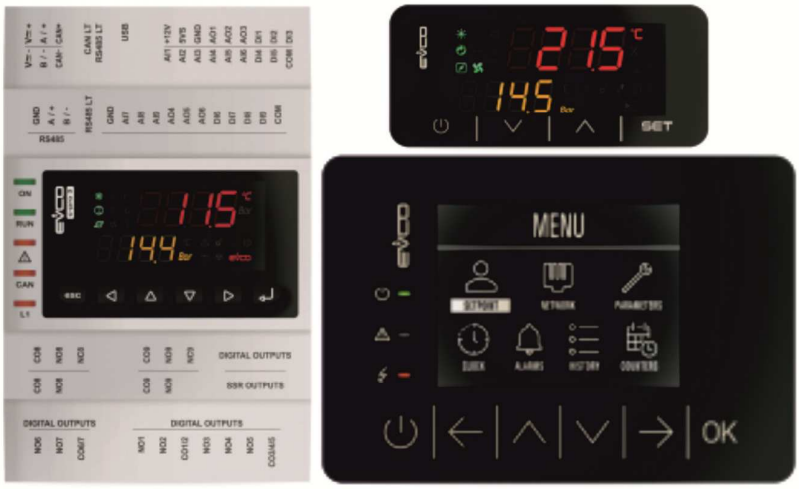
c-pro 3 kilo EEV *HPRU*

Programmable controllers for

heat pumps



Application manual ver. 4.0 December 2019 | ENGLISH

Codice 144CP3KHE404

Important

Read this document thoroughly before installation and before use of the device and follow all recommendations; keep this document with the device for future consultation.

The following symbols support reading of the document:

- indicates a suggestion
- ⚠ indicates a warning

The device must be disposed of in compliance with local Standards regarding the collection of electric and electronic equipment.

Index

1. GENERAL INFORMATION

1.1 Description

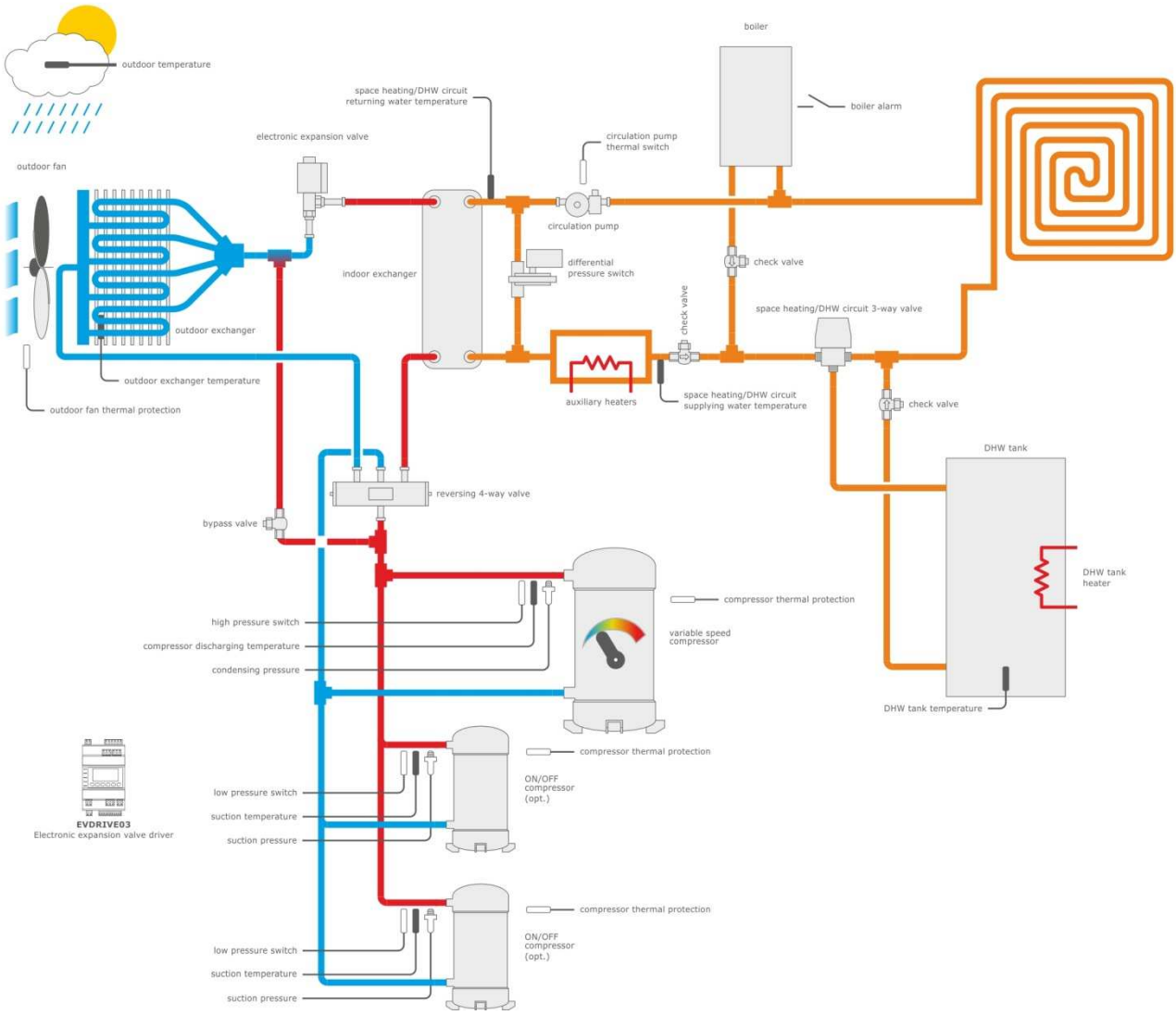
c-pro 3 HPRU is a line of programmable controllers for the management of reversible heat pumps and electronic expansion valve.

It is available in the built-Inversion with LED display or blind version with EPJgraph or Vled 3 remote user interface.

The controllers can manage the most common utilities of a residential heat pump and integrate the management of the electronic expansion valve to maximise plant efficiency.

Using the communication ports, controllers can be connected to the Parameters Manager set-up software system, to the monitoring and supervision system of the CloudEvolution plants (via Web) and to upload and download configuration parameters via a common USP peripheral.

1.2 Base drawing



2 HARDWARE SOLUTIONS

2.1 Hardware solution using c-pro 3 kilo EEV HPRU

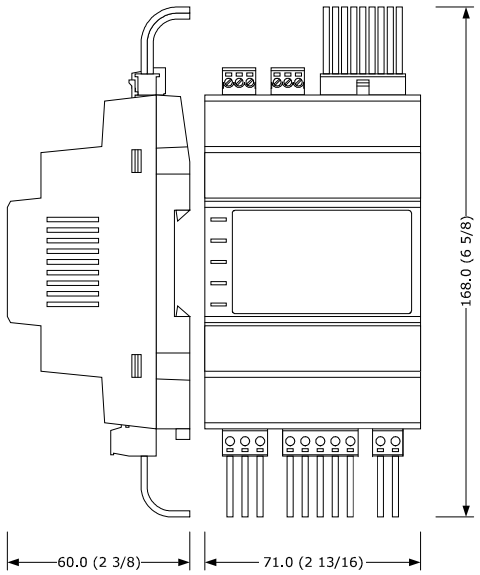
	c-pro 3 kilo EEV HPRU	Vled 3	EPJgraph
Function	controller with integrated EEV driver for superheat control	remote user interface	remote user interface
Connection to the controller	-	via CAN	via CAN

3 DIMENSIONS AND INSTALLATION

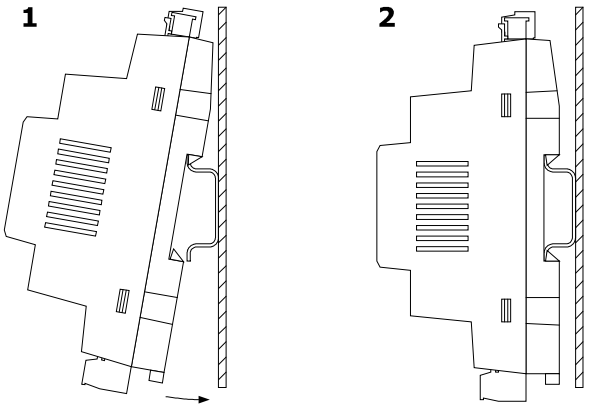
3.1 Dimensions and installation c-pro 3 kilo EEV HPRU

Measurements in mm (inches). To be fitted on a DIN rail, in a control panel.

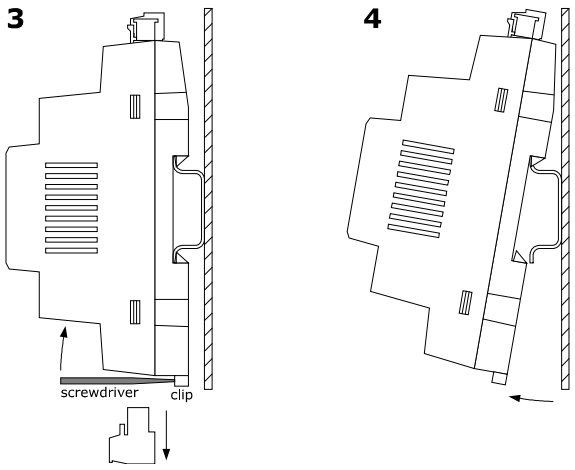
The DIN rail size must be 35.0 x 7.5 mm (1 3/8 x 5/16) or 35.0 x 15.0 mm (1 3/8 x 9/16).



To install the device operate as shown in pictures 1 and 2.



To remove the device, first remove any screw-in removable terminal blocks mounted in the lower part, then operate as shown in pictures 3 and 4.



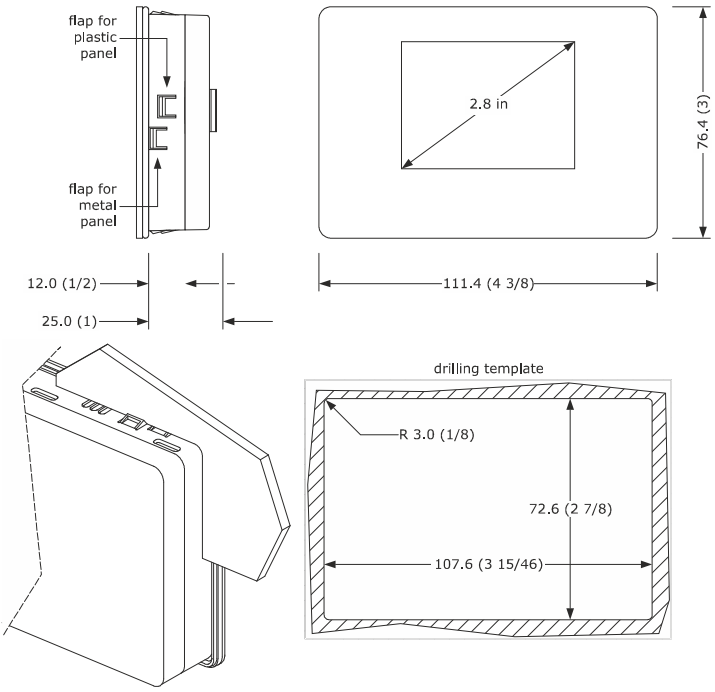
To install the device again press down the clip before.

3.2 Dimensions and installation EPJgraph

3.2.1 Models for panel mounting

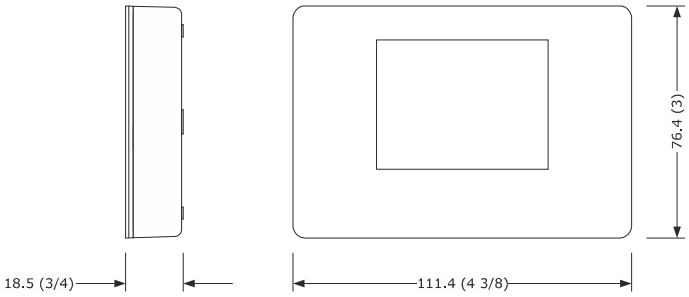
Measurements in mm (inches). To be fitted to a panel, with elastic holding flaps.

The thickness of a metal panel must be between 0.8 and 1.5 mm (1/32 and 1/16 in), while that for a plastic panel must be between 0.8 and 3.4 mm (1/32 and 1/8 in)



3.2.2 Models for wall mounting

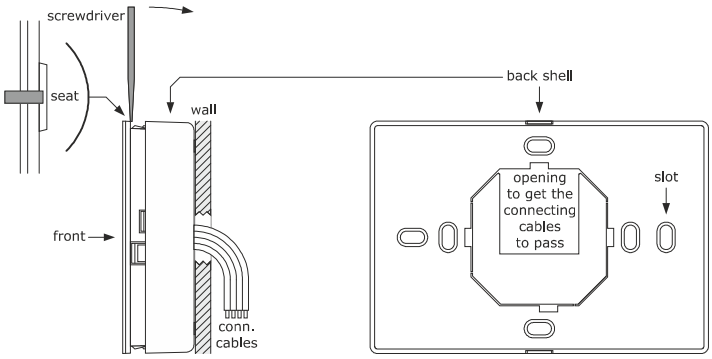
Measurements in mm (inches). Wall mounting (with bolts and fastening screws) or in the most common flush mounting boxes (with fastening screws).



1. Unhook the back shell from the front through a screwdriver and the proper seat.
   - 2.1 In case of wall mounting:
   - 2.1.1 Lean the back shell against the wall in a position suitable to get the connecting cable to pass through the proper opening.
   - 2.1.2 Use the slots of the back shell as template to drill 4 holes having a diameter suitable to the bolt. 5.0 mm (3/16 in) diameter bolts are suggested.
   - 2.1.3 Insert the bolts in the holes drilled in the wall.
   - 2.1.4 Fasten the back shell at the wall with 4 screws. Countersunk head screws are suggested.
   - 2.2 In case of flush mounting box, fasten the back shell at the box with 4 screws.

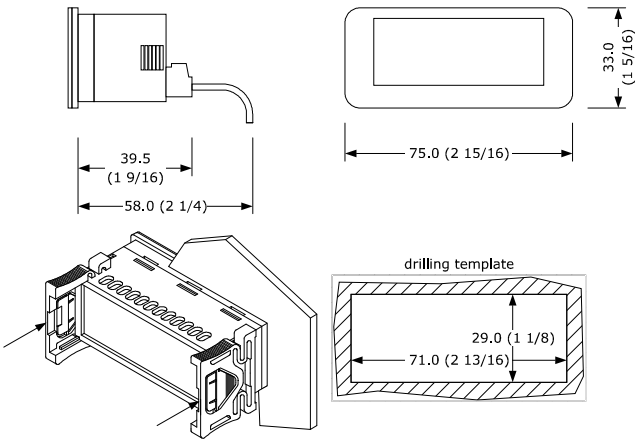
Countersunk head screws are suggested.

3. Make the electrical connection as shown in the section *ELECTRICAL CONNECTION* without powering up the device.
4. Fasten the front of the device at the back shell.



3.3 Dimensions and installation EPJgraph

Measurements in mm (inches). To be fitted to a panel, snap-in brackets provided.
The thickness of the panel must be between 0.8 and 2.0 mm (1/32 and 1/16 in).

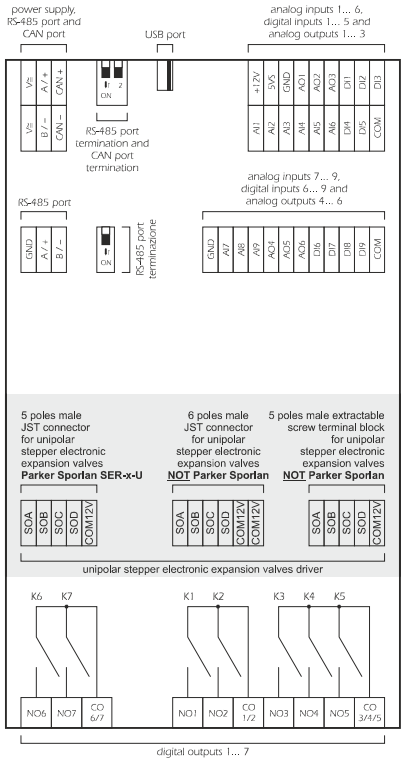


INSTALLATION PRECAUTIONS

- Ensure that the working conditions are within the limits stated in the *TECHNICAL SPECIFICATIONS* section
- Do not install the device close to heat sources, equipment with a strong magnetic field, in places subject to direct sunlight, rain, damp, excessive dust, mechanical vibrations or shocks
- In compliance with safety regulations, the device must be installed properly to ensure adequate protection from contact with electrical parts. All protective parts must be fixed in such a way as to need the aid of a tool to remove them.

4 ELECTRICAL CONNECTION

4.1 Electrical connection c-pro 3 kilo EEV HPRU



Meaning of connectors

Digital outputs 1... 7

Clamp	Meaning
NO1	digital output 1 normally open contact (3 A res. @ 250 VAC)
NO2	digital output 2 normally open contact (3 A res. @ 250 VAC)
CO1/2	common digital outputs 1 and 2
NO3	digital output 3 normally open contact (3 A res. @ 250 VAC)
NO4	digital output 4 normally open contact (3 A res. @ 250 VAC)
NO5	digital output 5 normally open contact (3 A res. @ 250 VAC)
CO3/4/5	common digital outputs 3, 4 and 5

Clamp	Meaning
NO6	digital output 6 normally open contact (3 A res. @ 250 VAC)
NO7	digital output 7 normally open contact (3 A res. @ 250 VAC)
CO6/7	common digital outputs 6 and 7

Digital outputs 8 and 9

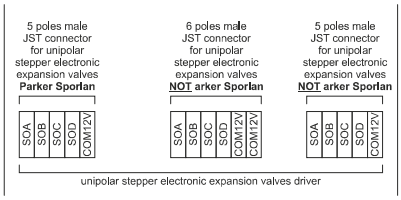
According to the model, electromechanical or solid state relays.

Terminal	Meaning
CO8	common digital output 8
NO8	normally open contact digital output 8 (3 res. A @ 250 VAC in case of electromechanical relay; 24 VAC/DC, 0,6 A max in case of solid state relay)
NC8	normally closed contact digital output 8

Terminal	Meaning
CO9	common digital output 9
NO9	normally open contact digital output 9 (3 res. A @ 250 VAC in case of electromechanical relay; 24 VAC/DC, 0,6 A max in case of solid state relay)
NC9	normally closed contact digital output 9

Unipolar stepper electronic expansion valves driver

The following drawing shows the connectors of the unipolar stepper electronic expansion valves driver.



The following table shows the meaning of the connectors.

Terminal	Meaning
SOA	unipolar stepper motor coli 1
SOB	unipolar stepper motor coli 2
SOC	unipolar stepper motor coli 3
SOD	unipolar stepper motor coli 4
COM12V	motor power supply (12 VDC)

RS-485 port

RS-485 port with MODBUS master communication protocol (with network already internally polarised).

Clamp	Meaning
GND	earth
A / +	terminal 1
B / -	terminal 0

RS-485 portal termination

Micro switch to connect the termination of the RS-485 port with MODBUS master communication protocol (120 Ω, 0.25 W); position micro switch 1 in the ON position in order to connect the RS-485 port termination (connect the termination of the first and last network element termination).

Power supply, RS-485 port with MODBUS slave communication protocol and CAN port

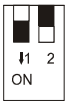
Clamp	Meaning
V≅ +	12 VAC controller power supply
V≅ -	12 VAC controller power supply
A / +	terminal 1
B / -	terminal 0
CAN +	signal + CAN port
CAN -	signal - CAN port

Do not supply another device with the same transformer.

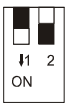
RS-485 port termination and CAN port termination

Micro-switch for:

- connect the termination of the CAN port (120 Ω, 0.5 W); position micro switch 2 in the ON position (connect the termination of the first and last network element).



- connect the termination of the RS-485 port with MODBUS slave communication protocol (120 Ω, 0.25 W); positioning micro switch 1 in the ON position in order to connect the RS-485 port termination (connect the termination of the first and last network element termination).



Analogue inputs 7... 9, digital inputs 6... 9 and analogue outputs 4... 6

Clamp	Meaning
GND	common analogue inputs and analogue outputs
AI7	analogue input 7
AI8	analogue input 8
AI9	analogue input 9
AO4	analogue output 4
AO5	analogue output 5
AO6	analogue output 6
DI6	digital input 6 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
DI7	digital input 7 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
DI8	digital input 8 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
DI9	digital input 9 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
COM	common digital inputs

USB port

USB OTG port.

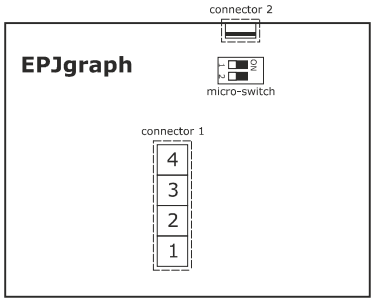
Analogue inputs 1... 6, digital inputs 1... 5 and analogue outputs 1... 3

Clamp	Meaning
AI1	analogue input 1
AI2	analogue input 2
AI3	analogue input 3
AI4	analogue input 4
AI5	analogue input 5
AI6	analogue input 6
DI4	digital input 4 (optoisolated, at 24 VAC / DC and up to 2 KHz)
DI5	digital input 5 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
COM	common digital inputs
+12V	transducers power supply 0-20 mA / 4-20 mA / 0-10 V (12 VDC, 120 mA max.)
5VS	0-5 V ratiometric transducers power supply (5 VDC, 60 mA max.)
GND	common analogue inputs and analogue outputs
AO1	analogue output 1
AO2	analogue output 2
AO3	analogue output 3

DI1	digital input 1 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
DI2	digital input 2 (optoisolated, at 24 VAC / DC and at 50 / 60 Hz)
DI3	digital input 3 (optoisolated, at 24 VAC / DC and up to 2 KHz)

4.2 Electrical connection EPJgraph

4.2.1 Models for panel mounting



Meaning of connectors

Connector 1

N.	DESCRIPTION
1	CAN port reference -
2	CAN port reference +
3	device power supply (24 VAC/12... 30 VDC). If the device is fed by DC power, connect terminal minus
4	device power supply (24 VAC/12... 30 VDC). If the device is fed by DC power, connect terminal plus

Do not supply another device with the same transformer.

Connector 2

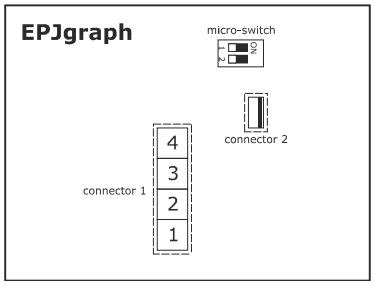
Reserved EVCO.

Micro-switch to insert the CAN port termination resistor.

Insertion of CAN port termination resistor

To insert the CAN port termination resistor, place micro-switch 2 in position ON. Micro-switch 1 is reserved EVCO.
The micro-switch is at the back of the device (remove the back shell from the front before).

4.2.2 Models for wall mounting



Meaning of connectors

Connector 1

N.	DESCRIPTION
1	CAN port reference -
2	CAN port reference +
3	device power supply (24 VAC/12... 30 VDC). If the device is fed by DC power, connect terminal minus
4	device power supply (24 VAC/12... 30 VDC). If the device is fed by DC power, connect terminal plus

Do not supply another device with the same transformer.

Connector 2

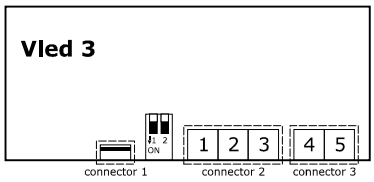
Reserved EVCO.

Micro-switch to insert the CAN port termination resistor.

Insertion of the CAN port termination resistor

To insert the CAN port termination resistor, place micro-switch 2 in position ON. Micro-switch 1 is reserved EVCO.
The micro-switch is at the back of the device (remove the back shell from the front before).

4.3 Electrical connection Vled 3



Meaning of connectors

Connector 1

Reserved EVCO.

Connector 2

N.	DESCRIPTION
1	signal + CAN port
2	signal - CAN port
3	reference (GND)

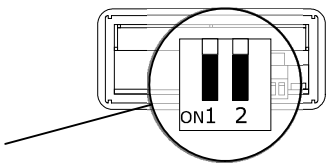
Connector 3

N.	DESCRIPTION
4	device power supply (12 VAC/DC). If the device is fed by DC power, connect terminal plus
5	device power supply (12 VAC/DC). If the device is fed by DC power, connect terminal minus

Do not supply another device with the same transformer.

Fitting the termination resistor of CAN network

To fit the CAN network termination resistor, place micro-switch 2 in position ON. Micro-switch 1 is reserved EVCO.



5 I/O CONFIGURATION TABLES

5.1 I/O configuration table for c-pro 3 kilo EEV HPRU without management of DHW circuit

I/O	Description
	Analogue inputs
AI 1	Utility input temperature
AI 2	External temperature
AI 3	Coil temperature
AI 4	Utility output temperature
AI 5	Compressor discharge temperature
AI 6	*Not used*
AI 7	Condensation pressure
AI 8	Compressor suction temperature
AI 9	Evaporation pressure
	Serial ports
RS-485	RTU Master + Slave MODBUS Protocol
CANbus	To EPJgraph and Vled 3
	Digital inputs
DI 1	Utility pump flow switch
DI 2	Boiler alarm
DI 3	Fan circuit breaker
DI 4	Summer/Winter
DI 5	ON/OFF
DI 6	Utility pump circuit breaker
DI 7	Utility pump circuit breaker
DI 8	High pressure alarm
DI 9	Compressor circuit breaker
	Analogue outputs
AO 1	Fan
AO 2	Compressor
	Digital Outputs
DO 1	Utility pump
DO 2	Fan

DO 3	Inversion valve
DO 4	Boiler
DO 5	Alarm
DO 6	Compressor 1
DO 7	Solenoid valve

5.2 I/O configuration table for c-pro 3 kilo EEV HPRU with management of DHW circuit

I/O	Description
	Analogue inputs
AI 1	Utility input temperature
AI 2	External temperature
AI 3	Coil temperature
AI 4	Upper part DHW temperature
AI 5	Utility output temperature
AI 6	Compressor discharge temperature
AI 7	Condensation pressure
AI 8	Compressor suction temperature
AI 9	Evaporation pressure
	Serial ports
RS-485	RTU Master + Slave MODBUS Protocol
CANbus	To EPJgraph and Vled 3
	Digital inputs
DI 1	Utility pump flow switch
DI 2	Boiler alarm
DI 3	Fan circuit breaker
DI 4	Summer/Winter
DI 5	ON/OFF
DI 6	Utility pump circuit breaker
DI 7	High pressure alarm
DI 8	Low pressure alarm
DI 9	Compressor circuit breaker
	Analogue outputs
AO 1	Fan
AO 2	Compressor
	Digital Outputs
DO 1	Utility pump
DO 2	Fan
DO 3	Inversion valve
DO 4	Boiler

DO 5	Solenoid valve
DO 6	Compressor 1
DO 7	DHW valve

6 I/O CONFIGURABILITY

The tables in the previous paragraphs define the default configuration of the I/O but this is not the only possibility offered. A set of possible acceptable values and a set of parameters are defined that the wizard parameters re-set. The possibility is given to modify the value.

