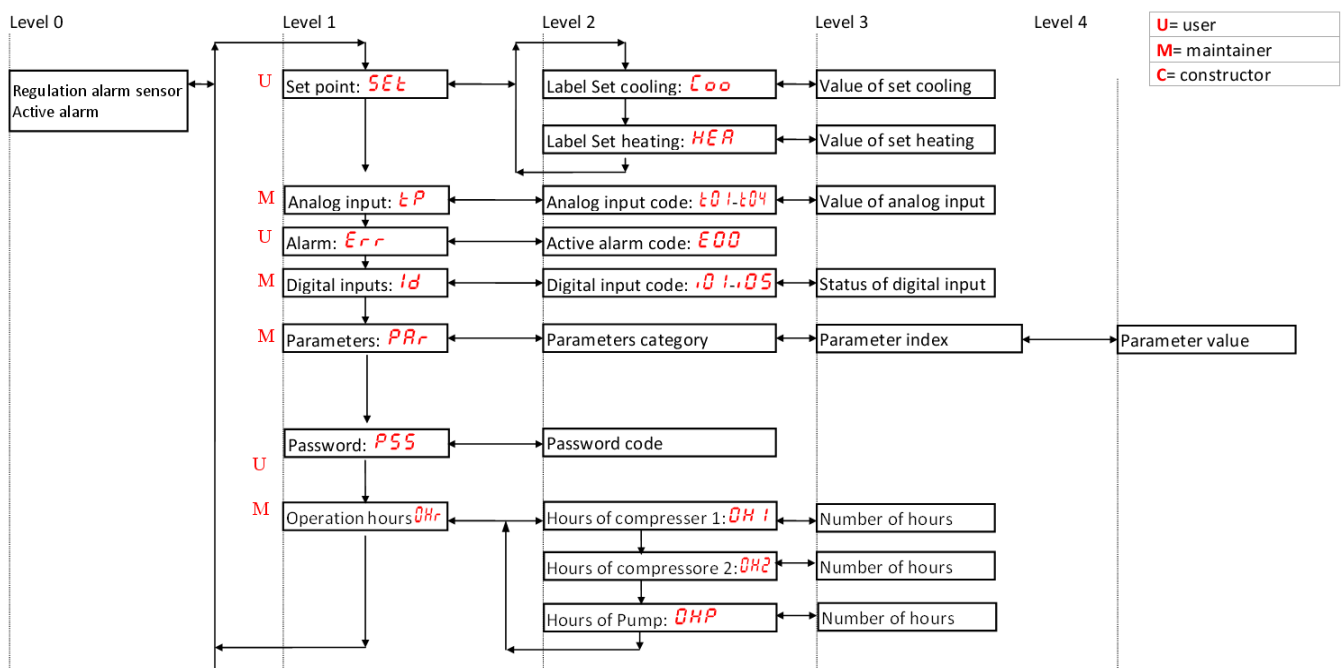
All the operations described below must be carried out only by qualified personnel.

Not all the configurations can be simultaneously enabled and/or changed.

Other values different than those of default can ensure the proper operation of the unit, in case of doubt about the value to be set contact please our office.

The company excludes any contractual and extra contractual liabilities for damages 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.

5.1 Menu structure diagram



Level 0 (U) = always appearing

Level 1 (M) = it appears if you enter the maintainer or manufacturer password

Level 2 (C) = it appears if you enter the manufacturer password

Level 3 (A) = it appears only via Modbus

5.2 Menu contents

The main functions of the menus are listed below, especially when there are some unambiguous functions. The main menu manages the following parameters:

MENU	LABEL	LIVEL OF PASSWORD	OTHER CONDITIONS
Setpoint	Set	User	Not accessible if the unit is connected to Hi-T control panel
Sensors	tP	Installer	---
Alarms	Err	User	Only in case of active alarms
Digital inputs	Id	Installer	---
Parameters	Par	Installer	---
Password	PSS	User	---
Number of operating hours	oHr	Installer	---
USB	USb	Installer	Only if the USB flash drive is present with its files

Enter in the password menu and insert its “password code” in order to enable an access with a greater privilege. Note that, once you exit completely from the menus, the password concession will be lost and you should to re-enter it in order to get access again.

5.2.1 Setpoint menu

You can display and modify the different setpoints.

SETPOINT	DESCRIPTION	UNIT	DEFAULT	RANGE
Coo	First setpoint in the summer	°C	7.0	$H03 \div Co2$
Hea	First setpoint in the winter	°C	45.0	$He2 \div H01$
*San	DHW setpoint	°C	48.0	$H02 \div H01$
Co2	Second setpoint in the summer	°C	18.0	$Coo \div H03$
He2	Second setpoint in the winter	°C	35.0	$H02 \div Hea$

* if the DHW function is active

5.2.2 Password menu

Enter and confirm the password for the desired access level. The controller will automatically open the desired access level and then the items which can be enabled from this level will appear.

5.2.3 Sensors menu

The value of the different sensors will appear. The number of visible sensor depends on the presence or not of the I/O expansion modules.

Particular cases:

- Err = Sensor is faulty
- --- = Sensor not used (no function is associated to such sensor)

By entering the maintainer password in the menu of analog inputs "tP", at the level 1 of the structure diagram menu of the on-board control panel, you can read the values of the current sensors:

tp	DESCRIPTION	Unit
t01	Water inlet temperature	(°C)
t02	Water outlet temperature	(°C)
t03	Compressor intake temperature	(°C)
t04	Compressor discharge temperature	(°C)
t05	Outdoor air temperature	(°C)
t06	Domestic hot water temperature (if enabled)	(°C)
t07	Plant water temperature remote sensor (if enabled)	(°C)
t09	Low pressure	(bar)
t10	High pressure	(bar)

5.2.4 Alarms' menu

This menu appears only in case of alarms warning. You can check all active alarms. The alarms are divided by circuit for multi-circuit units (the ALCx label allows to get access to the alarms of the circuit number x).

5.2.5 Digital inputs menu

You can check the status of the digital inputs as below:

0 = inactive input

1 = active input

5.2.6 Parameters menu

The parameters are collected into groups; each group is identified by a three-digit code, while the index of each parameter is preceded by a letter.

DESCRIPTION	GROUP'S IDENTIFICATIVE CODE	PARAMETER'S INDEX	VISIBILITY
Configuration	CnF	H-	USER/INSTALLER
Compressor	CP	C-	INSTALLER
Fan motor	FAn	F-	INSTALLER
Alarms	ALL	A-	INSTALLER
Regulation	Re	b-	INSTALLER
Pump	PUP	P-	INSTALLER
Electric heaters	Fro	r-	INSTALLER
Defrosting	dFr	d-	INSTALLER
Electronic valve	EEu	U-	INSTALLER
Offset	OFF	o-	INSTALLER
Inverter compressors	nCP	n-	INSTALLER


5.2.7 Operation's hours menu

You can display the number of operating hours of the compressors and of the pumps.

Press the ESC button for 3 seconds to resets the actual number of operating hours. Note that, you can enter into this menu only via password.

5.2.8 USB menu

The available functions through the use USB flash drive that is connected to the board are indicated below.

 WARNING	All the operations with installer visibility must be carried out by qualified personnel.
	The company excludes any contractual and extra contractual liabilities for damages 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.

5.2.8.1 Controller's firmware updating

You can update of the controller's firmware in case of new versions release, this can be done by mean of a USB flash drive via its proper port on the controller.

For the update:

1. Copy the updated files in the main directory of a USB pen-drive;
2. Place the unit in standby mode and turn it off, placing the main switch on OFF position;
3. Introduce the USB pen-drive into its port on the controller;
4. Turn ON the unit by placing the main switch in ON position;
5. Enter at the page of the parameters PRG→PSS→PRG→(introduce the maintainer password)→PRG→USB→UPdF→PRG.
The automatic firmware updating process starts with the selection of this option, the display shows the transferred data in Kilobytes. When the update is completed the display shows "boot" then the LEDs will light up in sequence.
6. Once the update is completed, the board returns to normal operation and the appliance is ready to start operation.
7. Turn off the unit by placing the main switch in OFF position.
8. Remove the USB pen-drive from its port.
9. Feed the unit by placing the main switch on the ON state.

5.2.8.2 Parameters' updating

You can upgrade the parameters in case of new ones, using the USB pen-drive via its port on the controller.









For the updating:

1. Copy the update files in the main directory of a USB pen-drive;
2. Place the unit in standby mode and turn it off, placing the main switch in OFF position;
3. Introduce the USB pen-drive in its port on the controller;
4. Turn ON the unit by placing the main switch in the ON position;
5. Enter at the page of the parameters PRG→PSS→PRG→(introduce the maintainer password)→PRG→USB→UPPA→PRG.
The automatic firmware update process starts with the selection of this option, the display shows the transferred data in Kilobytes. When the update is completed the display shows "boot" then the LEDs will light up in sequence.
6. Once the update is completed, turn off the unit by placing the main switch on OFF position.
7. Remove the USB pen-drive from its port.
8. Turn ON the unit by placing the main switch on the ON state;

5.2.9 Display

In normal view displays the outlet water temperature reported to tenths of degrees, or the alarm code if at least an alarm is active. In case of multiple alarms activation, it will display the first alarm, while the second appears when the first is reset. Into the menu mode, the display depends on the current position where you are.

5.2.10LED

	Compressor LED	<ul style="list-style-type: none"> ON if the compressor is running OFF if the compressor is off FLASHING if timings are in progress waiting for compressor's start up
	Sanitary water LED	<ul style="list-style-type: none"> ON if sanitary mode is active OFF if the sanitary mode is not active FLASHING if sanitary production in progress (sanitary valve is active)
	Defrosting LED	<ul style="list-style-type: none"> ON in defrost operating mode OFF if defrosting mode is disabled or completed FLASHING if defrosting cycle interval's time is in progress.
	Antifreeze electric heater LED	<ul style="list-style-type: none"> The LED is ON if the antifreeze electric heater is active.
	Water pump LED	<ul style="list-style-type: none"> The LED is ON if the water pump is running.
	Alarm LED	<ul style="list-style-type: none"> The LED is ON if an alarm is active.
	Heating mode LED	<ul style="list-style-type: none"> The LED is ON if the unit is the heating mode operation.
	Cooling mode LED	<ul style="list-style-type: none"> The LED is ON if the unit is the cooling mode operation.

5.3 Input/Output (I/O) ports of the system

The I/O (inputs/outputs) which can be configured in order to enable the control functions.

In order to configure the I/O ports from the onboard controller, you need to introduce the maintainer password in order to get access to the parameters **PRG→PSS→PRG→**(introduce the maintainer password)**→PRG→Par→PRG→CnF**.

5.3.1 Standard configuration

(I/O) PORTS	Terminals	Function	Parameter	Description
Analog input	ST6 / ST6	DHW temperature sensor (It's not active by default)	H17=6	Configurable analog input with NTC sensor 10kΩ at 25°C β 3435
Analog input	ST7 / ST7	Plant water temperature remote sensor (It's not active by default)	H18=41	Configurable analog input with NTC sensor 10kΩ at 25°C β 3435
Digital input	ID2 / ID2	Digital input for remote control operation mode (It's not active by default)	H46=3	Free voltage digital input To enable this function, see. 6.8.2
⁽¹⁾ Digital input	ID3 / ID3	Remote on/off control from digital input	H47=2	Free voltage digital input Active function by default.
⁽²⁾ Digital input	ST8 / ST8	Digital input for sanitary calling (It's not active by default)	H53=28	Free voltage digital input
Output	DO5 (phase) DO5N (neutral)	Undervoltage output for DHW valve (It's not active by default)	H83=6	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
⁽¹⁾⁽²⁾ Output	DO6 (phase) DO6N (neutral)	Undervoltage output of circulator's signal	H84=7	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)

⁽¹⁾ Enabled in the factory

⁽²⁾ Not available for the model 0250F and if included the CI6 integrated pump kit with high efficiency.

5.3.2 LT injection models configuration

Standard on i-HP LT models in addition to the previous ones, the following I/O ports can be configured:

PORTS	TERMINALS	FUNCTION	PARAMETER	DESCRIPTION
DIGITAL INPUT	ID2E/ID2E	Ambient thermostat (It's not active by default)	H56=19	Free voltage digital input
DIGITAL INPUT	ID3E/ID3E	Double set point (It's not active by default)	H57=26	Free voltage digital input
OUTPUT	DO1E (phase) DO1EN (neutral)	Plant auxiliary electric heater (It's not active by default)	H86=22	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
OUTPUT	DO2E (phase) DO2EN (neutral)	Auxiliaries heating elements of integration (It's not active by default)	H87=26	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
⁽¹⁾ OUTPUT	DO3E (phase) DO3EN (neutral)	Defrost cycle warning (It's not active by default)	H88= 21	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
		Plant season signalization (It's not active by default)	H88=31	
		Secondary circulator (It's not active by default)	H88=43	

OUTPUT	DO6E (phase) DO6EN (neutral)	Double setpoint valve (It's not active by default)	H91=25	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
⁽¹⁾ OUTPUT	DO7E (phase) DO7EN (neutral)	Alarm warning (It's not active by default)	H92=24	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
		Heat pump unit lockout warning (It's not active by default)	H92=47	

⁽¹⁾ It can be activated, only one signalization per output

5.3.3 Configuration with GI module accessory

When the GI optional plant management kit is present, furthermore to the ports of the standard configuration, you have also the following I/O ports.

PORTS	TERMINALS	FUNCTION	PARAMETER	DESCRIPTION
DIGITAL INPUT	ID2E / ID2E	Ambient thermostat (Not enabled by default)	H56=19	Free voltage digital input
DIGITAL INPUT	ID3E / ID3E	Double set point (Not enabled by default)	H57=26	Free voltage digital input
OUTPUT	DO1E (phase) DO1EN (neutral)	Plant auxiliary electric heater (It's not active by default)	H86=22	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
OUTPUT	DO2E (phase) DO2EN (neutral)	Auxiliaries heating elements of integration (It's not active by default)	H87=26	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
⁽¹⁾ OUTPUT	DO3E (phase) DO3EN (neutral)	Defrost cycle warning (It's not active by default)	H88= 21	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
		Plant season warning (It's not active by default)	H88=31	
		Secondary circulator (It's not active by default)	H88=43	
⁽¹⁾ OUTPUT	DO4E (phase) DO4EN (neutral)	Alarm warning (It's not active by default)	H89=24	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)
		Heat pump unit lockout warning (It's not active by default)	H89=47	
OUTPUT	DO5E (phase) DO5EN (neutral)	Double set point valve (It's not active by default)	H90=25	Under voltage output single phase 230Vac, 50Hz, 2A (AC1)

⁽¹⁾ It can be activated, only one warning (signalization) per output

6 OPERATION CONTROL LOGIC

The following operation logics are enabled by the master controller (CB), mounted on the front panel of the unit.

