Chiller and Heat Pumps

RDZ
invisible heating and cooling

UMHPI Controller

UMHPI on-board electronic user controller

USER MANUAL

INDUSTRIAL INVERTER AIR/WATER HEAT PUMPS WITH AXIAL FANS

CONTROLLER MANUAL

Models

UMHPI 25 / UMHPI V 25
UMHPI 35 / UMHPI V 35
UMHPI 50 / UMHPI V 50
UMHPI 60

00	10-2017	Alignment with Ver324Rev015rc12
Rev	**Date**	**Notes**

Serie / Series / Serie / Serie / Série
UMHPI INDUSTRIAL INVERTER AIR/WATER HEAT PUMPS WITH AXIAL FANS

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.

INDEX

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

	***Indicates prohibited operations.***
	***Indicates operations that can be dangerous for people and/or disrupts the correct operation of the equipment.***
	***Hazardous electrical voltage - risk of electric shock***
	***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.***

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 EQUIPMENTS

It's necessary to use the below personal protective equipment when operating and maintaining the UMHPI/UMHPI V units,

		***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.***
		***Gloves: Protection gloves should be used during maintenance or cleaning operations.***
		***Mask and goggles: Respiratory protection (mask) and eye protection (goggles) should be used during cleaning and maintenance operations.***

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 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 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 switch "QF" general differential 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 UMHPI/UMHPI V 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 SYSTEM ARCHITECTURE

The system UMHPI is composed of an electronic controller device:

a) **CB** = on-board (Master) controller located on the front panel of the unit.

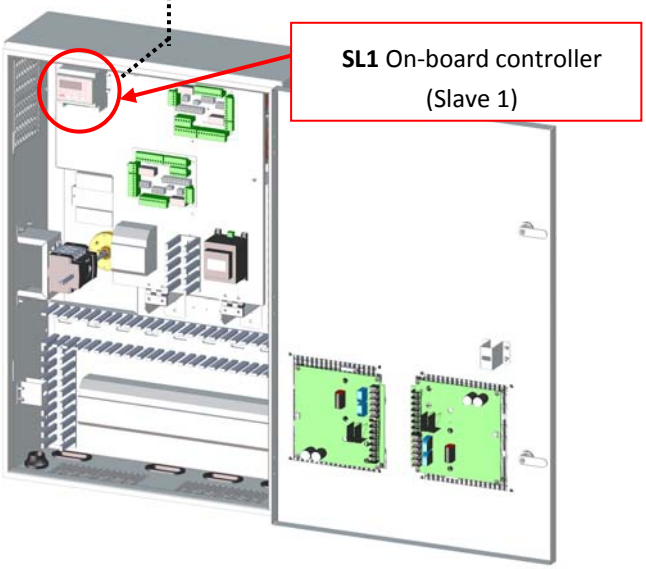
As for UMHPI V models and if are equipped with the optional kit mod. **GI**, the system includes an additional controller.

b) **SL1** = on-board (Slave 1) controller inside the electric panel of the unit.

The **CB** controller of the unit manages the Modbus communication of the whole.

N.B. This guide describes the control logics and functions that can be enabled by the CB unit controller

FRONT PANEL



INTERNAL ELECTRIC PANEL

*Included in UMHPI V series and in UMHPI models that are equipped with the optional mod. **GI** kit*

CB – SL1 ModBus communication

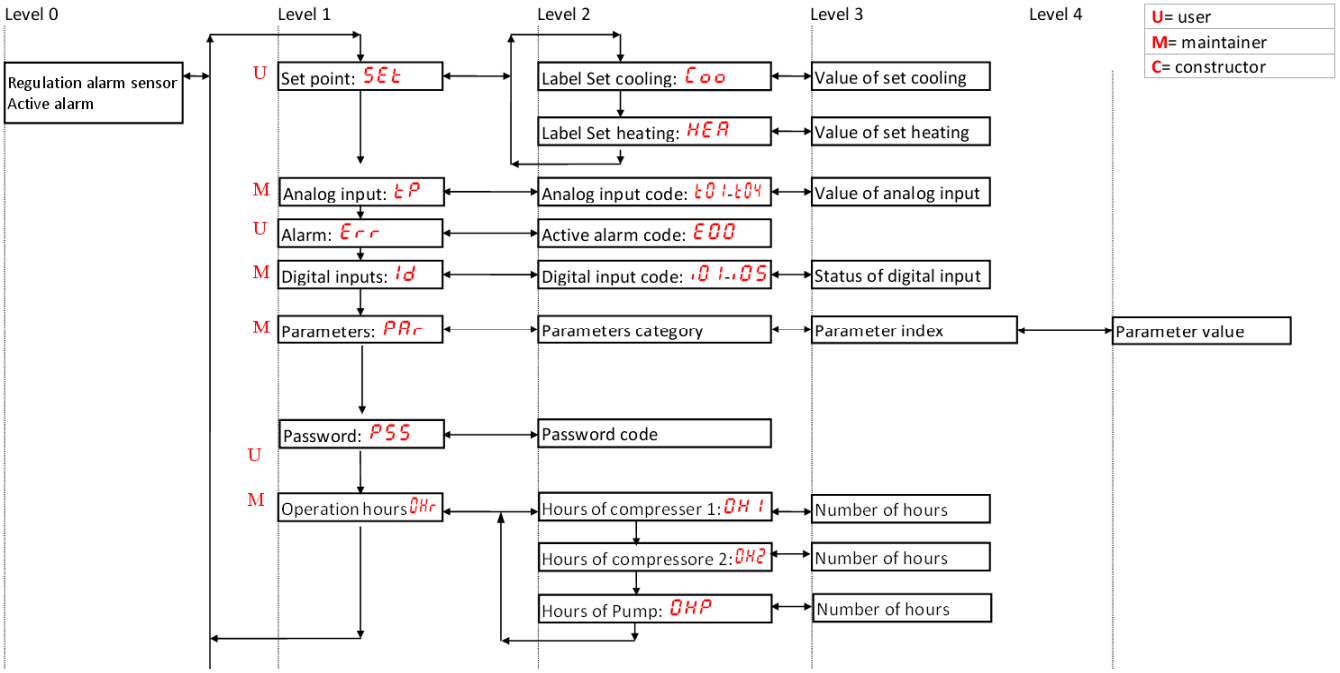
6 USER – CB MASTER CONTROLLER INTERFACE

Mode Esc	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.
PRG	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.

WARNING

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.

6.1 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

6.2 ANALOG INPUTS

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

tp	DESCRIPTION	Unit
t01	Water inlet temperature	(°C)
t02	Water outlet temperature	(°C)
t03	Compressor inlet temperature	(°C)
t04	Compressor outlet (discharge) temperature	(°C)
t05	High pressure	(bar)
t06	Low pressure	(bar)
t07	Outdoor air temperature	(°C)
t08	DHW temperature (if DHW is enabled)	(°C)
t09	DHW temperature (if DHW production is enabled)	(°C)
*t11	Plant circuit remote temperature sensor (if enabled)	(°C)
**t15	Injection pressure	(bar)
**t17	Injection temperature	(°C)

(*) Present in the UMHPI V models or with the optional kit mod. **Gi** in the the models UMHPI.

(**) Present in the UMHPI V models

6.3 PARAMETERS CATEGORIES

The parameters are classified into groups, each group is identified by a 3-digit code, while the index of each parameter is preceded by a letter.

DESCRIPTION	GROUP IDENTIFICATION CODE	PARAMETER 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 heater	Fro	r-	INSTALLER
Defrosting	dFr	d-	INSTALLER
Electronic expansion valve	EEu	U-	INSTALLER
Offset	OFF	o-	INSTALLER
**Mixer valve	rAd	i-	INSTALLER
**Solar	SUn	S-	INSTALLER
*Vapor injection	Eiu	u-	INSTALLER
Inverter compressors	nCP	n-	INSTALLER
**DHW preparer	AcS	Ac-	USER/INSTALLER

(*) Parameters present in UMHPI V series
(**) Parameters present with the optional KIE module

6.4 ADJUSTABLE SETPOINT BY THE USER

SETPOINT	DESCRIPTION	UNIT	DEFAULT	RANGE
Coo	Summer mode first setpoint	°C	7.0	5÷18
Hea	Winter mode first setpoint	°C	45.0	35÷57
*San	DHW mode setpoint	°C	48.0	25÷57
Co2	Summer mode second setpoint	°C	18.0	*Coo*÷23
He2	Winter mode second setpoint	°C	35.0	25÷*Hea*
**rCO	Mixer valve setpoint in Summer mode	°C	15.0	-50.0÷80.0
rHE	Mixer valve setpoint in Winter mode	°C	30.0	-50.0÷80.0
ACS	DHW instantaneous production setpoint	°C	45.0	0.0÷80.0

(*) Adjustable Setpoint if the DHW function is enabled.
(**) Adjustable Setpoint if the optional KIE module is included.