6.1 I/O configurability for c-pro 3 kilo EEV HPRU

Analogue inputs (AI) (AI1, AI2, AI3, AI7, AI8 and AI9)	
Value	**Description**
0	Disabled
1	Utility IN temperature
2	Utility OUT temperature
3	High DHW
4	Low DHW
5	External temperature
6	Coil 1 temperature
7	Coil 2 temperature
8	Source OUT temperature
9	Solar panels IN temperature
10	Solar panels OUT temperature
11	CMP Discharge Temperature
12	Compressor suction temperature
13	AUX1 probe (NTC)
14	AUX2 probe (NTC)
15	Condenser Pressure (4-20mA)
16	Condenser Pressure (0-5V)
17	Evaporator Pressure (4-20mA)
18	Evaporator Pressure (0-5V)
19	AUX1 probe (4-20mA)
20	AUX1 probe (0-5V)
21	AUX1 probe (0-10 V)
22	AUX2 probe (4-20mA)
23	AUX2 probe (0-5V)
24	AUX2 probe (0-10 V)
25	Utility pump flow switch NC
26	Utility pump flow switch NO

27	Utility pump circuit breaker NC
28	Utility pump circuit breaker NO
29	Utility pump flow switch + circuit breaker NC
30	Utility pump flow switch + circuit breaker NO
31	Boiler AL NC
32	Boiler AL NO
33	Resistor circuit breaker NC
34	Resistor circuit breaker NO
35	Boiler + resistor circuit breaker NC
36	Boiler + resistor circuit breaker NO
37	Fans circuit breaker NC
38	Fans circuit breaker NO
39	DHW resistor circuit breaker NC
40	DHW resistor circuit breaker NO
41	Solar panels pump flow switch + circuit breaker NC
42	Solar panels pump flow switch + circuit breaker NO
43	On-Off NC
44	On-Off NO
45	Summer-Winter NC
46	Summer-Winter NO
47	DHW mode NC
48	DHW mode NO
49	High pressure AL NC
50	High pressure AL NO
51	Low pressure AL NC
52	Low pressure AL NO
53	COMP1 circuit breaker NC
54	COMP1 circuit breaker NO
55	COMP2 circuit breaker NC
56	COMP2 circuit breaker NO
57	COMP3 circuit breaker NC
58	COMP3 circuit breaker NO
59	COMPRESSORS circuit breaker NC
60	COMPRESSORS circuit breaker NO

61	Source pump circuit breaker NC
62	Source pump circuit breaker NO
63	Auxiliary 1 NC
64	Auxiliary 1 NO
65	Auxiliary 1 NC
66	Auxiliary 1 NO

Analogue inputs (AI) (AI4, AI5 and AI6)	
Value	**Description**
0	Disabled
1	Utility IN temperature
2	Utility OUT temperature
3	High DHW
4	Low DHW
5	Ext. Temperature.
6	Temperature of Coil 1
7	Temperature of Coil 2
8	Source OUT temperature
9	Source IN temperature
10	Solar panels OUT temperature
11	CMP discharge temperature
12	Compressor suction temperature
13	AUX1 probe (NTC)
14	AUX2 probe (NTC)
15	Utility pump flow switch NC
16	Utility pump flow switch NO
17	Utility pump circuit breaker NC
18	Utility pump circuit breaker NO
19	Utility pump flow switch + circuit breaker NC
20	Utility pump flow switch + circuit breaker NO
21	Boiler AL NC
22	Boiler AL NO
23	Resistor circuit breaker NC
24	Resistor circuit breaker NO
25	Boiler + resistor circuit breaker NC

26	Boiler + resistor circuit breaker NO
27	Fans circuit breaker NC
28	Fans circuit breaker NO
29	DHW resistor circuit breaker NC
30	DHW resistor circuit breaker NO
31	Solar panels pump flow switch + circuit breaker NC
32	Solar panels pump flow switch + circuit breaker NO
33	On-Off NC
34	On-Off NO
35	Summer-Winter NC
36	Summer-Winter NO
37	DHW mode NC
38	DHW mode NO
39	High pressure AL NC
40	High pressure AL NO
41	Low pressure AL NC
42	Low pressure AL NO
43	COMP1 circuit breaker NC
44	COMP1 circuit breaker NO
45	COMP2 circuit breaker NC
46	COMP2 circuit breaker NO
47	COMP3 circuit breaker NC
48	COMP3 circuit breaker NO
49	COMPRESSORS circuit breaker NC
50	COMPRESSORS circuit breaker NO
51	Source pump circuit breaker NC
52	Source pump circuit breaker NO
53	Auxiliary 1 NC
54	Auxiliary 1 NO
55	Auxiliary 2 NC
56	Auxiliary 2 NO

Digital Inputs (DI)

Value	Description
0	Disabled

1	Utility pump flow switch NC
2	Utility pump flow switch NO
3	Utility pump circuit breaker NC
4	Utility pump circuit breaker NO
5	Utility pump flow switch + circuit breaker NC
6	Utility pump flow switch + circuit breaker NO
7	Boiler AL NC
8	Boiler AL NO
9	Resistor circuit breaker NC
10	Resistor circuit breaker NO
11	Boiler + resistor circuit breaker NC
12	Boiler + resistor circuit breaker NO
13	Fans circuit breaker NC
14	Fans circuit breaker NO
15	DHW resistor circuit breaker NC
16	DHW resistor circuit breaker NO
17	Solar panels pump flow switch + circuit breaker NC
18	Solar panels pump flow switch + circuit breaker NO
19	On-Off NC
20	On-Off NO
21	Summer-Winter NC
22	Summer-Winter NO
23	DHW mode NC
24	DHW mode NO
25	High pressure AL NC
26	High pressure AL NO
27	Low pressure AL NC
28	Low pressure AL NO
29	COMP1 circuit breaker NC
30	COMP1 circuit breaker NO
31	COMP2 circuit breaker NC
32	COMP2 circuit breaker NO
33	COMP3 circuit breaker NC
34	COMP3 circuit breaker NO

35	COMPRESSORS circuit breaker NC
36	COMPRESSORS circuit breaker NO
37	Source pump circuit breaker NC
38	Source pump circuit breaker NO
39	Auxiliary 1 NC
40	Auxiliary 1 NO
41	Auxiliary 2 NC
42	Auxiliary 2 NO

Analogue outputs (AO) (AO1 and AO2)	
Value	**Description**
0	Disabled
1	Fan 0-10 V
2	Compressor 0-10 V
3	PWM fan
4	FAN fan
5	Condensate drain pan anti-icing heaters
6	Auxiliary 1 0-10 V
7	Auxiliary 2 0-10 V

Analogue Outputs (AO) (AO3 and AO4)	
Value	**Description**
0	Disabled
1	Fan 0-10 V
2	Compressor 0-10 V
3	Compressor 40..20mA
4	Condensate drain pan anti-icing heater 0-10 V
5	Condensate drain pan anti-icing heater 4-20 mA
6	Auxiliary 1 0-10 V
7	Auxiliary 1 4-20 mA
8	Auxiliary 2 0-10 V
9	Auxiliary 2 4-20 mA

Analogue Outputs (AO) (AO5 and AO6)	
Value	**Description**
0	Disabled
1	Fan 0-10 V

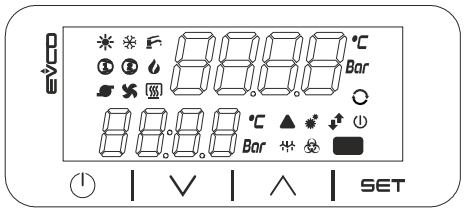
2	Compressor 0-10 V
3	Condensate drain pan anti-icing heater 0-10 V
4	Auxiliary 1 0-10 V
5	Auxiliary 2 0-10 V

Digital Outputs (DO)	
Value	**Description**
0	Disabled
1	Utility pump
2	Fan (enabling)
3	Source pump
4	Inversion valve NC
5	Inversion valve NO
6	Boiler
7	Integration resistors
8	DHW resistors
9	Alarm NC
10	Alarm NO
11	DHW 3-way valve
12	Compressor 1 (enabling)
13	Compressor 2
14	Compressor 3
15	PS pump
16	Compressor bypass NC
17	Compressor bypass NO
18	Solenoid valve (NO)
19	Antifreeze heater
20	Condensate drain pan anti-icing heater
21	Auxiliary 1 NC
22	Auxiliary 1 NO
23	Auxiliary 2 NC
24	Auxiliary 2 NO

7 USER INTERFACE

7.1 Vled 3 user interface

The user interface consists of a two-rows display and 4 keys.

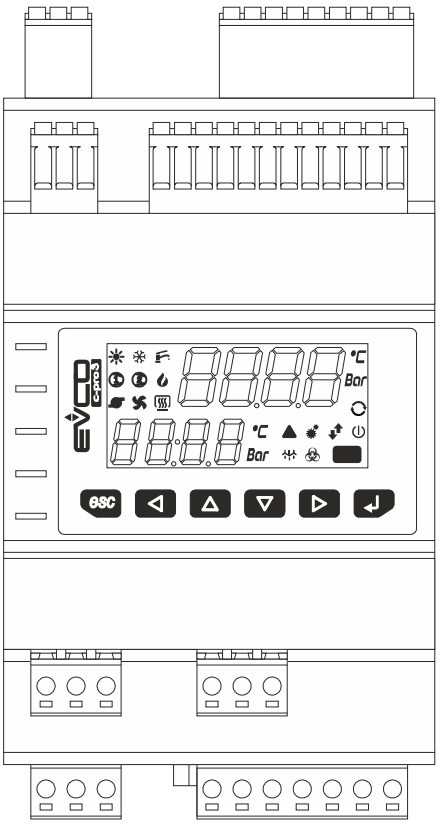


The following table illustrates the meaning of the keyboard.

Key	Predefined function
⏻	switching on/off, hereon called "ON/STAND-BY key"
∨	decrease key, hereon called "DOWN key"
∧	increase key, hereon called "UP key"
SET	confirm key, hereon called "SET key"

7.2 c-pro 3 kilo EEV HPRU user interface

The controllers are available in blind version or with integrated user interface. The user interface consists of a two-rows display and 6 keys.

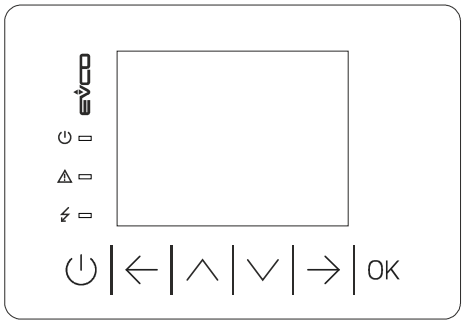


The following table illustrates the meaning of the keyboard.

Key	Predefined function
esc	annul key, hereon called "ESC key"
◁	offset to the left, hereon called also "LEFT key"
△	increase key, hereon called "UP key"
▽	decrease key, hereon called "DOWN key"
▷	offset to the right, hereon called also "RIGHT key"
↵	confirm key, hereon called "ENTER key"

7.3 EPJgraph user interface

The user interface consists of a colour LCD graphic display and 6 keys.



The following table illustrates the meaning of the keyboard.

Key	Predefined function
⏻	switching on/off, hereon called "ON/STAND-BY key"
←	offset to the left, hereon called also "LEFT key"
^	increase key, hereon called "UP key"
v	decrease key, hereon called "DOWN key"
→	offset to the right, hereon called also "RIGHT key"
OK	confirm key, hereon called "ENTER key"

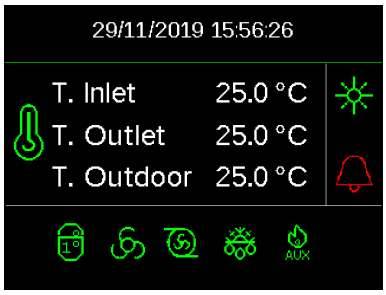
8 MENU AND SUBMENU STRUCTURE

This paragraph presents the main pages and menus present in the application.

8.1 EPJgraph pages

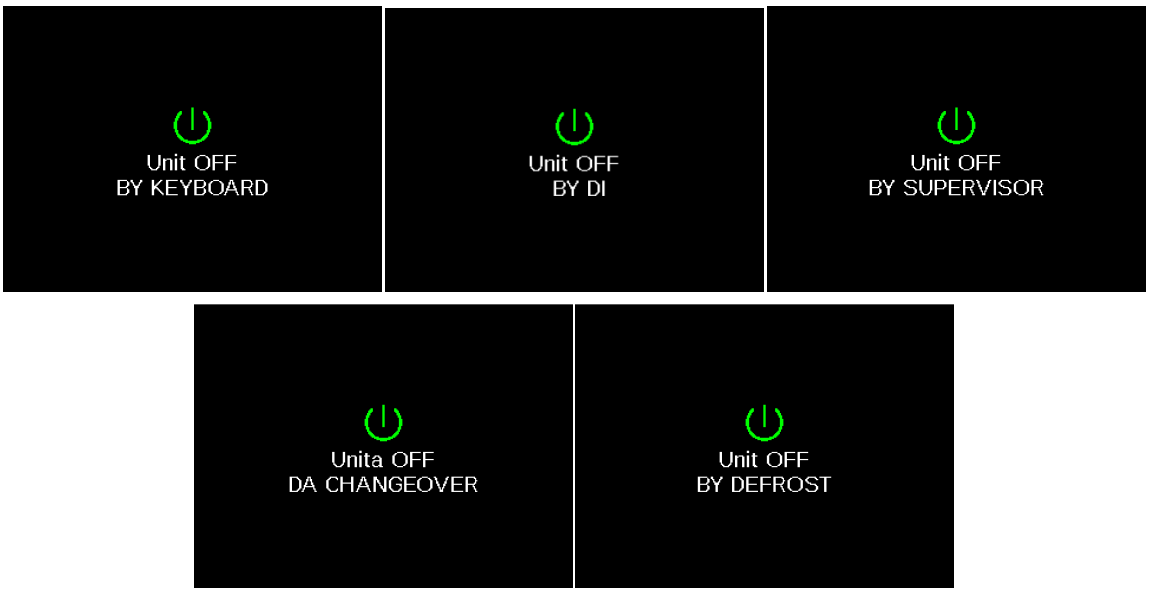
The EPJgraph main page changes according to the status of the unit.

If the unit is switched on, the temperature values will be shown. If the probe is in error (or if it is disconnected), the display will show "**----**".



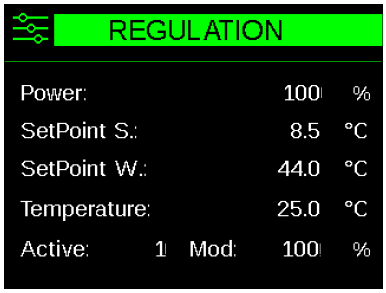
1. According to parameter PH41 the meaning changes Summer / Winter / Alarm
2. Fan on
3. 1st compressor on / 2nd compressor on / 3rd compressor on.
   Flashing if waiting for a protection time.
4. pump on.
5. defrost active.
6. auxiliary heting active.
7. domestic heat water active.

If the unit is switched off, Unit OFF will be shown. The reason of this status will be indicated (by keyboard, by no authorization via digital input, by no authorization via supervisor, etc.).



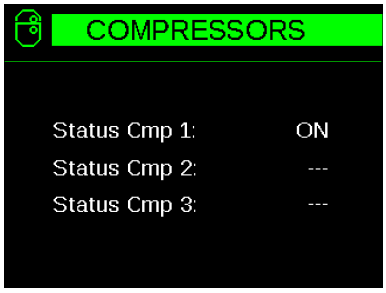
Pressing the keys RIGHT or LEFT from the main page (when the unit is switched on), it is possible to show information about the regulation, about the probes, etc.

Regulation page



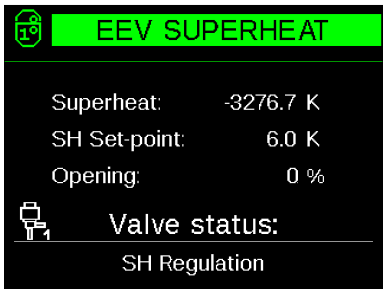
It shows the power supplied, the summer and winter setpoint, the regulation temperature and the number of compressors on, with relative modulation.

Compressor page



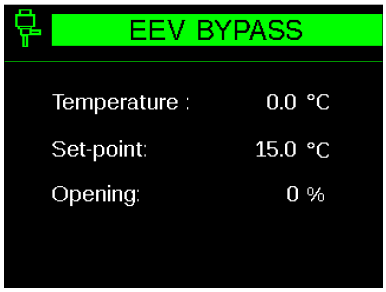
It shows the compressors statuses.

EEV super heating page



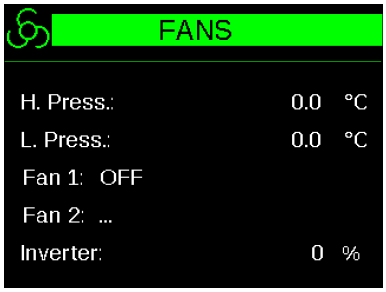
It shows the status the super heating valve and the relative value, setpoint and valve position.

EEV Bypass page



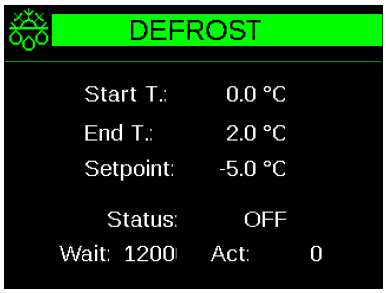
In case of bypass valve presence, the suction temperature will be shown and so the setpoint and valve position.

Fan page



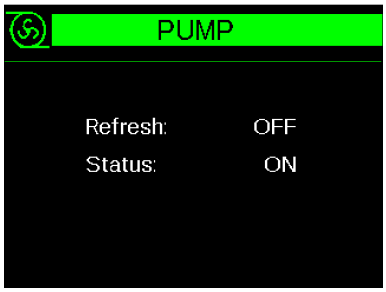
It shows the fan status and the relative high/low pressure values.

Defrost page



It shows the start/stop defrost temperatures, the defrost setpoint, the defrost status and the counters.

Pump page

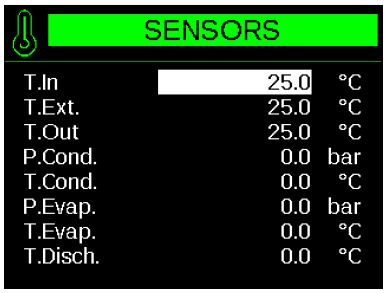


It shows the pump status and information about the system sniffing cycle.

Auxiliary regulation functions page

It shows information on the auxiliary probes and possible setpoint.

Probes page



It shows information on the sensors:
Ting. inlet temperature, T.Est. outdoor temperature, T. Usc outlet temperature, P.Cond condensing pressure, T.Cond condensing temperature, PEvap evaporating pressure, TEvap evaporating temperature, TScar. discharging temperature, TAsp. suction temperature,TBat1 coil 1 temperature, TBat2 coil 2 temperature, TIn(PS) solar panels inlet temperature, TUsc(PS) PS outlet temperature, TIn(S) inlet solar temperature, TUsc(S) outlet S temperature,TACS(A) high DHW temperature, TACS(B) low DHW temperature, AUX1 auxiliary 1 probe, AUX 2 auxiliary 2 probe, LIM. POT. power limit.

8.2 Main menu

The main menu is divided into 4 categories, which are the following:

- Operating status
- Parameters
- Input Output
- Alarms

8.2.1 Operating status

The status of all functions and loads are listed inside the operating status menu:

- Compressors
- Exchangers (pumps and fans)
- Domestic hot water
- Defrosting
- Solar panels
- Aux. heating
- Electronic valve

The operating status relative to the function selected will be found inside each item.

8.2.2 Parameters

Within the parameters menu it is possible to access the various management levels, which go from level 0 to level 3. Level 0 is the user level and does not need a password, while levels 1, 2 and 3 require a password. The menu items are the following:

- User (level 0)
- Maintenance technician (level 1)
- Installer (level 2)
- Manufacturer (level 3)

The submenu for these items is the following:

- Parameters Menu
  - User
  - Maintenance technician
    - Operating section
    - Manual section
    - Calibration section
    - Input/output section
  - Installer
    - Compressor section
    - Regulations section
    - Exchangers section
    - Defrost section
    - Pumps section
    - Anti-legionella section
    - Aux. heating section
    - Aux. section
    - Safety devices section (alarms)
    - Various section (other parameters)
    - Default section
    - MODBUS section
  - Manufacturer
    - Settings section
    - I/O section
    - Compressors section
    - Regulations section
    - Exchanger section
    - Defrosting section
    - Pumps section
    - Anti-legionella section
    - Aux. heating section
    - EVCM section
    - EVD bypass section
    - Safety devices section (alarms)
    - Various section (other parameters)

Refer to the parameters list for the content of each submenu. The belonging of a particular parameter (to the Installer menu rather than the Manufacturer menu) will depend on the password level associated to the parameter itself.

8.2.3 Input Output

This menu contains the list of Inputs and Outputs divided by type, accompanied by a description and the status.
Example:

I/O	Description	Logic status	Physical status
DO01	Utility Pump	Active	Closed

8.2.4 Alarms

The alarms menu is divided into 2 sub-menus:

- Active alarms
- Alarms log

All active alarms will be present in the active alarms submenu, while the last alarms will be listed in the alarms log.

9 OPERATION

The controller can manage reversible heat pumps with the following features:

- Air or water source exchanger
- Management of the DHW function
- Integrated management of the electronic thermostatic valve
- Management of a BLDC compressor
- Management of 1-3 ON-OFF compressors
- Management of the adaptive defrosting.

9.1 Management of the operating status

There are various ways to switch the machine on and off and change the operating mode of the same, on the basis of the relative configuration parameters.

9.1.1 Switch-on and switch-off

The machine can be switched on and off:

- From the keyboard (entering the relative menu or pressing the esc key for 2 seconds)
- From digital input
- From BMS (due to lack of communication after a delay that can be set, the unit goes into "offline" mode, however maintaining the previous operating status.

Other than the possibility to switch the machine off/on from the keyboard, always available, switch on/off is from remote can be performed from ID or BMS. One possibility excludes the other.

9.1.2 Changing operating mode

The machine has 3 operating modes

- Cold
- Hot
- DHW only, useful in mid-seasons.

Can be modified from keyboard, ID, BMS (offline after time that can be set and maintenance of the status if communication is missing), from external temperature probe, from regulation probe or from auxiliary probe. Also in this case, it will always be possible to change the operating status from the keyboard but the other modes will be mutually exclusive.

A machine OFF time will be set before the effective season change.

9.2 Heat regulation

The controller envisions the possibility to manage up to 3 compressors and a resource for the auxiliary heating (boiler or electric resistor), this is also ON-OFF or modulating. The auxiliary heating can be the unique source of heating or an integration to switch-on when the compressors cannot face up to the plant heating requirement.

A work setpoint will be defined in each case (differentiated for the heating and cooling functions), a Proportional Band (Lateral Band or Neutral Area) and eventual Integral Time (only for the modulating regulation). An offset is also defined with respect to the setpoint (below the set in cooling mode, above the set in heating mode) for compressor switch-off in order to prevent "jerks" in the event of regulation on the basis of the output temperature.

9.2.1 ON-OFF Compressors

The activation of the individual compressor or the 2 or 3 compressors depends on the temperature read by the heat regulation probes and can be in neutral area, lateral band or modulating mode. In the case of the modulating compressor, regulation can be purely proportional or PI. In the presence of a first modulating compressor and a second ON-OFF compressor, regulation will be "sawtooth" for the modulating compressor and in lateral band for the ON-OFF compressor

In the case of unit with 2 or 3 ON-OFF compressors, compressor rotation must also be managed; see the dedicated paragraph.

9.2.1.1 ON-OFF regulation in neutral area

This type of regulation is used by default when the heat regulation is based on the output temperature from the heat pump. A parameter will define the position of the neutral regulation area:

- Above or below the setpoint according to the active function
- Straddling the setpoint

To explain operation, it is necessary to distinguish the switch-on and off phases.

In switch-on mode:

- The compressor switches on when the regulation temperature exits the neutral area:
  - ✓ Cooling: Regulation temperature > Setpoint + Neutral Area
  - ✓ Heating: Regulation temperature < Setpoint – Neutral Area
- The compressor remains off if the regulation temperature remains within the neutral area or if:
  - ✓ Cooling: Regulation temperature < Setpoint
  - ✓ Heating: Regulation temperature > Setpoint

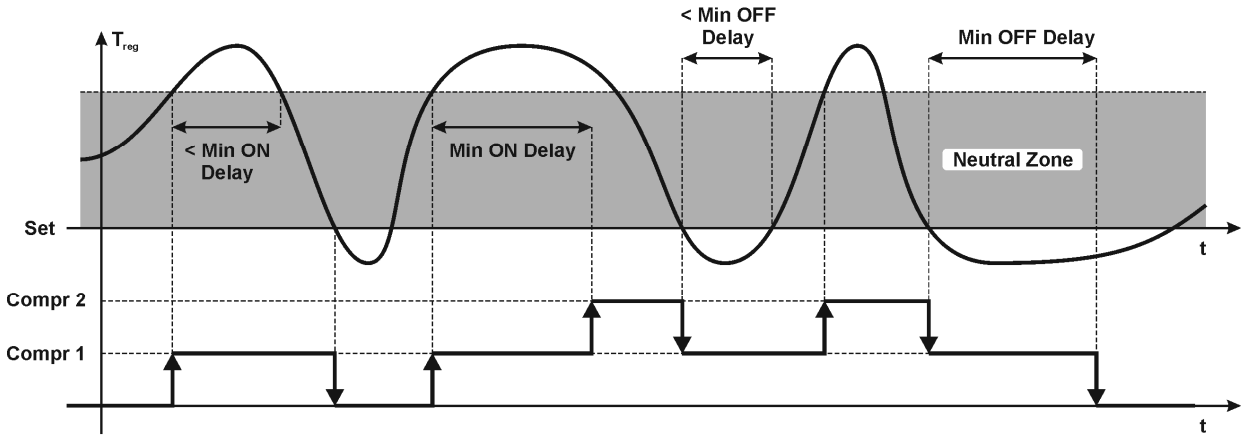
Any second compressor is not switched on immediately after the first even if the temperature remains outside the neutral area, but a delay defined by the parameter will be respected.

In switch-off mode:

- The compressor switches off when the regulation temperature:
  - ✓ Cooling: Regulation temperature < Setpoint
  - ✓ Heating: Regulation temperature > Setpoint
- The compressor remains on if the regulation temperature remains within the neutral area or if:
  - ✓ Cooling: Regulation temperature > Setpoint + Neutral Area
  - ✓ Heating: Regulation temperature < Setpoint – Neutral Area

Any second compressor is not switched off immediately after the first even if the temperature remains outside the neutral area, but a delay defined by the parameter will be respected.

The behaviour of the ON-OFF compressors in the neutral zone can be effectively schematised for the cooling function with the following diagram:



Code	Parameter description	Default	Min	Max	U.M.	Menu
SPC1	Cooling Setpoint	8.5 47.3	PC21	PC22	°C °F	UT
SPH1	Heating Setpoint	40.0 104.0	PC23	PC24	°C °F	UT
PC00	Heat regulation probe. 0: flow probe 1: return probe	1	0	1		CO-C
PC14	Neutral regulation area	5.0 9.0	PC15	PC16	°C °F	IS-R
PC17	Connection/release time (neutral area)	20	0	999	sec	IS-R
PC18	Type of neutral area: 0: divided 1: whole	0	0	1		IS-R

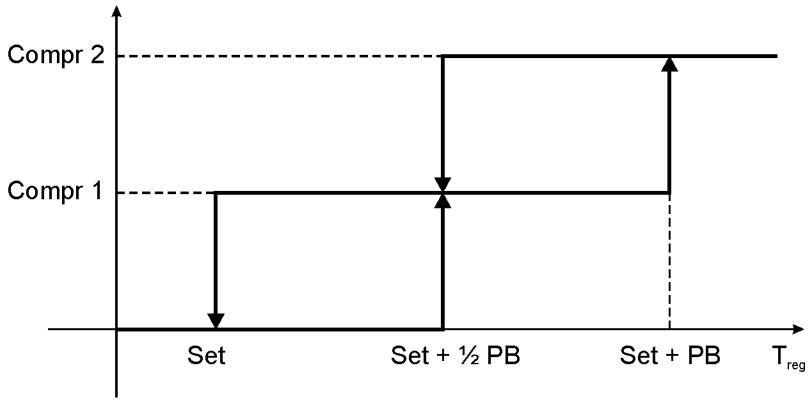
9.2.1.2 ON-OFF regulation in lateral band

This type of regulation is not affected by the compressor status, but depends only on the regulation temperature. It is used for default when the heat regulation is based on the input temperature at the heat pump.

- The compressor switches on if:
  - ✓ Cooling: Regulation temperature > Setpoint + Lateral Band
  - ✓ Heating: Regulation temperature < Setpoint - Lateral Band
- The compressor switches off if:
  - ✓ Cooling: Regulation temperature < Setpoint
  - ✓ Heating: Regulation temperature > Setpoint

If there are two compressors the lateral band is divided into 2 parts (identical or according to the % power specified) as per diagram below (cooling function powers of the compressors equal).

In case of three compressors operation, the lateral band will be divided into 3 parts (they have the same size or according to the configured percentage).



Code	Parameter description	Default	Min	Max	U.M.	Menu
SPC1	Cooling Setpoint	8.5 47.3	PC21	PC22	°C °F	UT
SPH1	Heating Setpoint	40.0 104.,0	PC23	PC24	°C °F	UT
PC00	Heat regulation probe. 0: flow probe 1: return probe	1	0	1		CO-C
PC12	Regulation band (lateral band)	2.5 4.5	0.1	20.0 36.0	°C °F	IS-R

9.2.2 Modulating regulation

The modulating regulation envisions 3 possibilities:

1) Individual modulating compressor
2) Modulating compressor + 1 OnOff compressor
3) Modulating compressor + 2 OnOff compressors

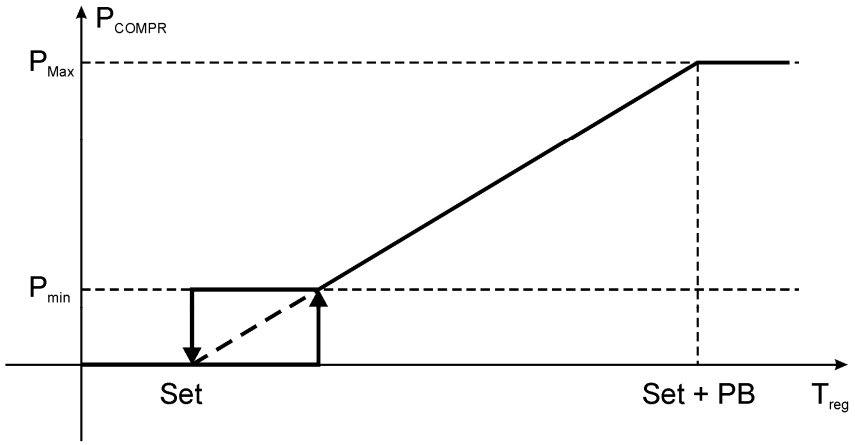
Below find the list of heat regulation characteristics. For problems relative to piloting the compressor with inverter, refer to the dedicated paragraph.

9.2.2.1 Individual compressor

In this case, the compressor power will assume a value depending on the output of the PI regulation algorithm. Depending on the required power value in the presence of just the modulating compressor, three cases are distinguished:

- Minimum power that can be supplied < Power required < Maximum power that can be supplied: The compressor will go to the requested power level
- Power required > Maximum power that can be supplied: The compressor will go to the maximum power that can be supplied
- Power required < Minimum power that can be supplied. In this case, behaviour depends on the compressor status:
  - ✓ Compressor off: The compressor will remain off, switching-on only when the power required reaches the minimum level that can be supplied.
  - ✓ Compressor on: The compressor remains on at minimum power level that can be supplied, switching-off when the required power level reaches zero.

The figure illustrates the modulation of an individual compressor in the purely proportional case, in cooling mode.