6.1 Dynamic setpoint adjustment

The controller allows you to change the set-point by adding a value as a function of the outdoor air temperature sensor detection. In this case, you need to change the values of the parameters from **b08** to **b14** according to the indications below (the settings are the installer's responsibility):

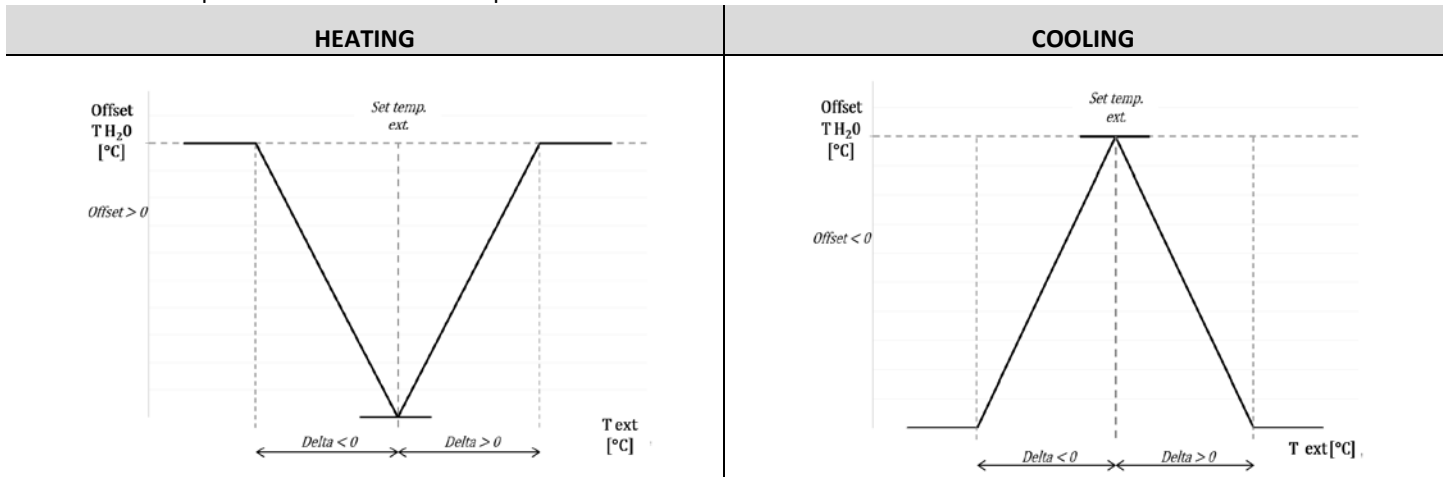
Parameters of the controller **PAr->rE->**

- **b08** = dynamic setpoint, enabled = ∇ disabled = 0 (this parameter must be disabled in the case of the use of climatic compensation by the optional remote touch screen panel Hi-T).
- **b09** = offset max in cooling mode operation.
- **b10** = offset max in heating mode operation.
- **b11** = Outdoor temperature setting in cooling mode.
- **b12** = Outdoor temperature setting in heating mode.
- **b13** = Temperature difference in cooling mode operation.
- **b14** = Temperature difference in heating mode operation.

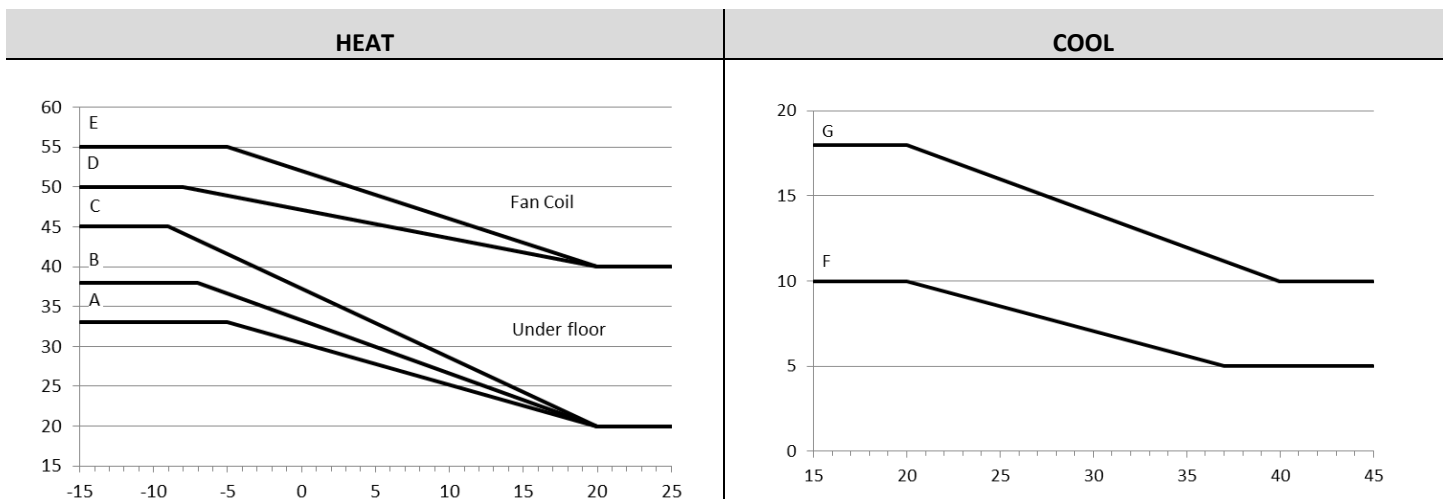
Please see paragraph 10.4 for to change the parameters.

Curve of the setpoint variation as a function of the outside temperature:

Modifica del set-point in funzione della temperatura esterna:



6.1.1 Settings for standard climatic curves

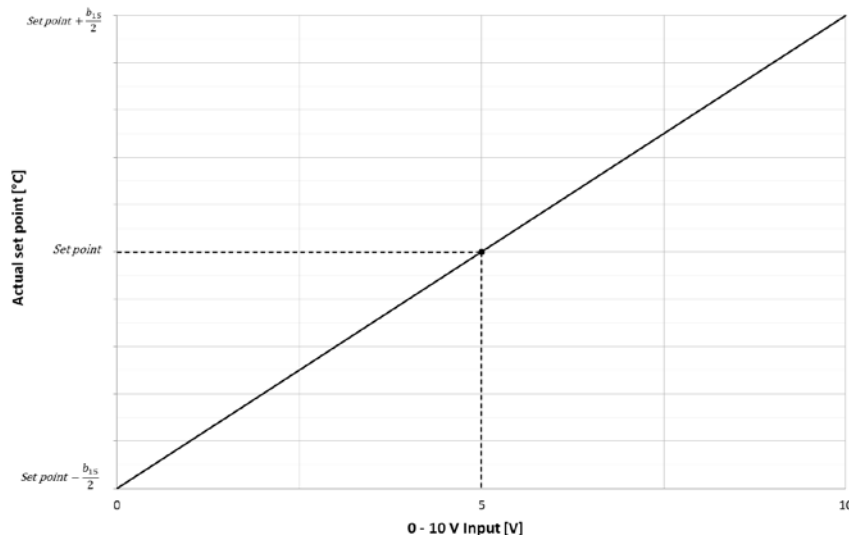


CURVE	Setpoint Heat	Setpoint Cool	b08	B09	b10	B11	b12	B13	b14
A	20°C	--	1	--	18°C	--	20°C	--	-27°C
B	20°C	--	1	--	13°C	--	20°C	--	-25°C
C	20°C	--	1	--	25°C	--	20°C	--	-29°C
D	40°C	--	1	--	10°C	--	20°C	--	-28°C
E	40°C	--	1	--	15°C	--	20°C	--	-25°C
F	--	5°C	1	5°C	--	37°C	--	-17°C	--
G	--	10°C	1	8°C	--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

6.2 Setpoint adjustment from 0-10v input

Another type of setting that allows to change the setpoint by adding (or subtracting) a value in function of the 0-10V analogue input (if enabled). To enable the function, you must set the **H21** parameter to be **40**, and change the values of the parameter **b15** (range 0-10), taking into account that:

- if the input is at 0 volts you will have the actual set point: **set point (Coo/Hea) - b15/2**.
- if the input is at 5 volts the set point will be the set of (Coo/Hea) mode.
- if the input is 10 volts you will have the actual set point: **set point (Coo/Hea) + b15/2**.



The 0-10V signal must be applied to the terminals AI10+ and AI10- (see the wiring diagrams).

Note: In "cool" mode, considering that the setpoint by default is set to be 7°C, the parameter (**b15**) should not assume any value greater than or equal to 6 in order to prevent that the new setpoint set from 0-10V input to take values below the threshold of the antifreeze operation which is 4°C. Please see paragraph 10.4 for changing the parameters.

6.3 Circulator

The circulator of the pump can be set according to one of the following operation modes:

- Operation by thermo-regulator
- Operation by thermo-regulator with periodic activation
- Continuous operation default)

The circulator SHUTDOWN immediately if:

- There is a lock pump alarm including the manual reset flow switch alarm.
- The unit is in stand-by mode or when it's switched off from remote input (when it's turned ON) It always turned off with a delay equal to P02.

The circulator is always running if the antifreeze heaters are ON.

The circulator can be configured with the parameter **P03** in order to operate independently than the compressor or under call.

0 = Continuous operation (in heating/cooling [default])

1 = Operation under the thermoregulatory call

Note: Whenever the flow switch alarm is automatically reset the pump is ON even if the compressor is off.

Contrarily, the circulator remains always in operation if the antifreeze heaters are on or when the hydraulic pump operates in antifreeze mode. The operation in antifreeze mode will start if the water setting temperature decreases below **P04 °C** (default value 5°C), and it will be disabled if the water setting temperature increases above **P04+P05 °C** (the default value of **P05** is 2,0°C).

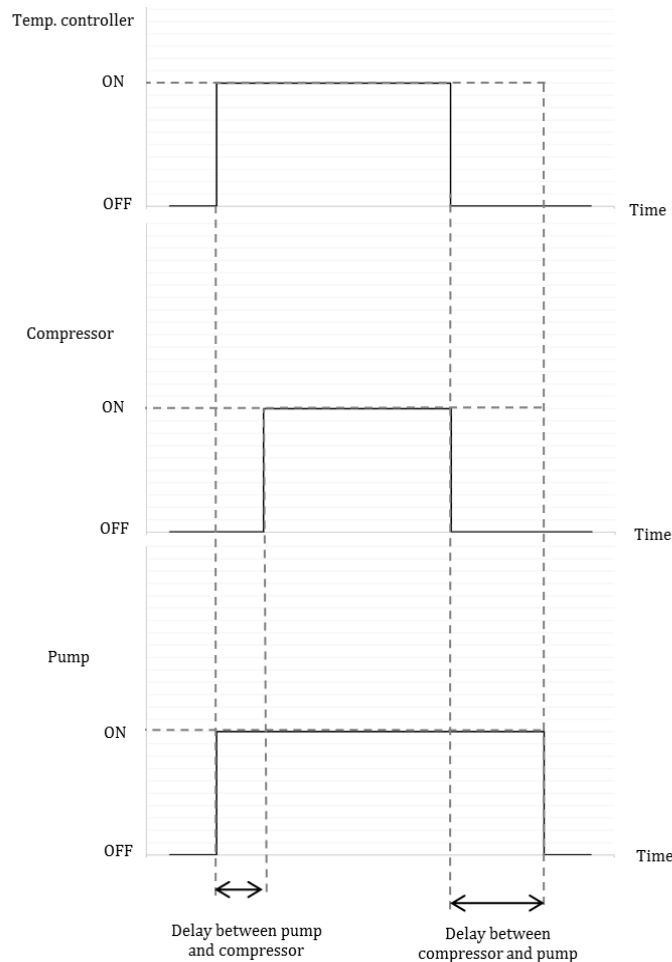
The adjustment of the circulator is linear (see Paragraph 6.3.5). Please see paragraph 10.6 for changing the parameters.

6.3.1 Operation by mean of the thermoregulator

During this operating mode (**P03=1**), the thermo-regulator actuates the circulator; after a time delay of **P01** seconds from startup of the circulator pump, the compressor also will turn on. However, during the power off status, the circulator pump turns off with a delay time of **P02** minutes after turning off status with thermo-regulator actuation (the turning off status is corresponding to the off status of the compressor).

If the flow switch alarm is active in automatic reset, the pump is anyway on even if the compressor is off.

If you enable the operation of the unit from "DI3" digital input corresponding to the remote "on-off" the circulator will be activated immediately for 2 minutes regardless of the internal thermoregulation of the unit (the activation of water recirculation in the plant leads to the correct activation of the thermoregulation).



6.3.2 Operation under thermoregulator call with periodic activation

The function is disabled if **P17= 0** (default). If the pump is set to operate by thermos-regulator actuation (**P03 = 1**, default), it will be activated periodically for a time period defined by the parameter **P17** (in seconds) after a counting time set by the parameter **P16** (in minutes), activated when the pump is turned off for satisfied thermoregulation.

In the case of the activation of the flow switch alarms with automatic reset the pump is still ON even if the compressor is off. The periodic function is interrupted also in the case of the intervention of the antifreeze thermo-regulator which constrains the operation of the pump. Please see paragraph 10.6 for changing the parameters.

6.3.3 Operation with active electric heater

The presence of the optional module “GI” is required for this function.

See paragraph 7.1.6

6.3.4 Continuous operation

This operating mode is enabled if **P03=0**, the pump is always turned on and it turns off only when the unit is not operating (OFF) after **P02** minutes.