6.4.1 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.

6.4.2 LED

	Compressor LED	• 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	• 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	• 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	• The LED is ON if the antifreeze electric heater is active.
	Water pump LED	• The LED is ON if the water pump is running.
	Alarm LED	• The LED is ON if an alarm is activated.
	Heating mode LED	• The LED is ON if the unit is in the heating mode operation.
	Cooling mode LED	• LED is ON if the unit is in the cooling mode operation.

6.5 INPUT/OUTPUT (I/O) PORTS

The I/O (inputs and outputs) that can be set to enable the control functions are listed below.
In order to set the I/O please enter with service password to the parameters **PRG→PSS→PRG→**(insert the service password)**→PRG→Par→PRG→CnF.**

Ports	Parameter	Terminals	Factory Setting	Description	
			Value	Function	Description
ST8	H19	AID2/AID2	0	Not set	Programmable analog input with NTC sensor 10kΩ at 25°C β 3435
ID2	H39	ONOFF/ONOFF	2	From remote on/off	Digital input, Voltage free contact. Active function by default.
ID3	H40	SW/SW	3	Remote summer/winter commutation	Free voltage digital input. To activate this function see paragraph 7.14.2
ID7	H44	AID2/AID2	0	Not set	Free voltage digital input, configurable in alternance of the analog input ST8 (H19=0)
(1)DO3	H58	AEH (phase) AEHN (neutral)	0	Not set	Single phase output 230Vac, 50Hz, 5A resistives, 1A inductives.
(2)OC1	H61	NO1 (phase) N1 (neutral) NC1 (phase)	7	Plant circulator	Switching contact, single phase voltage 230Vac, 50Hz, 5A resistive, 1A inductive. • NO1= Normally open • NC1= Normally-Closed

(1) Only for the model 125

(2) Not selectable if the GI2 is present

Standard on UMHPI V models and is present in the optional kit mod. Gi, in addition, the following I/O resources can be configured:

Ports	Parameter	Terminals of reference	Factory Setting		Description
			Value	Function	
ST3E	H24	AI1E/AI1E	0	Not set	Programmable analog input with NTC sensor 10kΩ at 25°C β 3435
ST7E	H28	AID1E/AID1E	0	Not set	Programmable analog input with NTC sensor 10kΩ at 25°C β 3435
ID4E	H49	AI1E/AI1E	0	Not set	Voltage free contact, configurable alternatively to the analog input ST3E (H24=0)
ID6E	H51	AID1E/AID1E	0	Not set	Free voltage digital input, configurable alternatively to the analog input ST7E (H28=0)

DO1E	H63	DO1E (phase) DO1EN (neutral)	22	Plant auxiliary heater See paragraph 8.1.1	Under voltage output single-phase 230Vac, 50Hz, 5A resistives, 1A inductives.
DO2E	H64	DO2E (phase) DO2EN (neutral)	26	DHW auxiliary heater See paragraph 8.1.3	Under voltage output single phase 230Vac, 50Hz, 5A resistives, 1A inductives.
DO3E	H65	DO3E (phase) DO3EN (neutral)	29	Boiler activation See paragraph 8.2	Under voltage output single phase 230Vac, 50Hz, 5A resistives, 1A inductives.
(3)DO4E	H66	DO4E (fase) DO4EN (neutro)	0	Not set	Under voltage output single phase 230Vac, 50Hz, 5A resistives, 1A inductives.
(3)DO5E	H67	DO5E (fase) DO5EN (neutro)	0	Not set	Under voltage output single phase 230Vac, 50Hz, 5A resistives, 1A inductives.
OC1	H68	NO1E (phase) N1E (neutral) NC1E (phase)	25	Double setpoint command valve See paragraph 8.4	Switching contact, single phase voltage 230Vac, 50Hz, 5A resistive, 1A inductive. - NO1= Normally open - NC1= Normally-Closed
(3)OC2	H69	NO2E (phase) N2E (neutral) NC2E (phase)	0	Not set	Switching contact, single phase voltage 230Vac, 50Hz, 5A resistive, 1A inductive. - NO2= Normally open - NC2= Normally-Closed

(3) Not selectable in the models of UMHPI V.

7 OPERATION LOGIC

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

7.1 DYNAMIC SETPOINT ADJUSTMENT

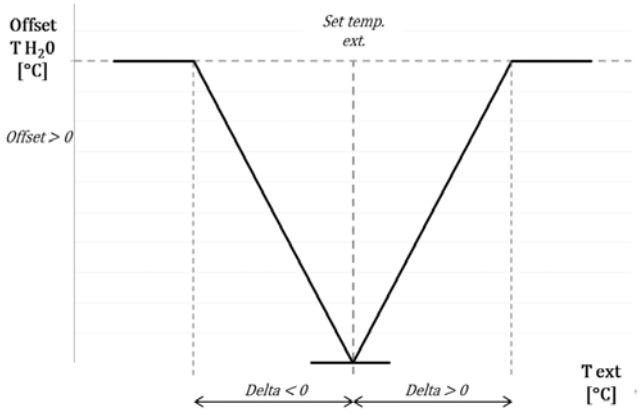
The controller can change the setpoint by adding a value depending on the outdoor air temperature sensor. In this case, you need to change the values of the parameters from **b08** to **b14** following the indications below (settings to be done by the installer):
Parameters of the controller **PAr->rE->**

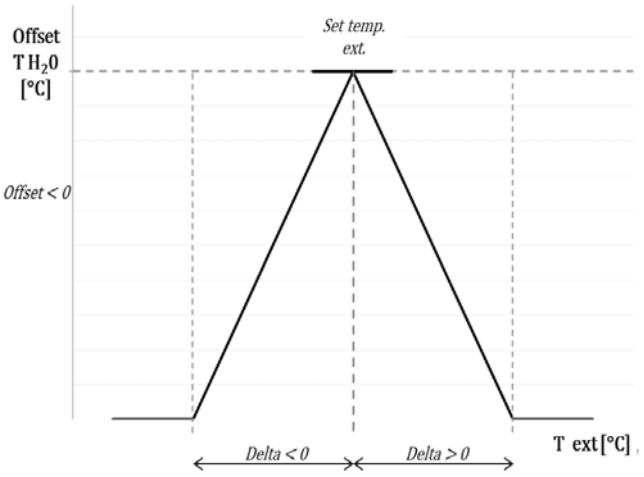
- **b08** = dynamic setpoint, enabled = 1/ disabled = 0 (this parameter must be disabled in the case of the use of climatic compensation by the optional remote touch screen panel Evo Touch).
- **b09** = offset max in cooling mode operation.
- **b10** = offset max in heating mode operation.
- **b11** = 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 11.4 for to change the parameters.

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

Cooling

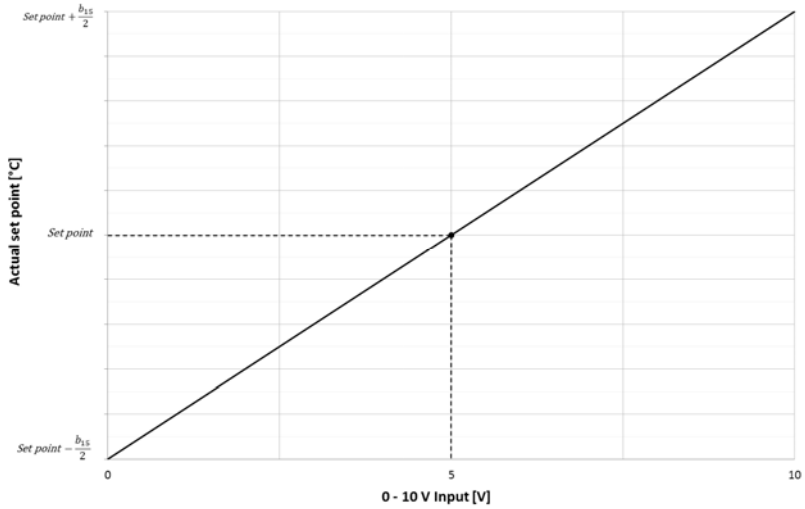




7.2 SETPOINT ADJUSTMENT FROM 0-10V INPUT

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 "cooling" 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 11.4 for changing the parameters.