Code	Parameter description	Default	Min	Max	U.M.	Menu
SPC1	Cooling Setpoint	8.5 47.3	PC21	PC22	°C °F	UT
SPH1	Heating Setpoint	40.0 104.0	PC23	PC24	°C °F	UT
PC30	Modulating compressor proportional band	10.0 18.0	0.0	20.0 36.0	°C °F	IS-R
PC31	Modulating compressor PI integral time	0	0	999	sec	IS-R
PC32	Modulating compressor minimum speed (% output PI)	16.70	0.00	100.00	%	CO-R
PC33	Modulating compressor maximum speed (% output PI)	100.00	0.00	100.00	%	CO-R

If configured, the compressor enabling relay will activate as soon as the analogue output value assumes a value over 0.

9.2.2.2 Modulating compressor and an ON-OFF compressor

In this case the heat regulator must be aware of the ratio between the maximum power that can be supplied by the modulating compressor and that which can be supplied by the ON-OFF compressor in a way to correctly divide the proportional band ($PB=PB_{MOD}+PB_{ON-OFF}$). For example, if the modulating compressor supplies 60% of the power and the ON-OFF compressor 40%, the proportional band will be divided in a way to respect this power ratio. $PB_{MOD}=60\% \times PB$, $PB_{ON-OFF}=40\% \times PB$.

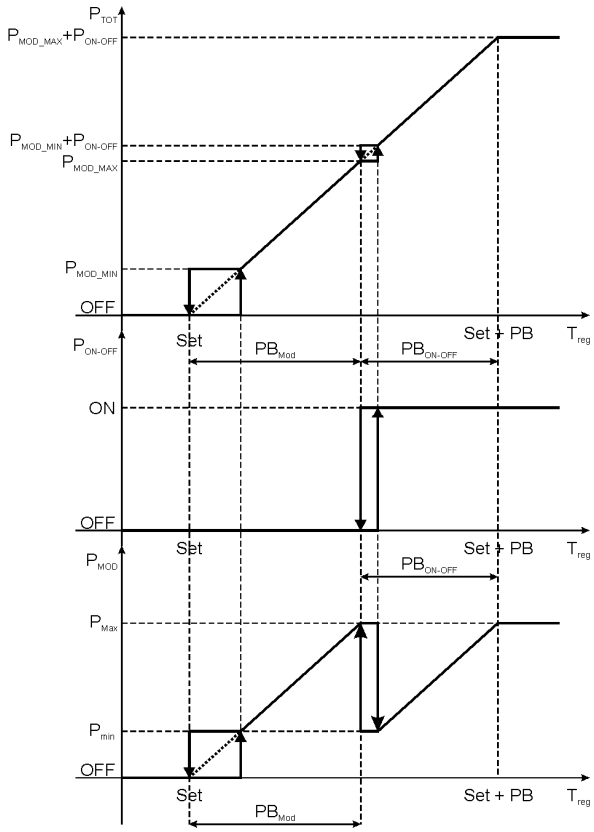
On increase of the temperature detected by the heat regulation probe, the power required ($\mathbf{P_{REQ}}$) at the compressors increases proportionally. The actions performed by the heat regulator depending on the required power level reached, are the following:

- $\mathbf{P_{REQ} < P_{MOD\text{-}MIN}}$ *(Minimum power that can be supplied by the modulating compressor)* → Both the modulating and ON-OFF compressor remain off.
- $\mathbf{P_{REQ} = P_{MOD\text{-}MIN}}$ → The modulating compressor is switched off at minimum power
- $\mathbf{P_{MOD\text{-}MIN} < P_{REQ} < P_{MOD\text{-}MAX}}$ *(maximum power that can be supplied by the modulating compressor)* → The power of the modulating compressor is adapted to the required power.
- $\mathbf{P_{REQ} = P_{MOD\text{-}MIN}}$ → The modulating compressor is taken to its maximum power
- $\mathbf{P_{MOD\text{-}MAX} < P_{REQ} < P_{MOD\text{-}MIN} + P_{ON\text{-}OFF}}$ *(Power of the ON-OFF compressor)* → The modulating compressor remains at maximum power and the ON-OFF compressor remains off.
- $\mathbf{P_{REQ} = P_{MOD\text{-}MIN} + P_{ON\text{-}OFF}}$ → First the modulating compressor is taken from the maximum to minimum power, considering the safety time has reached minimum, the ON-OFF compressor is activated.
- $\mathbf{P_{MOD\text{-}MIN} + P_{ON\text{-}OFF} < P_{REQ} < P_{MOD\text{-}MAX} + P_{ON\text{-}OFF}}$ → The ON-OFF compressor is on and the power of the modulating compressor is adapted to the required power.
- $\mathbf{P_{REQ} \geq P_{MOD\text{-}MAX} + P_{ON\text{-}OFF}}$ → The ON-OFF compressor is on and the modulating compressor is active at maximum power.

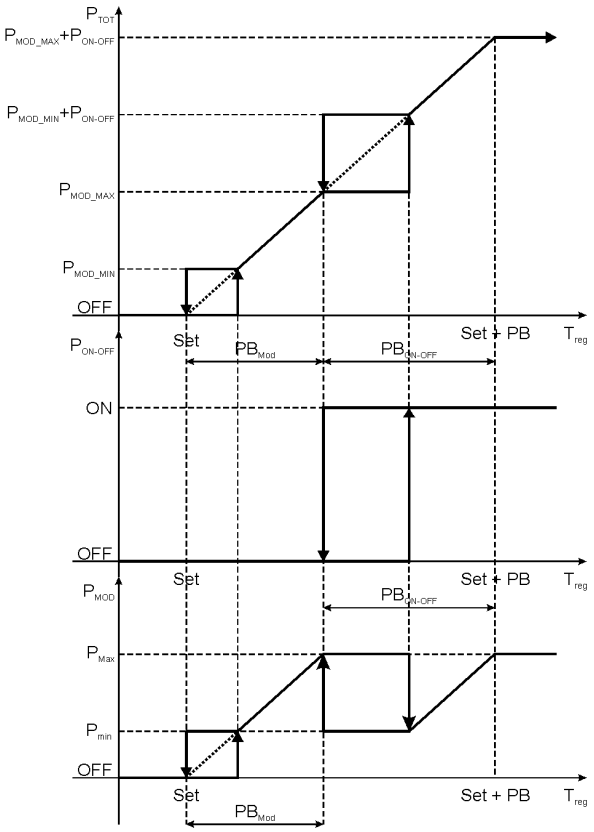
On decrease of the temperature detected by the heat regulation probe, the power required decreases proportionally. The pathway described above is followed in the opposite direction for the modulating parts; the behaviour is instead different in the following cases:

- $\mathbf{P_{MOD\text{-}MIN} + P_{ON\text{-}OFF} > P_{REQ} > P_{MOD\text{-}MAX}}$ → The ON-OFF compressor remains active and the modulating compressor is kept at minimum power.
- $\mathbf{P_{REQ} = P_{MOD\text{-}MAX}}$ → The ON-OFF compressor is switched-off first and then the modulating compressor is taken from minimum to maximum power, considering the safety times.
- $\mathbf{P_{MOD\text{-}MIN} > P_{REQ} > 0}$ → The modulating compressor is maintained active at minimum power that can be supplied.
- $\mathbf{P_{REQ} = 0}$ → The modulating compressor is only switched-off when the power required reaches 0

The figures illustrate the case of a modulating compressor in tandem with an ON-OFF compressor always in the purely proportional case in cooling mode:



Modulating compressor power > ON-OFF compressor power



Modulating compressor power < ON-OFF compressor power

Code	Parameter description	Default	Min	Max	U.M.	Menu
PC34	Percentage power supplied by the modulating compressor	100.00	0.00	100.00	%	CO-R
PC35	Percentage power expressed by the first OnOff compressor	0.00	0.00	100.00	%	CO-R
PC36	Percentage power expressed by the second OnOff compressor	0.00	0.00	100.00	%	CO-R

On controller switch-on, it is probable that the request for power by the plant is very high. In this case, the controller must try to adapt the power supplied to that requested as quickly as possible. For example, if the modulating compressor supplies 60% of the total power, the ON-OFF compressor 40% and the power required is 80% of the total, the ON-OF compressor will be switched on first and immediately after (according to safety times) the modulating compressor will be switched on, which will go to the correct power as quickly as possible.

9.2.2.3 Modulating compressor with two ON-OFF compressors

Operates like the previous case but with a second ON-OFF compressor to manage with the same method as the first. The modulating compressor will always have a "sawtooth" type modulation.

10 DOMESTIC HOT WATER (DHW)

The controller can manage the DHW function; the heat pump will be equipped with a 3-way valve for the diversion of the hot water flow from the plant to the DHW tank. In the presence of simultaneous heat regulation requests by the plant and the DHW tank, the controller will decide which request to privilege and will take all measures to satisfy this request.

During the changeover of the 3-way valve it may be necessary to stop the pump (if the valve is the ball type); therefore a parameterisable pump stop time is envisioned during the changeovers.

Having to "share" the compressor with the plant during operation in DHW mode, the machine will always operate at maximum power (any ON-OFF steps will switch on first and then the modulating compressor is taken to 100% power as quickly as possible) to reduce the cycle duration to minimum.

To ease reaching the DHW set, the aux. heating can be activated.

The DHW request is considered active when the temperature detected by the probe installed in the accumulation tank (top part if there are two) drops below the DHW set minus the regulation band (i.e. DHW Set = 50°C, DHW regulation band = 5°C → DHW request active if the probe in the top part of the DHW tank detects a temperature lower than 45°C). The regulation probe in the lower part of the DHW accumulation tank will be used for the anti-legionella function and for regulation of the solar panels.

10.1 Management of Priorities

The production of DHW always has priority with respect to the heat regulation request by the plant. A maximum limit time is defined for the operation of the unit for DHW production in order to prevent the plant being affected too much. Even if at the time of activation of the DHW function there is no request by the plant, this could occur during DHW operation; therefore, the maximum time will always be valid. On conclusion of the maximum time in DHW mode, after changeover of the 3-way valve, the pump will be activated for an established period of time (sniffing) in a way to ensure correct reading of the heat regulation probe.

A maximum operating time in cooling/heating mode must be defined in the same way, before going back to DHW production if there is requirement. In this case, the probe is dedicated and installed in the accumulation tank, therefore the presence or not of DHW requirement is easier.

10.1.1 Operation

During "Normal" operation in Heating/Cooling mode, i.e. with heat regulation request coming from the plant, the 3-way valve is in the rest status.

When a request for DHW occurs, the controller performs the following sequence:

- The compressor is switched off (only if the pump must be switched off and/or switch off is requested from configuration)
- After the *Minimum delay between compressor switch-off and pump switch-off* (PP05) the pump is switched off (only if PP06 > 0, otherwise the pump remains on)
- The 3-way valve changes over from the rest to the operation condition (the valve diverts the flow from the Heating/Cooling plant to the DHW tank. This operation envisions a changeover time that will depend of the type of valve defined at parameter PP06, during which the pump must remain off. This time can be set at 0, in which case the pump is not switched off
- Half way through the changeover time, the inversion valve is made to changeover if cooling mode is active; otherwise the inversion valve remains in the previous position. A compressor shutdown time is however envisioned (also if the pump is not switched off) for the operating mode change (Parameter PC08), if the cooling function is active, half way through which there will be the effective changeover of the cycle inversion valve.
- The pump is reactivated

- After the *Minimum delay between pump switch-on and compressor switch-on* (PP04) the compressor is reactivated. **If parameter PC07 is active** (compressor safety times bypass in the changeovers) **the compressor safety times are not respected** (compressor minimum switch-off time – PC05 and minimum time between two switch-ons of the same compressor – PC06). The compressor will remain off completely for a time that will be maximum between PC08 and (PP05+PP06+PP04). In the case when a 3-way valve changeover time with pump off and a minimum switch-off time for the compressor are not envisioned during changeover of the cycle inversion valve, the compressor will always remain on.

On conclusion of the operation on DHW mode to reach the Set set or maximum time, the controller performs the sequence in reverse order:

- The compressor is switched off (only if PC08 ≠ 0 and/or PP06 ≠ 0)
- After the *Minimum delay between compressor switch-off and pump switch-off* (PP05) the pump is switched off (only if PP06 ≠ 0, otherwise the pump remains on)
- The 3-way valve changes over from the operation to the rest condition (the valve diverts the flow from the DHW tank to the Heating/Cooling plant. This operation envisions a changeover time that will depend of the type of valve used defined at parameter PP06, during which the pump must remain off. This time can be set at 0, in which case the pump is not switched off
- Half way through the changeover time, the inversion valve is made to changeover if activation of the cooling mode is envisioned; otherwise the inversion valve remains in the previous position. A compressor shutdown time is however envisioned (also if PP06=0) for the operating mode change (Parameter PC08), if the cooling function is active, half way through which there will be the effective changeover of the cycle inversion valve.
- The pump is reactivated

After the *Minimum delay between pump switch-on and compressor switch-on* (PP04) the compressor is reactivated. **If parameter PC07 is active** (compressor safety times bypass in the changeovers) **the compressor safety times are not respected** (compressor minimum switch-off time – PC05 and minimum time between two switch-ons of the same compressor – PC06). The compressor will remain off completely for a time that will be maximum between PC08 and (PP05+PP06+PP04). In the case when a 3-way valve changeover time with pump off and a minimum switch-off time for the compressor are not envisioned during changeover of the cycle inversion valve, the compressor will always remain on.

10.2 Using the auxiliary heating

In all operating modes in DHW mode, if the heat pump does not manage to take the DHW tank temperature to set within a time set by parameter, it is possible to make the available auxiliary heating steps intervene.

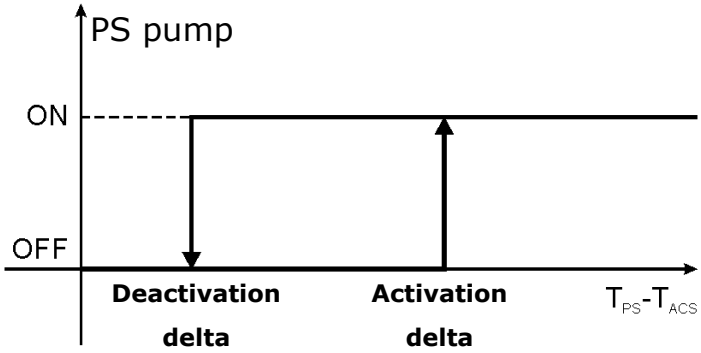
10.3 Management of a circuit of solar heating panels

The heat solar panels circuit is made up from a dedicated pump with relative flow meter an pump circuit breaker and a probe that detects the temperature of the water in the solar panels circuit.

The solar panels circuit pump can have a sniffing cycle, which can be activated from parameter with ON and OFF times always defined by parameter if pump operation is necessary to correctly detect the temperature of the solar panels circuit.

The solar panels pump will be activated as soon as the temperature detected by the solar panels circuit probe exceeds the temperature of the lower part of the DHW tank by a minimum delta defined by a parameter. The solar panels pump will be stopped when the temperature of the bottom part of the DHW tank rises above the temperature of the solar panels circuit decreased by a second delta defined by parameter (the second delta will be smaller than the first).

This regulation schematised in the following figure aims at maximum use of the solar panels "free" resource.



Code	Parameter description	Default	Min	Max	U.M.	Menu
PP31	Solar panels regulation probe: 0 – Input 1 – Output	0	0	1		IS-P
PP32	Solar panels pump activation delta	5.0 9.0	0.0	20.0 36.0	°C °F	IS-P
PP33	Solar panels pump deactivation delta	3.0 5.5	0.0	20.0 36.0	°C °F	IS-P
PP34	Pump switch on time during the Refresh Cycle	2	1	99	Min	IS-P
PP35	Pump delay before the refresh cycle	5	1	99	Min	IS-P

10.3.1 High temperature

In case of high temperature in the DHW tank (upper part of the tank) or in case of high temperature in the solar panel circuit, the pump will be disabled.

Code	Parameter description	Default	Min	Max	U.M.	Menu
PP36	DHW high temperature setpoint	70,0 158,0	0,0 32,0	90,0 194,0	°C °F	IS-P
PP37	DHW high temperature differential	10,0 18,0	0,0	20,0 36,0	°C °F	IS-P
PP38	Solar panel temperature setpoint	100,0 212,0	0,0 32,0	130,0 266,0	°C °F	IS-P
PP39	Solar panel high temperature differential	10,0 18,0	0,0	20,0 36,0	°C °F	IS-P

10.4 Anti-legionella

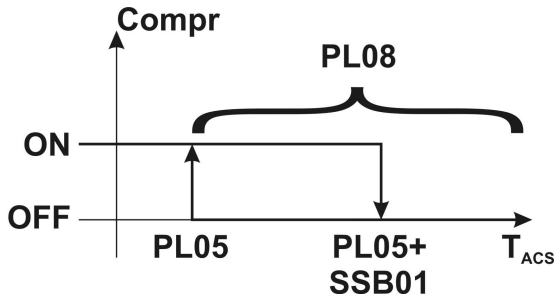
It is a high temperature heat treatment for the disinfection of the DHW accumulation tank, which must be performed periodically. If the anti-legionella cycle is enabled, it is performed with frequency defined by the *Anti-legionella cycle interval* (PL02); this is expressed in days. The count for the anti-legionella cycle is always active when the unit is powered. An anti-legionella cycle can be set at Power ON (PL03=1). In this case, as soon as the device is connected to the power supply voltage, an anti-legionella cycle is performed.

10.4.1 Performance method

On activation of the cycle, the unit changes over to DHW function with a regulation in lateral band mode with dedicated setpoint and bad the same as the DHW:

- Setpoint: *Set Anti-legionella* (PL05)
- Band: *DHW band* (SSB01)

During the anti-legionella cycle, if the temperature of the water in the DHW tank exceeds PL05+SSB01, the compressor is switched off. If the temperature drops below PL05, the compressor is re-activated as illustrated in the following figure:



To consider the anti-legionella cycle successful, the temperature must remain above PL05 for the *Anti-legionella maintenance time* (PL08). Once the anti-legionella cycle has been started, if just the compressor cannot manage to reach the anti-legionella set, aux. heating will be activated with the methods and delays defined in the dedicated paragraph.

If the unit cannot conclude the anti-legionella cycle successfully (T_{ACS} > PL05 for at least PL08), it will be interrupted after the *Maximum anti-legionella time* (PL04). In this case, the *anti-legionella alarm* (AL11) is activated as a signal. Once the anti-legionella cycle has been started, if the unit stops for an alarm or Power OFF, the status is memorised and on unit re-start, the anti-legionella cycle is also re-started. The PL08 time count is reset.

11 MANAGEMENT OF THE SOURCE EXCHANGER

The controller manages a source exchanger in a way to optimise the exchange of energy with the environment. There are three types of exchanger:

1. With finned heating elements: fan speed is regulated in this case
2. Water not reversible: in this case the source pump flow rate is regulated and the temperature of the water is monitored to prevent freezing. The reversing is in the refrigerated circuit with 2 exchangers. They change function moving from heating to cooling.
3. Water reversible: in this case the source pump flow rate is regulated and the temperature of the water is monitored to prevent freezing. The reversing is in the water circuit driving 2 electric valves changing the water flow. The thermoregulation is based on the condenser probe or on the evaporator probe according to the operation mode.

The regulation of the fans speed or the pump capacity is to maintain the condensing temperature in summer cycle and evaporation in winter cycle, within the established limits.

The condensation/evaporation temperature can be detected by one or two temperature or pressure probes according to the machine construction features. If there is just one sensor, this is not applicable if an EEV is used, which requires a pressure sensor and a temperature sensor always in low pressure.

In addition to the modulated automatic regulation of the probes, a fixed regulation of the exchanger speed/capacity is available through parameter PF01. The speed values are set by default through parameters PF61, PF62, PF63 e PF64.

11.1 Coils with finned heating elements with ventilation

Fan management, depending on machine configuration, can be managed with:

- Analogue output (0-10 V or PWM)
- Digital output (relay)
- Both analogue and digital output

In the last case, the digital output will be managed as enabling to the speed regulator operation (this enabling must be provided for some inverters in order to guarantee correct operation) and will be activated as soon as the analogue output value becomes greater than 0.

The regulation is PID. It is allowed to set a integral time (parameter PF67) and a derivative time (parameter PF68).

For all functions in which ventilation is envisioned (Cooling, Heating and Defrosting) a Set is defined, (condensation pressure in cooling mode (PF11) and defrosting mode (PF51), evaporation pressure in heating mode (PF21)), along with a proportional band (PF12/PF52/PF22), a minimum and maximum percentage in normal operating conditions for the activation and regulation of the fan speed (PF16 and PF17 / PF58 and PF59 / PF31 and PF32).

For modulating regulation when the pressure:

- from condensation is upwards in cooling mode
- from evaporation is downwards in heating mode

on reaching the relative set, the modulating ventilation is activated at minimum speed. In the case of PWM signal to pilot a phase cut regulation, a start-up at 100% will be envisioned for a period of time defined by parameter (PF27).

The fans speed modulates from minimum to maximum depending on the pressure trend:

- regarding condensation in ascent from Set to Set + PB (proportional band) in cooling mode
- regarding evaporation in descent from Set to Set – PB in heating mode

For the ON-OFF fans, activation occurs when the pressure:

- regarding condensation exceeds Set+PB in cooling mode
- regarding evaporation drops below Set+PB in heating mode

and deactivation occurs when the pressure:

- regarding condensation drops below the Set in cooling mode
- regarding evaporation rises above the Set in heating mode

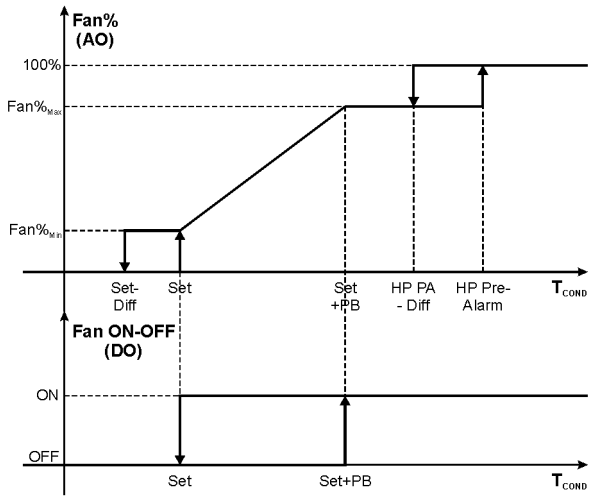
In the case of modulating regulation, if the relative high pressure prealarm is enabled when the pressure:

- from condensation upwards in cooling mode
- from evaporation downwards in heating mode

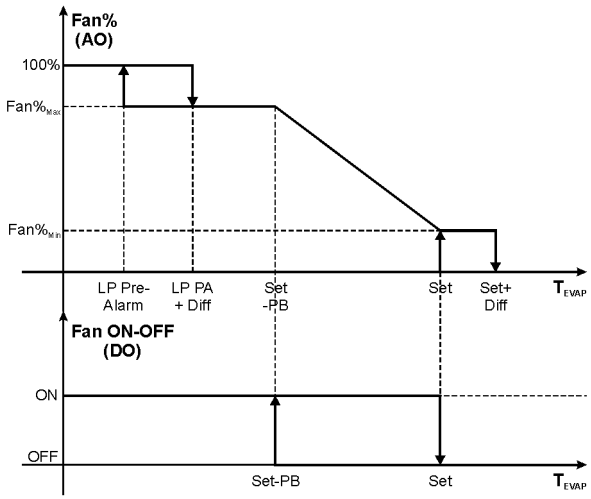
reaches the relative Prealarm set (HP in cooling mode, LP in heating mode), modulating ventilation is forced to 100% (parameters PF13, PF14, PF15, PF53, PF54, PF55, PF23, PF24 and PF25). This operation ends taking the fan speeds to the maximum in normal operating conditions of the active function when the pressure (parameters PF18, PF19, PF56, PF57, PF33 and PF34):

- regarding condensation drops below the HP prealarm threshold minus the relative differential is cooling mode
- regarding evaporation rises above the LP prealarm threshold plus the relative differential in heating mode

This trend is schematised for the cooling and heating functions by the figures 11.1 – 1 and 11.1 – 2 respectively.



Ventilation in Cooling mode



Ventilation in Heating mode

The functionality of the fans in defrosting mode differs slightly from that in cooling mode and will be detailed in the relative paragraph.

In case of 2 fans there will only be one analogue output. The first and the second fan will be switched on and so the relative enabling relay.

When switching on, it will be switched on the fan having the smallest number of working hours. When switching off, it will be switched off the fan having the biggest number of working hours.

Both of the fans satisfy the 50% of the total demand.

If the demand rises above 55% the second fan will be switched on and both them will work in parallel. If the demand falls below 45% the fan having the biggest number of hours will be switched off.

12 MANAGEMENT OF THE UTILITY EXCHANGER

The controller manages a utility water exchanger (typically, but not necessarily, with plates) with ON-OFF or modulating pump used to sustain the condensation pressure in cold winter start-ups of the plants (water in a very cold plant could lower the condensation too much) or to maintain the evaporation pressure sufficiently low in the hot summer start-ups of the plant (water in a very hot plant could raise the evaporation pressure too much). Also here there will be two ramps (one for the summer operating mode and one for the winter operating mode) to define pump modulation.
ON-OFF or modulating, the pump can be managed continuously, with heat regulation of with sniffing cycles.
The flow switch will also be managed in the same way.

13 MANAGEMENT OF DEFROSTING

Starting from the integration of simpler functions, the defrosting modes required for the controller (PD10) are described below.

13.1 Defrosting from key

Very simply it envisions a manual start-up mode of a defrosting cycle by entering any dedicated menu and starting the cycle by just pressing a key. In this case, it must be possible to select the exit from the cycle in "normal" mode or by time; his function is available in the user menu.

13.2 Timed defrosting

The most trivial way to perform defrosting, i.e. perform a defrosting cycle with pre-determined duration (PD06) after a certain operating time in heating mode (PD05).

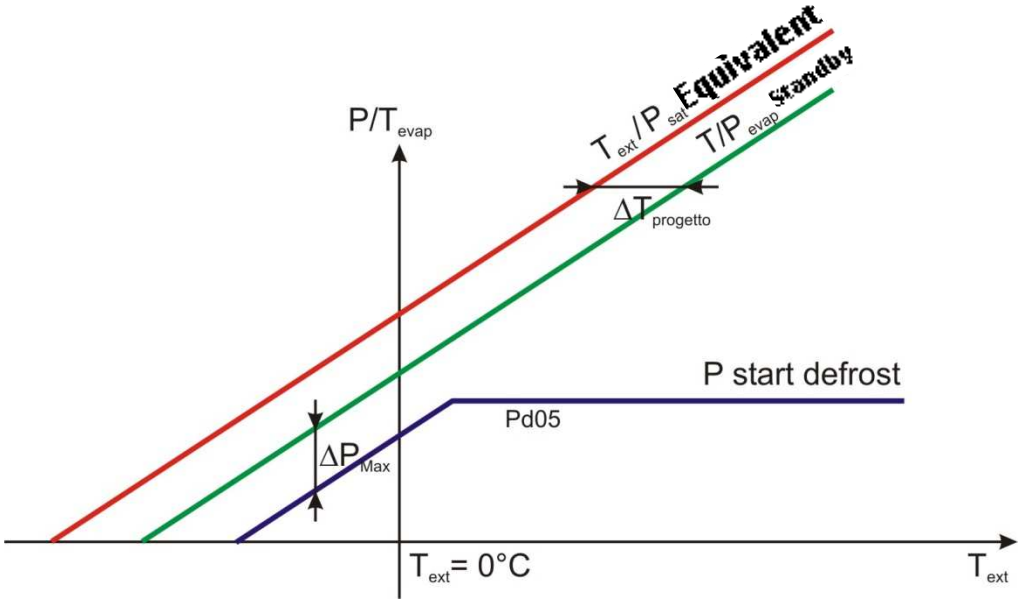
13.3 Defrosting in temperature and pressure modes

When the evaporation temperature drops below a value established by parameter (PD02), the counting of the defrosting delay time begins. The effective cycle starts at the end of this delay, with successive dripping period.
The length of the delay can be compensated on the basis of the temperature. The count will be suspended if the evaporation temperature rises above the count start set again and a count reset if the evaporation temperature exceeds the set of a differential established from parameter.

13.4 Adaptive defrosting

With the decrease of the external temperature, the evaporation pressure decreases even with clean coil. It is therefore logical to consequently reduce the defrosting delay set.
If the ***Dynamic compensation*** function is enabled via parameter PD10 described previously and the external temperature probe is present, enabled and not in error mode, the defrost start set is made dynamic.
The difference expected between the external temperature and the evaporation temperature must be set in the *External temperature – evaporation temperature differential* (PD11). This data will then be "updated" by the controller, measuring the effective difference after every successful defrost (not for maximum time) once the *Settling time after defrosting* has expired (PD13).
The differential measures will be mediated with the initial value of the parameter, which will be updated consequently. The effective differential can always be consulted (and modified) by accessing parameter PD11 (Manufacturer's Menu).
The maximum difference between expected and measured evaporation pressure (equivalent to Text – PD11), which can be accepted before starting the defrosting delay must then be declared in the *Dynamic defrosting pressure delta* (PD12).