6.3.5 Linear adjustment of the circulating pump—double water ΔT

The analog output varies according to difference in temperature between water inlet and water outlet of the heat exchanger. The controller is enabled setting **P12 = 1** and is defined by the following parameters:

- **P06** set difference in temperature between water inlet of modulating pump in heating mode
- **P07**: maximum speed of the modulating pump
- **P08**: minimum speed of the modulating pump
- **P09**: set ΔT inlet/outlet water of the modulating pump in cooling mode($^{\circ}\text{C}$)
- **P10**: Delta modulating pump ($^{\circ}\text{C}$)
 - In cooling mode: $\Delta T = [\text{Water inlet temperature}] - [\text{Water outlet temperature}]$
 - In heating mode: $\Delta T = [\text{Water outlet temperature}] - [\text{Water inlet temperature}]$

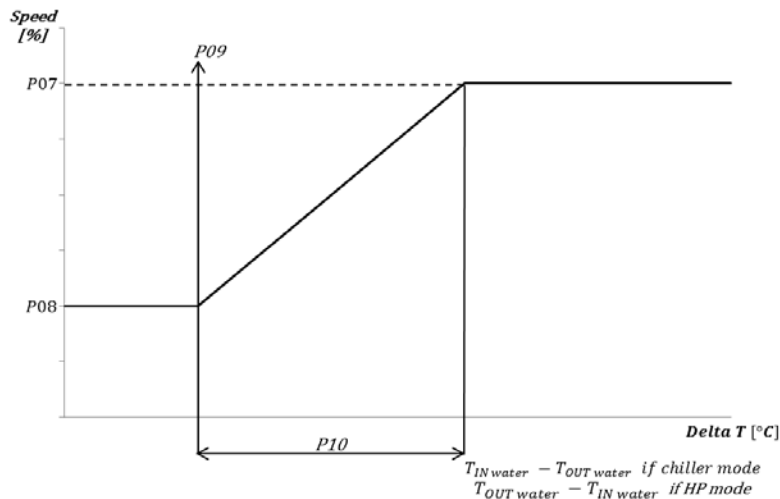
Example in cooling:

*If the difference in temperature between water inlet and outlet is greater than **P09 + P10**, the pump will run at maximum speed.*

*If the difference temperature between water inlet and outlet is less than **P09 - 0.2 $^{\circ}\text{C}$** , the pump will run the minimum speed.*

*In the other cases, the pump modulates trying to match the temperature difference with **P09**. For the heating mode, the same considerations are valid with replace only **P06** with **P09**. Please see paragraph 10.6 for changing the parameters.*

Warning: During the DHW production mode, the pump is constrained to run at its maximum speed.



In domestic hot water production mode, the pump will operate at the maximum speed.

6.3.6 Air purging of the system

This function allows the air purging of the system, during this operation, the circulator runs at its maximum speed.

To enable the function:

1. Put the controller in **OFF** mode
2. Enter at the parameters PRG→PSS→PRG→(introduce the maintainer password)
3. Press simultaneously for **3 seconds** the buttons **UP and DOWN**.

The circulator of the plant will run at the maximum speed for 5 minutes then it stops the operation.

It is possible to stop manually the air purge cycle function of the system by pressing the MODE/ESC button, or by pressing simultaneously the UP and DOWN buttons for 3 seconds.

During this function, the flow-switch alarm is deactivated.

6.4 Compressors' control logic

When the compressors are all switched off, in conjunction with the pre-opening of the expansion valve, the inversion valve reverses the flow direction for 5 seconds to the opposite one that is required by the ongoing operating mode in order to allow the rebalancing with optimal pressures for starting operation with the first step.

6.4.1 System with an inverter and an on/off compressor

For the 250F model equipped with an inverter compressor and an on/off compressor, the inverter compressor will always be the first to start and the last to stop operation. When the required capacity by the thermoregulator is higher than 90% for a continuous operation of 60-second duration, the on/off compressor will start operation for supporting the modulating compressor in order to achieve the required capacity.

The lack of operation may also be influenced by control logic that is linked to capacity limit or compressor protection.

The compressor start-up takes place in 3 phases:

- Reduction of the supplied capacity of the modulating compressor to the minimum frequency.
- On/off compressor start-up when the modulating compressor has reached the minimum frequency.
- Recovery of the compressor modulation by the thermoregulator after b19-duration from the on/off compressor start-up.

The on/off compressor will stop operation if the required output capacity by the thermoregulator to the modulating compressor is the minimum one for duration higher than 60 seconds.

Once the release has taken place, wait 60 seconds before releasing the next step.

6.4.2 Systems with multiple inverter compressors

For the systems with multiple inverter compressors, if the required output capacity by the thermoregulator is greater than **80%** for a continuous duration of **60** seconds, the compressor's activation becomes necessary where there is availability of other compressor.

The already activated compressor goes into the lowest frequency until the last activated compressor goes into the lowest frequency too.

After that, both compressors are brought to the frequency of **45Hz** (lubrication and equalization frequency) for **180 seconds**. At the end of this phase, the compressors follow what is required by the thermoregulator.

If the required output capacity is the minimum one by the thermoregulator to all operating inverter compressors for more than **180 seconds**, then one of compressors is called to stop operation.

Once the release has taken place, wait **60 seconds** again before releasing the next step.

If one of the inverter compressors is in alarm for which the activation of the respective compressor is no longer possible, the alarm code will be displayed and the setting will continue with the indicated modes while keeping off the inverter compressor in alarm.

To define the behaviour of the remaining inverter compressors:

If **N06 = 0** all the inverter compressors stop operation.

If **N06 = 1** only the inverter compressor which is in alarm stops operation, the remaining ones continue operate normally.

6.4.3 DHW logic control

The maximum serviceable capacity is used always in case of DHW mode operation (like if the controller regulates the compressors to run always at 100% capacity).

They are active however the various limitations of the maximum frequency that are related to the envelope and to the limitation for maximum power consumption.

6.4.4 Defrosting cycle

The defrost cycle function is available only in heat pump mode and is used to prevent the frost formation on the surface of the air/air coil. The frost formation on the evaporator, which occurs more frequently at very low ambient temperatures, further the important decreasing of the thermal efficiency of the unit, it can lead also to the risk of damaging the unit itself.

In defrosting cycle, after 60 seconds duration of operation at lower frequency **30Hz**, the compressor goes into a regime with fixed frequency of 30 Hz. In this case, the compressor speed remains constant and cannot be adjusted.

Note: In case of remote switch Off during the defrost cycle, the unit will terminate this process before stopping operation.

6.4.4.1 Forced manual defrost

If the appliance is in heating mode, you can constrain it manually to operate in the defrosting mode by pressing UP, DOWN, and ENTER buttons for 3 seconds.

6.4.5 Safe time periods

The compressors respect the minimum waiting time for the turning on and off actions (regardless of the configuration and if they are inverters or ON/OFF type):

C01 = Minimum Off time of a compressor # **300 sec** (default).

C02 = Minimum time between two start-up of the same compressor # **360 sec** (default).

C03 = Minimum delay time between the start-up of a given compressor and the next one # **10 sec** (default).

C04 = Minimum delay time between the shutdown of a compressor and the next one # **0 sec** (default).

6.4.6 Modulation for oil return

If this function is enabled in the factory, the return oil cycle will be performed during the compressor startup at the frequency of **45Hz** for 90 seconds duration.

6.4.7 Inverter compressor control in cooling mode

The management of the compressors depends on the ambient temperature and on the water temperature setpoint.

The regulation is proportional + integral (PI) with:

ST = regulation temperature sensor

Set cool (G01) = setting of cooling setpoint

b01 = cooling regulator proportional band

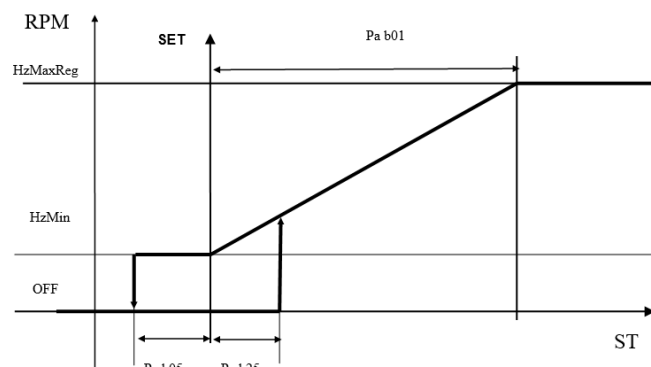
b05 = compressor control delta cut-off

b25 = compressor control delta cut-on

b07 = integral time

HzMin = Minimum frequency of operation derived from the algorithms of limitation

HzMaxReg = Maximum working frequency of the compressor in cooling mode based on the limitations described in the previous paragraphs



	0125	0135	0250F	0250	0260	0270
b05 (°C)	0,2	0,2	0,2	0,2	0,2	0,2
b25 (°C)	3,5	3,5	2,5	2,5	2,5	2,5

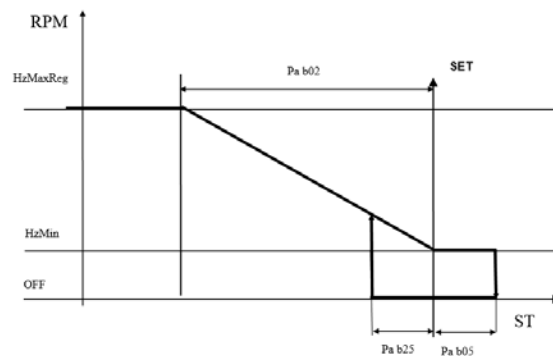
The following curve shows the adjustment without integral component (**b07 = 0**)

During the start-up, the compressor initiates at the minimum speed **C12** or **C14** (as defined from the envelope) for a given time period equal to **C11** and then changes its speed to **C13** for a period equal to **C51-C11**.

6.4.8 Heating function control

The compressors are active in heating mode if the heat pump is enabled

- **H09** = Configuration of the heat pump presence parameter (0 = Heat pump not present; 1 = heat pump is present)
- **ST** = regulation temperature sensor
- **Set heat G02** = setting of heating setpoint
- **b02** = compressor regulation band in heat pump mode
- **b05** = compressor control delta cut-off
- **b25** = compressor control delta cut-on
- **b07** = integral time
- **HzMin** = Minimum frequency of operation derived from the algorithms of limitation
- **HzMaxReg** = Maximum working frequency of the compressor in cooling mode based on the limitations described in the previous paragraphs



For the values of **b05** and **b25**, make reference to the table in the previous chapter.

The curve shows the adjustment without integral component (**b07** = 0)

During the start-up, the compressor initiates at the minimum speed **C12** or **C14** (as defined from the envelope) for a given time period equal to **C11** and then changes its speed to **C13** for a period equal to **C51-C11**.

6.5 Heat dissipation fan motor control

The control of the dissipation is as a function of the condensing pressure in chiller mode operation, whereas, it depends on the evaporation pressure in heat pump mode operation.

The adjustment of the fan speed occurs depending on the operation of the compressor.

The fan stop is bypassed for a duration equal **F12** beginning from a compressor startup of the circuit. During this period, if the controller requires the cut-off, the fan will run at minimum speed. Please see paragraph 10.5 for changing the parameters.

6.5.1 Fan speed control

The condensation control is a function of the condensing pressure in chiller mode and the evaporation pressure in heat pump mode.

The fan speed can be independently controlled from the compressors or under the actuation of the same.

F05 = fan output mode

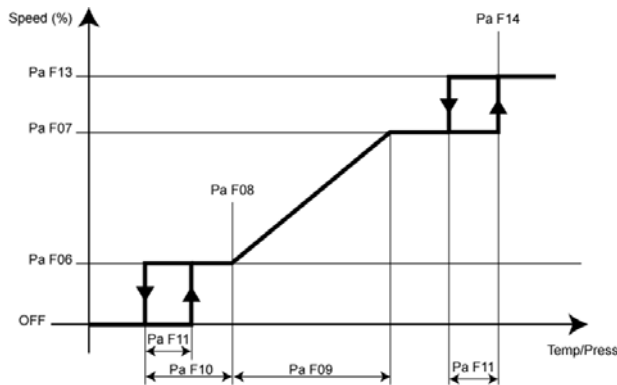
0: if all the compressors of the circuit are switched off and the fan is switched off. The fan stop is bypassed for a period equal to **F12** beginning from a compressor startup of the circuit. During this period, if the controller requires the cut-off, the fan will run at minimum speed.

1: The fan control is independent from the compressor (the fan motor operates only according to the condensing pressure). Please see paragraph 10.5 for changing the parameters.

6.5.2 Fan speed control in cooling mode

The fan speed control in cooling mode occurs according to the diagram shown below, where:

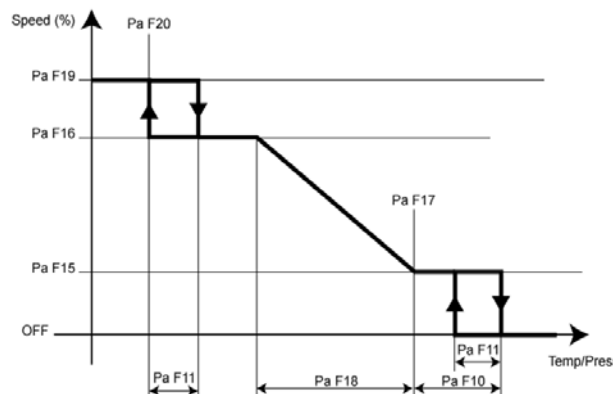
- F06** = Minimum fan speed in cooling mode;
- F07** = Maximum silent fan speed in cooling mode
- F08** = Set temperature/pressure to the minimum fan speed in cooling mode
- F09** = Fan motor linear band in cooling mode
- F10** = Delta cut-off of the fan
- F11** = Cut-off hysteresis and silent/maximum fan speed
- F13** = Maximum fan speed in cooling mode
- F14** = Set temperature/pressure to the maximum fan speed in cooling mode
- F6-F10** = Set forced fan stop for low condensing pressure



6.5.3 Fan speed control in heating mode

The fan speed control in heating mode follows the diagram shown below, where:

- F10** = Delta cut-off of the fan in cooling/heating mode
- F11** = Cut-off hysteresis in cooling/heating mode
- F15** = Minimum fan speed in heating mode
- F16** = Maximum silent fan speed in heating mode
- F17** = Set pressure for the minimum fan speed in heating mode
- F18** = Fan speed linear band in heating mode
- F19** = maximum fan speed in heating mode
- F20** = Set pressure for the maximum fan speed in heating mode
- F17+F10** = Set forced fan stop for high evaporating pressure



The fan speed can be controlled via analog/digital outputs or, alternatively, via serial on the same serial of the modulating compressor. Please see paragraph 10.5 for changing the parameters.

6.6 Compressor crankcase heater

The crankcase heater operates when the compressor remains off for at least 30 minutes and if the discharge temperature is below 20°C (with hysteresis of 2.0°C). When the compressor restarts, the crankcase heater will stop.