7.3 CIRCOLATOR

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

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

The circulator SHUTDOWN immediately if:

- There is a lock pump alarm including the manual reset flow switch alarm. See paragraph 12.1.
- 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

1 = Operation under the thermoregulatory call

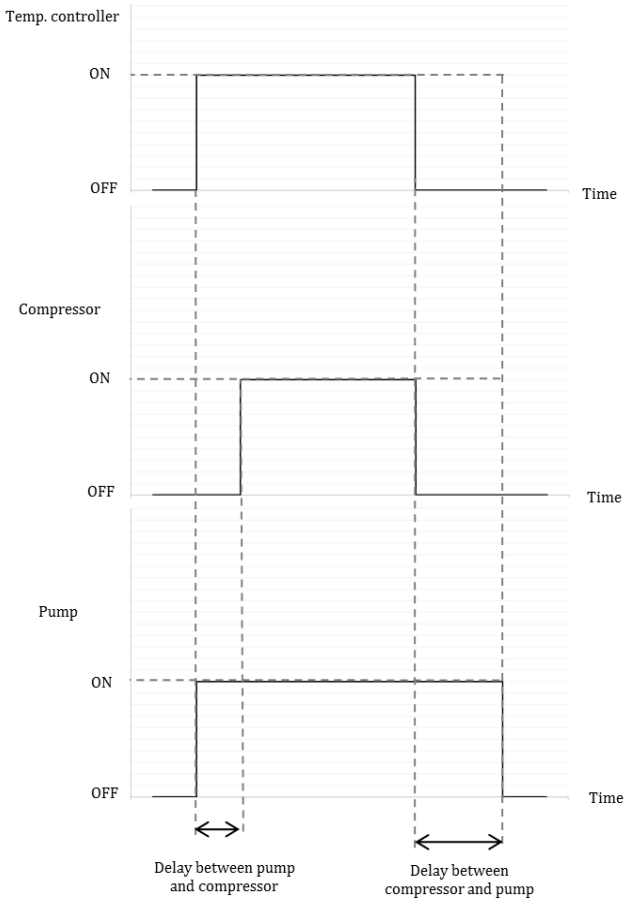
Note: Whenever the flow switch alarm is automatically reset the pump is ON even if the compressor is off.

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 7.3.5). Please see paragraph 11.6 for changing the parameters.

7.3.1 OPERATION BY MEAN OF THE THERMOREGULATOR (Default)

During this operating mode (**P03=1**, default), 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 "DI2" 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).



7.3.2 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 11.6 for changing the parameters.

7.3.3 OPERATION WITH ACTIVE ELECTRIC HEATER

The presence of the optional module “GI” is required for this function.
See paragraph 8.1.6

7.3.4 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).

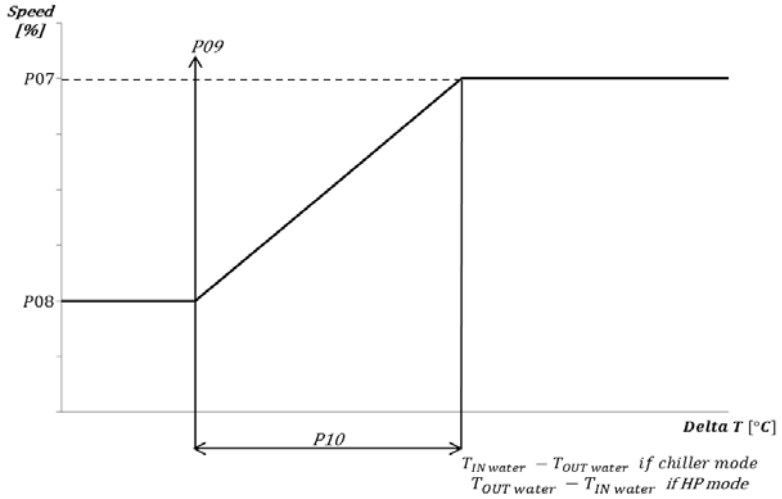
7.3.5 LINEAR ADJUSTMENT OF THE CIRCULATING PUMP–DOUBLE WATER ΔT

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(°C)

- **P10**: Delta modulating pump (°C)
  - In cooling mode: ΔT= [Water inlet temperature] – [Water outlet temperature]
  - In heating mode: ΔT = [Water outlet temperature] – [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°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 11.6 for changing the parameters.
Warning: During the DHW production mode, the pump is constrained to operate at its maximum speed.



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

7.4 MULTICOMPRESSORS

In case that multiple compressors operate, the adjustment will be done by turning on the first compressor according to the deviation of the water temperature from the set.
The selection of which compressor that must startup first occurs according to the technique based on the equalization of the cumulative hours of operation.
The control logic is to have the compressors operating at a frequency near the thermoregulation capacity threshold for to activate the second step **b17** and the nominal ***HzMaxReg*** calculated in the different conditions of the water and air temperatures as a function of the mode of operation.
The activation of the second step will occur only if the frequency of the operating compressor is included between these two values. It makes sure that only one compressor follows the variations of the thermoregulatory, the other is maintained at the ***HzMaxReg***.

7.4.1 LOGIC OF ACTIVATION

If the controller regulates all the modulating compressors in operation for to provide a capacity greater than the nominal value for a continuous time duration equal to **b16** seconds, the activation of a further available compressor is required. In case of unavailability of activation of any compressor, it could also be due to the logic related to the capacity limitations or to the compressors protection (see envelope paragraph).
For each activation of a new capacity step, the compressors already in operation pass to the minimum operating speed for a duration of **b19** seconds. Please see paragraph 11.6 for changing the parameters.

7.4.2 LOGIC OF RELEASE

If the controller regulates one or more modulating compressors (in operation) for providing the minimum capacity for a period of time greater than **b18** seconds, the compressor will stop operation.
When the release has occurred, you should wait again for a timer period equal to **b18** seconds before releasing the capacity step. Please see paragraph 11.6 for changing the parameters.
WARNING: In the case in which the regulation temperature is found to be lower than **Set - b05**, the release of the running compressors occurs sequentially with a minimum time delay between two commutations given by parameter **C04**, and not following logic described above.

7.4.3 CAPACITY CONTROL

The regulation of the delivered capacity is always made by only one of the running compressors; the best is to control the compressor that is not running at minimum or nominal capacity. If there is no compressor running at minimum or nominal capacity:

- The requests of capacity increasing will be done by selecting among the whole running compressors at the minimum capacity. The selection will consider the one with lower hours number of operation.

– The requests of capacity decreasing will be done by selecting among the whole running compressors at the nominal capacity. The selection will consider the one with higher hours number of operation.

7.4.4 EMERGENCY CONDITIONS

If an alarm is warned by one of the inverters, the compressor corresponding to the faulty inverter cannot startup and the error code will be displayed, note that, the alarm of any inverter will stop the operation of the whole compressors.
When the serviceman operates on the appliance and decides to make it operating by extruding the compressor related to the faulty inverter, in order to do that, he must change the value of the parameter **N06** from 0 to 1.
Please see paragraph 11.9 for changing the parameters.
This new setting will affect immediately the operation and will be memorized; the serviceman should restore the previous value once the fault inverter has been repaired or replaced.

7.4.5 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.

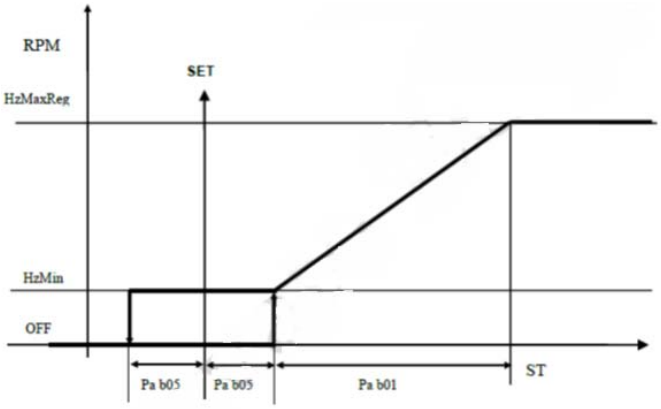
7.4.6 DEFROST FUNCTION CONTROL

In defrosting cycle, when the time period (**C11**) has finished at the minimum frequency Pa **C18** (according to what is required with the envelope), the regime of the compressor is set by the value of the parameter **C19**. The compressor speed cannot be adjusted. Anyway the eventual restrictions obtained from the envelope are still valid. Please see paragraph 11.9 for changing the parameters.