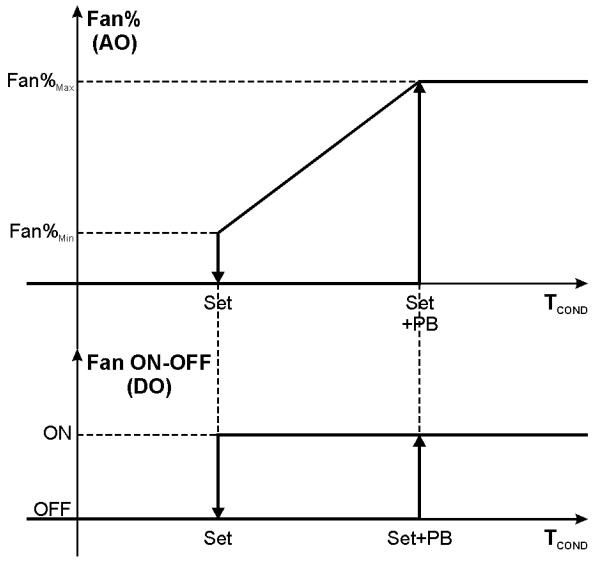
Depending on the differential expected between the external temperature and the evaporation temperature, the expected evaporation temperature is calculated and, consequently, the expected evaporation pressure. Starting from this datum, the set for start-up of the defrosting count is calculated by simply subtracting the value of the *Dynamic defrosting pressure delta* (PD12) described above.
The defrosting start effective set will be the lower of the value calculated as described above and the *Defrosting start set* (PD02). This value will be visible in the machine status menu and will however be limited by the parameter PD19.
The trend of the effective defrosting start set is schematised in the figure below.



By setting the *Type of defrosting compensation* at 4 (PD10 – default value), both time and dynamic compensation will be enabled, limiting the defrosting cycles to the strictly necessary and maximising the efficiency of the heat pump.

13.5 Ventilation in defrosting mode

It is necessary to be able to enable (from parameter PF03) ventilation during the defrosting cycle with a dedicated set of parameters (minimum and maximum speed, set and regulation band). In addition, the fan activation mode must be "inverted", i.e. instead of starting at the minimum speed when the condensing temperature exceeds the relative set, it must start at maximum speed when the condensing temperature exceeds the set + band.
This procedure allows to exit critical conditions in which the defrosting cycle cannot conclude satisfactorily with the complete evacuation of the ice from the coil. In fact, the ventilation causes a prolonged defrosting cycle without the condensing temperature becoming so high to send the machine into alarm mode, increasing the amount of ice removed from the coil. The trend of the fan speed in defrosting mode is represented in the following figure.



13.6 Holding time of the defrosting end temperature

There is a defrosting end condition, which determines the conclusion of the cycle itself (PD1) for any defrosting mode, except that timed. To prevent conclusions of the defrosting cycle without this having had the necessary effect, a machine operating time is defined in defrosting mode after the defrosting end condition has been reached (PD18).

13.7 Condensate drainage“anti-icing” heater

A heater is positioned inside the condensate drain pan in order to prevent the presence of ice during the defrosting. When the external temperature is lower than the limit set by parameter during a defrosting cycle, the heating element is activated.

The involved output can be:

- A dedicated digital output
- An analogue output with external relay
- The boiler output (if none of the above ones is configured)

Code	Parameter decription	Default	Min	Max	M.U.	Menu
Pd30	Enabling of the condensate drain pan heater during defrosting	No (0)	No (0)	Yes (1)		CO-D
Pd31	Condensate drain pan heater T° setpoint during defrosting	3,0 37,4	-10,0 14,0	30,0 86,0	°C °F	IS-D
Pd32	Condensate drain pan heater differential during defrosting	5,0 9,0	0,0 0,0	20,0 36,0	°C °F	IS-D

14 MANAGEMENT OF THE COMPRESSORS

The compressors require some simple precautional measures to guarantee the integrity, duration and good operation. There will be differences between ON-OFF and modulating compressors and other common characteristics. Below find the list of common characteristics.

14.1 Configuration of the power yielded by the compressors

In order to precisely modulate the power yielded by the machine in relation to the power required by the various active circuits, the controller allows to define the individual power fraction for each compressor. On the basis of the power required, at this data and the fact that the "next" compressor to switch-on/off is known, it will be possible to activate/deactivate the resources at the correct level.

Example: case of a modulating compressor plus an ON-OFF compressor. The fraction of the modulating compressor power is configured at 52% and of the ON-OFF compressor at 48%. This data will direct the heat regulation algorithm taking the modulating compressor to maximum power when the power requested reaches 52% of the total power. If the minimum power that can be supplied by the modulating compressor is 20%, the heat regulation algorithm can calculate that this fraction corresponds to 10.4% of the machine's total power. The modulating compressor will be taken to the minimum power and the ON-OFF compressor will be switched on when the power required by the plant reaches 58.4% of the total. Successively, the modulating compressor power will be increased proportionally to the required power.

14.2 Power limitation

This function allows limiting the total power of the unit according to the requirements. It is enabled configuring and connecting a power limitation probe (4-20 mA, 0-5V o 0-10 V) to an analog input of the controller or setting a value lower than 100 in parameter PC90 *Maximum power for the unit*.

When using the probe, this last will limit the power of the unit. The parameter PC90 will have no effect.

If the unit demands less than the power limitation, the unit works normally, vice-versa the power is limited.

Example

Limitation: 75%

The unit will normally work until the requested power is lower than 75%. As soon as the requested power rises above 75%, the power will be limited to this value.

14.3 Pump-down

The pump-down procedure is used to empty the evaporator partially from the refrigerant in excess.

Through the parameter *Enable pump-down* (PC91) it is possible to enable the pump-down and choose the kind of regulation: only by time (PC91=1) or with relative threshold (PC91=2) according to the evaporating pressure.

- In case of regulation by time, when the first compressor activation is required, the solenoid valve will be opened (it must be configured on a digital output) and after the time *Compressor delay since solenoid valve opening* (PC93) the compressor will be switched on. When switching off, all compressors will normally be switched off and after the time *Solenoid valve delay since compressor switching off* (PC94) the solenoid valve will be closed.

  In case of alarm of all compressors in the unit, the procedure does not take into consideration the valve delay.

- In case of regulation with relative threshold, when the first compressor activation is required the solenoid valve will be opened and after the time and after the time *Compressor delay since solenoid valve opening* (PC93) the compressor will be switched on. When switching off, when the last compressor is switched off the evaporating pressure value is recorded. This value will continuously be compared with the value read by the probe and when the difference between the recorded value and the value read by the probe is higher than the parameter *Pump-down disabling threshold* (PC92) the solenoid valve will be closed.
  In case of alarm of all compressors in the unit, the procedure does not take into consideration the valve delay.

14.4 Safety times

The following safety times will be defined (from parameter), valid for all compressors:

1. Minimum OFF time (PC05)
2. Minimum ON time(subject to alarm conditions) (PC04)
3. Minimum time between two successive starts of the same compressor (PC06)
4. Minimum time between the start of different compressors (PC03)
5. Minimum time between the switch-off of different compressors (PC11)
   There is also another safety time to avoid (in defrost) the contemporary switching on of more compressors, avoiding peaks of power consumprion.
6. Minimum time between the switching on of different compressors in defrost (PC13).

14.5 Switch-on/off sequence

If there is more than one compressor present, a sequence must be defined for activation of the compressors. There will be configurations that envision a fixed switch-on/off sequence and others in which the sequence will be variable. In the activation sequence, the correct power level for the activation of the "next compressor" will depend on the fraction of total power required for this compressor. The possible cases are listed below. The controller will be aware on the basis of the value of the configuration parameters.

14.5.1 Fixed sequence configurations

The configurations in which the switch-on and switch-off sequence is fixed are listed in Table 14.5.1 – 1 with relative explanation:

Configuration	Switch-on/off logic
A modulating compressor and an ON-OFF compressor	In normal conditions, the modulating compressor will always be activated first and then the fixed one. On switch-on, when the power required by the plant exceeds the level at which the modulating compressor is taken to minimum power and the ON-OFF compressor is switched on, the latter is switched on first and the modulating compressor is switched on after the ON-OFF compressor and its power is modulated according to plant requirement.
A modulating compressor and two ON-OFF compressors	In normal conditions, the modulating compressor will always be activated first and then the ON-OFF ones in sequence. On switch-on, when the power required by the plant exceeds the level at which the modulating compressor is taken to minimum power and the ON-OFF compressor is switched on, the latter is switched on first and the modulating compressor is switched on after the ON-OFF compressor and its power is modulated according to plant requirement.

14.5.2 Variable sequence configuration

Configuration with two or three ON-OFF compressors. Compressor activation is with steps (neutral area or proportional band) Independently from the number of active compressors, the "next" compressor to be activated will be that which, on the basis of the number of operating hours and number of peaks, has the least mechanical wear among those switched off. In the same way, the "next" compressor to be switched off will be that with the most mechanical wear among those switched on.

The compressors will be activated and deactivated in ascending order of number according to wear – The wear (w = wear) of the compressors is defined via a formula that relates it to the number of operating hours (h) and with the number of peaks (s) via two coefficients (n,k) defined by just as many parameters:

$$w = n \times h + k \times s$$

On selecting this type of sequence and putting on of the two parameters, which express the coefficients, to 0, only the number of operating hours or only the number of peaks can be taken into consideration. It is not possible to set both parameters at 0. The inactive compressor with lower wear index will be activated first. The active compressor with higher wear index will be switched off first.

Code	Parameter description	Default	Min	Max	U.M.	Menu
PC02	Compressors rotation: 0:FIFO 1:LIFO 2:FIFO+HS 3:LIFO+HS	3	0	3		CO-C
PC19	Compressors operating hours factor	1	0	255		IS-R
PC20	Compressors operating switch-on peaks factor	1	0	255		IS-R

14.6 Management of the modulating compressors

The modulating compressors require a series of additional measures with respect to the ON-OFF compressors. Every modulating compressor of each manufacturer has particular features, therefore it will be necessary to define an ABL for each of these, which contains all of these features. Below find the description of the envisioned management methods, which are qualitatively equal for all compressors. These management methods must be individualised for the various models. The BLDC compressors by SIAM will be taken as an example, whose features are known.

14.6.1 Switch-on and switch-off with relevant safety times

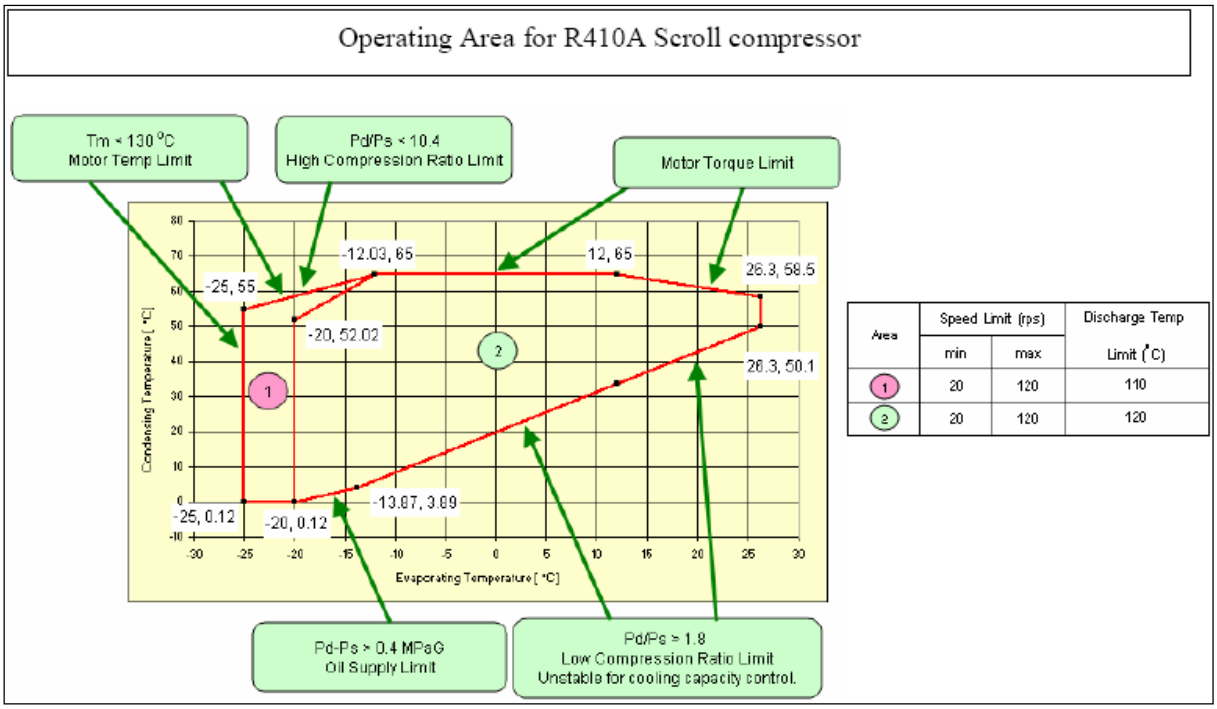
The compressor starts at a minimum speed, which depends on the model defined by the parameters (PC32-39-40).

Immediately after, the compressor will go to a high rotation speed to guarantee the oil returning and the stabilisation of the work conditions (PC41-42). In order to reach stabilisation speed from minimum rotation speed, the compressor must use the maximum acceleration allowed, which is limited by the parameter (PC47) also in deceleration. The compressor will start at minimum rotation conditions (PC32), it will go to a stabilisation speed (PC41) in a defined time (PC47).

Also on switch-off, the compressor must first go to the minimum speed and then switch off in a way to ensure the pressures in the circuit are balanced. In the case of switch-off due to an alarm, the compressor must not be switched off immediately but taken to minimum with greater deceleration, 7 rps (PC48).

14.6.2 Management of the modulating compressor envelope

In addition to the modulating compressor speed variation strategies, it is necessary to check that the work point is within the area allowed (Envelope), which is a work frequency function. The relative envelope that is managed by the application is defined for each compressor.

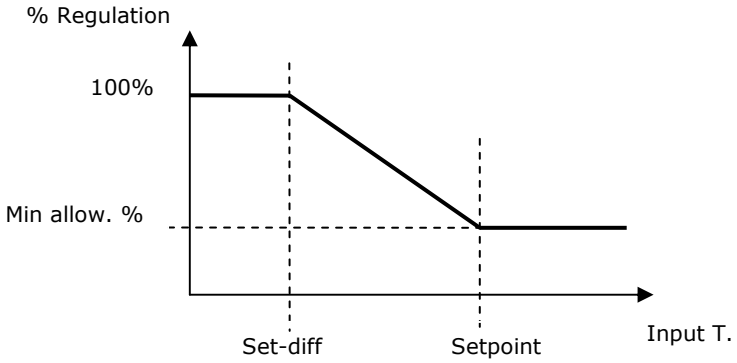


If the working point leaves the allowed area, the "AL17 Exit by envelope alarm" will be shown. The compressor will be switched off. The alarm is a self-resetting type. Over the number of alarms per hour (PA91), the alarm is a manual-resetting type.

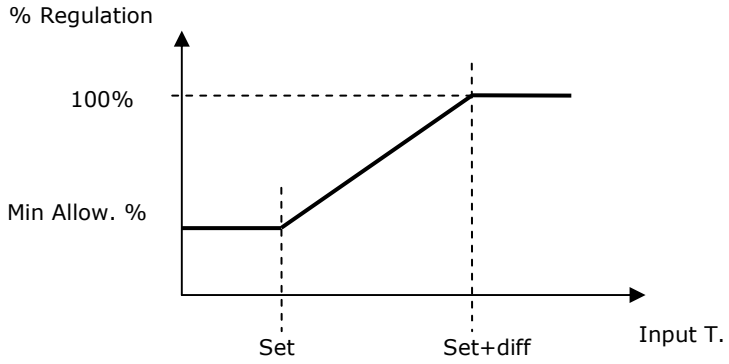
14.6.3 Reduction of rotation speed (unloading)

It is an unloading strategy (compressor rotation speed) for dealing with the transients (when water is too hot in summer time and too cold in winter time). The compressor speed is proportionally reduced until the water temperature falls back within a manageable range. If the limitation parameter is set to 100%, the regulation is disabled. If the parameter is set at a value lower than 100%, the regulation request, no matter if bigger, is limited to the said value.

Operation in Cooling mode



Operation in Heating mode



Code	Parameter description	Default	Min	Max	U.M.	Menu
PC80	Required power limit value (unloading) when using the modulating compressor	100,0	0,0	100,0	%	CO-R
PC81	Power limitation set (unloading) in cooling mode	25,0 29,0	SPC1	PA27	°C °F	CO-R
PC82	Power limitation set (unloading) in heating mode	15,0 29,0	PA26	SPH1	°C °F	CO-R
PC83	Unloading power limitation differential	5,0 9.0	0.0	20.0 36.0	°C °F	CO-R

14.6.4 Compressor oil return management

When compressor speed is low, oil return to the compressor is not granted. In order to avoid issues related to the lack of lubricant, compressor operations at low revolutions are allowed only for short times. The management strategy of this function is very simple: when the revolution speed falls below a valued determined by parameter (low load), a timing function is activated (determined by parameter). Once the timing has elapsed, the compressor is forced to the maximum speed for a time determined by a third parameter. As a result, water temperature usually reaches the setpoint and the compressor is consequently switched off at the end of the procedure. Should the request still be in progress, the compressor runs with a speed determined by the thermoregulation and another timing, where necessary, is activated.

Code	Parameter description	Default	Min	Max	U.M.	Menu
PC85	Modulating compressor oil return management mode: 0=Disabled 1=Only modulating mode 2=Modulating and OnOff mode	0	0	2		CO-R
PC86	Holding time below minimum threshold for oil return activation	5	0	999	Min	CO-R
PC87	Modulating compressor maximum speed forcing time for oil return activation	60	0	999	Sec	CO-R
PC88	Revolution minimum threshold for oil return activation	40.0	PC32	100.0	%	CO-R

15 MANAGEMENT OF ELECTRONIC EXPANSION VALVE

Management of electronic expansion valve with c-pro 3 kilo EEV HPRU (with with integrated driver)

The management of the electronic valve must be optimised and not limited to a classical overheating control.

There are several conditions and regulations that must consider other system variables as a whole, as well as the overheating variables (evaporation temperature and pressure) in a way to limit the problems due to the delays introduced by the temperature probe in the same and its positioning. These functions must be enabled from parameter in a way that the manufacturer can exclude them.

The selection of the type of valve is made with the parameter PV90. In the following table is specified how electronic driving valve parameters are set depending on the selection.

The minimum adjustment steps are the steps (Fullstep) to associate the 0% position (valve closed)

The maximum adjustment steps are the steps (Fullstep) to associate the 100% position (valve fully open)

The overdrive steps are the steps (Fullstep) of complete closure of synchronization

The StepRate is the speed of the valve, expressed in Fullstep/second

Step Mode is the valve driving method

The Duty Cycle is the wanted duty cycle to be set to avoid overheating of the board and depends on the phase current that requires the valve to be controlled (check with EVCO to setting this parameter if you are using the generic valve)

Setting PV90 = 0, the user is free to set the parameters (PV91 - PV96).

PV90	Valve name	Minimum regulation	Maximum regulation	Overdriving steps [FUll	Stepping rate [FullS	Mantenance volta	Supply voltage	Step Mode	Duty Cycle [%]
0	Generic valve	PV91	PV92	PV93	PV94	0V	12V	PV95	PV96
1	Sanhua DPF	0	250	300	45	0V	12V	HalfStep	100
2	Danfoss ETS6	0	250	300	45	0V	12V	HalfStep	100
3	Sporlan SER-U	0	800	1250	100	0V	12V	HalfStep	100
4	Sporlan ESX	0	250	300	45	0V	12V	HalfStep	100

15.1 Enabling of EEV operation

The controller knows when it is the time to activate the unit (switch a compressor on) and must consequently enable operation of the valve.

Operation enabling must precede compressor switch-on by a few seconds. The valve must be "prepared" in an open manner by a suitable percentage for the compressor being switched on.

15.2 PID parameters set

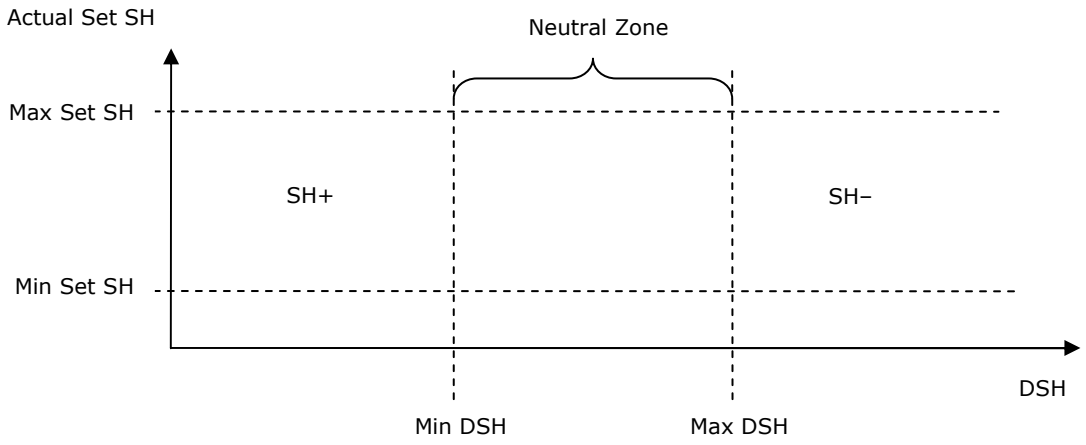
The controller envisions 2 independent sets of parameter to use in the cooling (and defrosting) and heating operating modes. The controller must be able to select the most appropriate parameters set on the basis of the operating mode. The set to use may simply be selected from the 2 available or the parameters could be passed directly (PV parameters can be reached from the manufacturer menu).

15.3 Modulation of the SH set (Neutral Zone)

In a machine operating correctly, the difference between compressor discharge temperature and the flow overheating condensing temperature (DSH) should be between 20 and 30K.

- If the DSH is too low, liquid may return to the compressor - to counter this phenomena it is useful to raise the SH set.
- If the differential is too high, there is no risk of liquid returning – considering the "favourable" condition in relation to safety of the compressor, the SH set can be reduced to increase system efficiency (reduction of the condensation pressure and increase of the evaporation pressure).

These variations will have a minimum and a maximum and can be set through parameter. A Neutral Zone regulation on the DSH is used to increase or decrease the SH set; each variation is subject to a delay time, thus enabling the system to become stable.



In this way, the risk of liquid return to the compressor is limited and system efficiency is increased according to the machine work conditions.

Code	Parameter description	Default	Min	Max	U.M.	Menu
PV60	Enables modulating SH (neutral zone)	Yes(1)	No (0)	Yes(1)		CO-V
PV61	Maximum SH set	15.0	3.0	25.0	K	CO-V
PV62	Minimum SH set	2.0	1.0	25.0	K	CO-V
PV63	Maximum DSH value	30.0	Pv64	50.0	K	CO-V
PV64	Minimum DSH value	20.0	0.0	Pv63	K	CO-V
PV65	SH variation delay outside the neutral zone	5	1	60	Min	CO-V
PV66	SH negative variation above the zone	0.2	0.1	2.0	K	CO-V
PV67	SH positive variation below the zone	1.0	0.1	2.0	K	CO-V

15.4 Pump down

The electronic valve can be disabled before switching the compressor off to perform the pump-down function where requested. The compressor (at minimum speed if modulating) will be switched off when the evaporating pressure drops below a dedicated parameter. On re-start, valve opening may be requested before the compressor starts to allow the pressures to rebalance. In this case, the compressor will be re-enabled when the evaporation pressure rises above another dedicated parameter.

16 MANAGEMENT OF THE COMPRESSOR BYPASS VALVE

This function, useful only if an ON-OFF compressor is used, sustains the evaporation pressure in winter cycle. The bypass valve will be activated if the evaporation temperature remains below a fixed value from parameter for a period of time defined by another parameter without this calling defrosting "into play". This means that the lowering of the evaporation temperature is fully justified by the lowering of the external temperature (or of the water that circulates in the external exchanger) but creates too many problems for the machine. In this case, the compressor bypass valve can be activated. The activation will have a maximum ON time, after which it must follow a minimum OFF period before being able to re-activate the valve and a maximum number of consecutive activations, after which the machine will "let itself go in alarm mode" without further interventions. The valve can be activated even if the discharge temperature is above a set for a defined time. In all cases, activation is intermittent with a T ON and a T OFF.

17 AUX. HEATING

The controller envisions the possibility to activate heating resources alternatively to compressors in situations where necessary. In all cases they are work conditions that lie outside normality and are considered "exceptional".
The resources available, will be set by the I/O configuration Manufacturer parameters:

- ***A boiler:*** this resource is connected downstream from the heat pump on the flow piping and can be used also for the production of DHW.
- ***An electric resistor for the heating circuit:*** as an alternative to the boiler, the possibility is envisioned to have this resistor when the boiler is absent or used only for the DHW tank.
- ***An electric resistor for the DHW tank:*** as an alternative or in addition to the boiler

The heat regulations that supervises the aux. heating will follow the same logic as those relative to the compressors defined by the configuration parameters, described in the paragraph relative to heat regulation (in lateral band or in neutral area if ON-OFF, PI if modulating); however they will have independent regulation bands for each resource listed.
The conditions and the modes with which heating can be activated are described in the following paragraphs, in addition to the alarm conditions, which will be highlighted in the relative paragraph.

17.1 External low temperature (air-water)

In the winter period, when the external temperature drops to particularly low values, it may no longer be convenient or sufficient to heat using the heat pump both regarding the heating circuit and the DHW. Two auxiliary heating levels are envisioned to manage this limit condition, defined by the *Aux. heating for low external temperature* parameter and which can assume the following values:

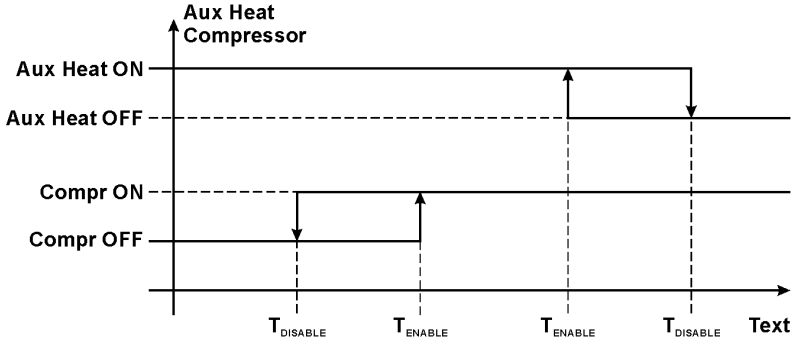
0 – Auxiliary heating for external low temperature disabled

1 – Auxiliary heating enabled in Integration mode: When the Text drops below the *Auxiliary heating set in integration mode*, the auxiliary heating is activated. The auxiliary heating is deactivated when the Text rises above the set + *Auxiliary heating differential in integration mode* again.

2 – Auxiliary heating enabled in Integration and Replacement mode: like in the previous case, in addition if the Text drops further below the *Auxiliary heating set in replacement mode*, the compressors are disabled. Therefore, only the aux. heating remains active. The compressors are re-enabled when the Text rises above the set + *Auxiliary heating differential in replacement mode* again.

3 – Auxiliary heating enabled in Replacement mode: When the Text drops below the *Auxiliary heating set in replacement mode*, the auxiliary heating is activated and the compressors are disabled. The auxiliary heating is deactivated and the compressors are re-enabled when the Text rises above the set + *Auxiliary heating differential in replacement mode* again.

In the last two cases, if the compressors are disabled due to low external temperature, they can be re-enabled (selected parameter) in the event of an alarm that blocks the auxiliary heating. Depending on the aux. heating for operating limit, the following figure illustrates:



Code	Parameter description	Default	Min	Max	U.M.	Menu
Pr16	Aux. heating (external air) set in integration mode for operating limit	0.0 32.0	-30.0 -22.0	10.0 50.0	°C °F	CO-A
Pr17	Aux. heating differential in integration mode for operating limit	10.0 18.0	0.0 0.0	20.0 36.0	°C °F	CO-A
Pr18	Aux. heating (external air) set in replacement mode for operating limit	-10.0 14.0	-30.0 -22.0	10.0 50.0	°C °F	CO-A
Pr19	Aux. heating differential in replacement mode for operating limit	10.0 18.0	0.0 0.0	20.0 36.0	°C °F	CO-A
Pr20	Compressor rehabilitation for resistor/boiler circuit breaker 0 = Compressor disabled 1 = Compressor enabled	1	0	1		CO-A

In this activation condition, the aux. heating configures as a further power step (integration) or a the unique source of energy both for the plant and for the DHW.
Replacement is easy. In fact, the operation of the aux. heating resource will be the same as that of the compressors.
In case of integration, it is more delicate as the compressors are active. In this case, the aux. heating will be activated, always maintaining the same work set (different according to the function active), only when the power required by the function exceeds 100% continuously for a minimum time defined by the parameter. The auxiliary heating resource will follow its own heat regulation independent from that of the compressor and will be deactivated (first) on reaching the set always maintaining the compressors at maximum power.

17.2 Setpoint not satisfied

Another case in which the auxiliary heating is activated is the impossibility to reach the active set (Heating, DHW and Anti-legionella) within a "reasonable" time, fixed by parameter.
In this case, an "individual" delay is defined for the various functions involved. The count of this delay will start from when the power required exceeds 100% and will continue until the power is maintained over this threshold. The count will be stopped if the power required drops below 100% and is restored at its initial value if the power required drops below 100% minus an offset defined by parameter. If the count reaches 0, the aux. heating is activated to favour arriving at the set in question. The auxiliary heating resource will follow its own heat regulation independent from that of the compressor and will be deactivated (first) on reaching the set always maintaining the compressors at maximum power.

17.3 Defrosting

During defrosting the temperature of the plant water of the DHW tank drops. A dedicated set will be defined to request activation of the aux. heating and to prevent the reference temperature from lowering too much.
Depending on the function active, the aux. heating resources available will be activated.

18 AUXILIARY FUNCTIONS

The controller manages the activation of auxiliary functions.