6.7 Antifreeze protection electric heaters (if the KA accessory is present)

The electric heaters of water antifreeze, installed on the outer surfaces of the evaporator plates, activates even when the unit is switched off (but energized) if the outlet water temperature goes below **r02** °C (default is 4°C) in heating mode or below **r03** °C (default is 4°C) in cooling mode and in shut off condition. The same electric heaters are switched off when the temperature measured by the outlet water sensor exceeds **r02+r06** in heating mode or **r03+r06** in cooling mode and in shut off condition (the default value is **r06=2,0°C**). The heating cable placed on the basement of the appliance turns on when the outdoor air temperature decreases below 3°C and the unit starts the defrosting cycle (or if **r19=0** even if the unit is not in defrosting cycle, or in stand-by mode). It will be deactivated if the outdoor temperature exceeds 5°C or the last defrosting cycle is concluded after more than **r19** minutes (default 10 minutes) (with **r19≠0**).

In case you want to produce gelid water, it is necessary to modify the actions of antifreeze resistances, as well as the set of activation of the antifreeze alarm (**A08** = 4°C by default) and its hysteresis (**A09** = 3.0°C by default).

6.8 Remote functions

The terminal block provides two digital inputs for supervising the unit via an external consent.

6.8.1 Remote switch On/Off

The remote switch On/Off function is already enabled by default. Remove the bridge of the terminal block then the unit will be placed in stand-by mode (in such status the display of the on-board unit controller will show the "E00" code). When the contact is closed, the machine exits from standby mode and the circulation pump will be activated for 2 minutes.

In order to change this function, you should enter into the parameters **PRG→PSS→PRG→** (insert the service password) **→PRG→Par→PRG→CnF**.

See paragraph 10.2.

PORT	TERMINAL	FUNCTION	PARAMETER	VALUE	Description
DIGITAL INPUT	ID3 / ID3	Remote switch On/Off (enabled by default)	H47	2 = remote switch On/Off	Voltage free contact input. This function is active by default.

If the domestic hot water is enabled and the parameter “**H10**” is set as below:

- If **H10 = 1, 3, 5** the remote on-off function does not have any effect on sanitary operating mode, it only disenables the heating and cooling on the plant system side (in such case the code “**SAN**” will be shown on the display of the on-board unit controller).
- If **H10 = 2, 4, 6** the remote on-off function disenables the production of domestic hot water and the operation of the heat pump in heating and cooling mode on plant system side.

6.8.2 Summer/Winter mode commutation

You can manage remotely the operating mode in heating or in cooling of the heat pump.

In order to enable this function, you should enter into parameters **PRG→PSS→PRG→** (insert the service password) **→PRG→Par→PRG→CnF**.

See paragraph 10.2.

PORT	TERMINAL	FUNCTION	PARAMETER	VALORE	DESCRIZIONE
DIGITAL INPUT	ID2 / ID2	Remote control mode (Not enabled by default)	H46	3 = remote control mode	Free voltage contact input

6.9 Plant circuit remote sensor



In some plant solutions (example: heat pump in parallel with a boiler on the same hydronic circuit and diverter valve) it could be necessary to remote the plant circuit temperature sensor in order to allow the on-board unit controller to correctly process the plant system management.

In order to enable this function, please enter into the parameters **PRG→PSS→PRG→** (insert the service password) **→ PRG → PAR → PRG → CnF**.

PORT	TERMINAL	FUNCTION	PARAMETER	VALUE	DESCRIPTION
ANALOG INPUT	ST7/ST7	Plant remote temperature sensor (Not active by default)	H18	41=Plant water remote temp. sensor	Configurable analog input with NTC sensor 10kΩ at 25°C β 3435

(*) Alternatively, it is possible to use another digital input, see paragraph 5.3.

The plant circuit remote sensor adjusts the heat pump temperature only during the startup period of the compressor(s), the shutdown is managed by the exhaust temperature sensor of the heat pump. For more explanation herein below is reported an illustrating table regarding the operation of the system:

Mode of operation	Enablement of the heat pump call
 Heating	Temperature measured by outlet sensor of the heat pump < setpoint Hea - b05 and Temperature measured by plant circuit remote sensor < water setpoint Hea - (b22-b05)
 Cooling	Temperature measured by the outlet sensor of the heat pump > setpoint Coo + b05 and Temperature measured by plant circuit remote sensor > setpoint Coo + (b22-b05)

NOTE: b05=1°C; b22=5°C.

6.10 Enablement of domestic hot water production (DHW)

In sanitary mode, the maximum serviceable capacity is employed (as if the thermoregulator is calling always for 100% of capacity). However, the various limitations of the maximum frequency associated with the envelope and the limitation for maximum electrical absorption are active.

To make active this function, it is necessary to connect to **ST6 – ST6** terminals (enabled as analog input) a temperature sensor which should be placed inside the water tank. Once connecting and placing the sensor, then it is necessary to enable the domestic hot water function.

To enable this function, enter at the parameters **PRG→PSS→PRG→**(introduce the maintainer password)**→ PRG→PAR→PRG→CnF**.

PORT	TERMINAL	FUNCTION	PARAMETER	VALUE	DESCRIPTION
ANALOG INPUT	ST6 / ST6	Domestic hot water temperature (Not active by default)	H17	6 = DHW remote temperature sensor	Configurable analog input with NTC sensor 10kΩ at 25°C β 3435
OUTPUT	DO5 (Phase) DO5N (Neutral)	DHW valve (Not active by default)	Not configured	6 = DHW valve	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)

The domestic hot water function can be activated by the parameter H10, which takes the following values.

I/O Port - Parameter	Value	Function
H10	0 (default)	The function is not active
	1	The function is active in heating and cooling mode. The remote switching on-off function doesn't deactivate the domestic hot water production (DHW).
	2	The function is active in heating and cooling mode. The remote switching on-off function deactivates the domestic hot water production (DHW)
	3	The function is active in heating mode. The remote switching on-off function doesn't deactivate the domestic hot water production (DHW).
	4	The function is active in heating mode. The remote switching on-off function deactivates the domestic hot water production (DHW).
	5	The function is active in cooling mode. The remote on-off function doesn't deactivate the domestic hot water production (DHW).
	6	The function is active in cooling mode. The remote on-off function deactivates the domestic hot water production (DHW).

If the DHW temperature is below the set point value (**PRG->Set->SAN**), the unit activates the sanitary valve and the compressor will be placed at the maximum frequency starting the modulation at 1°C before (setpoint-1°C) the set value and it stops at 1°C after the set value (setpoint+1°C). Once achieved the set point value, the valve switches to the stand-by mode and the compressor works normally.

While shifting from user's to domestic hot water, the operating sensor changes from "**outlet water temp. sensor**" to "**sanitary tank temp. sensor**". While shifting from the winter operating mode to the sanitary operating mode, the compressor does not stop operation, and will be placed at the maximum established frequency which can be controlled; however, when shifting from the summer operating mode to the sanitary operating mode, the compressor will stop operation for waiting for the safe period.

The defrost cycle during winter operation mode is always performed on the user side, never on the sanitary water tank.

Note:

- If **H10 = 1/3/5**, the remote shutdown of the unit (remote switching on-off) or from the on-board unit controller, or from the remote control panel has no effect on sanitary operating mode. The unit will be placed in sanitary mode as setting priority after its power on. The on-board unit display shows the temperature measured by the sensor placed inside the sanitary water tank. Once the sanitary cycle is completed, the display turns back to show the temperature of the outlet water sensor.
- If the remote ON-OFF digital input (onoff-onoff terminals) is open, with enablement of the function of domestic hot water (**H10=1**), the display on-board unit shows the code "**SAN**". Once the sanitary cycle is concluded, the display returns to show the code "**E00**" indicating that the remote **ON-OFF** contact is open.
- If **H10 = 2/4/6**, the remote on-off function disenable the production of domestic hot water and also the operation of the heat pump in heating and cooling on plant side.

6.10.1 Memorization of the sensor in heating mode

In the case of commutation from water users to the domestic hot water, the temperature sensor commutates from a "water outlet temperature sensor" to a "water tank temperature sensor". For such reason, in heating mode, the last value read by the sensor will be memorised before changing to DHW mode.

When the DHW thermoregulation is achieved, the reference temperature on the plant side will take the value which is previously memorised.

The memory function will be interrupted:

- When the temperature detected by the sensor becomes lower than the memorized value;
- Or after a period equal to **b06** seconds (default 45 seconds).

6.10.2 Sanitary mode calling from digital input

In the case where a digital input is configured for activating the sanitary water mode (instead of the DHW temperature sensor), the system will be placed in sanitary mode when the digital input is closed (the same behaviour is obtained when DHW temperature < (**G03** – Pa **b03**)) and the DHW production terminates when the digital input is open.

Note: If a DHW temperature sensor is installed and configured, this management will be ignored and the thermoregulation will be done on the basis of the temperature that is detected by the sensor.

PORTS	TERMINAL	FUNCTION	PARAMETER	VALUE	DESCRIPTION
DIGITAL INPUT	ST8 / ST8	DHW calling (Not enabled by default)	H53	28=DHW calling	Non-voltage digital input
OUTPUT	DO5 (Phase) DO5N (Neutral)	DHW (sanitary) valve (Not enabled by default)	H90	6= DHW valve	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)

In the case where a digital input is configured for sanitary water function calling (instead of the sensor), the heat pump will be placed in sanitary mode when the digital input is closed and exits from the DHW production when the digital input is open.

The DHW setpoint of the heat pump is not considered here, its management is the designer's responsibility, who must take into consideration the DHW protection and the configuration of the whole system.

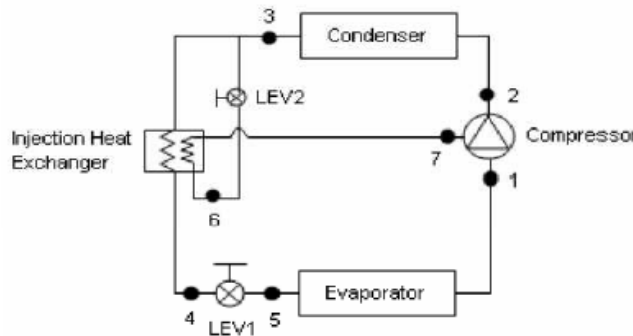
Note: It is possible to invert the polarity of the digital input, to do that, please contact our technical office.

6.10.3 Heating mode on domestic hot water tank

For the following setting **H83=1**, the unit employs the tank of domestic hot water also for plant side heating. In these conditions, therefore the relay which controls the DHW valve which will be energized during heating operation and not only in DHW mode. During defrost period and in cooling mode the valve will be de-energized.

6.11 Vapor injection (only for LT version)

The vapour injection cycle, in which a sub-cooling liquid is used to improve the performances in advanced low temperature applications by injecting the steam inside the compressor at an intermediate pressure.



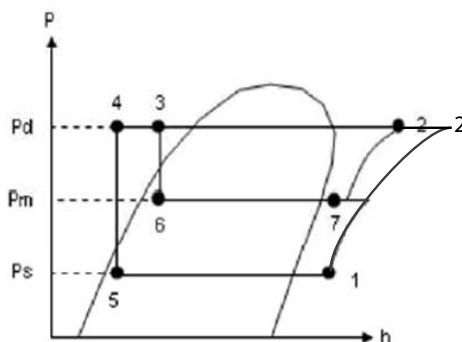
In the above drawing it is shown a simplified diagram of a refrigerant circuit that uses injection mono-compressor and intermediate exchanger with injection "economizer". The purpose of the injection is to obtain an "intermediate" cooling of the compressor in order to contain the discharge temperature below the critical values and allow it to operation even with very high compression ratios (for example, particularly with very low outdoor temperature and high temperature of the produced water).

As you can see from the diagram, this is obtained drawing off part of the liquid after the condenser and making it expand through the LEV2 valve which will be defined as "VEIV", at an intermediate temperature between the evaporating temperature and the condensing temperature, inside a freon-freon exchanger called economizer and through it the remaining liquid passes allowing to increase greatly the sub cooling.

The gas expanded the economizer is then "injected" into the compressor at an intermediate point of the compression so as to cause a cooling that allows to keep the exhaust temperature within the preset limits.

The cycle described above is represented on the pressure-enthalpy diagram, at the side of the diagram where represented the point 2 the conditions of the gas at the end of compression with suction always carried out under the conditions of point 1 but without vapor injection.

It is therefore evident that the main effects of the injection are the ones to increase the liquid sub-cooling from the temperature 3 to that of point 4 equal to about 10 - 15°C and decreasing the superheating at the exhaust from point 2' to point 2 (approximately 15 - 30°C). Please see the paragraph 10.8 for changing the parameters.



In the following section for to be consistent with the manuals the below definitions are adopted:

- VEIV** = Vapor injection electronic valve
- VEE** = main expansion electronic valve
- SSH** = superheating in suction
- DSH** = superheating at exhaust
- SSH I°** = overheating at inactive injection
- SSH II°** = overheating at active injection

Here in below are described the algorithms used in the vapor injection control and/or double set of superheating. The management is enabled if you have all the necessary resources.

In particular it is necessary that the parameter **v22** (step number of the vapor injection valve) is set not to be 0. The expansion valve for the vapor injection located on the expansion module I/O number 1.

The fact that **v22** is different from 0 enables automatically the presence of the first expansion module I/O.

6.11.1 Main circuit VEE, Double control

1) Sensor for calculation of primary circuit superheat calculation

If the parameter **v22** is set to be 0, the injection will be disabled.

2) SSH system

The "SSH" system is currently implemented and is always used

For superheat calculation are used:

- Suction pressure sensor
- Suction temperature sensor

It's necessary to have mounted these two sensors.

3) DSH calculation

The two below sensors are used for evaluating the superheat at DSH exhaust:

- Exhaust pressure sensor
- Exhaust temperature sensor

6.11.2 Injection electronic valve VEIV

1) Sensors for superheat calculation for the vapor injection

The management of **VEIV** (Vapor injection electronic valve) requires the acquisition of the following values:

- A temperature sensor (T1) positioned between the injection of the compressor and vapor injection heat exchanger.
- A pressure transducer, positioned between the injection of the compressor and vapor injection heat exchanger for getting the saturation temperature T2 of the refrigerant that is corresponding to the detected pressure.

Note: The T2 is different from the one obtained for VEE management, and then is neither the one of exhaust nor the one of suction of the compressor. Necessary condition for having the vapor injection function active furthermore, the T1 and T2 sensors should be mounted and configured.

2) Electronic valve control with vapor injection circuit

In the case of multi-inverter compressors and if are present the in addition to VEE, also the VEIV, the management of the valves must be as follows.