7.4.7 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
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



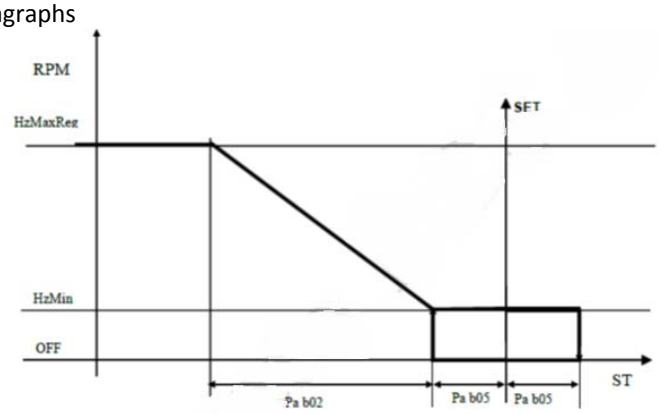
The following curve shows the adjustment without integral component (**b07** = 0)
During the start-up, the compressor initiates at the minimum speed ***C12*** or ***C14*** (as defined from the envelope) for a given time period equal to ***C11*** and then changes its speed to ***C13*** for a period equal to **C51-C11**.

7.4.8 HEATING FUNCTION CONTROL

<u>The compressors are active in heating mode if the heat pump is enabled</u>

- ***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
- ***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



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**.

7.4.9 TRANSITORY OF STARTING

When the compressors are all off, in conjunction with the pre-opening of the expansion valve, the reversing valve is commutated in the opposite direction to that required by the actual mode for 5 seconds in order to allow the equilibrium of the optimal pressures for starting the first capacity step.

7.5 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 11.5 for changing the parameters.

7.5.1 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

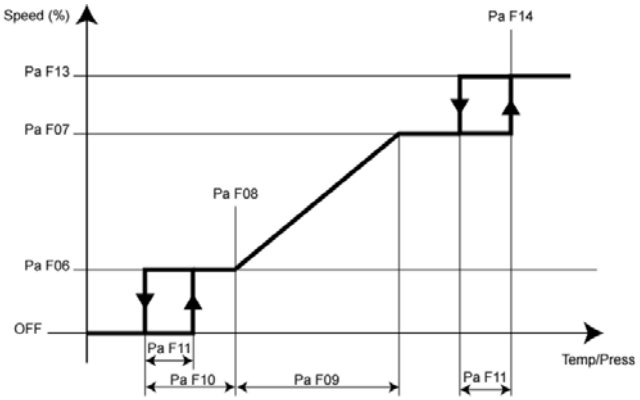
0: if all the compressors of the circuit are switched off and the fan is switched off. The fan stop is bypassed for a period equal to **F12** beginning from a compressor startup of the circuit. During this period, if the controller requires the cut-off, the fan will run at minimum speed.

1: The fan control is independent from the compressor (the fan motor operates only according to the condensing pressure). Please see paragraph 11.5 for changing the parameters.

7.5.2 FAN SPEED CONTROL IN COOLING MODE

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

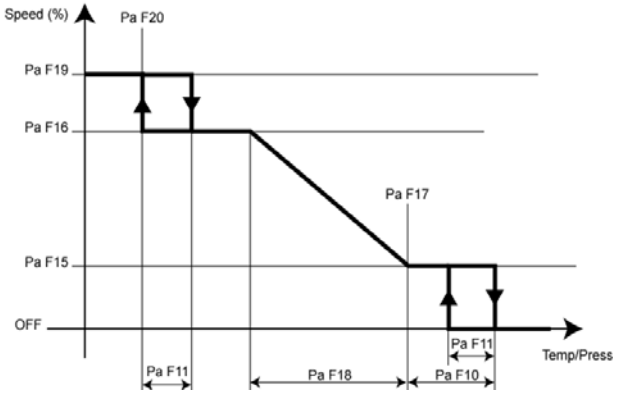
F06 = Minimum fan speed in cooling mode;
F07 = Maximum silent fan speed in cooling mode
F08 = Set temperature/pressure to the minimum fan speed in cooling mode
F09 = Fan motor linear band in cooling mode
F10 = Delta cut-off of the fan
F11 = Cut-off hysteresis and silent/maximum fan speed
F13 = Maximum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



7.5.3 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 11.5 for changing the parameters.

7.6 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 **C3** for the period of time **C51-C11**.

7.7 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, in addition to greatly decreasing the thermal efficiency of the unit, it can lead to the risk of damaging the unit itself. The adjustable parameter **d01** enables the defrost operation (=1 enabled defrosting). Please see paragraph 11.7 for changing the parameters.

7.7.1 DEFROST OPERATION SIGNALIZATION

You can configure a digital output for the defrosting process function notification.
In order to enable such function, you should enter into the parameters as following: press PRG→PSS→PRG→(then insert the service password) → PRG → PAr → PRG → **CnF**

See paragraph 11.2.

Parameter	Unit	Value	Description	Terminals	Notes
***H61**	num	21	Undervoltage output for notification of the defrost process	NO1(Phase) N1(Neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Connect this output to the relay coil in order to get a free contact.

(*) Alternatively, it is possible to use another output **DO** or **OC**, see paragraph 6.5.

7.8 ALARM NOTIFICATION

You can configure a digital output for alarm notification function.
In order to enable such function, you should enter into the parameters as following: press PRG→PSS→PRG→(then insert the service password) → PRG → PAr → PRG → **CnF**

See paragraph 11.2.

Parameter	Unit	Value	Description	Terminals	Notes
***H61**	num	24	Undervoltage output for alarm notification	NO1(Phase) N1(Neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Should be connected to the relay coil in order to get a free contact.

(*) Alternatively, it is possible to use another output **DO** or **OC**, see paragraph 6.5.

7.9 SUMMER/WINTER OPERATION NOTIFICATION FUNCTION

It is possible to configure a digital output for the notification of the operating mode of the unit, plant side.
The digital output is active during summer operation, while is not active during heating operation or when the unit is OFF.
During the DHW production and the defrosting, the output maintains the setting of the former season.
For enabling this function, you should enter into the parameters as following: press **PRG→PSS→PRG→**(then insert the service password)**→PRG→PAr→PRG→CnF:**

See paragraph 11.2.

Parameter	Unit	Value	Description	Terminals	Notes
***H61**	num	31	Undervoltage output for plant season notification.	NO1(phase) N1(neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Should be connected to the relay coil in order to get a free contact.

(*) Alternatively, it is possible to use another output **DO** or **OC**, see paragraph 6.5.

7.10 COMPRESSOR CRANCKASE 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.

7.11 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).

7.12 ACTIVATION OF DOMESTIC HOT WATER PRODUCTION

To activate the DHW water production mode, be sure to install a temperature sensor inside the tank and to connect it to the **AID2 – AID2** terminals (enabled as analog input). Once the temperature sensor is installed and connected, it is necessary to set the domestic heat water function.
To enable this function you should get access to the parameters PRG→PSS→ PRG →(insert the service password)→ PRG→PAr→ PRG→**CnF**
See paragraph 11.2.

I/O Ports - Parameter	Value	Function
H10	0 (default)	Disenabled function
	1	Function is active in **heating and cooling mode**. The remote on-off function **doesn't disenable** the DHW production.
	2	Function is active in **heating and cooling mode**. The remote on-off function **disenables** the DHW production.
*H19	6	Enablement of the DHW temperature sensor.
***H61** (active by default **OC1**)	6	DHW valve command

(*) Alternatively, it is possible to use another I/O ports, see paragraph 6.5.

If the DHW temperature is below the set point value (adjustable by entering the **PRG->Set->SAN** menu), the unit activates the sanitary valve and the compressor is set at the maximum frequency starting the modulation at one degree before the set value and it stops at one degree after the set value. Once reached 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 (sanitary) water, the operating sensor changes from "outlet water sensor" to "sanitary tank sensor". While shifting from the winter operating mode to the sanitary operating mode, the compressor does not switch off, and reaches the maximum established frequency that to be controlled; on the other hand, while shifting from the summer operating mode to the sanitary operating mode, the compressor is switched off to wait for the safety timing.
The defrosting during winter operation mode is always performed on the user side, never on the sanitary water tank.