AUXILIARY OUTPUTS (IS-U)*					
Kind of auxiliary 1 regulation 0 = Cooling 1 = Geating 2 = Direct 3 = InversRevers	0	0	3		IS-U
Cooling setpoint for auxiliary 1 regulation	14,0	-50,0	302,0		IS-U
Auxiliary 1 regulation cooling differential	2,0	0,0	36,0		IS-U
Minimum value auxiliary 1 regulation	0,0	0,0	100,0	%	IS-U
Maximum value auxiliary 1 regulation	100,0	0,0	100,0	%	IS-U
Kind of analogue regulation auxiliary 1 0 = Minimum at unit ON 1 = Enabling step	1	0	1		IS-U
Enable regulation also with unit off 0 = Disabled 1 = Enabled	0	0	1		IS-U
Probe for auxiliary 1 regulation 0 = Disabled 1 = Inlet temperature 2 = Outlet temperature 3 = Upper part DHW temperature 4 = Lower part DHW temperature 5 = Outdoor temperature 6 = Coil 1 temperature 7 = Coil 2 temperature 8 = Outlet source temperature 9 = Inlet SP temperature 10 = Outlet SP temperature 11 = Compressor discharging temperature 12 = Suction temperature 13 = Condensing pressure 14 = Evaporating pressure 15 = AUX1 probe 16 = AUX2 probe 17 = Power limitation 18 = Source inlet temperature	0	0	18		IS-U
Heating setpoint for auxiliary 1 regulation	36,0	-50,0	302,0		IS-U
Auxiliary 1 regulation heating differential	2,0	0,0	36,0		IS-U
Delay auxiliary 1 alarm	10	0	999	Sec	IS-U

Kind of auxiliary 2 regulation 0 = Cooling 1 = Geating 2 = Direct 3 = InversRevers	0	0	3		IS-U
Setpoint freddo regolazione ausiliaria 2	14,0	-50,0	302,0		IS-U
Differenziale freddo regolazione ausiliaria 2	2,0	0,0	36,0		IS-U
Minimum value auxiliary 2 regulation	0,0	0,0	100,0	%	IS-U
Maximum value auxiliary 2 regulation	100,0	0,0	100,0	%	IS-U
Kind of analogue regulation auxiliary 3 0 = Minimum at unit ON 1 = Enabling step	1	0	1		IS-U
Enable regulation also with unit off 0 = Disabled 1 = Enabled	0	0	1		IS-U
Probe for auxiliary 2 regulation 0 = Disabled 1 = Inlet temperature 2 = Outlet temperature 3 = Upper part DHW temperature 4 = Lower part DHW temperature 5 = Outdoor temperature 6 = Coil 1 temperature 7 = Coil 2 temperature 8 = Outlet source temperature 9 = Inlet SP temperature 10 = Outlet SP temperature 11 = Compressor discharging temperature 12 = Suction temperature 13 = Condensing pressure 14 = Evaporating pressure 15 = AUX1 probe 16 = AUX2 probe 17 = Power limitation 18 = Source inlet temperature	0	0	18		IS-U
Heating setpoint for auxiliary 1 regulation	36,0	-50,0	302,0		IS-U
Auxiliary 1 regulation heating differential	2,0	0,0	36,0		IS-U
Delay auxiliary 1 alarm	10	0	999	Sec	IS-U

19 MOTORIZED VALVE

In the application there is the possibility of configuring a motorized valve that excludes the unit from the system when it is not active.
This function is enabled simply by configuring a digital output as "Motorized valve".
Turning on the machine will activate the digital output of the motorized valve and, once the time defined by parameter "PC89 - Motorized valve waiting time" has passed, the pump will also be turned on to ensure complete opening.
On switching off, the pump will first be switched off and the valve will also be closed after the time defined by parameter PC89.

20 PRE ALARMS

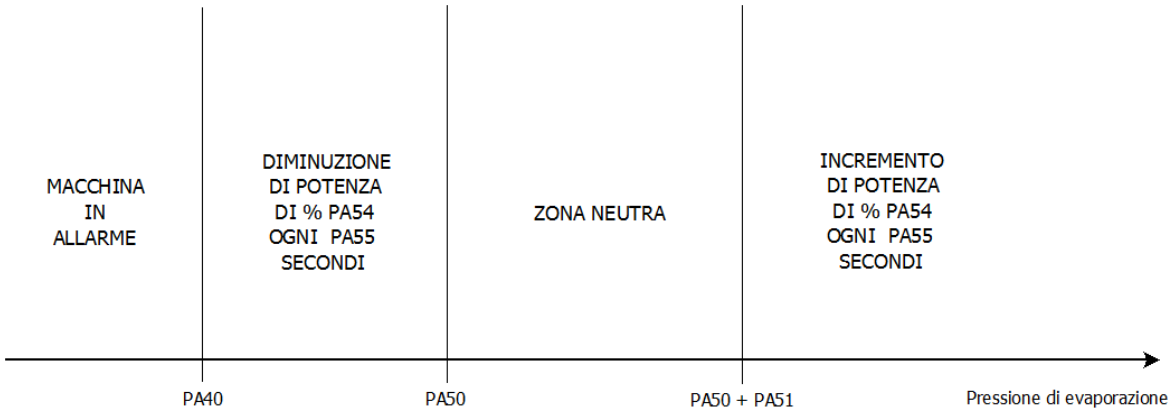
The management of low pressure, high pressure and cooling mode pre-alarms has been implemented to prevent limit conditions and to try not to make the machine go into alarm with consequent shutdown of the compressor and pump, trying to limit the power of the machine. This regulation is based on "global" parameters that are valid for each pre-alarm such as the percentage of power decrease and the time of engagement and release of the neutral zone and on specific setpoints and differentials for each of the 3 pre-alarms.
This adjustment is an adjustment in the neutral zone. This function is activated and therefore the power required by the machine will be decreased by a percentage defined by the parameter *Percent power decrease in pre-alarm* (PA54) after the *Pre-alarm neutral zone activation / release time* (PA55) when:

- in cooling mode, the value of the evaporation pressure probe is lower than the *Low pressure pre-alarm setpoint in cooling* (PA50)
- in heating, the value of the evaporation pressure probe is lower than the low *Pressure pre-alarm setpoint in heating* (PA97)
- the value of the condensation pressure probe is greater than the *High pressure pre-alarm setpoint* (PA52)
- the value of one of the user output temperature probes, user input probes, the lower part of the DHW tank or the source output is lower than the *Antifreeze pre-alarm Setpoint* (PA14)

The power will be decreased up to the minimum speed of the modulating compressor in the case of machines with modulating compressor or until only one compressor remains active in the case of machines with only On-Off compressors. A compressor will always remain on.
The power will always be increased by the parameter PA54 after the time PA55 until reaching the value of the requested power when:

- in cooling mode, the value of the evaporation pressure probe is greater than the *Low pressure pre-alarm setpoint in cooling* (PA50) plus the *Low pressure pre-alarm differential* (PA51)
- in heating, the value of the evaporation pressure probe is greater than the *Low pressure pre-alarm setpoint in heating* (PA97) plus the *Low pressure pre-alarm differential* (PA51)
- the value of the condensation pressure probe is lower than the *High pressure pre-alarm setpoint* (PA52) less the *High pressure pre-alarm differential* (PA53)
- the value of the probes specified above is greater than the *Antifreeze pre-alarm setpoint* (PA14) plus the pre-alarm antifreeze differential (PA15).

Esempio preallarme di bassa pressione



Each adjustment has its adjustment in the neutral zone and therefore its own percentage of decrease. If there are more pre-alarms that affect the power, only the pre-alarm that has the highest decrease percentage will be considered.

PRE ALARMS							
PA14	Antifreeze pre alarm set	5,0 41,0	PA03	10,0 50,0	°C °F	IS-S	
PA15	Antifreeze pre alarm differential	2,0 3,6	0,1 0,1	10,0 18,0	°C °F	IS-S	
PA50	Low pressure pre alarm set in cooling	4,0 58,0	PA40	10,0 145,0	Bar psi	CO-S	
PA51	Low pressure pre alarm differential	0,5 7,3	0,1 1,5	4,0 58,0	Bar psi	CO-S	
PA52	High pressure pre alarm set	37,0 536,5	16,0 232,0	PA48	Bar psi	CO-S	
PA53	High pressure pre alarm differential	5,0 72,5	0,1 1,5	10,0 145,0	Bar psi	CO-S	
PA54	Percentage decrease in power in pre-alarm	5,00	0	100,00	%	CO-S	
PA55	Activation/release time neutral zone pre alarm	10	1	999	Sec	CO-S	
PA97	Low pressure pre alarm set in heating	5,6 81,2	PA96	10,0 145,0	Bar psi	CO-S	

21 ALARMS

21.1 Anti-freeze

active function (Heating, Cooling or DHW) according to the parameters described below

- Plant anti-freeze alarm set
- Anti-freeze differential (as above)
- Anti-freeze alarm by-pass time
- Unit automatic switch-on for anti-freeze operation

The anti-freeze control is active also with unit off (controller powered and in anti-freeze stand-by operating mode).
A specific threshold is envisioned for the winter operating mode only, with relative differential to activate the unit and to signal an alarm.
If the anti-freeze alarm should remain for a *pumps operating time with low temperature*, the pump is switched off until the successive alarm reset.
If the integration resistors are present on the unit heating coil and on the DHW tank, these can be made to operate along with the pump or, alternatively, on unit start-up for anti-freeze according to the value of parameter Pr02.
If an anti-freeze condition occurs during the production of DHW, 2 situations may arise:
The DHW Enabling parameter in anti-freeze mode (PH05) = 1: in this case, the unit continues to operate in DHW mode
The DHW Enabling parameter in anti-freeze mode (PH05) = 0: in this case, the unit changes over to the previous operating mode.
In all cases the unit implements the actions envisioned (aux, heating switch-on etc.) and switches off if it is not possible to exit the anti-freeze condition.

21.2 Temperature alarms control

The temperature alarms are managed only with machine operating, on the basis of the operating mode, monitoring the temperature of the water detected by the various probes present and comparing them with the limits set in the dedicated parameters. The following parameters are valid for all temperature alarms:

- *Consequence of a temperature alarm* (PA20) which defines the action envisioned if one of this alarms occurs:
  - PA20 = 0 Disabled
  - PA13 = 1 – The temperature alarm is signal only.
  - PA13 = 2 – The temperature alarm causes the unit block with reset always automatic
  - PA13 = 3 – The temperature alarm causes unit block with automatic reset. If the alarm condition is maintained for the *Temperature alarm maximum time* (PA21), the alarm becomes manual reset.
- *Temperature alarm delay* (PA23), which defines the minimum time within which the alarm condition must remain active before the alarm is indicated and the actions envisioned are implemented.
- *Temperature alarm differential* (PA22), which defines the differential with respect to the set necessary to consider the alarm condition finished. Reset the alarm (always automatic) and restore full operability of the unit.
- *Temperature alarms bypass on switch-on* (PA24), which defines the prevention time of the temperature alarms on unit start-up (from OFF)

If an alarm condition has occurred and the condition remains active for the time PA18, the relative alarm code defined in the following paragraphs is signalled.

21.2.1 High temperature alarm:

The *High temperature alarm* (AL02) is defined within the limits and actions implemented (P20), as follows:

- Operation in heating mode: the **flow** temperature must exceed *the high temperature alarm in heating mode* (PA25). On activation of the alarm, the compressor is switched off along with all active auxiliary heating steps and the circulation pump is kept active.
- Operation in DHW mode: the **DHW and/or flow** temperature must exceed *the high temperature alarm in DHW mode* (PA29). On activation of the alarm, the compressor is switched off along with all active auxiliary heating steps and the circulation pump is kept active.
- Operation in Anti-legionella mode: the **DHW and/or flow** temperature must exceed *the high temperature alarm in Anti-legionella mode* (PA31). On activation of the alarm, the compressor is switched off along with all active auxiliary heating steps and the circulation pump is kept active.
- Operation in cooling mode: the **return** temperature must exceed *the high temperature alarm in cooling mode* (PA27). On activation of the alarm, the compressor and the circulation pump are switched off. The circulation pump will be re-activated periodically for a refresh cycle. If the condition is maintained for the temperature alarm maximum time (PA21) and PA20 = 3, the compressor and circulation pump are switched off and the alarm becomes manual reset.

21.2.2 Low temperature alarm:

The *Low temperature alarm* (AL01) is defined within the limits and actions implemented (PA20), as follows:

- Operation in heating mode: the **return** temperature must drop below *the low temperature alarm in heating mode* (PA26). On activation of the alarm, the auxiliary heating steps are activated in sequence. If the condition is maintained for the *temperature alarm maximum time* (PA21) and PA20 = 3, all of the utilities are switched off (compressor, auxiliary heating, circulation pump) and the alarm becomes manual reset. TBI
- Operation in DHW and Anti-legionella mode: the **DHW and/or return** temperature must drop below *the low temperature alarm in DHW mode* (PA30). On activation of the alarm, the heating steps are activated in sequence. If the condition is maintained for the *temperature alarm maximum time* (PA21) and PA20 = 3, all of the utilities are switched off (compressor, auxiliary heating, circulation pump) and the alarm becomes manual reset. TBI
- Operation in cooling mode: the **flow** temperature must drop below *the high temperature alarm in cooling mode* (PA28). On activation of the alarm, the compressor is switched off and the circulation pump is kept active.

21.2.3 Compressor discharge gas temperature high alarm

The controller also manages the "compressor discharge hot gas" temperature probe. If the temperature of the hot gas exceeds the discharge high temperature alarm (PA85), a *Compressor discharge high temperature* alarm (AL21) with automatic reset. The alarm becomes manual reset if the *Number of high temperature exhaust gas alarm interventions* (PA88) occurs in one hour. The alarm causes the compressor to switch off.

21.3 Pressure alarms control

The pressure alarms are managed, on the basis of the operating mode, by monitoring the status of the high and low pressure switches and the pressure detected by the high and low pressure transducers. The parameter PA95 can be used to select whether the circulation pump is switched off or on during high pressure alarms.

21.3.1 High pressure from pressure switch alarm

If the high pressure switch digital input is activated, the *high pressure alarm from pressure switch* (AL04) is activated, which causes the immediate shutdown of the compressor and has automatic reset. The alarm becomes manual reset if the *Number of high pressure alarm interventions* (PA89) occurs in one hour.

- If heating requests are in progress in heating of DHW mode, the heating is activated and the circulation pump remains active with normal operation.
- The circulation pump is switched off (if PA95=1) in cooling mode and ventilation is forced to (or maintained at) maximum, even if it is linked to compressor switch-on (PF02=1).

21.3.2 Low pressure from pressure switch alarm

If the low pressure switch digital input is activated, and remains active for the *Low pressure alarm delay* (PA56), the *low pressure alarm from pressure switch* (AL05) is activated, which causes the immediate shutdown of the compressor and has automatic reset. The alarm becomes with manual reset if the *Number of low pressure alarms for manual reset* (PA43) occurs several in an hour.

- In heating or DHW mode, if there are heating requests in progress, the heating is activated, the circulation pump remains active with normal operation and ventilation is forced to (or maintained at) maximum, even if it is linked to compressor switch-on (PF02=1).
- The circulation pump remains active in cooling mode.

Some particular cases must be indicated:

- Low pressure switch digital input active with compressor off: if in this situation the switching on of the compressor is required neither the activation of the circulation pump is allowed if it is linked to the thermoregulation (PP11> 0) nor the switching on of the compressor. The alarm *Low power start alarm* (AL08) will be signaled with automatic reset. The alarm becomes manual reset if the *Number of low start-up pressure alarms* (PA90) is checked in one hour.
- Bypass on start-up: on compressor switch-on, the low pressure alarm is prevented due to the *Low pressure alarm bypass time at compressor start (PA42)*, during which, activation of the low pressure switch does not cause the alarm to be triggered.

21.3.3 High pressure from transducer alarm

If the condensation pressure exceeds the *High pressure alarm set* (PA48), the *high pressure alarm from transducer* (AL06) is activated with management identical to that of the high pressure alarm from pressure switch. The alarm condition annuls (and the alarm becomes resettable) when the condensation pressure drops by the *High pressure alarm differential* (PA49) below the set PA48.

The alarm is initially with automatic reset, unless it exceeds a certain number of interventions in the hour (PA89), in which case it becomes manual reset and can be reset if in the meantime the pressure has fallen below the minimum threshold (PA48) of a certain differential value (PA49).

21.3.4 Low pressure from transducer alarm

If the pressure read by the transducer is lower than the setpoint (PA40 in cooling and PA96 in heating) with the compressor off and the compressor is requested to be switched on, neither the circulation pump is allowed to run if it is linked to the thermoregulation (PP11> 0) nor compressor start-up. The alarm *Low power start alarm* (AL08) will be signaled with automatic reset. The alarm will reset when the pressure is higher than the setpoint (PA40 or PA96) plus the *Low pressure alarm differential* (PA41). The alarm becomes manual reset if the *Number of low start-up pressure alarms* (PA90) is checked in one hour.

The low pressure transducer alarm can also be activated during the bypass time when the compressor is switched on, according to the *Low pressure alarm activation value during bypass* (PA44):

- PA44 = 0 – Alarm disabled during bypass
- PA44 = 1 – Alarm enabled during bypass only in cooling mode
- PA44 = 2 – Alarm enabled during bypass only in heating mode and DHW
- PA44 = 3 – Alarm always enabled during bypass

If during the bypass the evaporation pressure drops below the *Low pressure alarm setpoint during the bypass* (PA45) and for the *Low pressure alarm delay during the bypass* (PA47) it remains lower than the PA45 setpoint plus the *Low pressure alarm differential during the bypass* (PA46) the *Bypass low pressure alarm* (AL33) will be activated with manual reset with management identical to that of the low pressure alarm from pressure switch.

If the compressor is active and the bypass period is over, if the evaporation pressure drops below

- *Low pressure alarm set in cooling mode* (PA40) in cooling mode
- *Low pressure alarm set in heating mode* (PA96) in Heating mode

for the *Low pressure alarm delay* (PA56) the *Low pressure alarm from transducer* (AL07) is activated with management identical to that of the low pressure alarm from pressure switch.

The alarm condition is canceled and the alarm resets (or becomes resettable) when the evaporation pressure:

- Passes the *Low pressure differential* (PA41) over the PA40 set in cooling mode.
- Passes the *L*ow pressure differential (PA41) or the PA96 set in heating.

As for low pressure alarm from pressure switch, with the following additions:

The alarm is initially with automatic reset, unless it exceeds a certain number of interventions in the hour (PA43), in which case it becomes manual reset and can be reset if in the meantime the pressure has risen above the minimum threshold of one certain differential value.

21.4 Overheating control algorithm alarms control

Are alarms that are calculated only if the control algorithm of the overheating is enabled. Are automatically reset every time is disable the control of superheat.

For all these alarms can be set a delay time: if the measurement is out of range is first signaled a warning, when the set delay expires the alarm is activated.

It can be also set a differential: if you are in a state of warning and the measure falls on the threshold of an amount equal to the hysteresis, measurement status automatically returns OK without signaling an alarm.

21.4.1 Low overheating LoSH alarm

If the overheating drops below the set threshold (PV02, PV12) for longer than permitted (PV71) is activated the low overheating alarm. A differential can be set (PV70).

21.4.2 High overheating HiSH alarm

If the overheating rises over the set threshold (PV03, PV13) for longer than permitted (PV73) is activated the high overheating alarm. A differential can be set (PV72).

21.4.3 Low operative pressure LOP alarm

If the evaporation temperature drops below the set threshold (PV04, PV14) for longer than permitted (PV83) LOP alarm is activated. A differential can be set (PV82).

A correction algorithm is activated during the state of warning that changes the position of valve opening.

21.4.4 High operative pressure MOP alarm

If the evaporation temperature rises above the set threshold (PV05, PV15) for longer than permitted (PV77) the MOP alarm is activated. A differential can be set (PV76).

A correction algorithm is activated during the state of warning that modifies the setpoint of overheating which acts on the control of overheating.

The parameters that regulate this algorithm are:

- PV78: working band of the control algorithm of the MOP
- PV79: filter applied to the measurement of the evaporation temperature
- PV80: maximum variation applicable to the superheat setpoint
- PV81: delay with which is activated the control algorithm of MOP to activation of the superheat control.

21.4.5 Low pressur LP alarm

If the evaporator pressure drops below the set threshold (PV34) for longer than permitted (PV75) LOP alarm is activated. A differential can be set (PV74).

21.5 Phase sequence alarm

It is possible to manage the condition of phase failure or phase sequence incorrect by configuring a digital input as "Phase sequence" and connecting the output of a relay that detects this condition.

If the digital input is activated, the phase sequence alarm will be signaled and all active three-phase loads will be turned off: compressors, user pump, source pump and solar panel pump, fans, integration resistors, antifreeze heater and auxiliary outputs.

21.6 Diagnostics

There are two types of alarms, those with manual reset and those with automatic reset. It is possible for many alarms to set the type of reset most suitable for needs from parameter.

21.6.1 Alarms with manual reset

If an alarm with manual reset occurs:

- The alarm icon will start to flash

By pressing the ENTER key (set) from the "Alar" menu, the code of the first active alarm is displayed.

Once the conditions for which the alarm has occurred have ceased, the alarm can be reset manually. To perform this operation:

- position on the page of the alarm to be restored
- hold down the ENTER key (set) for about 2 seconds.

At this point, if there is no other alarms, the page indicating "none" will be presented. The alarm icon will switch off and the machine will go back to regular operation. If instead, other alarms are present, the code relative to the next active alarm will be displayed.

The consequences that derive from an active manual alarm remain valid until the user cancels the alarm message.

21.6.2 Alarms with automatic reset

If an alarm with automatic reset occurs:

- The alarm icon will start to flash

By pressing the ENTER key (set) from the "Alar" menu, the code of the first active alarm is displayed.
Once the conditions causing the alarm have ceased, reset and cancellation of the alarm message restore themselves automatically without user intervention.
The consequences that derive from an active automatic alarm remain valid until the causes triggering the alarm are reset.

21.7 Alarms Table

Code	Description of the alarm	Type	Consequence	Notes
AL01	Low temperature	S/A/M	Signal only or OFF Compressor (*1)	Settable delay
AL02	High temperature	S/A/M	Signal only or Compressor OFF (*1)	Settable delay
AL03	Flow switch	A/M	Compressor OFF Pump OFF after PP09	Settable delay
AL04	High pressure from pressure switch	A/M	compressor OFF (*2)	
AL05	Low pressure from pressure switch	A/M	compressor and fan OFF (*2)	Start delay at settable operating conditions
AL06	High pressure from transducer	A/M	compressor OFF (*2)	
AL07	Low pressure from transducer	A/M	compressor and fan OFF (*2)	Start delay at settable operating conditions
AL08	No start-up due to low pressure	A/M	Compressor OFF	Settable delay
AL09	Anti-freeze	Manu	Compressor OFF pump OFF after PP10 (*3)	Settable delay
AL10	Solar panels flow switch	A/M	Pump OFF after PP09	Settable delay
AC21	Compressor 1 circuit breaker	A/M	Compressor OFF	Settable delay
AC22	Compressor 2 circuit breaker	A/M	Compressor OFF	Settable delay
AC23	Compressor 3 circuit breaker	A/M	Compressor OFF	Settable delay
AC24	Boiler circuit breaker	A/M	Boiler OFF	Settable delay

AC25	Fan circuit breaker	A/M	Fan OFF Compressor lock if PA84 > 0	Settable delay
AC26	Utility pump circuit breaker	A/M	Pump OFF	Settable delay
AC27	Source pump circuit breaker	A/M	Pump OFF	Settable delay
AC28	Solar panels pump circuit breaker	A/M	Pump OFF	Settable delay
AC29	Resistor circuit breaker	A/M	Resistor OFF	Settable delay
AC30	DHW resistor circuit breaker	A/M	DHW resistor OFF	Settable delay
AL11	Compressor discharge gas temperature high	A/M	Compressor OFF	Settable delay
AL12	Anti-legionella	A/M	Display	Settable delay
AL13	Operating limit	A/M	Display	
AL14	Defrost	A/M	Display	
AC01	Compressors operating hours	Auto	Display	
AP01	Utility pump operating hours	Auto	Display	
AP02	Source pump operating hours	Auto	Display	
AP03	PS pump operating hours	Auto	Display	
AF01	Fan 1 operating hours	Auto	Display	
ES01	Input temperature probe (utility)	Auto	Inhibits the functionalities that use it	Settable delay
ES02	External temperature probe	Auto	Inhibits the functionalities that use it	Settable delay
ES03	Output temperature probe (utility)	Auto	Inhibits the functionalities that use it	Settable delay
ES04	Output temperature probe (source)	Auto	Inhibits the functionalities that use it	Settable delay
ES05	Coil probe temperature 1	Auto	Inhibits the functionalities that use it	Settable delay
ES06	DHW temperature probe (high part)	Auto	Inhibits the functionalities that use it	Settable delay
ES07	DHW temperature probe (low part)	Auto	Inhibits the functionalities that use it	Settable delay

ES08	Solar panels output temperature probe	Auto	Inhibits the functionalities that use it	Settable delay
ES09	Solar panels input temperature probe	Auto	Inhibits the functionalities that use it	Settable delay
ES10	Condensation pressure transducer	Auto	Inhibits the functionalities that use it	Settable delay
ES11	Compressors unload temperature probe	Auto	Inhibits the functionalities that use it	Settable delay
ES12	Suction temperature probe	Auto	Inhibits the functionalities that use it	Settable delay
ES13	Evaporation pressure transducer	Auto	Inhibits the functionalities that use it	Settable delay
ES14	Coil probe temperature 2	Auto	Inhibits the functionalities that use it	Settable delay
AL15	I/O configuration alarm	Auto	Display	
AL16	Modulation compressor discharge temperature limit	Auto	Compressor OFF	
AL17	Output alarm from envelope	A/M	Compressor OFF	Settable delay
AL19	RTC discharged/broken alarm	A/M	Display	
AL20	Inverter alarm	Auto	Compressor OFF	
ES15	Auxiliary 1 probe	Auto	Inhibits the functionalities that use it	Settable delay
ES16	Auxiliary 2 probe	Auto	Inhibits the functionalities that use it	Settable delay
ES17	Power limitation probe	Auto	Inhibits the functionalities that use it	Settable delay
AL27	Phases sequence alarm	Manu	Compressor OFF Pumps OFF (utility, source and solar panels) fans OFF	

			heater OFF auxiliary outputs OFF	
ES18	Source input temperature probe	Auto	Inhibits the functionalities that use it	Settable delay
AL28	Master communication alarm	A/M	Display	Fix 5 minutes
AF02	Working hours fan 2	Auto	Display	
AC31	Fan 2 circuit breaker	A/M	fans OFF compressor lock if PA84 > 0	Settable delay
AL29	Auxiliary 1 alarm	Auto	Inibisce la regolazione ausiliaria se presente altrimenti sola segnalazione	Settable delay
AL30	Auxiliary 2 alarm	Auto	Inibisce la regolazione ausiliaria se presente altrimenti sola segnalazione	Settable delay
AL31	Water level alarm	A/M	compressor OFF pump OFF after PP09	Settable delay
AL32	EVD bypass alarm	Auto	Inhibits the functionalities that use it	Settable delay
AL33	Bypass low pressure alarm	Manu	Compressor and fan OFF (*[2])	Settable delay
AL21	EEV alarm: LoSH (low overheating)	Auto	Compressor OFF	Alarm for c-pro 3 kilo EEV HPRU Settable delay
AL22	EEV alarm: HiSH (high overheating)	Auto	Compressor OFF	Alarm for c-pro 3 kilo EEV HPRU Settable delay
AL23	EEV alarm: LOP (low operative pressure)	Auto	Compressor OFF	Alarm for c-pro 3 kilo EEV HPRU Settable delay
AL24	EEV alarm: MOP (high operative pressure)	Auto	Compressor OFF	Alarm for c-pro 3 kilo EEV HPRU Settable delay
AL25	EEV alarm: LP (Low pressure)	Auto	Compressor OFF	Alarm for c-pro 3

				kilo EEV HPRU Settable delay

(*) To the startup all the alarms are cancelled

(*1) The pump is commanded on the basis of the mode (heat/cool) and the type of alarm (high/low temperature)

(*2) The pump is commanded on the basis of the mode (heat/cool) and the type of alarm (high/low pressure)

(*3) Alternatively, the unit is switched on or the resistors are activated

S/A/M = Signal alarm, Auto or Manual (can be set from parameter or for number of interventions/hour)

21.8 Alarms log

The controller envisions an alarm log that traces the last 100 "exceptional" events (including, for example, manual operation or defrosting from key). On exceeding 100 events, the oldest will be overwritten. In the case of events that do not indicate an alarm (defrosting from key etc.), pre-alarms and automatic reset alarms, the date and time of the start and end of the alarm condition will be recorded. In the case of alarms with manual reset the date and time of manual reset will also be recorded.