The management of the VEE proceeds with the SSH adjustment until the fulfillment of one of the following conditions depending on the mode of operation:

Heat pump operation

(Eq.1) $T_{air} < T_{air\ set} \text{ (v09) Chiller operation}$

(Eq.2) $T_{air} > T_{air\ set} \text{ (v10) Heat pump operation}$

Before proceeding, the equation must be: in continuous mode, fulfilled or unfulfilled respectively for **v11** minutes (fulfillment) and **v12** minutes (unfulfillment). At the power-on, the unit turns on with unfulfilled equation.

6.11.3 Vapor injection valve (VEIV)

Even after the fulfillment of one of the two equations (Eq.1 or Eq.2) the VEIV valve must remain closed until the below condition is met also:

(Eq.3) $DSH > \text{v13}$

Before proceeding, the equation must be fulfilled or unfulfilled, in continuous mode respectively **v14/v15** minutes (fulfilled) and **v16/v17** minutes (unfulfilled).

After the condition fulfillment, the valve will be managed following the superheating given by:

- $ISH \text{ (superheating of vapor injection)} = T1 \text{ (detected)} - T2 \text{ (resulted)}$

The recognition of the situation of the preconditioned unfulfillment DHS value will close the VEIV valve. At the shutdown of the whole compressors the VEIV valve will be closed and the above control logic will resume only after their re-ignition.

In the case of multi compressor systems in addition to the VEIV valve, each compressor will have its own ON/OFF valve to allow the vapor injection only when the corresponding compressor is turned on and not only to the fulfillment of the above conditions. The valve that enables vapor injection will turn on only when the compressor is switched on for at least **v18** seconds and the injection is active.

- **Initial steps:** Set the number of initial steps of the valve. At the first opening of the valve, the superheat control is bypassed for Pa **v18** seconds and the valve positioned with this initial value. After the end of **v18** seconds the superheating control will be activated.
- **Control algorithm of the vapor injection valve:** The control is of the PID type (proportional/integral/derivative) operates on the process variable ISH. The valve opening may vary between the maximum (**v22**) and the minimum steps (depending on the operating mode).

7 OTHER CONTROL FUNCTIONS WITH THE PLANT MANAGEMENT GI-MODULE (optional)

The presence of GI optional plant management kit allows you to get a third controller located inside the electrical board acting as an I/O ports expansion module. By mean of this last controller, it is therefore possible to increase the number of logic functions that can be managed by the main controller; in particular, these logic functions concerns the plant management, as described below.

1. Auxiliary heating elements
 - Plant auxiliary electric heater
 - DHW auxiliary electric heater
 - Defrosting electric heater
2. Double setpoint management
3. Secondday circulator management
4. Warning
 - Defrosting
 - Plant management
 - Alarm
 - Appliance lockout

The functions described below can be enabled from the on-board controller that is located on the front panel of i-HP unit. The LT models are supplied with the plant management module.

7.1 Auxiliary heating elements

In some plant systems configurations, it could be necessary the use an auxiliary electric heater for the system and/or DHW sides. To define the mode of using of the auxiliary electric heaters for plant system and DHW side, you must set the parameter “**r24**” as below.

- **r24=0** Auxiliary electric heaters not used;
- **r24=1** Utilization only of the auxiliary electric heater of the plant side;
- **r24=2** Utilization only of the auxiliary DHW electric heater;
- **r24=3** Utilization of both auxiliary electric heaters of plant side and of domestic (sanitary) hot water production.

To change the parameters, please see paragraph 10.10.

7.1.1 Plant's auxiliary electric heater

In some plants' configurations, the use of an auxiliary electric heater for the plant system side could be necessary.

If the temperature of regulation remains below the **water setpoint in heating (Hea) - 0.5°C** for a period of time equal to **r12**, the auxiliary electric heater will be activated depending on the in joint or in substitution operation of the unit indicated in Paragraph 7.2. The electric heater turns off after reaching the setpoint (taking into account of an eventual offset set with the parameters **r29** or **r30** (check Paragraph 7.3.6).

If the temperature of regulation remains less than **water setpoint - r11(°C)** and the unit is blocked that is caused by an error-alarm, the electric heater will be activated. Then it will turn off when the lock-alarm is resolved.

To activate this function you should set **CnF** and **rE** by getting access to these two parameters using the maintainer password:

7.1.2 Auxiliary electric heater of the plant in defrost cycle

During the **defrosting cycle** (see Paragraph **Errore. L'origine riferimento non è stata trovata.**), by setting **r21=1** (in addition to **r10=1** and **r24=1** or **3**) the electric heater of the plant side will be activated if required (regulating temperature lower than the **water setpoint - r11 (°C)**), without waiting for the time defined by **r12**.

7.1.3 Auxiliary electric heater of DHW production

It is an additional energy resource for the domestic hot water tank heating when the compressor is not able to reach alone the set temperature within a reasonable time.

To activate such function, you should enter into the parameters **CnF** and **rF** by using the maintainer password.

PORTS	TERMINALS	FUNCTION	PARAMETER	VALUE	DESCRIPTION
OUTPUT	DO2E (phase) DO2EN (neutral)	Auxiliary heating elements (Not active by default)	H87	0 = Digital output not assigned 26=DHW auxiliary electric heater	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)
		Activation of the function	r15	1	
		Activation delay of DHW auxiliary electric heater	r16	10min (default)	
		Type of utilization of the electric heaters	r24	2 or 3	

If the production of DHW hot water lasts for a period of time greater than **r16** (minutes) and the unit gets blocked due to an alarm intervention, the electric heater will be enabled. It turns off when the unit concludes the DHW production. The auxiliary DHW electric heater can also be activated with the heat pump is running if the machine is in joint operation or in substitution operation indicated in the Paragraph 7.2. To change the parameters you can check the paragraph 10.10.

7.1.4 One auxiliary electric heater for both plant side and DHW production

By configuring the auxiliary electric heater for **DHW** production with the use of the following setting **r15=2**, when the auxiliary electric heater is required for DHW production and/or plant heating side and/or plant in defrosting mode, the electric heater that is declared for DHW production will be activated allowing you to get a single auxiliary electric heater.

7.1.5 Selection mode of auxiliary electric heaters

It is possible to set the activation order priority of the auxiliary electric heaters of the plant side and of DHW side as described below:

1. **r14=0** (default), the heaters are activated simultaneously if they are present;
2. **r14=1**, the heaters are activated excluding each other:
 - 2.1 **r20=0**, the priority is for the plant (the domestic electric heater will operate only if the thermoregulation for the heater of plant side is accomplished);
 - 2.2 **r20=1**, the priority is for the DHW (the heater of the plant side will operate only if the thermoregulation of the DHW heater is achieved).

7.1.6 Management of the circulator with active electric heater

It is possible to activate the circulator of the heat pump when the plant system and/or the DHW auxiliary electric heaters are active in the absence of compressors operations (for substitution, for alarm or for integration in band II or III).

To enable such function, you should enter into the parameters **Fro** using the service password.

- **r33 = 0**: The circulator of the heat pump will be activated upon request of the compressors or by the boiler.
- **r33 = 1**: The circulator of the heat pump will be activated if the plant circuit electric heater is active.
- **r33 = 2**: The circulator of the heat pump will be activated if the DHW electric heater is active.
- **r33 = 3**: The circulator of the heat pump will be activated if the plant system electric heater or if the DHW electric heater is active.

The circulator will stop operation after the post-pumping (**P02**). To change the parameters, please see paragraph 10.10.

7.2 Boiler enablement

It is an additional resource that enables the boiler in integration or in substitution of the heat pump.

To change the parameters, please see paragraph 10.10. Select the operating mode by setting the parameter "**r23**" as below:

- **r23=0** (default) boiler not used (priority of intervention is for electric heaters);
- **r23=1** boiler used just on plant side (priority of intervention is for electric heaters);
- **r23=2** boiler used just for DHW hot water (priority of intervention is for electric heaters);
- **r23=3** (default) boiler used for both DHW hot water and plant sides (priority of intervention is for electric heaters);
- **r23=4** boiler used only for plant side with priority (no intervention priority for electric heaters);
- **r23=5** boiler used only for DHW hot water with priority (no intervention priority for electric heaters);
- **r23=6** boiler used on both DHW and plant sides with priority (no intervention priority for electric heaters);

Settings of the parameter "**r32**" for boiler equipment:

- **r32 = 0**: boiler without a circulating pump with thermoregulation to be performed by the heat pump unit.
- **r32 = 1**: boiler equipped with an independent circulating pump with thermoregulation to be performed by the heat pump unit.
- **r32 = 2**: boiler without circulating pump with independent thermoregulation.
- **r32 = 3**: boiler equipped with a circulating pump with independent thermoregulation.

PORT	TERMINAL	FUNCTION	PARAMETER	VALUE	DESCRIPTION
OUTPUT	DO2E (phase) DO2EN (neutral)	Auxiliary heating elements (It is not active by default)	H87	0 = Digital output not assigned 26= DHW auxiliary electric heater 29= Activation of the boiler	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)
		Type of utilization of the boiler	r23	1/2/3/4/5/6	
		Boiler is installed	r32	1/2/3	

The intervention modes of the boiler are settable as described in Paragraph 7.2.

7.3 Activation of auxiliary electric heater and boiler during the joint/in substitution operation to the compressor

The available auxiliary systems for the joint operation or substitution operation are as below:

- **Boiler**
- **Plant auxiliary electric heater**
- **DHW auxiliary electric heater**

Considering the heating and sanitary mode of operation, you have 4 types of operation:

For the models i-HP LT the parameter **r08** = -20°C

When changing the values of the parameters **r22**, **r28**, **r08**, you have to respect the following condition: **r22 ≥ r28 ≥ r08**.

You can remove the zone corresponding to the “in joint operation I” just by putting **r22=r28**; you can also remove the zone corresponding to the “in joint operation II” by putting **r28=r08**; and hence you can remove both “in joint operations I and II” just by setting the three parameters as the following configuration **r22=r28=r08**.

7.3.1 Operation in heat pump mode

Normal operation of the heat pump in which the electric heaters and-or the boiler will be activated only if the heat pump goes into error-alarm.

7.3.2 In joint operation (ZONE I)

If the outdoor air temperature is included between **r22** and **r28**, the compressor operates in synergy with the auxiliary electric heaters during winter and domestic hot water (sanitary) mode.

In this operation area, the heat pump will start at the beginning and then the plant side auxiliary electric heaters will operate after a period of time given by **r12** (in minutes) and after **r16** (in minutes) the DHW auxiliary electric heaters will start operation.

The activation priorities are defined by the parameters **r14**, **r20**, **r23** and **r24**.

The operation becomes **normal** if the temperature increases above the value given by **r22+1,0°C**.

Notes:

In the joint operation, the temperature of the boiler is controlled by the water temperature remote sensor of the plant circuit (if enabled), particularly if the temperature measured by the remote sensor is less than the setpoint **Hea**, the boiler will be activated, and then will be deactivated when the measured temperature by the remote sensor is greater than setpoint **Hea**.

The boiler will be managed by the outlet temperature sensor of the heat pump if the water plant circuit remote sensor is not enabled.

7.3.3 In joint operation (ZONE II)

If the outdoor air temperature is included between **r28** and **r08**, the compressor will operate in synergy with the auxiliary electric heaters.

In this operation area, the devices will start operation in the following working order: at first the boiler will start the operation, then the heat pump and the plant circuit auxiliary electric heaters will start operation after a period of time given by **r12** (in minutes) and after **r16** (in minutes) the DHW auxiliary electric heaters will start operation.

The activation priorities are defined by the following parameters **r14**, **r20**, **r23** and **r24**.

The operation becomes **normal** if the temperature increases above the value of **r28+1,0°C**.

Note: In the joint operation, the temperature of the boiler is adjusted by the water temperature remote sensor of the plant circuit (if enabled), particularly if the temperature measured by this remote sensor is less than the setpoint **Hea**, the boiler will be activated, and then will be deactivated when the measured temperature by the remote sensor is greater than setpoint **Hea**.

The boiler will be managed by the outlet sensor of the heat pump if the water plant circuit remote sensor is not active.

7.3.4 In substitution operation

If the outdoor air temperature decreases below **r08**, the compressor operation will be inhibited.

If the auxiliary system is composed of the plant circuit and/or the DHW electric heaters, they will be activated in substitution to the compressor with a duration defined by **r12** (minutes) for the plant circuit side and by **r16** (minutes) for the domestic hot water side.

During the substitution operation, instead it is not necessary to enable the auxiliary electric heaters with the parameter **r10** or **r15**, because the auxiliary electric heaters operate in substitution (and not as auxiliary heating systems) to the heat pump (therefore it is enough to select the type of utilization of the auxiliary electric heaters by setting only the parameter **r24**).

If the auxiliary system is a boiler with its proper circulator (**r32 = 1** or **3**).

The circulator of the heat pump will be off, the boiler will be enabled after **P01** (default 30 seconds).

Note: When the defrosting protection occurs on the water side, the utilization pump will be activated (or remains on).

If the in substitution auxiliary system is a boiler with its proper temperature control (**r32 = 2** or **3**).

The boiler will be enabled independently than thermoregulation of the heat pump.

If the in substitution auxiliary system is a boiler without circulator (**r32 = 0** or **2**).

The circulator of the heat pump will be active when the boiler is enabled.

The compressor will be enabled again if the temperature increases above the value of **r08+ r09** (°C) (by default **r09=1,0°C**)

7.3.5 Operation zone - activation of the auxiliary electric heater and boiler (plant circuit water temperature sensor is not enabled)

The possible configurations of the parameters related to auxiliary heaters are listed below in the tables 1, 2, 3 and 4, that are divided by areas of operation (the columns of "MODE" and "rxx" parameters indicate the operation mode and the possible values of the parameters for allowing the auxiliary heaters to intervene according to a predefined order of intervention, when the unit is running in a certain type of operation; several modes and values of the parameters can be alternatively selected and they are reported in the same cell separated by the symbol "/").