Note:

- If **H10 = 1**. The remote turning off the unit (remote onoff), or by the on board unit controller, or by a remote control board does not affect the sanitary operating mode. The unit starts in sanitary mode as setting priority when it's powered 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 returns to show the temperature of the outlet water sensor.

If the remote ON-OFF digital input (onoff-onoff terminals) is open, with the enabling of the domestic hot water production (**H10=1** and **H20=6**), the display on-board unit shows the item "**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, the remote on-off function disenables the production of domestic hot water and the operations of the heat pump in heating and cooling on plant side.

Example *of a*ctivation of this function*:*

H10 =	*1*		
H19 =	*6*	→	*DHW temperature sensor [terminals: SAN – SAN]*
H61 =	*6(default)*	→	*In case of using a 3-way changeover valve with 3 contacts for power supply [terminals: NO1 – N - NC1]*
		→	*In case of using a 3-way changeover valve with 2 contacts for power supply (with spring return), [terminals: NO1 – N]*

- **Closed contact NO1** means that the valve is energized and diverts the water flow to the DHW tank.
- **Open contact NO1** means that the valve is de-energized and diverts the water flow to users.

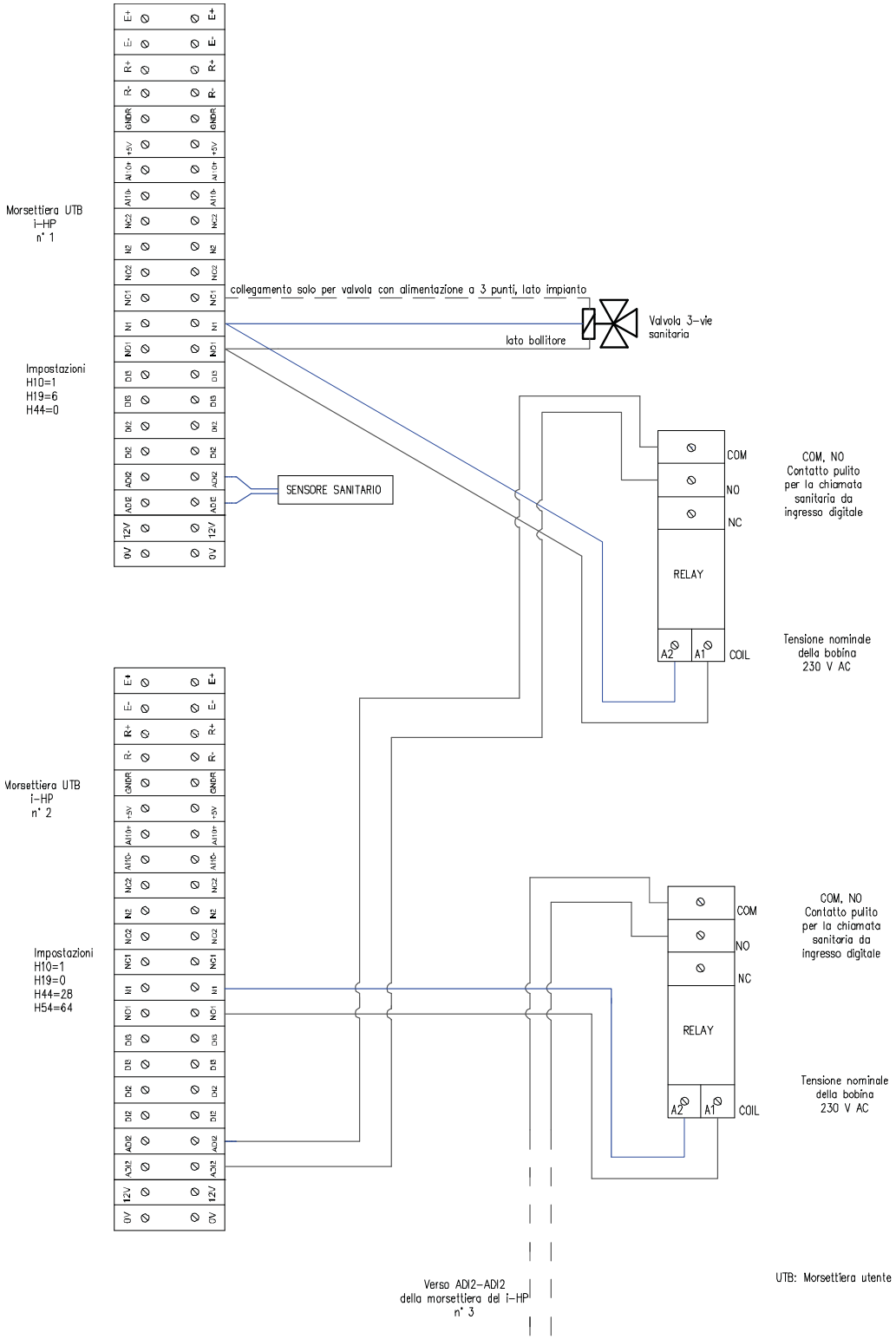
For the models UMHPI 60, this function can be activated only with the presence of the optional "GI" module.

7.12.1 MEMORY OF THE SENSOR IN HEATING MODE

In the case of commutation from water users to the domestic hot water, the temperature sensor changes 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 memorized before changing to DHW mode.
When the DHW thermoregulation is reached, the reference temperature on the plant side will take the value which is previously memorized.
The memory function will be interrupted:

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

For each **UMHPI** unit (except the last unit of the cascade), you must implement a relay (not included), controlled by the output 230VAC **NO1** and **N** located on the terminal block, that can enable through its free contacts **COM** and **NO** the **ADI2-ADI2** digital input of the successive unit in the cascade. For such configuration you may refer to the wiring diagram below.



NOTE: turning off the unit remotely (onoff-onoff terminals), or by the on board keyboard, or by a remote keyboard does not affect the DHW operating mode. Once the **H10** parameter is set to be **1**, the unit switches to DHW priority as soon as powered. The on board display shows the temperature measured by the sensor placed inside the DHW water tank. Once the DHW cycle is completed, the display returns to show the outlet water sensor temperature.

If the remote ON-OFF digital input (DI2-DI2 terminals) is opened, with the enabled domestic hot water production (**H10=1** and **H19=6**), the display on the unit shows the word "**SAN**". Once the DHW cycle is concluded, the display returns to show the code "**E00**" indicating that the remote ON-OFF contact is in open state.
The defrosting function during winter operation mode is always performed on the user side, never on the DHW tank.

7.13 HEATING MODE ON DOMESTIC HOT WATER TANK

If the parameter **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 will be also energized during heating operation and not only in DHW mode. During defrost period and in cooling mode the valve will be de-energized. When **H83=1**, the DHW auxiliary electric heater can be enabled also to act as a plant auxiliary electric heater: to this purpose you should set **r10=1** and **r15=2** (for further settings of the parameter **r15** please see paragraph 8.1.3); also no digital output has to be set for the auxiliary electric heater for the plant.

For the models UMHPI 60, this function can be activated only with the presence of the optional "GI" module.

7.14 REMOTE FUNCTIONS

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

7.14.1 ON/OFF

The 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**" item). 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 11.2.

Parameter	Unit	Value	Description	Terminals	Notes
H39	Num	2 (default)	Remote On/Off digital input	ON - OFF	Voltage free contact input

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

- If **H10 = 1**. 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, 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.

7.14.2 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 11.2.

Parameter	Unit	Value	Description	Terminals	Notes
H40	Num	3 (default)	Digital input for mode selection. At Open/Closed Contact condition the heat pump in set "heat"/"cool" mode.	DI3-DI3	Free voltage contact input
H76	Num	1	Selection of operating mode		

7.14.3 SANITARY MODE CALL FROM DIGITAL INPUT

If the domestic hot water mode operation is enabled and the parameter used as alternative of the temperature sensor, the activation of the domestic hot water operation can be performed through the opening/closing of a digital input of the unit. This function is recommended in the case of utilization of two or more UMHPI units installed in cascade configuration and linked through a hydronic connection to the same accumulation tank of domestic hot water; in this way the activation of the domestic hot water function will be selected through the sensor of the accumulation tank connected to the first unit, while the other units will be automatically enabled by a digital consent.
The system enters in domestic hot water mode when the digital input closes and the system quits it when the digital input opens.
In order to enable this function, you should enter into the page of parameters **PRG→PSS→PRG →** (insert the service password) **→ PRG → PAr → PRG → CnF.**

I/O Ports - Parameter	Value	Function
H54	128	Digital inputs polarities
*H44	28	Closed contact → Heat pump in DHW mode. Open contact → Heat pump in heating or cooling mode of the environment (plant system mode).