22 CONFIGURATION PARAMETERS

22.1 General list of configuration parameters

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
USER MENU (UT)							
MOdE	Sets the operating mode: 0: CooL, (Cooling/Summer) 1: HEAt (Heating/Winter)	0	0	1		UT	
SPC1	Cooling Setpoint	8.5 47.3	PC21	PC22	°C °F	UT	
SPH1	Heating Setpoint	40.0 104.0	PC23	PC24	°C °F	UT	
SPB1	Domestic Hot Water (DHW)	50.0 122.0	20.0 68.0	95.0 203.0	°C °F	UT	
SSB1	Sets the differential value of the domestic water setpoint	1.0 1.8	0.0 0.0	10.0 18.0	°C °F	UT	
SCDI	Cooling setpoint from DI	10.0 50.0	PC21	PC22	°C °F	UT	
SHDI	Heating setpoint from DI	45.0 113.0	PC23	PC24	°C °F	UT	
PSd1	User Password	0	-999	9999		UT	
MAINTENANCE MENU (MA)							
OPERATION (MA-F)							
PM00	Compressor operating hours limit	2000	0	9999	hours x 10	MA-F	
PM30	Pump operating hours limit	2000	0	9999	hours x 10	MA-F	
PM40	Fan operating hours limit	2000	0	9999	hours x 10	MA-F	
FORCING (MA-F)							
PM01	Compressor 1 operating hours	0	0	9999	hours x 10	MA-F	
PM02	Compressor 2 operating hours	0	0	9999	hours x 10	MA-F	
PM03	Compressor 3 operating hours	0	0	9999	hours x 10	MA-F	
PM04	Peaks of compressor 1	0	0	9999	peaks x 100	MA-F	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PM05	Peaks of compressor 2	0	0	9999	peaks x 100	MA-F	
PM06	Peaks of compressor 3	0	0	9999	peaks x 100	MA-F	
PM31	Pump operating hours	0	0	9999	hours x 10	MA-F	
PM32	Source pump operating hours	0	0	9999	hours x 10	MA-F	
PM33	Solar panels pump operating hours	0	0	9999	hours x 10	MA-F	
PM41	Fan 1 operating hours	0	0	9999	hours x 10	MA-F	
PM42	Fan 2 operating hours	0	0	9999	hours x 10	MA-F	
PM91	Year of last maintenance	2011	2011	2060		MA-F	
PM92	Month of last maintenance	1	1	12		MA-F	
PM93	Day of last maintenance	1	1	31		MA-F	
MANUAL OPERATION (MA-M)							
PM11	Enabling of manual operation of compressor 1 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM12	Enabling of manual operation of compressor 2 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM13	Enabling of manual operation of compressor 3 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM21	Compressor 1 forced switch-on 0: compressor switch off 1: compressor switch on	0	0	1		MA-M	
PM22	Compressor 2 forced switch-on 0: compressor switch off 1: compressor switch on	0	0	1		MA-M	
PM23	Compressor 3 forced switch-on 0: compressor switch off 1: compressor switch on	0	0	1		MA-M	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PM51	Enabling of fan manual operation 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM52	Enabling of pump manual operation 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM53	Enabling of solar panels pump manual operation 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM54	Enabling of manual operation of the source pump 0: Auto – normal operation 1: Manu – manual operation	0	0	1		MA-M	
PM61	Fan speed forcing	0.0	0.0	100.0	%	MA-M	
PM62	Pump switch-on forcing 0: pump switch off 1: pump switch on	0	0	1		MA-M	
PM63	Solar panels pump switch-on forcing 0: pump switch off 1: pump switch on	0	0	1		MA-M	
PM64	Source pump switch-on forcing 0: pump switch off 1: pump switch on	0	0	1		MA-M	
CALIBRATION (MA-CA)							
PM81	Return temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM82	External temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM83	Low pressure transducer calibration	0.0 0.0	-20.0 -290.0	20.0 290.0	Bar psi	MA-CA	
PM84	Flow temperature probe calibration	0.0 0.0	-20.0 -290.0	20.0 290.0	Bar psi	MA-CA	
PM85	High pressure transducer calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PM86	Compressor discharge temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM87	DHW high part temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM88	DHW low part temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM89	Coil 1 temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM90	Coil 2 temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM91	Source output temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM92	Solar panels input temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM93	Solar panels output temperature probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM94	Auxiliary 1 probe calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM95	Auxiliary 2 probe calibration	0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PM96	Power limitation probe calibration	0.0	-10.0	10.0	%	MA-CA	
PM97	Source input temperature calibration	0.0 0.0	-20.0 -36.0	20.0 36.0	°C °F	MA-CA	
PSd2	Maintenance technician Password	-1	-999	9999		MA-F	
INSTALLER MENU (IS)							
COMPRESSOR (IS-C)							
PC28	Maximum time in cooling/heating mode	10	1	999	Min	IS-C	
PC29	DHW maximum time	30	1	999	Min	IS-C	
PC56	Maximum number of by-pass valve activations	5	1	10		IS-C	
REGULATION (IS-R)							
PC00	Heat regulation probe. 0: flow probe 1: return probe	1	0	1		CO-C	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PC02	Compressors rotation: 0:FIFO 1:LIFO 2:FIFO+HS 3:LIFO+HS	3	0	3		CO-C	
PC12	Regulation band (lateral band)	2.5 4.5	0.1	20.0 36.0	°C °F	IS-R	
PC14	Neutral regulation area	5.0 9.0	PC15	PC16	°C °F	IS-R	
PC17	Connection/release time (neutral area)	20	0	999	sec	IS-R	
PC18	Type of neutral area: 0: divided 1: whole	0	0	1		IS-R	
PC19	Compressors operating hours factor	1	0	255		IS-R	
PC20	Compressors operating switch-on peaks factor	1	0	255		IS-R	
PC30	Modulating compressor proportional band	10.0 18.0	0.0	20.0 36.0	°C °F	IS-R	
PC31	Modulating compressor PI integral time	0	0	999	sec	IS-R	
PC62	Automatic heating - cooling automatic changeover set	20.0 68.0	PC63	40.0 104.0	°C °F	IS-R	
PC63	Automatic cooling - heating automatic changeover set	10.0 50.0	0.0 32.0	PC62	°C °F	IS-R	
PC64	Dynamic setpoint maximum offset in cooling mode	-5.0 -9.0	-10.0 -18.0	10.0 18.0	°C °F	IS-R	
PC65	External temperature for dynamic set maximum offset in Cooling mode	25.0 77.0	10.0 50.0	PC66	°C °F	IS-R	
PC66	External temperature for dynamic set offset annulment in Cooling mode	35.0 95.0	PC65	50.0 122.0	°C °F	IS-R	
PC67	Dynamic setpoint maximum offset in heating mode	-10.0 -18.0	-20.0 -36.0	20.0 36.0	°C °F	IS-R	
PC68	External temperature for dynamic setpoint maximum offset in Heating mode	5.0 41.0	-10.0 14.0	PC69	°C °F	IS-R	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PC69	External temperature for dynamic setpoint offset annulment in Heating mode	15.0 59.0	PC68	25.0 77.0	°C °F	IS-R	
PC89	Waiting time for motorized valve	30	0	999	Sec	IS-R	
PC90	Maximum machine power	100.00	0.00	100.00	%	IS-R	
PC91	Enable pump-down: 0 : Disabled 1 : By time 2 : By pressure	0	0	2		IS-R	
PC92	Pump-down disabling threshold	1.5 21.7	0.0	5.0 72.5	Bar psi	IS-R	
PC93	Compressor ignition delay from solenoid valve opening	60	0	999	Sec	IS-R	
PC94	Solenoid valve closing delay from compressor switch-off	1	0	240	Sec	IS-R	
VENTILATION (IS-F)							
PF01	Exchanger regulation type: 0: Automatic 1: Speed 1 (par. PF61) 2: Speed 2 (par. PF62) 3: Speed 3 (par. PF63) 4: Speed 4 (par. PF64)	0 (Auto.)	0	4		IS-F	
DEFROSTING (IS-D)							
Pd10	Defrosting Cycle Compensation Type 0: none 1: time 2: temperature 3: dynamic 4: dynamic + time	4	0	4		IS-D	
Pd18	Holding time for defrost end	60	0	600	Sec	CO-D	
Pd21	External temperature for defrosting time compensation offset annulment	5.0	Pd22	20.0 68.0	°C °F	IS-D	
Pd22	External temperature for defrosting time maximum compensation offset	-5.0	-30.0 -22.0	Pd21	°C °F	IS-D	
Pd23	Maximum defrosting delay	3600	Pd05	9600	Sec	IS-D	
Pd31	Condensate drain pan heater T° setpoint during defrosting	3.0 37.4	-10.0 14.0	30.0 86.0	°C °F	IS-D	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
Pd32	Condensate drain pan heater differential during defrosting	5.0 9.0	0.0 0.0	20.0 36.0	°C °F	IS-D	
PUMP AND FLOW SWITCH (IS-P)							
PP07	Pump switch off in defrost	No (0)	No (0)	YES (1)		IS-P	By enabling pump switch-off in defrosting mode, the anti-freeze will be determined by the low transducer
PP11	Pump activation method: 0 – Pump always active with unit ON 1 – Pump active only on heat adjuster request 2 – Pump active on heat regulation request with Refresh Cycle	2	0	2		IS-P	
PP12	Pump delay before the refresh cycle	5	1	99	Min	IS-P	
PP13	Pump switch on time during the Refresh Cycle	2	1	99	Min	IS-P	
PP15	Number of days with pump in OFF mode for the anti-grip function activation	3	0	30	Gg	IS-P	If PP15=0 the function is not active
PP16	Pump ON mode time during antigrip	30	5	999	Sec	IS-P	
PP21	Source pump activation method: 0 – Pump always active with unit ON 1 – Pump active only on heat adjuster request 2 – Pump active on heat regulation request with Refresh Cycle	0	0	2		IS-P	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PP31	Solar panels regulation probe: 0 – Input 1 – Output	0	0	1		IS-P	
PP32	Solar panels pump activation delta	5.0 9.0	PP33	20.0 36.0	°C °F	IS-P	
PP33	Solar panels pump deactivation delta	3.0 5.5	0.0	PP32	°C °F	IS-P	
PP34	Pump switch on time during the Refresh Cycle	2	0	999	Min	IS-P	
PP35	Pump delay before the refresh cycle	5	0	999	Min	IS-P	
PP36	High temperature setpoint in DHW	70.0 158.0	0.0 32.0	90.0 194.0	°C °F	IS-P	
PP37	High temperature differential in DHW	10.0 18.0	0.0	20.0 36.0	°C °F	IS-P	
PP38	High temperature setpoint solar panels	100.0 212.0	0.0 32.0	130.0 266.0	°C °F	IS-P	
PP39	High temperature differential solar panels	10.0 18.0	0.0	20.0 36.0	°C °F	IS-P	
ANTI-LEGIONELLA (IS-L)							
PL01	Enabling of anti-legionella cycle: 0: disabled 1: enabled	0	0	1		IS-L	
PL02	Power ON interval to perform an anti-legionella cycle	7	1	60	Gg	IS-L	Power ON, not effective operation
PL03	Enables an anti-legionella cycle at Power ON 0: disabled 1: enabled	0	0	1		IS-L	
PL04	Maximum duration of the anti-legionella cycle	120	1	999	Min	IS-L	
PL05	Anti-legionella setpoint	70.0 158.0	SPB1	80.0 176.0	°C °F	IS-L	
AUXILIARY HEATING (IS-A)							
Pr06	Auxiliary heating set in defrosting mode	15.0 59.0	0.0 32.0	70.0 158.0	°C °F	IS-A	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
Pr07	Neutral area aux. heating in defrosting mode	5.0 9.0	0.1 0.1	10.0 18.0	°C °F	IS-A	
Pr08	Auxiliary heating priority 0 = Disabled 1 = Resistor then boiler in integration mode 2 = Resistor then boiler in replacement mode 3 = Boiler then resistor in integration mode 4 = Boiler then resistor in replacement mode	0	0	4	0	IS-A	Only the enabled auxiliary heating steps are activated
Pr09	Aux. heating step first activation delay (resistor or boiler)	60	0	600	60	IS-A	
Pr10	Aux. heating step second activation delay (resistor or boiler)	60	0	600	60	IS-A	
Pr11	Aux. heating step third activation delay (resistor or boiler)	60	0	600	60	IS-A	
Pr12	Plant water low temperature aux. heating set	30.0 86.0	0.0 32.0	70.0 158.0	30.0 86.0	IS-A	
Pr13	Plant water low temperature aux. heating neutral area	5.0 9.0	0.1 0.1	10.0 18.0	5.0 9.0	IS-A	
Pr14	Plant water low temperature aux. heating delay	60	1	600	60	IS-A	
Pr22	DHW tank resistor set in defrosting mode	30.0 86.0	10.0 50.0	70.0 158.0	30.0 86.0	IS-A	
Pr23	DHW tank resistor differential in defrosting mode	10.0 18.0	0.0 0.0	20.0 36.0	10.0 18.0	IS-A	
Pr24	DHW resistor activation delay integrated to the heat pump	30	0	999	30	IS-A	
Pr25	Delay set not reached for aux. heating	20	0	999	20	IS-A	
AUXILIARY OUTPUTS (IS-U)*							
PU01	Kind of auxiliary 1 regulation: 0: Cooling 1: Heating 2: Direct 3: Reverse	0	0	3		IS-U	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PU02	Cooling setpoint auxiliary 1 regulation	14.0	-50.0	302.0		IS-U	
PU03	Auxiliary 1 regulation cooling differential	2.0	0.0	36.0		IS-U	
PU04	Auxiliary 1 output minimum value	0.0	0.0	100.0	%	IS-U	
PU05	Auxiliary 1 output maximum value	100.0	0.0	100.0	%	IS-U	
PU06	Kind of analogue regulation auxiliary 1: 0: Minimum at unit ON 1: Enabling step	1	0	1		IS-U	
PU07	Enable regulation also with unit OFF: 0: Disabled 1: Enabled	0	0	1		IS-U	
PU08	Regulation probe auxiliary 1: 0: Disabled 1: Inlet tmperature 2: Outlet temperature 3: Upper part DHW temperature 4: Lower part DHW temperature 5: Outdoor temperature 6: Coil 1 temperature 7: Coil 2 temperature 8: Source outlet temperature 9: SP inlet temperature 10: SP outlet temperature 11: Compressor discharging temp. 12: Suction temperature 13: Condenser pressure 14: Evaporator pressure 15: AUX1 probe 16: AUX2 probe 17: Power limitation 18: Source inlet temperature	0	0	18		IS-U	
PU09	Heating setpoint auxiliary 1 regulation	36.0	-50.0	302.0		IS-U	
PU10	Auxiliary 1 regulation heating differential	2.0	0.0	36.0		IS-U	
PU11	Auxiliary 1 alarm delay	10	0	999	Sec	IS-U	
PU21	Kind of auxiliary 2 regulation: 0: Cooling 1: Heating 2: Direct 3: Reverse	0	0	3		IS-U	
PU22	Cooling setpoint auxiliary 2 regulation	14.0	-50.0	302.0		IS-U	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PU23	Auxiliary 2 regulation cooling differential	2.0	0.0	36.0		IS-U	
PU24	Auxiliary 2 output minimum value	0.0	0.0	100.0	%	IS-U	
PU25	Auxiliary 2 output maximum value	100.0	0.0	100.0	%	IS-U	
PU26	Kind of analogue regulation auxiliary 2: 0: Minimum at unit ON 1: Enabling step	1	0	1		IS-U	
PU27	Enable regulation also with unit OFF: 0: Disabled 1: Enabled	0	0	1		IS-U	
PU28	Regulation probe auxiliary 2: 0: Disabled 1: Inlet tmperature 2: Outlet temperature 3: Upper part DHW temperature 4: Lower part DHW temperature 5: Outdoor temperature 6: Coil 1 temperature 7: Coil 2 temperature 8: Source outlet temperature 9: SP inlet temperature 10: SP outlet temperature 11: Compressor discharging temp. 12: Suction temperature 13: Condenser pressure 14: Evaporator pressure 15: AUX1 probe 16: AUX2 probe 17: Power limitation 18: Source inlet temperature	0	0	18		IS-U	
PU29	Heating setpoint auxiliary 2 regulation	36.0	-50.0	302.0		IS-U	
PU30	Auxiliary 2 regulation heating differential	2.0	0.0	36.0		IS-U	
PU31	Auxiliary 2 alarm delay	10	0	999	Sec	IS-U	
ALARM (IS-S)							
PA01	Anti-freeze set for unit switch-on in Heating mode	5.0 41.0	PA03	10.0 50.0	°C °F	IS-S	
PA02	Anti-freeze differential	2.0 3.6	0.1 0.2	10.0 18.0	°C °F	IS-S	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PA03	Anti-freeze alarm set	3.0 37.4	-30.0 -22.0	PA01	°C °F	IS-S	
PA04	Anti-freeze alarm differential	2.0 3.6	0.1 0.2	10.0 18.0	°C °F	IS-S	
PA14	Antefreeze pre alarm set	5.0 41.0	PA03	10.0 50.0	°C °F	IS-S	
PA15	Antifreeze pre alarm differential	2.0 3.6	0.1 0.1	10.0 18.0	°C °F	IS-S	
PA80	Compressor operating time alarm enabling	YES (1)	No (0)	YES (1)		IS-S	
PA81	Pump operating time alarm enabling	YES (1)	No (0)	YES (1)		IS-S	
PA82	Fan operating time alarm enabling	YES (1)	No (0)	YES (1)		IS-S	
PA83	Enabling of defrosting end alarm	No (0)	No (0)	YES (1)		IS-S	
OTHER PARAMETERS (IS-V)							
PH01	Start of low pressure transducer scale	0.0 0.0	-1.0 -14.5	PH02	Bar psi	IS-V	
PH02	Low pressure transducer high full scale	20.0 290.0	PH01	15.0 217.5	Bar psi	IS-V	
PH03	Start of high pressure transducer scale	0.0 0.0	-1.0 -14.5	PH04	Bar psi	IS-V	
PH04	High pressure transducer high full scale	50.0 725.0	PH03	60.0 870.0	Bar psi	IS-V	
PH05	3-way valve forcing towards the plant due to anti-freeze alarm	Yes (1)	No (0)	Yes (1)		IS-V	
PH06	Defines the unit switch off method: 0 = From ESC key (⏻) 1 = From Digital Input 2 = From Key and from Digital Input 3 = From Supervisor 4 = From Key and from Supervisor	0	0	4		IS-V	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PH07	Defines the changeover method: 0 = Disabled 1 = From Digital Input 2 = From external temperature probe 3 = From regulation probe 4 = From auxiliary probe 5 = From Supervisor	0	0	5		IS-V	The changeover from keyboard (User/Mode Menu) is always active but never has priority over other modes.
PH09	Language: 0 = English 1 = Italian	1	0	1		IS-V	
PH10	CAN baudrate 1= 20K 2= 50K 3= 125K 3= 500K	3	1	4		IS-V	
PH11	Board MODBUS address	1	1	247		IS-V	
PH12	Communication Baud Rate for the board (1=2400, 2=4800, 3=9600, 4=19200)	3	1	4		IS-V	
PH13	MODBUS parity (0=none, 1=Odd, 2=Even)	2	0	2		IS-V	
PH14	StopBit MODBUS (0=1bit, 1=2bit)	0	0	1		IS-V	
PH15	Restore the parameters factory default	No (0)	No (0)	Yes (1)		IS-V	Wait for 0 value to be read again at the end of restore
PH16	Start of scale power limitation probe	0.0	0.0	PH17	%	IS-V	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PH17	End of scale power limitation probe	100.0	PH16	100.0	%	IS-V	
PH18	Cancel hystorical	No (0)	No (0)	Sì (1)		IS-V	
PH29	Enabling of dynamic Setpoint	No (0)	No (0)	Yes (1)		IS-V	
PSd3	Installer Password	-2	-999	9999		IS-V	
MANUFACTURER PARAMETERS (CO)							
SETTINGS PARAMETERS (CO-I)							
PG00	Machine type: 0= Standard 1= With Domestic Hot Water	0	0	1		CO-I	
PG02	Compressors type: 0= compressor 1 OnOff 1= compressor 2 OnOff 2= compressor 3 OnOff 3=modulating compressor 1 4=1 modulating compressor + 1OnOff 5=1 modulating compressor + 2OnOff	3	0	5		CO-I	
PG03	Compressor models: 0= SANYO C-SDP205H02B 1= TOSHIBA DA422A3F-27M 2 = LG AR055VAD 3 = LG GJT240DAA.A11EMB 4 = LG GKT141DAA_EMB 5 = LG GPT425DAA A11EMB 6 = BOCK HGX34e/215-4 S 7 = BRISTOL V80J503MB2A	0	0	7		CO-I	
PG04	Inverter 0= Disabled 1= Enabled	0	0	1		CO-I	
COMPRESSOR PARAMETERS (CO-C)							
PC03	Switch-on time between 2 compressors	10	0	999	Sec	CO-C	
PC04	Compressor minimum switch-on time	20	0	999	Sec	CO-C	
PC05	Compressor minimum switch-off time	120	0	999	Sec	CO-C	
PC06	Minimum time between two switch-ons of the same compressor	360	0	999	Sec	CO-C	
PC07	Enabling of compressor safety device times by-pass in changeovers	1	0	1		CO-C	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PC08	Compressor minimum switch-off time during changeover of the cycle inversion valve for DHW operation (from cooling)	30	0	999	Sec	CO-C	
PC09	Machine OFFc minimum time during the operating mode change	5	0	999	Min	CO-C	
PC10	Compressor status in probe error mode 0: OFF – off 1: ON – on	0	0	1		CO-C	
PC11	Switch-off time between 2 compressors	20	0	999	Min	CO-C	
PC13	Switch-on time between 2 compressors in defrost	5	0	999	Sec	CO-C	
PC54	Hot gas by-pass activation maximum time	30	1	999	Sec	CO-C	
PC55	Hot gas by-pass deactivation maximum time	30	1	999	Sec	CO-C	
REGULATION PARAMETERS (CO-R)							
PC15	Regulation neutral area minimum value	1.0 1.8	0.1	PC16	°C °F	CO-R	
PC16	Regulation neutral area maximum value	10.0 18.0	PC15	20.0 36.0	°C °F	CO-R	
PC21	Cooling setpoint minimum value	5.0 41.0	-30.0 -22.0	PC22	°C °F	CO-R	
PC22	Cooling setpoint maximum value	10.0 50.0	PC21	40.0 104.0	°C °F	CO-R	
PC23	Heating setpoint minimum value	30.0 86.0	20.0 68.0	PC24	°C °F	CO-R	
PC24	Heating setpoint maximum value	45.0 113.0	PC23	80.0 176.0	°C °F	CO-R	
PC34	Percentage power supplied by the modulating compressor	100.00	0.00	100.00	%	CO-R	
PC35	Percentage power expressed by the first compressor OnOff	0.00	0.00	100.00	%	CO-R	
PC36	Percentage power expressed by the second compressor OnOff	0.00	0.00	100.00	%	CO-R	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PC49	Enables modulating compressor output modulation control from PRS (par PC46/PC47)	Yes (1)	No (0)	Yes (1)		CO-R	
PC50	Type of by-pass: 0= Disabled 1= Chiller mode 2= HP mode 3= Always	2	0	3		CO-R	
PC51	Pressure set for by-pass (chiller)	5.0 72.5	0.1	15.0 217.5	Bar psi	CO-R	
PC52	Pressure set for by-pass (HP)	5.0 72.5	0.1	15.0 217.5	Bar psi	CO-R	
PC53	Low pressure differential for partialisation in cooling mode	2.0 29.0	0.1	5.0 72.5	Bar psi	CO-R	
PC80	Required power limit value (unloading) when using the modulating compressor	100,0	0,0	100,0	%	CO-R	If PC80=100% the function is disabled
PC81	Power limitation set (unloading) in cooling mode	25,0 29,0	SPC1	PA27	°C °F	CO-R	
PC82	Power limitation set (unloading) in heating mode	15,0 29,0	PA26	SPH1	°C °F	CO-R	
PC83	Unloading power limitation differential	5,0 9.0	0.0	20.0 36.0	°C °F	CO-R	
PC85	Modulating compressor oil return management mode: 0=Disabled 1=Only modulating mode 2=Modulating and OnOff mode	0	0	2		CO-R	
PC86	Holding time below minimum threshold for oil return activation	5	0	999	Min	CO-R	
PC87	Modulating compressor maximum speed forcing time for oil return activation	60	0	999	Sec	CO-R	
PC88	Revolution minimum threshold for oil return activation	40.0	PC32	100.0	%	CO-R	
VENTILATION (CO-F)							
PF02	Enabling of fans only if the compressor is on	No (0)	No (0)	Yes (1)		CO-F	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PF03	Enabling of ventilation during defrosting	No (0)	No (0)	Yes (1)		CO-F	
PF04	External temperature set for ventilation in dripping mode	5.0 41.0	0.0 32.0	20.0 68.0	°C °F	CO-F	
PF10	Fans forcing if in alarm mode on the condensation probe	0.0	0.0	100.0	%	CO-F	
PF11	Ventilation set in cooling mode	20.0 290.0	5.0 72.5	45.0 652.5	Bar psi	CO-F	
PF12	Ventilation band in cooling mode	12.0 174.0	0.1 1.5	15.0 217.5	Bar psi	CO-F	
PF14	Forcing set at maximum in cooling mode	26.0 377.0	15.0 217.5	45.0 652.5	Bar psi	CO-F	
PF15	Forcing differential at maximum in cooling mode	2.0 29.0	0.1 1.5	5.0 72.5	Bar psi	CO-F	
PF16	Maximum ventilation linear regulation lower limit in cooling mode	30.0	0	PF32	%	CO-F	
PF17	Maximum ventilation regulation upper limit in cooling mode	100.0	PF31	100.0	%	CO-F	
PF18	Enabling of regulation below ventilation minimum limit, maximum in cooling mode	Yes (1)	No (0)	Yes (1)		CO-F	
PF19	Switch-off differential below ventilation minimum limit, maximum in cooling mode	2.0 29.0	0.0 0.0	5.0 72.5	Bar psi	CO-F	
PF21	Ventilation set in heating mode	9.0 130.5	0.5 7.3	15.0 217.5	Bar psi	CO-F	
PF22	Ventilation band in heating mode	2.0 29.0	0.1 1.5	15.0 217.5	Bar psi	CO-F	
PF24	Forcing set at maximum in heating mode	3.2 46.4	0.5 7.3	20.0 290.0	Bar psi	CO-F	
PF25	Forcing differential at maximum in heating mode	0.5 7.3	0.1 1.5	5.0 72.5	Bar psi	CO-F	
PF26	Inverter minimum value	0.0	0.0	50.0	0.0	CO-F	
PF27	Speed-up time on fan switch-on	4	0	999	4	CO-F	
PF31	Ventilation linear regulation lower limit	30.0	0	PF32	30.0	CO-F	
PF32	Ventilation regulation upper limit	80.0	PF31	100.0	80.0	CO-F	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PF33	Enabling of regulation below ventilation minimum limit	Yes (1)	No (0)	Yes (1)		CO-F	
PF34	Switch off differential below ventilation minimum limit	2.0 29.0	0.0 0.0	5.0 72.5	Bar psi	CO-F	
PF36	Enables condensation fans pre-start for high external temperatures	No (0)	No (0)	Yes (1)		CO-F	
PF37	External temperature probe for condensation fan pre-start	30.0 86.0	20.0 68.0	40.0 104.0	°C °F	CO-F	
PF38	Fans pre-start speed	50.0	0	100.0	%	CO-F	
PF39	Compressors delay from condensation fan pre-start	5	0	999	sec	CO-F	
PF51	Ventilation set in defrost mode	20.0 290.0	5.0 72.5	45.0 652.5	Bar psi	CO-F	
PF52	Ventilation band in defrost mode	4.0 58.0	0.1 1.5	15.0 217.5	Bar psi	CO-F	
PF54	Forcing set at maximum in defrost mode	26.0 377.0	15.0 217.5	45.0 652.5	Bar psi	CO-F	
PF55	Forcing differential at maximum in defrost mode	2.0 29.0	0.1 1.5	5.0 72.5	Bar psi	CO-F	
PF56	Enabling of regulation below ventilation minimum limit, maximum in cooling mode	Yes (1)	No (0)	Yes (1)		CO-F	
PF57	Switch-off differential below ventilation minimum limit, maximum in cooling mode	2.0 29.0	0.0 0.0	5.0 72.5	Bar psi	CO-F	
PF58	Maximum ventilation regulation upper limit in defrost mode	100.0	PF59	100.0	%	CO-F	
PF59	Maximum ventilation linear regulation lower limit in defrost mode	30.0	0.0	PF58	%	CO-F	
PF60	Condensation type: 0: Fan (air) 1: Water not reversible (mod. pump) 2: Water reversible (mod. pump)	0	0	2		CO-F	
PF61	Speed 1 in fixed regulation mode	20.0	0.0	100.0	%	CO-F	Con PF01 = 1
PF62	Speed 2 in fixed regulation mode	40.0	0.0	100.0	%	CO-F	Con PF01 = 2