TABLE 1. NORMAL OPERATION IN HEAT PUMP MODE

N°	ORDER OF INTERVENTION OF AUXILIARY ELECTRIC HEATERS (when the setpoint is not achieved and the unit is in alarm condition)	MODE	OPERATION	r10	r15	r12	r16	r23	r24
1	1) Auxiliary electric heater of plant	HEAT/HEAT+SAN	HEAT	1	0/1/2	/	/	0/2/5	1/3
2	1) Boiler	HEAT/HEAT+SAN	HEAT	0/1	0/1/2	/	/	1/3/4/6	0/2
3	1) Auxiliary electric heater of plant 2) After r12 minutes, Boiler	HEAT/HEAT+SAN	HEAT	1	0/1/2	Set up of minutes	/	1/3	1/3
4	1) Boiler 2) After r12 minutes, plant auxiliary electric heater	HEAT/HEAT+SAN	HEAT	1	0/1/2	Set up of minutes	/	4/6	1/3
5	1) Auxiliary electric heater of DHW	HEAT+SAN	SAN	0/1	1	/	/	0/1/4	2/3
6	1) Boiler	HEAT+ SAN / COOL+ SAN	SAN	0/1	0/1/2	/	/	2/3/5/6	0/1
7	1) Auxiliary electric heater of DHW 2) After r15 minutes, boiler	HEAT+ SAN	SAN	0/1	1	/	Set up of minutes	2/3	2/3
8	1) Boiler 2) After r15 minutes, auxiliary electric heater of DHW	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	5/6	2/3
9	1) Auxiliary electric heater of Plant/DHW	HEAT/HEAT+SAN	In HEAT OR in SAN	1	1	/	/	0	3
10	1) Boiler	HEAT/HEAT+SAN	In HEAT OR in SAN	0/1	0/1/2	/	/	3/6	0
11	1) Auxiliary electric heater of plant/DHW 2) After r12 minutes, Boiler	HEAT / HEAT+ SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	3	3
12	1) Boiler 2) After r12 minutes, auxiliary electric heater of plant/DHW	HEAT / HEAT+ SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	6	3

TABLE 2. JOINT OPERATION "ZONE 1"

N°	ORDER OF INTERVENTION OF HEATING EQUIPMENTS (when the setpoint is not achieved)	MODE	OPERATION	r10	r15	r12	r16	r23	r24
1	1) Heat pump 2) After r12 minutes, plant auxiliary electric heater	HEAT / HEAT+ SAN	HEAT	1	0/1/2	Set up of minutes	/	0/2/5	1/3
2	1) Heat pump 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set up of minutes	/	1/3/4/6	0/2
3	1) Heat pump 2) After r12 minutes, plant auxiliary electric heater 3) After r12 minutes later, boiler	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set up of minutes	/	1/3	1/3
4	1) Pompa di calore 2) After r12 minutes, boiler 3) After r12 minutes later, plant auxiliary electric heater	HEAT / HEAT+ SAN	HEAT	1	0/1/2	Set up of minutes	/	4/6	1/3
5	1) Heat pump 2) After r16 minutes, DHW E- heater	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	0/1/4	2/3
6	1) Heat pump 2) After r16 minutes, boiler	HEAT+SAN	SAN	0/1	0/1/2	/	Set up of minutes	2/3/5/6	0/1
7	1) Heat pump 2) After r16 minutes, DHW E- heater 3) After r16 minutes later, boiler	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	2/3	2/3
8	1) Heat pump 2) After r16 minutes, boiler 3) After r16 minutes later, DHW auxiliary electric heater	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	5/6	2/3
9	1) Heat pump 2) After r12 minutes, Plant/DHW auxiliary electric heater	HEAT / HEAT+ SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	0	3
10	1) Heat pump 2) After r12 minutes, boiler	HEAT / HEAT+SAN	In HEAT OR in SAN	0/1	0/1/2	Set up of minutes	Set up of minutes	3/6	0
11	1) Heat pump 2) After r12 minutes, Plant/DHW auxiliary electric heater 3) After r12 minutes later, boiler	HEAT / HEAT+SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	3	3
12	1) Heat pump 2) After r12 minutes, boiler 3) After r12 minutes later, Plant/DHW auxiliary electric heater	HEAT / HEAT+SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	6	3

TABLE 3. JOINT OPERATION "ZONE 2"

N°	ORDER OF INTERVENTION (When the setpoint is not fulfilled)	MODE	OPERATION	r10	r15	r12	r16	r23	r24
1	ORDER OF INTERVENTION OF HEATING EQUIPMENTS (when the setpoint is not achieved)	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set up of minutes	/	1/3/4/6	0/2
2	1) Boiler 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set up of minutes	/	1/3	1/3
3	1) Boiler 2) After r12 minutes, auxiliary electric heater of plant 3) After r12 minutes later, heat pump	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set up of minutes	/	4/6	1/3
4	1) Boiler 2) After r12 minutes, heat pump 3) After r12 minutes later, auxiliary electric heater of plant	HEAT / HEAT+SAN	HEAT	1	0/1/2	Set up of minutes	/	0/2/5	1/3
5	1) Auxiliary electric heater of plant 2) After r12 minutes, heat pump	HEAT+SAN	SAN	0/1	0/1/2	/	Set up of minutes	2/3/5/6	0/1
6	1) Boiler 2) After r15 minutes, heat pump	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	2/3	2/3
7	1) Boiler 2) After r15 minutes, DHW auxiliary electric heater 3) After r15 minutes later, heat pump	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	5/6	2/3
8	1) Boiler 2) After r15 minutes, heat pump 3) After r15 minutes later, DHW auxiliary electric heater	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	0/1/4	2/3
9	1) DHW auxiliary electric heater 2) After r15 minutes, heat pump	HEAT / HEAT+SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	3/6	0
10	1) Boiler 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	3	3
11	ORDER OF INTERVENTION OF HEATING EQUIPMENTS (when the setpoint is not achieved)	HEAT / HEAT+SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	6	3
12	1) Boiler 2) After r12 minutes, heat pump	HEAT / HEAT+SAN	In HEAT OR in SAN	1	1	Set up of minutes	Set up of minutes	0	3

TABLE 4. SUBSTITUTION OPERATION

N°	ORDER OF INTERVENTION OF HEATING SYSTEMS (when the setpoint is not achieved)	MODE	OPERATION	r10	r15	r12	r16	r23	r24
1	1) Boiler 2) After r12 minutes, auxiliary E-heater of the plant	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set up of minutes	/	4/6	1/3
2	1) Auxiliary plant E-heater 2) After r12 minutes, boiler	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set up of minutes	/	1/3	1/3
3	1) Boiler 2) After r12 minutes, DHW auxiliary electric heater	HEAT+SAN	SAN	0/1	0/1/2	/	Set up of minutes	5/6	2/3
4	1) DHW Auxiliary heater 2) After r12 minutes, boiler	HEAT+SAN	SAN	0/1	0/1/2	/	Set up of minutes	2/3	2/3
5	1) Boiler 2) After r12 minutes, Auxiliary electric heater of plant/DHW sides	HEAT / HEAT+SAN	In HEAT OR in SAN	0/1	0/1/2	Set up of minutes	Set up of minutes	6	3
6	1) Auxiliary electric heater of plant/DHW 2) After r12 minutes, boiler	HEAT / HEAT+SAN	In HEAT OR in SAN	0/1	0/1/2	Set up of minutes	Set up of minutes	3	3
7	1) Boiler	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set up of minutes	/	1/3/4/6	0/2
8	1) Auxiliary electric heater of the plant	HEAT / HEAT+SAN	HEAT	0/1	0/1/2	Set up of minutes	/	0/2/5	1/3
9	1) Boiler	HEAT+SAN	SAN	0/1	0/1/2	/	Set up of minutes	2/3/5/6	0/1
10	1) DHW electric heater	HEAT+SAN	SAN	0/1	0/1/2	/	Set up of minutes	0/1/4	2/3

11	1) Boiler	HEAT/ HEAT+SAN	In HEAT OR in SAN	0/1	0/1/2	Set up of minutes	Set up of minutes	3/6	0
12	1) Plant/DHW Auxiliary electric heater	HEAT / HEAT+SAN	In HEAT OR in SAN	0/1	0/1/2	Set up of minutes	Set up of minutes	0	3

The below Table (5) shows the parameter to be set in order to enable the auxiliary electric heaters in "Summer and DHW" mode (in this case, the only active auxiliary electric heater is the one of DHW side and the subdivision between normal/joint/substitution operation is not valid).

TABLE 5. (COOLING + DHW PRODUCTION OPERATION MODE)

N°	ORDER OF INTERVENTION OF AUXILIARY ELECTRIC HEATERS - when the set point is not achieved after r16 minutes from the compressor start-up or - when the setpoint is not achieved and the unit is in alarm condition.	MODE	OPERATION	r10	r15	r12	r16	r23	r24
1	1) DHW auxiliary electric heater	COOL+SAN	SAN	0/1	1	/	Set up of minutes	0/1/2/3/4/ 5/6	2/3

The below Table (6) shows the behavior of DHW and plant auxiliary electric heaters in all cases when the unit is operating.

TABLE 6. OPERATION OF AUXILIARY ELECTRIC HEATERS

N°	MODE	OPERATION	AUXILIARY ELECTRIC HEATER OF PLANT	AUXILIARY ELECTRIC HEATER OF DHW
1	HEAT+SAN	HEAT	It works as indicated in the 1, 2, 3 and 4.	During "HEAT+SAN" operation, the DHW thermoregulation by default will have priority over that of the plant side, so if the thermoregulation is required, the unit will start the "DHW" mode operation and the auxiliary electric heater of DHW side behaves as described in the TABLES 1, 2, 3 and 4.
2	HEAT+SAN	SAN	<p>Only if the following 3 conditions are fulfilled:</p> <ul style="list-style-type: none"> - Output for auxiliary electric heater of plant side is configured; - r24=1/3; - the remote sensor of water plant temperature is installed and configured; <p>the auxiliary electric heater of the plant is available in the following cases:</p> <ul style="list-style-type: none"> - after r12 minutes from the beginning of its counting when activated previously in "HEAT" operation mode (see line N°1); - if not already activated its counting in the previous "HEAT" operation mode, after r12 minutes from the thermoregulation requirement. <p>In DHW mode, if the remote sensor is not set, the auxiliary electric heater of the plant will be disabled or its eventual counting will be stopped.</p> <p>If the "on-off remote contact" turns to the open state, the auxiliary electric heater of the plant will be turned off.</p>	It works as indicated in the TABLE 1,2,3 and 4.
3	COOL+SAN	SAN	Not available.	It works as indicated in TABLE 5.
4	COOL+SAN	COOL	Not available.	Not available.

7.3.6 Auxiliary systems offset management

During the joint operation or in substitution operation, for boiler and/or auxiliary electric heaters (depending on your resources and on the selected priorities) it is possible to determine a setpoint in heating or DHW production greater than the one of the heat pump. This is achieved by setting a temperature offset for the set point:

- **r29**: Temperature offset for boiler and electric heaters of the plant for the first set point (**G02**);
- **r30**: Temperature offset for boiler and electric heaters of the plant for second set point (**G05**);
- **r31**: Temperature offset for boiler and DHW electric heaters (**G03**).

In this way, the heat pump will stop when achieving the setpoint (**G02**, **G03**, **G05**) and the temperature difference can be supplemented by the boiler and/or electric heaters according to the selected temperature offset.

7.4 Double set-point

The double set-point function introduces a second working set-point of the plant side (in both cooling and heating modes). You can configure in the "GI" module a digital input which provides consent for the transition from the first to the second set-point or vice versa.

7.4.1 Settings

The **H129** parameter is used for setting the double set-point function (from maintainer menu).

H129	OPERATION
1	Classic mode
2	Double set-point active in summer operation
3	Double set-point active in the winter operation
4	Double set-point active in both summer and winter operation

To activate this function you should set the parameters by using the maintainer service password:

PORTS	TERMINALS	FUNCTION	PARAMETERS	VALUE	DESCRIPTION
DIGITAL INPUT	ID3E / ID3E	Double set point (It is not active by default)	H57	0 = Not active function 26= Double set point	Voltage free digital input
⁽¹⁾ OUTPUT	DO5E (phase) DO5EN (neutral)	Double set point valve (It is not active by default)	H90	0 = Digital output not assigned 25= Double set point valve	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)
⁽²⁾ OUTPUT	DO6E (phase) DO6EN (neutral)	Double set-point valve (It is not active by default)	H91	0 = Digital output not assigned 25= Double set-point valve	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)

⁽¹⁾ Not selectable for i-HP LT models.

⁽²⁾ Selectable only for i-HP LT models.

The under voltage output with undervoltage changeover contact commutates during the transition from the first to the second set-point and vice versa. This can be used for example to commutate a hydronic valve for deviating the water flow between radiant plant and ventilating systems. Please use a relay when it's necessary for the power supply line of the hydronic valve.

7.4.2 Adjustable set-point

Set-point type	Setpoint (Summer/Winter)	Summer	Winter
First set-point (°C)	Coo/Hea	7 (5÷18)	45 (35÷57)
Second set-point (°C)	Co2/He2	18 (7÷23)	35 (25÷45)

To set the setpoints from the on-board control panel, please use the SET button.

The second setpoint is greater than the first setpoint in the summer season and is lower in the winter season:

- in the summer: $T2 \geq T$
- in the winter: $T2 \leq T$

7.4.3 Commutations

The commutation sequence from normal set-point to the second setpoint:

1) Change of operating set-point

2a) in the summer: commutation of the 3-way valve only when the second set-point -5°C is reached.

2b) in the winter: commutation of the 3-way valve only when the second set-point +5°C is reached.

(At any case, the commutation of the valve will be carried out after 5 min from the setpoints modification)

The commutation sequence from second set-point to the normal setpoint:

1) Commutation of the 3-way valve

2) Modification of the operating setpoint after a lap of time equal to the required time for opening of the valve.

(Default **b04=30s** from maintainer menu)

7.5 Management of the secondary circulator (Relaunching pump)

It allows the management of a secondary (relaunching) circulator for serving the plant system.

- Open contact thermostat → The secondary circulator will be active;
- Closed contact thermostat → The secondary circulator is off with a delay fixed by the P02 parameter (post-pumping).

In order to enable such function, please enter into the parameters **PRG→PSS→PRG→** (insert the service password)→**PRG→PAr→PRG→CnF**.

PORTS	TERMINALS	FUNCTION	PARAMETERS	VALUES	DESCRIPTON
DIGITAL INPUT	ID2E / ID2E	Ambient thermostat (It is not active by default)	H56	0 = Function is not active 19= Secondary circulator thermostat	Voltage free digital input
OUTPUT	DO3E (phase) DO3EN (neutral)	Warnings (It is not active by default)	H88	0 = Digital output not assigned 24= Alarm warning 21= Defrosting warning 47= Lockout warning 43= Secondary circulator	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)

The temperature control of the heat pump is independent than the call of the thermostat.

With heat pump in off mode, the relaunching circulator will be switched off independently of the thermostat calling.