(*) Alternatively, it is possible to use another digital input, see paragraph 6.5.

- In the case where a digital input is configured for sanitary function call (as sensor's alternative), the heat pump is will be placed in sanitary mode when the digital input is closed and quits the DHW production when the digital input is open.
  The **SAN** setpoint is not considered because, its *management should be done by the designer, who must take into account the domestic hot water protection, (see paragraph 10.4) and the configuration of the whole system.*
  Note:
- You can reverse the polarity of the digital input, putting the maintainer (service) parameter to be **H54 = 0**.

Example of activation of the function:

H10 = 1

H44 = 28 → *Digital input [terminals: AID2 – AID2]*
Closed contact → Heat pump in sanitary mode.
Open contact → Heat pump in plant mode.

H54 = 128

H61 = 6(default) → *In case of using a 3-way changeover valve with 3 contacts for power supply [terminals: NO1 – N - NC1]*
→ *In case of using a 3-way changeover valve with 2 contacts for power supply (with spring return), [terminals: NO1 – N]*

For the models UMHPI 260, this function can be activated only with the presence of the optional "GI" module.

7.15 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.**

I/O ports – Parameter	Value	Description
*H19	41	Enablement of the plant remote sensor

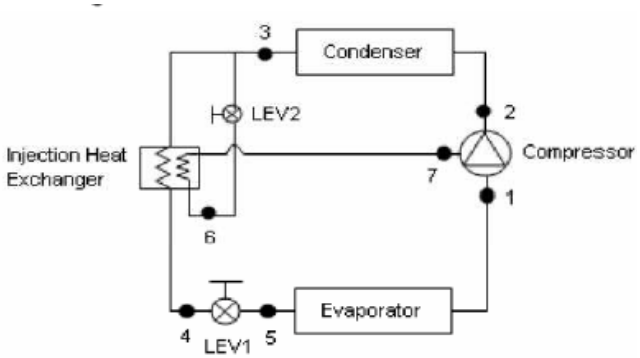
(*) Alternatively, it is possible to use another digital input, see paragraph 6.5.

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)**

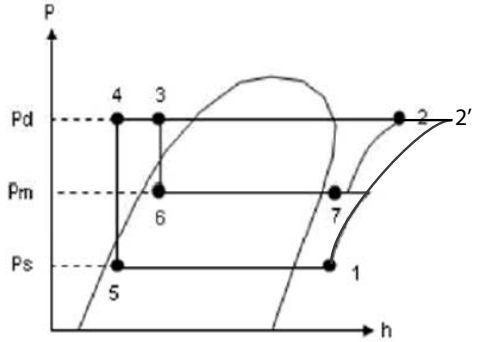
NOTE: b05=1°C; b22=5°C.

7.16 VAPOR INJECTION (only for V version)



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 11.8 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.

7.16.1 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
SSH system is currently implemented and that 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

7.16.2 Injection electronic valve VEIV

1) Sensors for superheat calculation for the vapor injection
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 (**v09**) Chiller operation*

*(Eq.2) T air > T air set (**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.

7.16.3 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 > ***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** (superheating of vapor injection) = **T1** (detected) - **T2** (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).

8 ACTIVABLE LOGIC FUNCTIONS WITH GI- MODULE FOR PLANT MANAGEMENT (optional)

Wherever the GI optional plant management kit is present, there is a second controller located inside the electrical board that acts as expansion module of the I/O resources. With this second controller (SL1), it is therefore possible to increase the number of logic functions managed by the main controller; in particular, these logic functions are used for management the plant, as we described below. The following functions can be activated by the controller of the Master unit which is located on its front panel.

8.1 AUXILIARY ELECTRIC HEATERS

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 11.11.

8.1.1 AUXILIARY ELECTRIC HEATER THE PLANT SYSTEM

In some configurations of plants, 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 8.2. 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 8.3.6).
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 the parameters **CnF** and **rE** by getting access with the service password:

Parameter	Unit	Value	Description	Terminals	Notes
***H63**	Num	22 (default)	Undervoltage output plant system auxiliary E-heater	DO1E(Live) DO1EN (Neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Should be connected to the relay coil in order to get a free contact.
r10	Num	1	Enablement of the function	-	-
r11	°C	0.5 (default)	(Delta of the auxiliary electric heaters in heating operation)	-	-
r12	Min	10 (default)	Activation delay of auxiliary electric heater	-	-
r24	Num	1 o 3	Type of use of the electric heater	-	-

(*) Alternatively, it is possible to use another output DO or OC, see paragraph 6.5.

8.1.2 AUXILIARY ELECTRIC HEATER OF THE PLANT IN DEFROST CYCLE

During the **defrosting cycle** (see Paragraph 7.6), 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**.

8.1.3 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** using the service password.

Parameter	Unit	Value	Description	Terminals	Notes
***H64**	Num	26 (default)	Undervoltage output DHW auxiliary electric heater	DO2E (L: Live) DO2EN (N: Neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Should be connected to the relay coil in order to get a free contact.
r15	Num	1	Function enablement	-	-
r16	Min	10 (default)	Activation delay of auxiliary DHW electric heater	-	-
r24	Num	2 o 3	Type of utilization of the heater	-	-

(*) Alternatively, it is possible to use another output DO or OC, see paragraph 6.5.

The heater is activated when the parameter **r15** is set to **1** (with **r15=0** the electric heater is disabled).
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 8.2. To change the parameters you can check the paragraph 11.11.

8.1.4 SINGLE AUXILIARY HEATER FOR PLANT/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.

8.1.5 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:

r14=0 (default), the heaters are activated simultaneously if they are present;
r14=1, the heaters are activated excluding each other:
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);
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 accomplished).

8.1.6 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 11.11.

8.2 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 11.11. 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.

Parameter	Unit	Value	Description	Funciton	Terminals	Notes
***H65**	Num	29 (default)	Undervoltage output for boiler enablement	Boiler enablement	DO3E(phase) DO3EN(neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Connect this output to the relay coil in order to get a free contact.
r23	Num	1/2/3/4/5/6	Type of boiler utilization	-	-	-
r32	Num	1/2/3	Boiler endowment	-	-	-

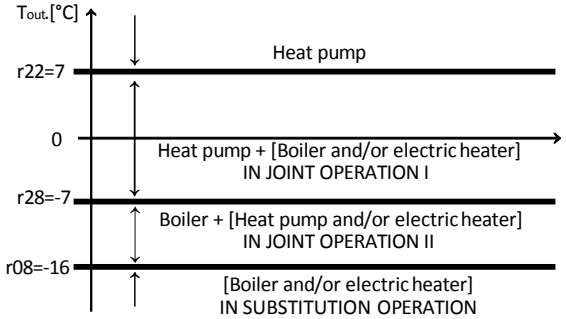
(*) Alternatively, it is possible to use another output DO or OC, see paragraph 6.5.
The intervention modes of the boiler are settable as described in Paragraph 8.2.

8.3 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 UMHPI V 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**.

8.3.1 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.

8.3.2 IN JOINT OPERATION (AREA 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.
Note:
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.

8.3.3 IN JOINT OPERATION (AREA 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 temp. sensor of the heat pump if the water plant circuit remote sensor is not active.

8.3.4 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)

8.3.5 OPERATION AREA - 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 "AREA 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 OPERAZIONI "AREA 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**	HEAT+SAN	SAN	0/1	1	/	Set up of minutes	0/1/4	2/3

	3) After r15 minutes later, **DHW auxiliary electric heater**								
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 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**	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 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	Only if the following 3 conditions are fulfilled: - Output for auxiliary electric heater of plant side is configured; **-r24=1/3;** - **the remote sensor of water plant temperature is installed and configured** (see paragraph **0**); the auxiliary electric heater of the plant is available in the following cases: - 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. 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. If the "on-off remote contact" turns to the open state, the auxiliary electric heater of the plant will turned off.	It works as indicated in the TABLE 1,2,3 and 4.
3	COOL+SAN	SAN	Not available.	It works as indicated in the TABLE 5.
4	COOL+SAN	COOL	Not available.	Not available.

8.3.6 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.

8.4 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.

8.4.1 SETTINGS

H82 is the parameter used for to set the double set-point function (from service menu).