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PF63	Speed 3 in fixed regulation mode	60.0	0.0	100.0	%	CO-F	Con PF01 = 3
PF64	Speed 4 in fixed regulation mode	80.0	0.0	100.0	%	CO-F	Con PF01 = 4
PF65	Ventilation forcing time for low pressure alarm	0	0	99	Min	CO-F	
PF66	Pre ventilation speed	100.00	PF26	100.00	%	CO-F	
PF67	Integral time fans regulation	0	0	999	Sec	CO-F	
PF68	Derivative time fans regulation	0	0	999	Sec	CO-F	
DEFROSTING (CO-D)							
Pd01	Probe selection for defrost start up 1: Evaporation temperature 2: Coil temperature probe (medium value) 3: Coil temperature probe (lower value)	1	1	3		CO-D	
Pd02	Defrost start up pressure set	-5,0 23,0	Pd14	20,0 68,0	°C °F	CO-D	
Pd03	Scelta sonda per la fine dello sbrinamento 1: Temperatura di evaporazione 2: Condensation transducer 3: Coil temperature probe (medium value) 4: Coil temperature probe (lower value)	1	1	4		CO-D	
Pd04	Defrosting end temperature set	15.0 59.0	0.0 32.0	99.0 210.0	°C °F	CO-D	
Pd05	Defrosting delay	1200	0	Pd23	Sec	CO-D	
Pd06	Defrosting maximum time	300	60	1200	Sec	CO-D	
Pd07	Compressor stop before defrosting	30	0	600	Sec	CO-D	
Pd08	Dripping duration	30	0	600	Sec	CO-D	
Pd11	Project delta between external temperature and evaporation temperature	5.0 9.0	0.0 0.0	50.0 90.0	°C °F	CO-D	
Pd12	Pressure delta for dynamic defrosting	10.0 50.0	0.0 0.0	50.0 90.0	Bar psi	CO-D	
Pd13	Settling time after defrosting (self-learning)	5	0	99	Min	CO-D	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
Pd14	Forced defrosting set	-25.0 -13.0	-40.0 -40.0	Pd02	°C °F	CO-D	
Pd15	Forced defrosting differential	5.0 9.0	0.0 0.0	30.0 54.0	°C °F	CO-D	
Pd16	Forced defrosting delay	60	0	999	Sec	CO-D	
Pd17	Differential for defrosting count reset	10.0 18.0	0.0 0.0	30.0 54.0	°C °F	CO-D	
Pd19	Defrost start set minimum limit	-40.0 -40.0	-40.0 -40.0	Pd02	°C °F	CO-D	
Pd30	Enables condensate drain pan heater during defrosting	No (0)	No (0)	Yes (1)		CO-D	
PUMP AND FLOW SWITCH (CO-P)							
PP04	Minimum delay between pump switch-on and compressor switch-on	60	0	999	Sec	CO-P	
PP05	Minimum delay between compressor switch-off and pump switch-off	60	0	999	Sec	CO-P	
PP06	Pump switch-off time for 3-way valve changeover	60	0	999	Sec	CO-P	
PP09	Pumps operating time with flow switch alarm active	30	0	999	Sec	CO-P	
PP10	Pump operating time with output water low temperature (anti-freeze alarm)	15	0	999	Sec	CO-P	
ANTI-LEGIONELLA PARAMETERS (CO-L)							
PL08	Anti-legionella maintenance time	5	1	999	Min	CO-L	
AUXILIARY HEATING PARAMETERS (CO-A)							
Pr04	Enabling of aux. heating for anti-freeze in cooling mode	1	0	1		CO-A	After having switched the compressors off with Pr09 – 11 delays
Pr05	Enabling of aux. heating in defrosting mode	0	0	1		CO-A	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
Pr15	Aux. heating operation for operating limit 0 = Disabled 1 = Integration 2 = Integration then replacement 3 = Replacement	2	0	3		CO-A	Also DHW
Pr16	Aux. heating (external air) set in integration mode for operating limit	0.0 32.0	-30.0 -22.0	10.0 50.0	°C °F	CO-A	
Pr17	Aux. heating differential in integration mode for operating limit	10.0 18.0	0.0 0.0	20.0 36.0	°C °F	CO-A	
Pr18	Aux. heating (external air) set in replacement mode for operating limit	-10.0 14.0	-30.0 -22.0	10.0 50.0	°C °F	CO-A	
Pr19	Aux. heating differential in replacement mode for operating limit	10.0 18.0	0.0 0.0	20.0 36.0	°C °F	CO-A	
Pr20	Compressor rehabilitation for resistor/boiler circuit breaker 0 = Compressor disabled 1 = Compressor enabled	1	0	1		CO-A	
Pr28	Use of anti-freeze heater: 0=No 1=Only heater DO 2=Only unit switch-on (Winter Mode) 3=Heater + Unit Switch-on	3	0	3		CO-A	
	ALARM (CO-S)						
PA05	Anti-freeze alarm delay	30	0	999	Sec	CO-S	
PA06	Anti-freeze setpoint during defrosting	3.0 43.5	PA08	15.0 217.5	Bar psi	CO-S	For pump activation if PP07=1
PA07	Anti-freeze differential during defrosting	1.0 14.5	0.1 1.5	4.0 58.0	Bar psi	CO-S	
PA08	Anti-freeze alarm setpoint during defrosting	1.0 14.5	0.0 0.0	PA06	Bar psi	CO-S	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PA09	Anti-freeze alarm differential during defrosting	1.0 14.5	0.1 1.5	4.0 58.0	Bar psi	CO-S	
PA10	Flow alarm bypass on activation of the pump	30	1	999	Sec	CO-S	
PA11	Flow alarm delay in normal operating mode	10	1	999	Sec	CO-S	
PA12	Number of flow alarm interventions/alarm for manual reset	5	0	10		CO-S	
PA19	Probe error signal delay time	10	0	240	Sec	CO-S	
PA20	Consequence of a temperature alarm: 0 = Disabled 1 = Signal only 2 = Machine block on automatic reset 3= Machine block on first automatic and then manual reset	0	0	3	Sec	CO-S	
PA21	Maximum time in temperature alarm for manual reset	5	0	99	Min	CO-S	
PA22	Temperature alarm return differential	2.0 3.6	0.1 0.2	10.0 18.0	°C °F	CO-S	
PA23	Temperature alarm intervention delay	30	1	999	Sec	CO-S	
PA24	Temperature alarms bypass on switch on	15	0	999	Sec	CO-S	
PA25	High temperature alarm set in heating mode	50.0 122.0	SPH1	80.0 176.0	°C °F	CO-S	
PA26	Low temperature alarm set in heating mode	10.0 50.0	0.0 32.0	SPH1	°C °F	CO-S	
PA27	High temperature alarm set in cooling mode	30.0 86.0	SPC1	99.0 210.0	°C °F	CO-S	
PA28	Low temperature alarm set in cooling mode	6.0 42.8	PA01	SPC1	°C °F	CO-S	
PA29	High temperature alarm set in DHW mode	60.0 140.0	SPB1	70.0 158.0	°C °F	CO-S	
PA30	Low temperature alarm set in DHW mode	25.0 77.0	20.0 68.0	SPB1	°C °F	CO-S	
PA31	High temperature alarm set in anti-legionella mode	70.0 158.0	SPB1	95.0 203.0	°C °F	CO-S	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PA38	Enables RTC alarm	No (0)	No (0)	Sì (1)		CO-S	
PA39	RTC alarm type	Auto (0)	Auto (0)	Manu (1)		CO-S	
PA40	Low pressure alarm set in cooling mode	3.0 43.5	PA45	PA50	Bar psi	CO-S	
PA41	Low pressure alarm differential in cooling mode	1.0 14.5	0.1 1.5	4.0 58.0	Bar psi	CO-S	
PA42	Low pressure alarm by-pass at compressor switch-on	120	0	999	Sec	CO-S	
PA43	Number of low pressure alarms per hour for manual reset	3	0	5		CO-S	
PA44	Low pressure alarm enabling during by-pass 0 = Disabled 1 = Cooling Only 2 = Heating Only (DHW included) 3 = Both operating modes	2	0	3		CO-S	
PA45	Low pressure alarm set during bypass	1.0 14.5	0.1 1.5	PA40	Bar psi	CO-S	
PA46	Low pressure alarm differential during bypass	0.5 7.3	0.1 1.5	4.0 58.0	Bar psi	CO-S	
PA47	Low pressure alarm delay on compressor start-up	5	0	PA42	Sec	CO-S	
PA48	High pressure alarm set	42.0 609.0	PA52	45.0 652.5	Bar psi	CO-S	
PA49	High pressure alarm differential	7.0 101.5	0.1 1.5	10.0 145.0	Bar psi	CO-S	
PA50	Cooling low pressure pre alarm set	4.0 58.0	PA40	10.0 145.0	Bar psi	CO-S	
PA51	Low pressure pre alarm differential	0.5 7.3	0.1 1.5	4.0 58.0	Bar psi	CO-S	
PA52	High pressure pre alarm set	37.0 536.5	16.0 232.0	PA48	Bar psi	CO-S	
PA53	High pressure alarm differential	5.0 72.5	0.1 1.5	10.0 145.0	Bar psi	CO-S	
PA54	Percentage decrease in power in pre alarm	5.00	0	100.00	%	CO-S	
PA55	Pre-alarm zone activation / release time	10	1	999	Sec	CO-S	
PA56	Low pressure alarm delay	10	0	999	Sec	CO-S	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PA66	Solar panels pump circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA67	Solar panels pump circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Auto (0)	Manual (1)		CO-S	
PA68	Source pump circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA69	Source pump circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Auto (0)	Manual (1)		CO-S	
PA70	Compressor circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA71	Compressors circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Auto (0)	Manual (1)		CO-S	
PA72	Fans circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA73	Fans circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Auto (0)	Manual (1)		CO-S	
PA74	Pump circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA75	Pump circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Automatic (0)	Manual (1)		CO-S	
PA76	Boiler circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA77	Boiler circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Auto (0)	Manual (1)		CO-S	
PA78	Resistor circuit breaker alarm activation delay	10	0	999	Sec	CO-S	
PA79	Resistor circuit breaker alarm reset type 0: Automatic 1: Manual	Manual (1)	Auto (0)	Manual (1)		CO-S	

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PA84	Enable unit lock in case of fan circuit breaker alarm 0: No 1: Only in winter mode 2: Always	1	0	2		CO-S	
PA85	Discharge gas high temperature alarm set	90,0 194,0	70.0 158.0	140.0 284.0	°C °F	CO-S	
PA86	Discharge gas high temperature alarm differential	20,0 36,0	10.0 18.0	30.0 54.0	°C °F	CO-S	
PA87	Discharge gas high temperature alarm activation delay	30	0	999	Sec	CO-S	
PA88	Number of high temperature exhaust gas alarms now for manual reset	3	0	5		CO-S	
PA89	Number of high pressure alarms per hour for manual reset	3	0	5		CO-S	
PA90	Number of low start-up pressure alarms per hour for manual reset	3	0	5		CO-S	
PA91	Number of envelope alarms now for manual reset	3	0	5		CO-S	
PA92	Water level alarm bypass when the unit is turned on	30	1	999	Sec	CO-S	
PA93	Water level alarm delay	10	1	999	Sec	CO-S	
PA94	Number of water level alarms per hour for manual reset	5	0	10		CO-S	
PA95	Pump stop in high pressure alarm	Si (1)	No (0)	Si (1)		CO-S	
PA96	Low pressure alarm setpoint in heating mode	3.6 52.2	PA45	PA97	Bar psi	CO-S	
PA97	Low pressure pre-alarm setpoint in heating	5.6 81.2	PA96	10.0 145.0	Bar Psi	CO-S	
OTHER PARAMETERS (CO-V)							

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
PH31	Kind of refrigerant (conversion temperature-pressure): 0: R-22 1: R-134A 2: R-402A 3: R-404A 4: R-407A 5: R-407C 6: R-410A 7: R-417A 8: R-422A 9: R-422D 10: R-507A 11: R-744 12: R-438A 13: R-401B 14: R-290 15: R-717 16: R-1270 17: R-32 18: R-407F 19: R-1234ZE	6 (R-410A)	0	19		CO-V	

22.2 Configuration parameters of c-pro 3 kilo EEV HPRU

EVCM PARAMETERS (CO-V)							
PV01	SH Setpoint (1)	6.0 10.8	3.0 5.4	25.0 45.0	K R	CO-V	
PV02	LoSH Setpoint (1)	2.0 3.6	1.0 1.8	3.0 5.4	K R	CO-V	
PV03	HiSH Setpoint (1)	15.0 27.0	10.0 18.0	40.0 72.0	K R	CO-V	
PV04	LOP Setpoint (1)	-40.0 -72.0	-40.0 -72.0	40.0 72.0	K R	CO-V	
PV05	MOP Setpoint (1)	40.0 72.0	-40.0 -72.0	40.0 72.0	K R	CO-V	
PV06	PID – proportional band (1)	7.0 12.6	1.0 1.8	100.0 180.0	K R	CO-V	
PV07	PID – integral time (1)	120	0	999	sec	CO-V	
PV08	PID – derivative time (1)	120	0	999	sec	CO-V	
PV09	Start-up delay (1)	5	1	255	sec	CO-V	
PV10	Start-up position (1)	50.00	0.00	100.00	%	CO-V	
PV11	SH Setpoint (2)	6.0 10.8	3.0 5.4	25.0 45.0	K R	CO-V	
PV12	LoSH Setpoint (2)	2.0 3.6	1.0 1.8	3.0 5.4	K R	CO-V	
PV13	HiSH Setpoint (2)	15.0 27.0	10.0 18.0	40.0 72.0	K R	CO-V	
PV14	LOP Setpoint (2)	-40.0 -72.0	-40.0 -72.0	40.0 72.0	K R	CO-V	
PV15	MOP Setpoint (2)	40.0 72.0	-40.0 -72.0	40.0 72.0	K R	CO-V	
PV16	PID – proportional band (2)	7.0 12.6	1.0 1.8	100.0 180.0	K R	CO-V	
PV17	PID – integral time (2)	120	0	999	sec	CO-V	
PV18	PID – derivative time (2)	120	0	999	sec	CO-V	
PV19	Start-up delay (2)	5	1	255	sec	CO-V	
PV20	Start-up position (2)	50.00	0.00	100.00	%	CO-V	
PV21	Stabilisation time	0	0	255	sec	CO-V	
PV22	Stabilisation position	100.00	0.00	100.00	%	CO-V	

PV23	Operating mode: 0= SH algo 1= Manual	0	0	1		CO-V	
PV24	Manual position	0.00	0.00	100.00	%	CO-V	
PV25	SH parameters set: 0= set1 1= set2	0	0	1		CO-V	
PV26	Stand-by position	0.00	0.00	100.00	%	CO-V	
PV27	Alarm position	0.00	0.00	100.00	%	CO-V	
PV28	Filter on PID SH value	10	1	255	100ms	CO-V	
PV29	Fast action level	100	1	100	%	CO-V	100 = disabled 1= max level
PV30	Threshold fast action	-1.0 -1.8	-10.0 -18.0	0.0	K R	CO-V	
PV31	Dead zone threshold	1.0 1.8	0.0	25.0 45.0	K R	CO-V	
PV32	Constant proportion zone threshold (smart band)	3.0 5.4	0.0	25.0 45.0	K R	CO-V	
PV33	interval between two resynchronizations	1	0	255	giorni	CO-V	0= disabled
PV34	Setpoint LowPressure	0.00	0.00	20.00 290.00	Bar psi	CO-V	
PV60	Enables modulating SH	Yes (1)	No (0)	Yes (1)		CO-V	
PV61	SH maximum set	15.0	3.0	25.0	K	CO-V	
PV62	SH minimum set	2.0	1.0	25.0	K	CO-V	
PV63	DSH maximum value	30.0	Pv64	50.0	K	CO-V	
PV64	DSH minimum value	20.0	0.0	Pv63	K	CO-V	
PV65	SH variation delay outside the neutral zone	5	1	60	Min	CO-V	
PV66	SH negative variation above the zone	0.2	0.1	2.0	K	CO-V	
PV67	SH positive variation below the zone	1.0	0.1	2.0	K	CO-V	
PV71	LoSH alarm delay	3	0	255	min	COV	
PV72	HiSH alarm differential	1.0 1.8	0.0	25.0 45.0	K R	CO-V	
PV73	HiSH alarm delay	3	0	255	min	COV	

PV74	LP alarm differential	0.30 4.35	0.20 2.9	1.00 14.50	Bar Psi	CO-V	
PV75	LP alarm delay	3	0	255	min	COV	
PV76	MOP alarm differential	1.0 1.8	0.0	25.0 45.0	K R	CO-V	
PV77	MOP alarm delay	3	0	255	min	CO-V	
PV78	MOP correction algorithm band	8.0 14.4	0.0	25.0 45.0	K R	CO-V	
PV79	MOP correction time constant	15	0	255	10s	CO-V	
PV80	Maximum applicable DSH by the correction	7.0 12.6	0.0	25.0 45.0	K R	CO-V	
PV81	Maximum applicable delay to the calculation of the correction from the algorithm start	10	0	255	min	CO-V	
PV82	LOP alarm differential	1.0 1.8	0.0	25.0 45.0	K R	CO-V	
PV83	LOP alarm delay	3	0	255	min	CO-V	
PV90	Type of unipolar valve 0: Generic valve (see parameters PV91-PV96) 1: Sanhua DPF 2: Danfoss ETS 3:Sporlan SER-U 4: Sporlan ESX	1	0	4		CO-V	
PV91	Generic valve minimum steps	0	0	4900	step	CO-V	
PV92	Generic valve maximum steps	1000	0	4900	step	CO-V	
PV93	Generic valve total closure steps	1500	0	4900	step	CO-V	
PV94	Generic valve steps rate	100	25	1000	step/s	CO-V	
PV95	Generice valve driving mode 0: Full step 2 Ph On 1: Full step 1 Ph On 2: Half step	2	0	2		CO-V	

PV96	Generic valve duty cycle	100	50	100	%	CO-V	Duty cycle on the valve movement during work placements to avoid the board overheating.
CONFIG. I/O (CO-O)							
HA01	Analogue Input 1 (see AI values table)	2	0	66		CO-O	
HA02	Analogue Input 2 (see AI values table)	5	0	66		CO-O	
HA03	Analogue Input 3 (see AI values table)	8	0	66		CO-O	
HA04	Analogue Input 4 (see AI values table)	1	0	56		CO-O	
HA05	Analogue Input 5 (see AI values table)	6	0	56		CO-O	
HA06	Analogue Input 6 (see AI values table)	3	0	56		CO-O	
HA07	Analogue Input 7 (see AI values table)	4	0	66		CO-O	
HA08	Analogue Input 8 (see AI values table)	10	0	66		CO-O	
HA09	Analogue Input 9 (see AI values table)	9	0	66		CO-O	
HB01	Digital Input 1 (see DI values table)	2	0	42		CO-O	
HB02	Digital Input 2 (see DI values table)	8	0	42		CO-O	
HB03	Digital Input 3 (see DI values table)	14	0	42		CO-O	

HB04	Digital Input 4 (see DI values table)	22	0	42		CO-O	
HB05	Digital Input 5 (see DI values table)	20	0	42		CO-O	
HB06	Digital Input 6 (see DI values table)	38	0	42		CO-O	
HB07	Digital Input 7 (see DI values table)	4	0	42		CO-O	
HB08	Digital Input 8 (see DI values table)	0	0	42		CO-O	
HB09	Digital Input 9 (see DI values table)	0	0	42		CO-O	
HC01	Analogue Output 1 (see AO values table)	1	0	7		CO-O	
HC02	Analogue Output 2 (see AO values table)	2	0	7		CO-O	
HC03	Analogue Output 3 (see AO values table)	0	0	9		CO-O	
HC04	Analogue Output 4 (see AO values table)	0	0	9		CO-O	
HC05	Analogue Output 5 (see AO values table)	0	0	5		CO-O	
HC06	Analogue Output 6 (see AO values table)	0	0	5		CO-O	
HCF1	PWM fan frequency	10	10	2000		CO-O	
HD01	Digital Output 1 (see DO values table)	1	0	24		CO-O	
HD02	Digital Output 2 (see DO values table)	2	0	24		CO-O	
HD03	Digital Output 3 (see DO values table)	5	0	24		CO-O	
HD04	Digital Output 4 (see DO values table)	6	0	24		CO-O	
HD05	Digital Output 5 (see DO values table)	10	0	24		CO-O	
HD06	Digital Output 6 (see DO values table)	12	0	24		CO-O	
HD07	Digital Output 7 (see DO values table)	18	0	24		CO-O	

PSd4	Manufacturer Password	-3	-999	9999		CO	

23 LIST OF MODBUS VARIABLES

23.1 List of MODBUS variables c-pro 3 kilo EEV HPRU

Addr Base 0	Addr Base 1	Name	Value	Min	Max	Mode
0x0000	1	PMxx_EnSimulation	0	0	1	R/W
0x0001	2	PMxx_Simul_AIbatteria1	8.2	-15.0	160.0	R/W
0x0002	3	PMxx_Simul_AIhigh	18.6	-145.0	625.5	R/W
0x0003	4	PMxx_Simul_AIscarico	64.7	-15.0	160.0	R/W
0x0004	5	PMxx_Simul_AISuction	72.1	-145.0	625.5	R/W
0x0005	6	PMxx_Simul_AI_acsHigh	10.7	-15.0	160.0	R/W
0x0006	7	PMxx_Simul_AI_acsLow	10.7	-15.0	160.0	R/W
0x0007	8	PMxx_Simul_AI_LP	6.2	-145.0	625.5	R/W
0x0008	9	PMxx_Simul_batt2	8.2	-15.0	160.0	R/W
0x0009	10	PMxx_Simul_Text	12.3	-15.0	160.0	R/W
0x000A	11	PMxx_Simul_Tin	16.4	-15.0	160.0	R/W
0x000B	12	PMxx_Simul_TinPS	16.4	-15.0	160.0	R/W
0x000C	13	PMxx_Simul_Tout	9.9	-15.0	160.0	R/W
0x000D	14	PMxx_Simul_ToutPS	9.9	-15.0	160.0	R/W
0x000E	15	PMxx_Simul_ToutSource	9.9	-15.0	160.0	R/W
0x000F	16	PMxx_Simul_Aux1	9.9	-15.0	160.0	R/W
0x0010	17	PMxx_Simul_Aux2	9.9	-15.0	160.0	R/W
0x0100	257	Packed_DI	0	0	65535	R/W
0x0101	258	Packed_logicDI	0	0	65535	R/W
0x0102	259	Packed_logicDI1	0	0	65535	R/W
0x0103	260	Packed_logicDI2	0	0	65535	R/W
0x0180	385	Packed_DO1	0	0	65535	R/W
0x0181	386	Packed_DO2	0	0	65535	R/W
0x0182	387	Packed_DO3	0	0	65535	R/W
0x0200	513	AI_TempIngresso	0.0	-3276.8	3276.7	R/O
0x0201	514	AI_TempExt	0.0	-3276.8	3276.7	R/O
0x0202	515	AI_TemperaturaBatteria1	0.0	-3276.8	3276.7	R/O
0x0203	516	AI_TempOut	0.0	-3276.8	3276.7	R/O
0x0204	517	AI_HighPressCond	0.0	-3276.8	3276.7	R/O
0x0205	518	AI_TempScarico	0.0	-3276.8	3276.7	R/O

0x0206	519	AI_Tsuction	0.0	-3276.8	3276.7	R/O
0x0207	520	AI_LowPressEvap	0.0	-3276.8	3276.7	R/O
0x0208	521	AI_ACShigh	0.0	-3276.8	3276.7	R/O
0x0209	522	AI_ACSlow	0.0	-3276.8	3276.7	R/O
0x020A	523	AI_TemperaturaBatteria2	0.0	-3276.8	3276.7	R/O
0x020B	524	AI_TempInPS	0.0	-3276.8	3276.7	R/O
0x020C	525	AI_TempOutPS	0.0	-3276.8	3276.7	R/O
0x020D	526	AI_TempOutSource	0.0	-3276.8	3276.7	R/O
0x020E	527	TCond_hpc	0.0	-3276.8	3276.7	R/O
0x020F	528	TEvap_lpe	0.0	-3276.8	3276.7	R/O
0x0210	529	AI_AUX1	0.0	-3276.8	3276.7	R/O
0x0211	530	AI_AUX2	0.0	-3276.8	3276.7	R/O
0x0280	641	out_AOfan	0.00	0.00	100.00	R/W
0x0281	642	out_AOcmp	0.00	0.00	100.00	R/W
0x0282	643	out_AO_Tank_Resistor	0.00	0.00	100.00	R/W
0x0300	769	PackedAlarm1	0	0	65535	R/W
0x0301	770	PackedAlarm2	0	0	65535	R/W
0x0302	771	PackedAlarm3	0	0	65535	R/W
0x0303	772	BMS_AL1	0	0	1	R/W
0x0304	773	BMS_AL2	0	0	1	R/W
0x0305	774	BMS_AL03	0	0	1	R/W
0x0306	775	BMS_AL4	0	0	1	R/W
0x0307	776	BMS_AL5	0	0	1	R/W
0x0308	777	BMS_AL6	0	0	1	R/W
0x0309	778	BMS_AL7	0	0	1	R/W
0x030A	779	BMS_AL9	0	0	1	R/W
0x030B	780	BMS_AC21[0]	0	0	1	R/W
0x030C	781	BMS_AC21[1]	0	0	1	R/W
0x030D	782	BMS_AC21[2]	0	0	1	R/W
0x030E	783	BMS_AC24	0	0	1	R/W
0x030F	784	BMS_AC25	0	0	1	R/W
0x0310	785	BMS_AC26	0	0	1	R/W
0x0311	786	BMS_AC27	0	0	1	R/W
0x0312	787	BMS_AC28	0	0	1	R/W

0x0313	788	BMS_AC29	0	0	1	R/W
0x0314	789	BMS_AC30	0	0	1	R/W
0x0315	790	BMS_AL10	0	0	1	R/W
0x0316	791	BMS_AL11	0	0	1	R/W
0x0317	792	BMS_AL12	0	0	1	R/W
0x0318	793	BMS_AL14	0	0	1	R/W
0x0319	794	BMS_AL17	0	0	1	R/W
0x031A	795	BMS_AL19	0	0	1	R/W
0x031B	796	PackedAlarm4	0	0	65535	R/W
0x0400	1025	OnOffBySuperv	1	0	1	R/W
0x0401	1026	ModoFunzBySuperv	0	0	1	R/W
0x04FE	1279	CLOCK_RTC (Low)	-	01/01/2000	19/01/2068 03:14:07	R/W
0x04FF	1280	CLOCK_RTC (High)				
0x0500	1281	StatoOnOffMacchina	0	0	6	R/W
0x0501	1282	ModoUnita	0	0	5	R/W
0x0502	1283	ModoFunz	0	0	1	R/W
0x0503	1284	SetpointEstivo_Attuale	8.5	-3276.8	3276.7	R/W
0x0504	1285	SetpointInverno_Attuale	44.0	-3276.8	3276.7	R/W
0x0505	1286	StatoSbrinamento_C1	0	0	13	R/W
0x0506	1287	StatoFan1	0	0	6	R/W
0x0507	1288	StatoPompa	0	0	6	R/W
0x0508	1289	setD	0.0	-3276.8	3276.7	R/W
0x0509	1290	Cnt_WaitSbrinamento_C1	0	0	65535	R/W
0x050A	1291	Cnt_OnSbrinamento_C1	0	0	65535	R/W
0x050B	1292	StatoPompa_Source	0	0	3	R/W
0x050C	1293	SM_antilegionella	0	0	255	R/W
0x050D	1294	GeneralAlarm	0	0	1	R/W
0x050E	1295	StatoCompressori[0]	0	0	6	R/W
0x050F	1296	StatoCompressori[1]	0	0	6	R/W
0x0510	1297	StatoCompressori[2]	0	0	6	R/W
0x0511	1298	StatoPompa_PS	0	0	3	R/W
0x0512	1299	InverterStatus	0	0	65535	R/W
0x0513	1300	pack_InverterAL	0	0	65535	R/W

0x0514	1301	InverterFreq	0	0	65535	R/W
0x0515	1302	InverterWarnin	0	0	65535	R/W
0x0516	1303	InverterHeatSink	0.0	-3276.8	3276.7	R/W
0x0517	1304	FSMstatus	0	0	255	R/W
0x0518	1305	SetPointPosition	0	0	65535	R/W
0x0519	1306	MeasuredSH	0.0	-3276.8	3276.7	R/W
0x051A	1307	LOPstatus	0	0	255	R/W
0x051B	1308	MOPstatus	0	0	255	R/W
0x051C	1309	LPstatus	0	0	255	R/W
0x051D	1310	HiSHstatus	0	0	255	R/W
0x051E	1311	LoSHstatus	0	0	255	R/W
0x0600	1537	MOdE_ModoFunzionamento	0	0	1	R/W
0x0601	1538	SPC1_SetpointRiscaldamentoEstate	8.5	0.0	104.0	R/W
0x0602	1539	SPH1_SetpointRiscaldamentoInverno	40.0	20.0	176.0	R/W
0x0603	1540	SPB1_SetpointSerbatoioACS	50.0	20.0	203.0	R/W
0x0604	1541	SSB1_DifferenzialeSerbatoioACS	1.0	0.0	18.0	R/W
0x0605	1542	PM00_Limit_HourCmp (Low)	2000.0	0.0	9999.0	R/W
0x0606	1543	PM00_Limit_HourCmp (High)				
0x0607	1544	PM01a03_OreCompressore[0] (Low)	0.0	0.0	9999.0	R/W
0x0608	1545	PM01a03_OreCompressore[0] (High)				
0x0609	1546	PM01a03_OreCompressore[1] (Low)	0.0	0.0	9999.0	R/W
0x060A	1547	PM01a03_OreCompressore[1] (High)				
0x060B	1548	PM01a03_OreCompressore[2] (Low)	0.0	0.0	9999.0	R/W
0x060C	1549	PM01a03_OreCompressore[2] (High)				
0x060D	1550	PM32_OrePompaS (Low)	0.0	0.0	9999.0	R/W
0x060E	1551	PM32_OrePompaS (High)				
0x060F	1552	PM30_Limit_HourPump (Low)	2000.0	0.0	9999.0	R/W
0x0610	1553	PM30_Limit_HourPump (High)				
0x0611	1554	PM31_OrePompa1_VentilatoreRicircolo (Low)	0.0	0.0	9999.0	R/W
0x0612	1555	PM31_OrePompa1_VentilatoreRicircolo (High)				
0x0613	1556	PM40_Limit_HourFan (Low)	2000.0	0.0	9999.0	R/W
0x0614	1557	PM40_Limit_HourFan (High)				
0x0615	1558	PM41_OreVentilatore1_Or_Inverter (	0.0	0.0	9999.0	R/W