7.6 Signalizations

It is possible to configure an under voltage output single phase 230Vac for alarm signalization, by setting the following parameters using the user's password from the menu's controller situated on the front panel of the unit.

To enable this function, enter at the page of the parameters PRG→PSS→ PRG →(introduce the maintainer password)→ PRG→PAR→ PRG→CnF.

PORT	TERMINALS	FUNCTION	PARAMETER	VALUE	DESCRIPTION
OUTPUT	DO3E (phase) DO3EN (neutral)	Warnings (It is not active by default)	H88	0 = Digital output not assigned 24= Alarm warning 21= Defrosting cycle warning 47= Lockout warning	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)
⁽¹⁾ OUTPUT	DO4E (phase) DO4EN (neutral)	Warnings (It is not active by default)	H89	0 = Digital output not assigned 31=Plant season warning 21= Defrosting cycle warning 47= Lockout warning	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)
⁽²⁾ OUTPUT	DO7E (phase) DO7EN (neutral)	Warnings (It is not active by default)	H92	0 = Digital output not assigned 31=Plant season warning 21= Defrosting cycle warning 47= Lockout warning	Under voltage output single phase 230Vac, 50Hz, 2A(AC1)

⁽¹⁾ Not selectable in i-HP LT models,

⁽²⁾ Selectable only in i-HP LT models.

7.6.1 Plant season signalization

It is possible to configure a digital output for the plant season mode signalization. This is can be done by one of the digital output to be 31. The relay will be active in summer mode and not active in off status or in winter mode. During domestic hot water production and defrosting cycle, the relay keeps the setting of last season mode of operation.

7.6.2 Defrosting cycle signalization

It is possible to configure a digital output for the signalization of the beginning of defrosting cycle.

If a digital output is configured with the value 24, there will be a warning during the defrosting cycle

7.6.3 Alarm signalization

There will be an alarm signal if a digital output is configured with the value 24.

Digital output will be activated in case of unlocking alarm and it will be deactivated when the alarm goes off.

7.6.4 Heat pump alarm codes

If you configure a digital output with the value 47, the alarm will surge immediately in the below cases and once the corresponding conditions are fulfilled:

Codes	Recovery condition	Permanence condition
E001	Manual	-
E002	Manual	-
E005	Manual	-
E006	Manual	-
E008	Manual	-
E018	Automatic	-
E041	Manual	-
E101	Automatic	-
E102	Automatic	-
Sensor errors	Automatic	-
E801 – E802	Automatic	-
E851-E852	Automatic	All compressors are off for at least # 180 seconds
E861-E862	Automatic	All compressors are off for at least # 180 seconds
E871-E872	Automatic	All compressors are off for at least # 180 seconds
E881-E882	Automatic	All compressors are off for at least # 180 seconds
E891-E892	Automatic	All compressors are off for at least # 180 seconds
E901-E902	Automatic	All compressors are off for at least # 180 seconds
E911-E912	Automatic	All compressors are off for at least # 180 seconds
E921-E922	Automatic	All compressors are off for at least # 180 seconds
E931-E932	Automatic	All compressors are off for at least # 180 seconds
E941-E942	Automatic	All compressors are off for at least # 180 seconds
E951-E952	Automatic	All compressors are off for at least # 180 seconds
E961-E962	Automatic	All compressors are off for at least # 180 seconds
E971-E972	Automatic	All compressors are off for at least # 180 seconds

8 AVAILABLE FUNCTIONS WITH HI-T CONTROL PANEL (OPTIONAL)

The Hi-T is a touch screen remote control panel for centralized management of chiller/heat pump, it equipped with humidity and temperature sensors for environment analysis and for the management of the double setpoint for radiant floor systems equipped a dehumidification system.

This remote control panel is an intuitive interface very simple for utilization; the functions are all easy to set through the use of synoptic of immediate understanding.

The functions accessible through the touch screen Control Panel are listed below:


- Remote management
- Management of a network, up to 7 heat pumps;
- Single water pump for heat pumps (up to 7 units) system installation;
- Zone thermostat
- Legionella disinfection;
- Double set-point and dehumidification;
- Dew point control
- Climatic compensation
- Management of the secondary (relaunching) circulator
- Management of a unique network pump
- Faults diagnostic system

For further information, please see the user's-installer's manual, or contact our offices.

9 HANDBOOK FOR SOME CONFIGURATIONS OF INSTALLATION

For more information about some configurations of installation, you can contact our office and ask for the handbook which collects a series of some recommended highlighted drawings of plants concerning the installation configurations of our high efficiency heat pumps. The "Handbook" shows the symbiotic potential with some of our products present in the catalogue.

10 USER'S AND INSTALLER'S ALLOWED PARAMETERS

 WARNING	<i>All the operations with installer visibility must be carried out by qualified personnel.</i>
	<i>Not all the configurations can be simultaneously enabled and/or changed.</i>
	<i>Other values different than those of default may ensure the proper operation of the unit, in case of necessity contact please our office.</i>
	<i>The company excludes any contractual and extra contractual liabilities for damages 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.</i>

The company declines all responsibility for damages or malfunctions caused by the modifications of the factory default settings of the parameters by third parties, not expressly authorized.

The parameters can be activated and/or modified by the user or by getting access by using the installer's password to the menu of the **CB controller** located on the front panel of the unit.

DESCRIPTION	GROUP IDENTIFICATIVE CODE	PARAMETER'S INDEX	VISIBILITY
Configuration	CnF	H-	USER/INSTALLER
Compressor	CP	C-	INSTALLER
Fan	FAn	F-	INSTALLER
Alarms	ALL	A-	INSTALLER
Regulation	Re	b-	INSTALLER
Pump	PUP	P-	INSTALLER
Electric heaters	Fro	r-	INSTALLER
Defrosting	dFr	d-	INSTALLER
Electronic valve	EEu	U-	INSTALLER
Offset	OFF	o-	INSTALLER
*Vapor injection	Eiv	u-	INSTALLER

(*) Parameters present in i-HP LT series.

10.1 Set-point configuration parameters

Parameter	Description	Unit	Default	Range	Visibility	Admitted configuration	Notes
Coo	First setpoint in cooling mode	°C	7.0	H03÷Co2	USER		
Hea	First setpoint in heating mode	°C	45.0	He2÷H01	USER		
San	DHW temperature Setpoint	°C	48.0	H02÷H01	USER		
Co2	Second setpoint in cooling mode	°C	18.0	Coo÷H03	USER		
He2	Second setpoint in heating mode	°C	35.0	H02÷Hea	USER		

10.2 Configuration parameters

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations	Notes
H01	Max setpoint in heating mode	°C	(¹)58.0	-50.0÷80.0	INSTALLER		
H02	Min setpoint in heating mode	°C	25.0	-50.0÷80.0	INSTALLER		
H03	Max setpoint in cooling mode	°C	23.0	-50.0÷80.0	INSTALLER		
H04	Min setpoint in cooling mode	°C	3.0	-50.0÷80.0	INSTALLER		
H47	Digital input configuration D3	/	2	0÷30	INSTALLER	0 = Digital input not assigned 2 = On/Off	Terminals: ID3, ID3
H126	Serial address	/	1	1÷200	INSTALLER	For cascading multi-units configuration, you need to set for each controller a proper address.	

(¹) H01=60°C for i-HP LT versions.

10.3 Alarms configuration parameters

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations	Notes
A08	Antifreeze alarm activation setting	°C	2	-127÷127	INSTALLER		
A09	Antifreeze alarm hysteresis	°C	3.0	0.0÷25.5	INSTALLER		
A16	Low pressure set in cooling operation	Bar	according to the model	4,0÷80,0	INSTALLER		
A27	Low pressure set in heating operation	/	1.0	0.0÷25.5	INSTALLER		

10.4 Adjustment parameters

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations	Notes
b01	Band in cooling mode	°C	2,0	0÷10,0	INSTALLER		
b02	Band in heating mode	°C	2,0	0÷10,0	INSTALLER		
b03	Differential in DHW mode	°C	2,0	0÷10,0	INSTALLER		
b04	Commutation time valve radiant panels	sec	30	0÷600	INSTALLER		
b05	Hysteresis cut-off of the compressor in cooling and heating	°C	1	0.0÷25.5	INSTALLER		
b06	DHW transitory output in heating	sec	45	0÷255	INSTALLER		
b07	Regulator-integral time PI	sec	150	0÷255	INSTALLER		
b08	Enabling dynamic set	/	0	0÷1	INSTALLER		
b09	Max Offset in cooling dynamic set	°C	3.0	-50.0÷80.0	INSTALLER		
b10	Max Offset in heating dynamic set	°C	-3.0	-50.0÷80.0	INSTALLER		
b11	Outdoor set temperature in cooling dynamic set	°C	25	-127÷127	INSTALLER		
b12	Outdoor set temperature in heating dynamic set	°C	15	-127÷127	INSTALLER		
b13	Temperature differential in cooling	°C	-10.0	-50.0÷80.0	INSTALLER		
b14	Temperature differential in heating	°C	10.0	-50.0÷80.0	INSTALLER		
b15	Setpoint regulation band from analog input 0-10V	°C	5.0	0.0÷10.0	INSTALLER		
b16	Scan time of compressors start-up	sec	60	0÷255	INSTALLER		
b19	Duration of the modulating comp. at minimum capacity that is necessary for second comp. startup	sec	30	0÷255	INSTALLER		
b20	Enabling of 0-10V/ratiometric input	/	0	0÷1	INSTALLER	0 = 0-10V input 1 = ratiometric input	
b22	Thermoregulation Hysteresis cut-off plant sensor	°C	1,5	0.0÷25.5	INSTALLER		
b25	Hysteresis cut-on of the compressor in cooling and heating	°C	according to the model	0.0÷25.5	INSTALLER		

10.5 Condenstation parameters

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations	Notes
F05	Operation under compressor call	/	0	0 ÷ 1	INSTALLER		
F06	Min fan speed	%	30	0 ÷ 100	INSTALLER		
F07	Max silent fan speed in cooling mode	%	according to the model	0 ÷ 100	INSTALLER		
F08	Set of the pressure at the minimum speed of the fan in cooling mode	Bar	16.0	-50.0÷80.0	INSTALLER		
F09	Proportional band for modulation of the fan in cooling mode	Bar	9	0.0÷25.5	INSTALLER		
F10	Delta cut-off fan adjustment	Bar	2.6	0.0÷25.5	INSTALLER		
F11	Hysteresis cut-off	Bar	1.3	0.0÷25.5	INSTALLER		
F13	Max fan speed in cooling mode	%	according to the model	0 ÷ 100	INSTALLER		
F14	Setting of the pressure at the maximum fan speed in cooling mode	Bar	28	-50.0÷80.0	INSTALLER		
F15	Min fan speed in heating	%	according to the model	0 ÷ 100	INSTALLER		
F16	Max. silent fan speed in heating mode	%	according to the model	0 ÷ 100	INSTALLER		
F17	Set of the pressure at the minimum fan speed in heating mode	Bar	15.0	-50.0÷80.0	INSTALLER		
F18	Linear band for fan motor modulation in heating mode	Bar	7.0	0.0÷25.5	INSTALLER		
F19	Max. fan speed in heating mode	%	according to the model	0 ÷ 100	INSTALLER		
F20	Setting of the pressure at the maximum fan speed in heating mode	Bar	6.8	-50.0÷80.0	INSTALLER		

10.6 Pump configuration parameters

Parameter	Description	Unit	Default	Range	Visibility	Allowed configurations	Notes
P01	Pump ON Compressor ON delay	sec	20	0÷255	INSTALLER		
P02	Pump OFF compressor OFF delay	min	2.0	0÷255	INSTALLER		
P03	Pump operation mode	/	0	0÷1	INSTALLER	0 = continuous operation 1 = operation according to the thermoregulation	
P04	Set of the pump in antifreeze	°C	5	-127÷127	INSTALLER		
P05	Hysteresis for the pump in antifreeze mode	°C	2.0	0.0÷25.0	INSTALLER		
P06	Pump proportional band in heating	°C	according to the model	0.0÷25.0	INSTALLER		
P07	Maximum speed of modulating pump	%	100	0÷100	INSTALLER		
P08	Minimum speed of modulating pump	%	according to the model	0÷100	INSTALLER		
P09	Set ΔT (T _{inlet} water/outlet) of modulating pump	°C	5	-127÷127	INSTALLER		
P10	Temperature differential of modulating pump	°C	2.0	0.0÷25.0	INSTALLER		
P16	Time between 2 actuations of the pump in periodical mode	min	20	0÷600	INSTALLER		
P17	Operating time of the pump in periodical mode	sec	90	0÷255	INSTALLER	0 = deactivation of periodic mode	
P18	Enabling of unique pump operation in network	/	0	0÷1	INSTALLER	0 = deactivated function 1 = enabled function	
P19	Unique pump operation in network in presence of offline machines	/	0	0÷1	INSTALLER		

10.7 Defrosting parameters

Parameter	Description	Unit	Default	Range	Visibility	Allowed Configurations	Notes
d02	Pressure during initial defrosting	bar	5.8	-50.0÷80.0	INSTALLER		Parameters enabled only if are configured by default
d08	Minimum interval between two consecutive defrost cycles	min	0	0÷255	INSTALLER		After a time equal to d08, the circuit enters in defrosting mode.

10.8 Compressor parameters configuration

Parameter	Description	Unit	Default	Range	Visibility	Allowed Configurations	Notes
n01	Output power from PC1	/	according to the model	0÷100	INSTALLER		
n02	Output power from PC2	/	according to the model	0÷100	INSTALLER		
n06	Compressors Lock Mode for installer	/	according to the model	0÷1	INSTALLER	0 = Operation 1 = Lockout	
C11	Operation time of compressor with minimum frequency	sec	60	0÷255	INSTALLER		

10.9 “GI” Module Configuration parameters –standard for i-HP LT version

As for i-HP LT units and in case of installation of the optional kit module (GI2) on i-HP units, it is possible to manage the following additional functions. Such parameters can be activated and/or adjusted by the installer from of **CB master controller menu** mounted on the front panel of the unit.