H82	OPERATION
1	Classic mode
2	Double set-point active in the 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 getting access with the service password:

Parameter	Unit	Default	Value	Description	Terminals	Notes
***H51**	Num	26	0	Digital input for the second setpoint	ADI1E ADI1E	-
***H68**	Num	25	-	Undervoltage output for 3-way valve for radiant panels	NC1E (fase NC) N1E (neutro) NO1E (fase NA)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Connect this output to the relay coil in order to get a free contact.

(*) Alternatively, it is possible to use another I/O ports, see paragraph 6.5.
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 system and ventilating system. Please use a relay when it's necessary for the power supply line of the hydronic valve.

8.4.2 ADJUASTABLE 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 summer time and is lower in winter time:

- in the summer: T2 >= T
- in the winter: T2 <= T

8.4.3 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)

8.5 MANAGEMENT OF THE SECONDARY CIRCULATOR (Relaunching pump)

It allows the management of a secondary or relaunching circulator for serving the plant system.
A normally closed (NC) room thermostat must be properly configured, connected to DI3-DI3 terminals.

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

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

Parameter	Unit	Value	Description	Terminals	Notes
***H40**	Num	19	Digital input for thermostat call	DI3-DI3	-
***H69**	Num	43	Undervoltage output for the secondary circulator	NO2E(Live) N2E(Neutral)	Undervoltage output 230V ac, 50Hz, 5A resistive, 1A inductive. Connect this output to the relay coil in order to get a free contact.

(*) Alternatively, it is possible to use another I/O ports, see paragraph 6.5.

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 call.

9 ACTIVABLE FUNCTIONS WITH KIE MODULE (optional)

The KIE module is an optional kit, it allows managing the below functions with the installed additional controller (SL2):

1. Management of the re-launching pump (secondary) plant side
2. Management of the DHW rapid preparer and DHW re-circulation
3. Management of the plant side mixing valve in heating and cooling modes;
4. Management of solar-thermal auxiliary.

Please refer to the "manual of the KIE module" for further details.

10 AVAILABLE FUNCTIONS WITH EVO TOUCH CONTROLLER (OPTIONAL)

The Evo Touch 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;
- Zone thermostat
- Screed function;
- Legionella disinfection;
- Double set-point and dehumidification;
- Dew point control
- Climatic compensation
- Relaunching circulator Management
- Management of a unique network pump
- Faults diagnostic system

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

11 TABLE OF ALLOWED PARAMETERS FOR THE USER AND INSTALLER

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

DESCRIPTION	GROUP IDENTIFICATIVE CODE	PARAMETER 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
**Mixing valve	rAd	i-	INSTALLER
*Vapor injection	Eiv	u-	INSTALLER
Inverter compressors	nCP	n-	INSTALLER
**Solar	SUn	S-	INSTALLER
**DHW preparer	AcS	Ac-	USER/INSTALLER

(*) Parameters present in the UMHPI V series
(**) Parameters present with the optional KIE module.

11.1 SETPOINT 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		
rCO	Mixing valve Setpoint in summer mode	°C	15.0	-50.0÷80.0	USER		Settable if the optional KIE module is present
rHE	Mixing valvle Setpoint in winter mode	°C	30.0	-50.0÷80.0	USER		Settable if the optional KIE module is present
ACS	Setpoint for the instantaneous domestic hot water production	°C	0.0	0.0÷80.0	USER		Settable if the optional KIE module is present

11.2 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		

H10	Enabling of DHW production	/	0	0÷6	INSTALLER		
H19	ST8 input configuration	/	0	0÷49	INSTALLER	0 = input not assigned 6 = DHW temperature	**ADI2-ADI2** terminals Serviceable input in exclusion of D.I.7
H39	Configuration of digital input 2 DI2	/	2	0÷30	INSTALLER	0 = digital input not assigned 2 = Remote On / Off	DI2/ DI2 terminals
H40	Configurazione DI3	/	3	0÷30	INSTALLATORE	0 = ingresso non assegnato 3 = cambio modo estate / inverno	DI3- DI3 terminals For activation put H76=1
H44	DI7 configuration	/	0	0÷30	INSTALLER	0 = input not assigned 28 = actuation of DHW thermoregulation from digital input	ADI2-ADI2 terminals Serviceable input in exclusion of ST8. H54 must be set also.
H54	Polarità ingressi digitali	/	0	0÷255	INSTALLATORE	0 = polarità ingressi digitali=NO 64 = polarità DI7=NC (per chiamata termoregolatore sanitario da digitale da ADI2-ADI2).	
(2)H58	Configuration of open collector 1	/	24	0÷44	INSTALLER	0 = input not assigned 6 = DHW 3 way valve 21 = Defrosting notification 24 = Alarm notification 31 = Plant season notification	DO3N-DO3 terminals
H61	Configuration of open collector 1	/	6	0÷44	INSTALLER	0 = input not assigned 6 = DHW 3-way valve 21 = Defrosting notification 24 = Alarm notification 31 = Plant season notification	NC1, N1, NO1 terminals
H54	Digital input polarity	/	0	0÷255	INSTALLER	0 = digital inputs polarity=NO 64 = polarity DI7=NC (for actuation of DHW thermo-regulator from the digital input ADI2- ADI2 terminals)	
H61	Open collector 1 configuration	/	6	0÷44	INSTALLER	0 = input not assigned 6 = DHW 3-way valve	Output under 230Vac, 50Hz, 5A resistive, 1A inductive. Terminals of exchange contact NC1, N1, NO1. It is recommended to implement an external relay
H76	Remote operating mode selection (summer/winter)	/	0	0÷1	INSTALLER	0 = deactivated function 1 = enabled function	
H79	Serial address	/	1	1÷200	INSTALLER	In case of several units installed in cascade configuration, you have to assign different addresses for each controller.	
H82	Enabling of double setpoint	/	0	0÷4	INSTALLER	0 = Selection menu appears on CRH 1= Classic mode 2= Summer double setpoint 3= Winter double setpoint 4 = Summer and winter double setpoint	
H83	Enabling of heating always to divert towards the DHW mode	/	0	0÷1	INSTALLER	0 = deactivated function 1 = In heating operation always diverts towards the DHW	

(1) Selectable only for the versions size 125

(2) Selectable only for the size 125

11.3 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		

11.4 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	Recommended values included between 1 and 1.5 Other different values can ensure the proper operation of the unit	
b06	DHW transitory output in heating	sec	45	0÷255	INSTALLER		
b07	Regulator-integral time PI	sec	150	0÷255	INSTALLER	A value of 60 sec is recommended for plants with limited water flow, while for plants with a high water flow rate a value of 180 sec is recommended. Other different values may ensure the proper operation of the unit.	
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		

11.5 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		

11.6 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	/	1	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 Delta T[°C] 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		

11.7 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.

11.8 VAPOR INJECTION PARAMETERS CONFIGURATION

Parameter	Description	Unit	Default	Range	Visibility	Allowed Configurations	Notes
V03	DSH set in cooling mode	°C	5.5	0.0÷25.5	INSTALLER		
V04	DSH set in heating mode	°C	1.8	0.0÷25.5	INSTALLER		
V05	Hysteresis for DSH adjustment release	°C	40	0.0÷25.5	INSTALLER		
V09	Outdoor air temperature set for winter vapor injection	°C	5	0÷50	INSTALLER		
V10	Outdoor air temperature set for summer vapor injection	°C	28	0÷50	INSTALLER		
V13	DSH threshold	°C	25	0÷50	INSTALLER		
V14	Minimum time for DSH threshold fulfillment	min	1	0÷255	INSTALLER		
V16	Minimum time for DSH threshold unfulfillment	min	2	0÷255	INSTALLER		
V22	Step number of VEIV valve	/	500	0÷2000	INSTALLER		

11.9 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		

11.10 CONFIGURATION PARAMETERS – Module "GI"

As for UMHPI V units and in case of installation of the optional kit module (GI2) on UMHPI 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.
(3)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 ù H51 = 0.
(3)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 Evo Touch 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 input	/	26	0÷44	INSTALLER	0 = input not assigned 21 = Defrosting signalization 24= Alarm signalization (notification) 25 = double set point valve 26 = DHW auxiliary electric heater 29 = Boiler 31 = Plant season signalization 42 = Unique pump in the network 43 = Relaunching (secondary) pump	DO1EN-DO1E terminals
H64	Configuration of DO2E	/	22	0÷44	INSTALLER		DO2EN-DO2E terminals
(3)H65	Configuration of DO3E	/	29	0÷44	INSTALLER		DO3EN-DO3E terminals
(3)H66	Configuration of DO4E	/	0	0÷44	INSTALLER		DO4EN-DO4E terminals
(3)H67	Configuration of DO5E	/	0	0÷44	INSTALLER		DO5EN-DO5E terminals
H68	Configuration of OC1E	/	25	0÷44	INSTALLER		NC1E-N1E-NO1E terminals.
H69	Configuration of OC2E	/	31	0÷44	INSTALLER		NC1E-N1E-NO1E terminals

(3) Is not selectable for UMHPI V units.
(4) Adjustable with Evo Touch accessory.

11.11 CONFIGURATION PARAMETERS OF THE HEATING DEVICES – 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		
(5)r08	Upper limit during in substitution operation	°C	according to the model	-16÷50	INSTALLER		Respect the condition **r22** ≥ **r28** ≥ **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 enabling of the electric heaters 1 = Exclusive enablement of the 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** ≥ **r28** ≥ **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 **Evo**

							Touch
r26	Disinfection period	min	12	0÷255	INSTALLER		Adjustable parameters by mean of remote control panel **Evo Touch**
r27	Heat pump set in disinfection operation	°C	55.0	-50.0÷80.0	INSTALLER		Adjustable parameters by mean of remote control panel **Evo Touch**
r28	Upper limit for joint operation area II	°C	according to the model	-16÷50	INSTALLER		Respect the condition **r22** ≥ **r28** ≥ **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		

(5) For the model UMHPI V r08=-20°C.

11.12 CONFIGURATION PARAMETERS OF UMHPI V

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		

12 ALARMS

12.1 FLOW SWITCH [E06]

The water side flow switch is already installed inside the unit and DOES NOT HAVE to be tampered with or by-passed in any way. The flow switch is by-passed for 10 seconds after the unit's start up. The alarm signal occurs after 5 seconds of the error appearance (lack of water flow, air inside the circuit, etc.). The alarm will automatically reset itself for the first two times and it will be deactivated after 5 seconds. If the alarm happens more than 3 times per hour, it cannot automatically reset itself and so you should manually reset the alarm.
The alarm is not active for 10 seconds from the pump start up;

12.2 ANTI-FREEZING [E05]

The alarm will be activated when the outlet water temperature sensor is less than 4°C. It turns off when the temperature becomes higher than +7°C.

12.3 WATER SIDE HIGH TEMPERATURE [E18]

The alarm will be activated when the outlet water temperature sensor becomes higher than 65°C for at least 50 seconds. It turns off when the water outlet temperature decreases below 62°C.

12.4 SENSORS ALARM [E61÷E69]

The alarm will be activated in the case of short or open circuit of any connected and enabled sensor.
The alarm will be activated also when the temperature becomes higher than the sensors' upper limit of 100°C or less than the lower limit which is -50°C.

A configured temperature sensor for DHW production mode does give any alarm if the DHW production mode is not enabled, see table 12.13.

Temperature sensor characterization: NTC-10kΩ a 25°C ß3435

12.5 TIMEOUT INVERTER [E801]

The time out alarm indicates that the control of the system is lost. The alarm will be activated when:

- The controller **CB** of the unit does not communicate with the compressor driver board.

12.6 REMOTE ON/OFF [E00]

The E00 code will be displayed when the unit is controlled from a remote digital input.

12.7 HIGH PRESSURE [E01]

If the on board pressure transductor detects a pressure higher than 39,5 bar, the alarm will be activated.
In this case the compressor will stop immediately via software. The alarm will reset when the pressure decreases under 33,5 bar.
If the number of alarm interventions in one-hour is equal to 3 times, it will become manual reset.

12.8 HIGH PRESSURE FLOW SWITCH (IN SERIES WITH THE COMPRESSOR OUTLET SENSOR) [E64]

If the pressure switch of the machine detects a pressure higher than 41,5bar the alarm will be active.
In this case, the compressors and fan motor will be immediately electromechanically stopped and **E64** error code will be displayed. The alarm resets when the pressure drops below 30bar. With the problem resolved, you must restart the machine with the disconnector (wait at least 1 minute between the power off and the following power on).

12.9 LOW PRESSURE [E02]

If the on board pressure transducer detects a pressure lower than value set from the controller (**A16=5** bar by default in cooling mode, 1.5 bar in heating mode) the alarm will be activated. In this case the compressor will stop immediately. The alarm will reset when the pressure goes over a hysteresis of 2.0bar.
If the alarm occurs more than 3 times per hour, the alarm becomes a manual reset.

12.10 [E08] DRIVER LIMITATION

If the compressor does not reach the speed to ramp value which is expected within 30 minutes, the alarm becomes active and the compressor will stop for safety.
If the alarm occurs more than 3 times per hour, the alarm becomes a manual reset.

12.11 [E101] MODBUS 1 CONNECTION ERROR

Standard on UMHPI V models and if present the optional kit mod. Gi,
ModBus communication connection between **CB** and **SL1 controller** is wrong. Check the wiring.

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 USER BLOCK ALLARMS TABLE

In the case of indoor/outdoor unit alarm, an error code will appear on the **display of CB outdoor unit controller**.

Error code	Error description	Compressor	Circulator	Fan motor	E-heaters
E00	Remote Off	OFF	OFF	OFF	OFF
E01	High pressure	OFF	OFF		
E02	Low pressure	OFF		OFF	
E05	Antifreeze alarm	OFF	ON	OFF	ON
E06	Flowswitch / AC fan motor	OFF	OFF	OFF	OFF
E08	Compressors shut off for lack of lubrication	OFF			
E18	High temperature	OFF			OFF
E101	modbus1 connection error [Indoor/outdoor unit]	OFF	OFF	OFF	
E611	Input water sensor error	OFF	OFF	OFF	OFF
E612	Plant circuit remote sensor (if enabled)	OFF	OFF	OFF	OFF
E621	Outlet water temperature	OFF	OFF	OFF	OFF
E631	Compressor return sensor	OFF	OFF	OFF	OFF
E641	Compressor exhaust sensor + High pressure switch	OFF	OFF	OFF	OFF
E651	High pressure transducer	OFF	OFF	OFF	OFF
E652	Injection high pressure transducer (for “LT” version)	OFF	OFF	OFF	OFF
E661	Low pressure transducer	OFF	OFF	OFF	OFF
E671	Outside air temp. sensor for climatic regulation	OFF	OFF	OFF	OFF
E672	Vapor injection temp. sensor (for “LT” version)	OFF	OFF	OFF	OFF
E681	DHW boiler temp. sensor (if enabled)	OFF	OFF	OFF	OFF
E801	Timeout inverter 1	OFF		OFF	
E802	Timeout inverter 2	OFF		OFF	
E851	Inverter 1 hardware malfunction	OFF		OFF	
E852	Inverter 2 hardware malfunction	OFF		OFF	
E861	Compressor 1 overcurrent protection	OFF		OFF	
E862	Compressor 2 overcurrent protection	OFF		OFF	
E871	Dissipater(heat sink) of Inverter 1 in high temperature	OFF		OFF	
E872	Dissipater(heat sink) of Inverter 2 in high temperature	OFF		OFF	
E881	Power voltage inverter 1 out of limit	OFF		OFF	
E882	Power voltage inverter 2 out of limit	OFF		OFF	
*E891	Compressor 1 disconnected from the power supply	OFF		OFF	
*E892	Compressor 2 disconnected from the power supply	OFF		OFF	
*E901	Compressor 1 model	OFF		OFF	
*E902	Compressor 2 model	OFF		OFF	
*E911	Inverter 1 overload protection	OFF		OFF	
*E912	Inverter 2 overload protection	OFF		OFF	
*E921	Inverter 1 overcurrent	OFF		OFF	
*E922	Inverter 2 overcurrent	OFF		OFF	
*E931	Inverter 1 communication error	OFF		OFF	
*E932	Inverter 2 communication error	OFF		OFF	
*E941	Inverter 1 PFC	OFF		OFF	
*E942	Inverter 2 PFC	OFF		OFF	
*E951	Inverter 1 temp. sensor error	OFF		OFF	
*E952	Inverter 2 temp. sensor error	OFF		OFF	
*E961	Inverter 1 failure	OFF		OFF	
*E962	Inverter 2 failure	OFF		OFF	
*E971	Inverter 1 EEPROM error	OFF		OFF	
*E971	Inverter 2 EEPROM error	OFF		OFF	

(*) Only for the models “UMHPI 60”

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