Parameter	Description	Unit	Default	Range	Visibility	Allowed Configurations	Notes
H24	Configuration of ST3E input	/	41	0÷49	INSTALLER	0 = input not assigned 6 = DHW temperature sensor 41 = water plant temp. remote sensor	Terminals: AI1E-AI1E H49 = 0.
⁽¹⁾ H28	Configuration of ST7E input	/	0	0÷49	INSTALLER	0 = input not assigned 6 = DHW temperature sensor 41 = water plant temp. remote sensor	Terminals: ADI1E-ADI1E H51 = 0.
⁽¹⁾ H49	Configuration of DI4E input	/	0	0÷30	INSTALLER	0 = input not assigned 19 = Ambient thermostat 26 = Double set-point 28 = sanitary thermoregulation call from digital input	Terminals: ADI1E-ADI1E H24 = 0. The input is used only in the absence of the Hi-T control panel.
H51	Configuration of DI6E input	/	0	0÷30	INSTALLER	0 = input not assigned 19 = Ambient thermostat 26 = Double set-point 28 = sanitary thermoregulation call from digital input	ADI1E-ADI1E terminals H28 = 0.
H63	Configuration of DO1E	/	26	0÷44	INSTALLER	0 = input not assigned	DO1E-DO1E terminals
H64	Configuration of DO2E	/	22	0÷44	INSTALLER	21 = Defrosting signalization	DO2E-DO2E terminals
⁽¹⁾ H65	Configuration of DO3E	/	29	0÷44	INSTALLER	24 = Alarm signalization (notification)	DO3E-DO3E terminals
⁽¹⁾ H66	Configuration of DO4E	/	0	0÷44	INSTALLER	25 = double set point valve	DO4E-DO4E terminals
⁽¹⁾ H67	Configuration of DO5E	/	0	0÷44	INSTALLER	26 = DHW auxiliary electric heater 29 = Boiler	DO5E-DO5E terminals
H68	Configuration of OC1E	/	25	0÷44	INSTALLER	31 = Plant season signalization	NC1E-N1E-NO1E terminals.
H69	Configuration of OC2E	/	31	0÷44	INSTALLER	42 = Unique pump in the network 43 = Relaunching (secondary) pump	NC1E-N1E-NO1E terminals

⁽³⁾ Not selectable for i-HP LT units.

10.10 Configuration parameters of the heating elements – Mod Gi

CONFIGURATION PARAMETERS OF THE HEATING DEVICES							
Parameter	Description	Unit	Default	Range	Visibility	Allowed configuration	Note
r02	Setpoint of anti-freeze heater in heating mode	°C	3	3÷6	INSTALLER		
r03	Setpoint of anti-freeze heater in cooling mode	°C	3	3÷6	INSTALLER		
r06	Differential of anti-freeze electric heater	°C	2.0	0.0÷25.5	INSTALLER		
⁽¹⁾ r08	Upper limit during in substitution operation	°C	according to the model	-16÷50	INSTALLER		Respect the condition $r22 \geq r28 \geq r08$
r09	Hysteresis for heat pump lockout	°C	1.0	0.0÷25.5	INSTALLER		
r10	Enabling the auxiliary electric heater of the plant	/	0	0÷1	INSTALLER	0 = deactivated function 1 = enabled function	
r11	Differential of the plant auxiliary electric heater	°C	0.5	0.0÷25.5	INSTALLER		
r12	Auxiliary plant/HP electric heater activation delay	min	10	0÷255	INSTALLER		
r13	Auxiliary heater deactivation delay	min	10	0÷255	INSTALLER		
r14	Exclusive operation of the electric-heaters	/	0	0÷1	INSTALLER	0 = Simultaneous enablement of electric heaters 1 = Exclusive enablement of electric heaters	
r15	DHW auxiliary electric heater enablement	/	0	0÷2	INSTALLER	0 = deactivated function 1 = enabled function 2 = Operation of auxiliary plant-side electric only if H83=1	
r16	DHW auxiliary heater/heat pump activation delay	min	15	0÷255	INSTALLER		
r19	Activation time of drain pan heaters from last defrost	min	0	0÷255	INSTALLER	0 = activation of E-heater independently of defrosting.	
r20	E-heater priority utilization	/	1	0÷1	INSTALLER	0 = priority for plant-side 1 = priority for DHW side	Only if r14 = 1
r21	Plant side mitigation enabling with heaters in defrost	/	0	0÷1	INSTALLER	0 = deactivated function 1 = enabled function	
r22	Upper limit joint operation area I	°C	according to the model	-127÷127	INSTALLER		Respect the condition $r22 \geq r28 \geq r08$
r23	Type of boiler utilization	/	60	0÷6	INSTALLER		
r24	Type of use of the auxiliary heaters	/	3	0÷3	INSTALLER		
r25	Disinfection Setpoint (anti-legionella)	°C	80	0÷100	INSTALLER		Adjustable parameters by mean of remote control panel Hi-T
r26	Disinfection period	min	12	0÷255	INSTALLER		Adjustable parameters by mean of remote control panel Hi-T
r27	Heat pump set in disinfection operation	°C	55.0	-50.0÷80.0	INSTALLER		Adjustable parameters by mean of remote control panel Hi-T
r28	Upper limit for joint operation area II	°C	according to the model	-16÷50	INSTALLER		Respect the condition $r22 \geq r28 \geq r08$
r29	Temperature offset for boiler and plant according to the setpoint (G02)	°C	0	0÷100	INSTALLER		
r30	Temperature offset for boiler and plant according to the setpoint (G05)	°C	0	0÷100	INSTALLER		
r31	Temperature offset for boiler and DHW electric heaters (G03)	°C	0	0÷100	INSTALLER		
r32	Boiler endowment	/	1	0÷3	INSTALLER		
r33	Pump management with electric heaters ON	/	3	0÷4	INSTALLER		

⁽¹⁾ For the model i-HP LT r08=-20°C.

10.11 Configuration parameters of i-HP LT

Parameter	Description	Unit	Default	Range	Visibility	Allowed configuration	Note
V03	Set DSH in cooling	°C	5.5	0.0÷25.5	INSTALLER		
V04	Set DSH in heating	°C	1.8	0.0÷25.5	INSTALLER		
V05	Hysteresis for DSH adjustment output	°C	40	0.0÷25.5	INSTALLER		
V09	Outdoor air set temperature for winter vapor injection	°C	5	0÷50	INSTALLER		
V10	Outdoor air set temperature for summer vapor injection	°C	28	0÷50	INSTALLER		
V13	Threshold DSH	°C	25	0÷50	INSTALLER		
V14	Minimum time for DSH threshold satisfaction	min	1	0÷255	INSTALLER		
V16	Minimum time for DSH threshold unsatisfaction	min	2	0÷255	INSTALLER		

11 GLYCOL-WATER SOLUTIONS

In the models where glycol-water solution is used, it's necessary to contact our Technical Office for the adjusting the settings of the parameters.

12 ALARMS

Herein below the main alarms messages are reported.

Note: When manual reset is performed after N time of interventions, the alarm counting occurs with minute granularity (ie multiple interventions within 1 minute are counted as a one intervention).

As for digital inputs, the Closed configuration is considered the default Active setting of digital inputs. For reversing the polarity of the digital input, it's necessary to change setting of the polarity parameters of the digital inputs

Change the setting of the

12.1 E001 – High pressure

If the on board pressure transducer detects a pressure higher than 39,5bar, the alarm will be activated.

In this case the compressor will stop immediately via software. The alarm will reset when the pressure decreases under 29,6 bar.

If the number of alarm interventions in one-hour is equal to 3 times, the **E001** alarm will become manual reset.

12.2 E002 – Low pressure

The alarm goes ON if the evaporation pressure drops below **3.5bar** with cooling circuit, or below **1.3bar** with heating circuit (also here, the bypass conditions must be terminated).

The alarm resets when the pressure increases with 3bar respecting the intervention threshold.

During defrosting cycle, the low pressure alarm condition is ignored for the entire defrosting process.

Each time a compressor is activated, a 60-second bypass time is counted during which no alarm event is considered.

If the **E002** alarm occurs more than 3 times per hour, the alarm becomes a manual reset.

In case of alarm, the pump in matter will be locked out. If there is no other resources to use (1 single serviceable configured pump or both unserviceable pumps) obviously the whole unit will be blocked.

12.3 E016 – Inverter pump thermal protection

Only if the high prevalence integrated pump **CI6** kit is present.

The digital input "ST8" is associated to this alarm.

The alarm goes ON only when its proper digital input switches to the active state.

The alarm resets automatically when the contact returns to its initial state.

12.4 E003 - ON/OFF Compressor thermal protection

Only in the case of i-HP 250F model

The digital input "ST8" is associated to this alarm.

The alarm goes ON only when its proper digital input switches to the active state.

The alarm resets automatically when the contact returns back to its initial state.

12.5 E005 – Antifreeze alarm

This alarm goes ON when the outlet water temperature sensor decreases below **2°C** (The below bypass conditions must be fulfilled). A small anti-bouncing of **2 seconds** is managed also.

The alarm resets when the temperature increases with **3°C** respecting intervention threshold.

When switching from Off state, defrost, or from cooling to Heat mode, a 5 minute bypass time is charged which prevents the anti-freeze alarm.

This alarm is a manual reset type

12.6 E006 – Flow switch alarm

The water side flow switch is already installed inside the unit and must NOT be tampered or bypassed in any way. The flow switch is bypassed for 10 seconds from the start-up of the machine. The alarm signalization occurs after 5 seconds of error persistence (lack of water flow, air in the circuit, etc.). The alarm is automatically reset for the first 2 times and goes off after 5 seconds. If the alarm occurs more than 3 times per hour, the manual reset of the alarm is required.

The alarm is not active for 10 seconds after activating the circulator.

12.7 E008 Constrained stop of the compressors for lack of lubrication

The compressors stop operation for safety when the minimum frequency of lubrication is not reached during this period and subsequently the alarm E08 will appear on the display.

Such alarm resets itself as soon as all the compressors stop working.

The alarm becomes manual reset if it occurs for more than 3 times (i.e. it's necessary to disconnect the unit from power supply)

12.8 E018 – High temperature

The alarm will be activated when the outlet water temperature sensor becomes higher than **60°C** for at least **240 seconds**. It turns off when the water outlet temperature decreases below **57°C**.

This alarm is active only in cool mode.

12.9 E042 – Poor heat exchange in defrosting cycle

This alarm may activate only during sanitary hot water production and goes on during this operating mode when the outlet temperature exceeds the values of 58°C(60°C for i-HP LT models). When the alarm goes on, the compressors stop to operate but the unit keeps in memory the sanitary mode until the reset of the alarm (except for the case of below conditions).

The alarm goes off if the return temperature drops below the threshold of **55°C(57°C for i-HP LT models)**, and in this case the compressors are again ready to restart the operation.

If the alarm goes on for 3 consecutive times during the same sanitary production cycle, it temporarily inhibits sanitary production and the unit returns to operate for the plant side.

The inhibition of sanitary hot water production will be cancelled when the plant regulation achieves below the setpoint value with **0.5°C** or in any case, if there is no need of thermoregulation on the plant.

Note: The **E042** alarm code is displayed all along the entire cycle of sanitary hot water production.

12.10 E101, E102 – I/O Module communication timeout

Only if the optional GI module is present.

There is 10-second of timeout for communication between the main board and GI module.

The automatic alarm reset alarm goes on when you have a communication error,

With this alarm the unit is completely lockout.

12.11 Alarms' sensors

The sensor alarms are all auto-reset. The alarm of a given sensor inhibits the functions which need its value. For each encoding, see the table below.

Conditions of alarm sensor:

- Disconnected sensor.
- Short-circuit sensor.
- Sensor records a wrong range of temperature.

Note: note that, not all analog inputs' categories can diagnose the disconnected sensors (see, for example, 0-10Volt signal).

12.12 Power failure

After power supply reset:

- The system comes back to the previous state before the power failure.
- If the system is in defrosting period, this mode will be cancelled after power supply reset.
- All the running timings will be cleared and reset again.

12.13 Inverter compressors' alarms

Several alarm codes are managed by the inverter. Please refer to the table below for details regarding the inverter alarms.

Note: The descriptions of individual alarms may differ slightly between different inverter models.

12.14 E871 - E873 – Inverter high temperature alarm

This type of alarm, in addition, it could be activated by a special error flag read by the inverter, it can be also managed in the following case:

This alarm goes on if the temperature of the heatsink detected by the inverter exceeds the threshold value **80°C** for 10 seconds.

The alarm goes OFF if the detected temperature decreases below the 75°C.

12.15 Alarms list

Code	Description	Lockout
E000	Remote switch Off of the unit	Heat pump
E001	High pressure alarm	Heat pump
E002	Low pressure alarm	Heat pump
E003	Compressor 1 thermal overload protection (only for i-HP 0250F model)	Compressor
E005	Antifreeze alarm	Heat pump
E006	Flow switch alarm	Heat pump
E008	Lack of compressors lubrication alarm	Heat pump
E009	High compressor's discharge temperature	Heat pump
E016	Usage pump 1 thermal overload protection (only if the CI16 configuration is present)	Pump 1
E018	High temperature alarm in cooling operation	Heat pump
E042	Poor heat exchange alarm	Heat pump/sanitary
E101	Communication timeout with GI module	Heat pump
E611	Inlet water temperature sensor error	Heat pump
E621	Outlet water temperature sensor error	Heat pump
E631	Compressor intake temperature sensor	Associated functions
E632	Injection temperature sensor (only for i-HP LT models)	Heat pump functions
E641	Compressor discharge temperature sensor/High pressure in the circuit	Heat pump
E651	Outdoor air temp. sensor for climatic regulation	Associated functions
E661	Domestic hot water temperature sensor	Associated functions
E671	Plant remote temperature sensor	Associated functions
E691	High pressure transducer	Heat pump
E692	Pressure injection transducer (only for i-HP LT models)	Heat pump
E701	Low pressure transducer	Heat pump
E801 – E802	Timeout inverter 1, 2 or 3	Compressor
E851 – E852	Inverter hardware error	Compressor
E861 – E862	Overcurrent of the motor	Compressor
E871 – E872	Inverter heatsink over temperature	Compressor
E881 – E882	Power supply voltage out of limits	Compressor
E891 – E892	Compressor disconnected from power supply	Compressor
E901 – E902	Compressor driver and model mismatch	Compressor
E911 – E912	Overload protection	Compressor
E921 – E922	PFC-POE overcurrent	Compressor
E931 – E932	Communication error with main controller	Compressor
E941 – E942	PFC converter fault	Compressor
E951 – E952	Heatsink or/and ambient temperature sensor error	Compressor
E961 – E962	Abnormal condition	Compressor
E971 – E972	EEPROM not initialize	Compressor



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<p>The data indicated in this manual is purely indicative. The manufacturer reserves the right to modify the data whenever it is considered necessary.</p>
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