		Low)				
0x0616	1559	PM41_OreVentilatore1_Or_Inverter (High)				
0x0617	1560	PM51_ManualeVentilatore1	0	0	1	R/W
0x0618	1561	PM52_ManualePompa	0	0	1	R/W
0x0619	1562	PM61_ForzaturaInvFan_C1	0.00	0.00	100.00	R/W
0x061A	1563	PM62_ForcePump	0	0	1	R/W
0x061B	1564	PM81_TaraturaTritorno	0.0	-36.0	36.0	R/W
0x061C	1565	PM82_TaraturaTesterna	0.0	-36.0	36.0	R/W
0x061D	1566	PM83_TaraturaSondaBassaPressione	0.0	-290.0	290.0	R/W
0x061E	1567	PM84_TaraturaMandata	0.0	-36.0	36.0	R/W
0x061F	1568	PM85_TaraturaSondaAltaPressione	0.0	-290.0	290.0	R/W
0x0620	1569	PM86_TaraturaTscarico	0.0	-36.0	36.0	R/W
0x0621	1570	PM99_LastMaintainDATE (Low)	01/01/2013	01/01/2013	19/01/2068 03:14:07	R/W
0x0622	1571	PM99_LastMaintainDATE (High)				
0x0623	1572	PM33_OrePompaPS (Low)	0.0	0.0	9999.0	R/W
0x0624	1573	PM33_OrePompaPS (High)				
0x0625	1574	PC00_SondaRegolazione	1	0	1	R/W
0x0626	1575	PC03_Cmp_TonOther	10	0	999	R/W
0x0627	1576	PC04_Cmp_TminOn	20	0	999	R/W
0x0628	1577	PC05_Cmp_TminOff	120	0	999	R/W
0x0629	1578	PC06_Cmp_TonOn	360	0	999	R/W
0x062A	1579	PC07_AbilitaByPassSicurezzeCompressore	1	0	1	R/W
0x062B	1580	PC08_ToffCmpAfterInvValve	30	0	999	R/W
0x062C	1581	PC09_MinTimeOFFc	5	0	999	R/W
0x062D	1582	PC10_CompressorenErroreSonda	0	0	1	R/W
0x062E	1583	PC11_Cmp_ToffOther	20	0	999	R/W
0x062F	1584	PC12_BandaRegolazioneGradini	5.0	0.1	36.0	R/W
0x0630	1585	PC14_DeadZone	5.0	0.1	68.0	R/W
0x0631	1586	PC15_DeadZone_Min	1.0	0.1	36.0	R/W
0x0632	1587	PC16_DeadZone_Max	10.0	0.1	36.0	R/W
0x0633	1588	PC17_DeadZoneOutsideTime	20	0	999	R/W
0x0634	1589	PC18_DeadZoneType	0	0	1	R/W

0x0635	1590	PC21_LimiteMinimoSetChiller	5.0	0.0	104.0	R/W
0x0636	1591	PC22_LimiteMassimoSetChiller	10.0	0.0	104.0	R/W
0x0637	1592	PC23_LimiteMinimoSetPompaCalore	30.0	20.0	176.0	R/W
0x0638	1593	PC24_LimiteMassimoSetPompaCalore	45.0	20.0	176.0	R/W
0x0639	1594	PC28_TminHC	10	1	999	R/W
0x063A	1595	PC29_TminACS	30	1	999	R/W
0x063B	1596	PC30_PropBandMod	10.0	0.0	36.0	R/W
0x063C	1597	PC31_IntegralTime	0	0	999	R/W
0x063D	1598	PC32_PmodMin_HIDDEN	16.70	0.00	100.00	R/W
0x063E	1599	PC33_PmodMax_HIDDEN	100.00	0.00	100.00	R/W
0x063F	1600	PC34_Pmod	100.00	0.00	100.00	R/W
0x0640	1601	PC35_Ponoff1	0.00	0.00	100.00	R/W
0x0641	1602	PC36_Ponoff2	0.00	0.00	100.00	R/W
0x0642	1603	PC37_minPerc_HIDDEN	0.00	0.00	100.00	R/W
0x0643	1604	PC38_maxPerc_HIDDEN	100.00	0.00	100.00	R/W
0x0644	1605	PC39_minRPS_HIDDEN	0	0	200	R/W
0x0645	1606	PC40_maxRPS_HIDDEN	120	0	200	R/W
0x0646	1607	PC41_InitSpeed_HIDDEN	63	20	120	R/W
0x0647	1608	PC42_SyncroTime_HIDDEN	180	0	999	R/W
0x0648	1609	PC43_TdischOK_HIDDEN	105.0	50.0	266.0	R/W
0x0649	1610	PC44_TdischProtect_HIDDEN	115.0	50.0	266.0	R/W
0x064A	1611	PC45_TdischLimit_HIDDEN	120.0	50.0	266.0	R/W
0x064B	1612	PC46_MaxLimitSpeed_HIDDEN	20	0	200	R/W
0x064C	1613	PC50_enabByPass	2	0	3	R/W
0x064D	1614	PC51_SetPressByPassCHIL	5.0	0.1	217.5	R/W
0x064E	1615	PC52_SetPressByPassHP	5.0	0.1	217.5	R/W
0x064F	1616	PC53_DiffSetPessByPass	2.0	0.1	72.5	R/W
0x0650	1617	PC54_MaxTimeByPass	30	1	999	R/W
0x0651	1618	PC55_MaxTimeDisactByPass	30	1	999	R/W
0x0652	1619	PC56_NumeroMaxByPass	5	1	10	R/W
0x0653	1620	PC47_minRPSvar_HIDDEN	0.5	0.0	20.0	R/W
0x0654	1621	PC48_minRPSalarmVar_HIDDEN	7.0	0.0	20.0	R/W
0x0655	1622	PC49_enabRPScontrol	1	0	1	R/W
0x0658	1625	PC62_SetCommutazioneEstate	20.0	0.0	104.0	R/W

0x0659	1626	PC63_SetCommutazioneInverno	10.0	0.0	104.0	R/W
0x065A	1627	PC64_offsetSetPointDinamico_Estate	-5.0	-18.0	18.0	R/W
0x065B	1628	PC65_tempInizo_SPDinamico_Estate	25.0	10.0	122.0	R/W
0x065C	1629	PC66_tempFine_SPDinamico_Estate	35.0	10.0	122.0	R/W
0x065D	1630	PC67_offsetSetPointDinamico_Inverno	-10.0	-36.0	36.0	R/W
0x065E	1631	PC68_tempInizo_SPDinamico_Inverno	5.0	-10.0	77.0	R/W
0x065F	1632	PC69_tempFine_SPDinamico_Inverno	15.0	-10.0	77.0	R/W
0x0660	1633	Pd01_StartDefrostProbe	1	1	3	R/W
0x0661	1634	Pd02_SetInizioSbrinamento	-5.0	-40.0	68.0	R/W
0x0662	1635	Pd03_End_DefrostProbe	1	1	4	R/W
0x0663	1636	Pd04_SetFineSbrinamentoTemp	15.0	0.0	86.0	R/W
0x0664	1637	Pd05_RitardoAttivazioneSbrinamento	1200	60	9600	R/W
0x0665	1638	Pd06_TempoMaxDurataSbrinamento	300	60	1200	R/W
0x0666	1639	Pd07_TempoFermataCompressoreInDefrost	30	0	600	R/W
0x0667	1640	Pd08_TempoSgocciolamento	30	0	600	R/W
0x0669	1642	Pd10_DefrostType	4	0	4	R/W
0x066A	1643	Pd11_DeltaTempExtEvap	5.0	0.0	90.0	R/W
0x066B	1644	Pd12_DeltaTPerDefrostDinamico	10.0	0.0	54.0	R/W
0x066C	1645	Pd13_TempoAutoApprendimento	5	0	99	R/W
0x066D	1646	Pd14_SetInizioSbrinamentoForzato	-25.0	-40.0	68.0	R/W
0x066E	1647	Pd15_differenzialeSbrinamentoForzato	5.0	0.0	54.0	R/W
0x066F	1648	Pd16_TempoAttesaSbrinamentoForzato	60	0	999	R/W
0x0670	1649	Pd17_differenzialeResetSbrinamento	10.0	0.0	54.0	R/W
0x0671	1650	Pd18_DelayEndDefrost	60	0	600	R/W
0x0672	1651	Pd19_MinLimDefrost	-40.0	-40.0	68.0	R/W
0x0673	1652	Pd21_SetInizio_CompensazioneSbr	5.0	-30.0	68.0	R/W
0x0674	1653	Pd22_SetFine_CompensazioneSbr	-5.0	-30.0	68.0	R/W
0x0675	1654	Pd23_RitardoMassimoFineSbr	3600	0	9600	R/W
0x0676	1655	PF02_CondDipDaiCompr	0	0	1	R/W
0x0677	1656	PF03_StopFan_Defrost	0	0	1	R/W
0x0678	1657	PF04_SetTesternaFanInDefrost	5.0	0.0	68.0	R/W
0x0679	1658	PF10_ForzaturaInErroreSonda	0.00	0.00	100.00	R/W
0x067A	1659	PF11_SetRegolazioneCond_Chiller	20.0	5.0	625.5	R/W

0x067B	1660	PF12_DiffRegolazioneCond_Chiller	12.0	0.1	217.5	R/W
0x067C	1661	PF13_AbiForzaturaMaxCond_Chiller	1	0	1	R/W
0x067D	1662	PF14_SetForzaturaMaxCond_Chiller	34.0	15.0	652.5	R/W
0x067E	1663	PF15_DiffForzaturaMaxCond_Chiller	2.0	0.1	72.5	R/W
0x067F	1664	PF21_SetRegolazioneCond_PdC	9.0	0.5	217.5	R/W
0x0680	1665	PF22_DiffRegolazioneCond_PdC	2.0	0.1	217.5	R/W
0x0681	1666	PF23_AbiForzaturaMaxCond_PdC	1	0	1	R/W
0x0682	1667	PF24_SetForzaturaMaxCond_PdC	3.2	0.5	290.0	R/W
0x0683	1668	PF25_DiffForzaturaMaxCond_PdC	0.5	0.1	72.5	R/W
0x0684	1669	PF26_MinVal_InverterFan	0.00	0.00	100.00	R/W
0x0685	1670	PF27_SpeedUp_InverterFan	4	0	999	R/W
0x0686	1671	PF31_LimiteMinCondensazioneLineare_PdC	30.00	0.00	100.00	R/W
0x0687	1672	PF32_LimiteMaxCondensazioneLineare_PdC	80.00	0.00	100.00	R/W
0x0688	1673	PF33_AbiRegolazioneSottoLimiteMinCond_PdC	1	0	1	R/W
0x0689	1674	PF34_DiffSpegnimentoSottoLimiteMinCond_PdC	2.0	0.0	72.5	R/W
0x068A	1675	PF36_AbilitaPreavvioVentilatoreCond	0	0	1	R/W
0x068B	1676	PF37_SetPreavvioVentilatoreCond	30.0	20.0	104.0	R/W
0x068C	1677	PF38_VelocitaPreavvio	50.00	0.00	100.00	R/W
0x068D	1678	PF39_TempoAnticipoVentilatoreCond	5	0	999	R/W
0x068E	1679	PF51_SetRegolazioneCond_Def	20.0	5.0	652.5	R/W
0x068F	1680	PF52_DiffRegolazioneCond_Def	4.0	0.1	217.5	R/W
0x0690	1681	PF53_AbiForzaturaMaxCond_Def	1	0	1	R/W
0x0691	1682	PF54_SetForzaturaMaxCond_Def	26.0	15.0	652.5	R/W
0x0692	1683	PF55_DiffForzaturaMaxCond_Def	2.0	0.1	72.5	R/W
0x0693	1684	PF56_AbiRegolazioneSottoLimiteMinCondDef	1	0	1	R/W
0x0694	1685	PF57_DiffSpegnimentoSottoLimiteMinCondDef	2.0	0.0	72.5	R/W
0x0695	1686	PF58_LimiteMaxCondensazioneLineareDef	100.00	0.00	100.00	R/W
0x0696	1687	PF59_LimiteMinCondensazioneLineareDef	30.00	0.00	100.00	R/W

0x0697	1688	PF60_CondensorType	0	0	1	R/W
0x069D	1694	PP04_TMinPompe_Ventilatore	60	0	999	R/W
0x069E	1695	PP05_RitardoSpegnimentoPompe_Ventilatore	60	0	999	R/W
0x069F	1696	PP06_TempoAttesaPompaCommutazioneValvolaTreVie	60	0	255	R/W
0x06A0	1697	PP07_SpegnimentoPompaInDfrst	0	0	1	R/W
0x06A1	1698	PP09_TempoFunzPompeConBassoQuantitativoAcqua	30	0	999	R/W
0x06A2	1699	PP10_TempoFunzPompeConBassaTemperatura	15	0	999	R/W
0x06A3	1700	PP11_PumpMode	2	0	2	R/W
0x06A4	1701	PP12_WaitTime_RefreshCycle	5	1	99	R/W
0x06A5	1702	PP13_ActiveTime_RefreshCycle	2	1	99	R/W
0x06A6	1703	PL01_enabAntilegionella	0	0	1	R/W
0x06A7	1704	PL02_IntervalloAntilegionella	7	1	60	R/W
0x06A8	1705	PL03_AbilitaCicloAntilegionellaAvvio	0	0	1	R/W
0x06A9	1706	PL04_MaxTimeAntilegionella	120	1	999	R/W
0x06AA	1707	PL05_SetpointAntilegionella	70.0	20.0	176.0	R/W
0x06AB	1708	PL08_MaxTimeMantenimento	5	1	999	R/W
0x06AF	1712	Pr04_AbilitaRAantigeloRaff	1	0	1	R/W
0x06B0	1713	Pr05_AbilitaRAsbrinamento	0	0	1	R/W
0x06B1	1714	Pr06_sogliaRAsbrinamento	15.0	0.0	158.0	R/W
0x06B2	1715	Pr07_ZonaNeutraAttivazioneRAsbrinamento	5.0	0.1	18.0	R/W
0x06B3	1716	Pr08_PrioritaRA	0	0	4	R/W
0x06B4	1717	Pr09_DelayStep1RA	60	0	600	R/W
0x06B5	1718	Pr10_DelayStep2RA	60	0	600	R/W
0x06B6	1719	Pr11_DelayStep3RA	60	0	600	R/W
0x06B7	1720	Pr12_sogliaRAperLT	30.0	0.0	158.0	R/W
0x06B8	1721	Pr13_ZonaNeutraAttivazioneRAperLT	5.0	0.1	18.0	R/W
0x06B9	1722	Pr14_DelayRAperLT	60	1	600	R/W
0x06BA	1723	Pr15_PrioritaRAlimiteFunzionamento	2	0	3	R/W
0x06BB	1724	Pr16_sogliaRAlimiteFunzIntegraz	0.0	-30.0	50.0	R/W
0x06BC	1725	Pr17_diffRAlimiteFunzIntegraz	10.0	0.0	36.0	R/W
0x06BD	1726	Pr18_sogliaRAlimiteFunzSostituz	-10.0	-30.0	50.0	R/W

0x06BE	1727	Pr19_diffRAlimiteFunzSostituz	10.0	0.0	36.0	R/W
0x06BF	1728	Pr20_RiabilitazioneCmpInTermico	1	0	1	R/W
0x06C0	1729	Pr22_sogliaResACSinDefrost	30.0	10.0	158.0	R/W
0x06C1	1730	Pr23_diffResACSinDefrost	10.0	0.0	36.0	R/W
0x06C2	1731	Pr24_DelayResistenzaACS	30	0	999	R/W
0x06C3	1732	PV01_SHsetpoint1	6.0	3.0	45.0	R/W
0x06C4	1733	PV02_LoSHsetpoint1	2.0	1.0	5.4	R/W
0x06C5	1734	PV03_HiSHsetpoint1	15.0	10.0	72.0	R/W
0x06C6	1735	PV04_LOPtemp1	-40.0	-72.0	72.0	R/W
0x06C7	1736	PV05_MOPtemp1	40.0	-72.0	72.0	R/W
0x06C8	1737	PV06_PIDpropBand1	7.0	1.0	180.0	R/W
0x06C9	1738	PV07_PIDintegralTime1	120	0	999	R/W
0x06CA	1739	PV08_PIDderivTime1	120	0	999	R/W
0x06CB	1740	PV09_StartUpDelay1	5	1	255	R/W
0x06CC	1741	PV10_StartUpPosition1	50.00	0.00	100.00	R/W
0x06CD	1742	PV11_SHsetpoint2	6.0	3.0	45.0	R/W
0x06CE	1743	PV12_LoSHsetpoint2	2.0	1.0	5.4	R/W
0x06CF	1744	PV13_HiSHsetpoint2	15.0	10.0	72.0	R/W
0x06D0	1745	PV14_LOPtemp2	-40.0	-72.0	72.0	R/W
0x06D1	1746	PV15_MOPtemp2	40.0	-72.0	72.0	R/W
0x06D2	1747	PV16_PIDpropBand2	7.0	1.0	180.0	R/W
0x06D3	1748	PV17_PIDintegralTime2	120	0	999	R/W
0x06D4	1749	PV18_PIDderivTime2	120	0	999	R/W
0x06D5	1750	PV19_StartUpDelay2	5	1	255	R/W
0x06D6	1751	PV20_StartUpPosition2	50.00	0.00	100.00	R/W
0x06D7	1752	PV21_StabilizationDelay	0	0	65535	R/W
0x06D8	1753	PV22_SabilizationPosition	100.00	0.00	100.00	R/W
0x06D9	1754	PV23_FunctioningMode	0	0	1	R/W
0x06DA	1755	PV24_ManualValvePositionSetPoint	0.00	0.00	100.00	R/W
0x06DB	1756	PV25_SHcontrolParametersSet	0	0	1	R/W
0x06E5	1766	PV60_enabSHmod	1	0	1	R/W
0x06E6	1767	PV61_maxSetSH	15.0	3.0	25.0	R/W
0x06E7	1768	PV62_minSetSH	2.0	1.0	25.0	R/W
0x06E8	1769	PV63_maxDSH	30.0	0.0	50.0	R/W

0x06E9	1770	PV64_minDSH	20.0	0.0	50.0	R/W
0x06EA	1771	PA01_SetpointAntigelo	5.0	-30.0	50.0	R/W
0x06EB	1772	PA02_DifferenzialeAntigelo	2.0	0.1	18.0	R/W
0x06EC	1773	PA03_SetpointAllarmeAntigelo	3.0	-30.0	50.0	R/W
0x06ED	1774	PA04_DifferenzialeAllarmeAntigelo	2.0	0.1	18.0	R/W
0x06EE	1775	PA05_DelayAllarmeAntigelo	30	0	999	R/W
0x06EF	1776	PA06_SetAntigeloInDefrost	3.0	0.0	217.5	R/W
0x06F0	1777	PA07_DiffAntigeloInDefrost	1.0	0.1	58.0	R/W
0x06F1	1778	PA08_SetALAntigeloInDefrost	1.0	0.0	217.5	R/W
0x06F2	1779	PA09_DiffALAntigeloInDefrost	1.0	0.1	58.0	R/W
0x06F3	1780	PA10_FlowStartup_AlarmDelay	30	1	999	R/W
0x06F4	1781	PA11_FlowRunning_AlarmDelay	10	1	999	R/W
0x06F5	1782	PA12_NumeroInterventiAllarmeFlusso	5	0	10	R/W
0x06F6	1783	PA19_RitardoErroreSonda	10	0	240	R/W
0x06F7	1784	PA20_SegnalazioneAllarmeTemperatura	0	0	3	R/W
0x06F8	1785	PA21_RitardoManualeAllarmiTemperatura	5	0	99	R/W
0x06F9	1786	PA22_DifferenzialeAllarmeTemp	2.0	0.1	18.0	R/W
0x06FA	1787	PA23_RitardoAttivazioneAllarmeTemperatura	30	1	999	R/W
0x06FB	1788	PA24_TempoInibizioneAllarmiTemperaturaInAccensione	15	0	999	R/W
0x06FC	1789	PA25_SetAllHTriscaldamento	50.0	20.0	176.0	R/W
0x06FD	1790	PA26_SetAllLTriscaldamento	10.0	8.0	176.0	R/W
0x06FE	1791	PA27_SetAllHTraffrescamento	30.0	0.1	95.0	R/W
0x06FF	1792	PA28_SetAllLTraffrescamento	6.0	-30.0	104.0	R/W
0x0700	1793	PA29_SetpointAllarmeAltaTempACS	60.0	20.0	158.0	R/W
0x0701	1794	PA30_SetpointAllarmeBassaTempACS	25.0	20.0	203.0	R/W
0x0702	1795	PA31_SetpointAllarmeAltaTempAntilegionella	70.0	20.0	203.0	R/W
0x0703	1796	PA38_EnableAlarmRTC	1	0	1	R/W
0x0704	1797	PA39_ResetType_AlarmRTC	1	0	1	R/W
0x0705	1798	PA40_SetAllarmeBassaPressioneRaffrescamento	3.0	0.1	145.0	R/W
0x0706	1799	PA41_DiffAllarmeBassaPressioneRaffrescamento	1.0	0.1	58.0	R/W

0x0707	1800	PA42_TempoByPassAllarmeBassaPressione	120	0	999	R/W
0x0708	1801	PA43_NumeroInterventiAllarmeBP	3	0	5	R/W
0x0709	1802	PA44_AbilitaControlloBassaPressConBassaTemp	2	0	3	R/W
0x070A	1803	PA45_SetAllarmeBassaPressioneAvviamentoCompressore	1.0	0.1	145.0	R/W
0x070B	1804	PA46_DiffAllarmeBassaPressioneInBassaTemp	0.5	0.1	58.0	R/W
0x070C	1805	PA47_TempoAttivazControlloBPconBT	5	0	999	R/W
0x070D	1806	PA48_SetAllarmeAltaPressione	42.0	16.0	652.2	R/W
0x070E	1807	PA49_DiffAllarmeAltaPressione	7.0	0.1	145.0	R/W
0x071B	1820	PA78_ThermalRes_Delay	10	0	999	R/W
0x071C	1821	PA79_ThermalRes_ResetType	1	0	1	R/W
0x071D	1822	PA66_ThermalPumpPS_Delay	10	0	999	R/W
0x071E	1823	PA67_ThermalPumpsPS_ResetType	1	0	1	R/W
0x071F	1824	PA68_ThermalPumpS_Delay	10	0	999	R/W
0x0720	1825	PA69_ThermalPumps_ResetType	1	0	1	R/W
0x0721	1826	PA70_ThermalCmp_Delay	10	0	999	R/W
0x0722	1827	PA71_ThermalCmp_ResetType	1	0	1	R/W
0x0723	1828	PA72_ThermalFan_Delay	10	0	999	R/W
0x0724	1829	PA73_ThermalFan_ResetType	1	0	1	R/W
0x0725	1830	PA74_ThermalPump_Delay	10	0	999	R/W
0x0726	1831	PA75_ThermalPump_ResetType	1	0	1	R/W
0x0727	1832	PA76_ThermalBoiler_Delay	10	0	999	R/W
0x0728	1833	PA77_ThermalBoiler_ResetType	1	0	1	R/W
0x0729	1834	PA83_EnabDefrostAlarm	0	0	1	R/W
0x072A	1835	PA80_En_Alarm_HourCmp	1	0	1	R/W
0x072B	1836	PA81_En_Alarm_HourPump	1	0	1	R/W
0x072C	1837	PA82_En_Alarm_HourFan	1	0	1	R/W
0x072D	1838	PA85_SetpointAllarmeAltaTempGas	90.0	70.0	284.0	R/W
0x072E	1839	PA86_DiffAllarmeTempGas	20.0	10.0	54.0	R/W
0x072F	1840	PA87_RitardoAllarmeTemperaturaGas	30	0	999	R/W
0x0730	1841	PA88_AutoManualALgasScarico	1	0	1	R/W
0x0732	1843	PH03_HighPressureMin	0.0	-14.5	870.0	R/W

0x0733	1844	PH04_HighPressureMax	50.0	-14.5	870.0	R/W
0x0734	1845	PH05_AbilitaCommutazioneValvola3 vieAntigelo	1	0	1	R/W
0x0735	1846	PH06_OnOffType	0	0	4	R/W
0x0736	1847	PH07_ModeChenageOver	0	0	3	R/W
0x0737	1848	PH09_Param_Language	1	0	1	R/W
0x0738	1849	PH10_CAN_1st_BaudRate	3	1	4	R/W
0x0739	1850	PH11_MODBUS_Address	1	1	247	R/W
0x073A	1851	PH12_MODBUS_Baud	3	0	4	R/W
0x073B	1852	PH13_MODBUS_Parity	2	0	2	R/W
0x073C	1853	PH14_MODBUS_StopBit	0	0	1	R/W
0x073D	1854	PH15_RipristinoDefaultParametri	0	0	1	R/W
0x073E	1855	PH18_HistoryReset	0	0	1	R/W
0x0747	1864	PH29_AbilitaSetPointDinamico	0	0	1	R/W
0x0748	1865	PH31_RefrigerationType	5	1	6	R/W
0x0749	1866	PH32_Temp_UM	0	0	1	R/W
0x074A	1867	PH33_Press_UM	0	0	1	R/W
0x075B	1884	PSd1_Password_Utente	0	-999	9999	R/W
0x075C	1885	PSd2_Password_Manutentore	-1	-999	9999	R/W
0x075D	1886	PSd3_Password_Installatore	-2	-999	9999	R/W
0x075E	1887	PSd4_Password_Costruttore	-3	-999	9999	R/W
0x075F	1888	Pr25_delaySetNotReached	20	0	999	R/W
0x0760	1889	PF16_LimiteMinCondensazioneLineare_Chiller	30.00	0.00	100.00	R/W
0x0761	1890	PF17_LimiteMaxCondensazioneLineare_ Chiller	80.00	0.00	100.00	R/W
0x0762	1891	PF18_AbiRegolazioneSottoLimiteMinCond_Chiller	1	0	1	R/W
0x0763	1892	PF19_DiffSpegnimentoSottoLimiteMinCond_Chiller	2.0	0.0	72.5	R/W
0x0764	1893	PrXX40_EnabFreeCoolingGeo	0	0	1	R/W
0x0765	1894	PrXX41_DeltaONtempGeo	3.0	1.0	18.0	R/W
0x0766	1895	PrXX42_DeltaOFFtempGeo	1.0	1.0	18.0	R/W
0x076B	1900	PC02_Cmp_Rotation_Type	3	0	3	R/W
0x076C	1901	PC19_HoursWearFactor	1	0	255	R/W
0x076D	1902	PC20_StartWearFactor	1	0	255	R/W

0x076E	1903	PC70_delayCmpEnv_HIDDEN	10	0	999	R/W
0x076F	1904	PC71_TimeForceCmpEnv_HIDDEN	30	0	999	R/W
0x0770	1905	PG00_MachineType	0	0	1	R/W
0x0771	1906	PG01_EnEVDRIVE	1	0	1	R/W
0x0772	1907	PG02_CmpType	3	0	5	R/W
0x0773	1908	PH01_LowPressureMin	0.0	-14.5	870.0	R/W
0x0774	1909	PH02_LowPressureMax	20.0	-14.5	870.0	R/W
0x0775	1910	PM11a13_AbilitaManuale_Comp[0]	0	0	1	R/W
0x0776	1911	PM11a13_AbilitaManuale_Comp[1]	0	0	1	R/W
0x0777	1912	PM11a13_AbilitaManuale_Comp[2]	0	0	1	R/W
0x0778	1913	PM21a23_outCmp[0]	0	0	1	R/W
0x0779	1914	PM21a23_outCmp[1]	0	0	1	R/W
0x077A	1915	PM21a23_outCmp[2]	0	0	1	R/W
0x077B	1916	PM53_ManualePompaPS	0	0	1	R/W
0x077C	1917	PM54_ManualePompaS	0	0	1	R/W
0x077D	1918	PM63_ForcePumpPS	0	0	1	R/W
0x077E	1919	PM64_ForcePumpS	0	0	1	R/W
0x077F	1920	PM87_TaraturaT_ACS_High	0.0	-36.0	36.0	R/W
0x0780	1921	PM88_TaraturaT_ACS_Low	0.0	-36.0	36.0	R/W
0x0781	1922	PM89_TaraturaTemperaturaBatteria1	0.0	-36.0	36.0	R/W
0x0782	1923	PM90_TaraturaTemperaturaBat2	0.0	-36.0	36.0	R/W
0x0783	1924	PM91_TaraturaOutSource	0.0	-36.0	36.0	R/W
0x0784	1925	PM92_TinPS	0.0	-36.0	36.0	R/W
0x0785	1926	PM93_TaraturaOutPS	0.0	-36.0	36.0	R/W
0x0786	1927	PP21_TipoFunzionamentoPompaS	0	0	2	R/W
0x0787	1928	PP31_sondaRegolazione	0	0	1	R/W
0x0788	1929	PP32_deltaON	5.0	0.0	36.0	R/W
0x0789	1930	PP33_deltaOFF	3.0	0.0	36.0	R/W
0x078A	1931	PP34_TOnFunzCiclicoPompaPS	2	0	999	R/W
0x078B	1932	PP35_TOffFunzCiclicoPompa_PS	5	0	999	R/W
0x078E	1935	PM04_startupCmp[0] (Low)	0.00	0.00	9999.00	R/W
0x078F	1936	PM04_startupCmp[0] (High)				
0x0790	1937	PM04_startupCmp[1] (Low)	0.00	0.00	9999.00	R/W
0x0791	1938	PM04_startupCmp[1] (High)				

0x0792	1939	PM04_startupCmp[2] (Low)	0.00	0.00	9999.00	R/W
0x0793	1940	PM04_startupCmp[2] (High)				
0x0794	1941	HA01	1	0	66	R/W
0x0795	1942	HA02	5	0	66	R/W
0x0796	1943	HA03	6	0	66	R/W
0x0797	1944	HA04	2	0	56	R/W
0x0798	1945	HA05	11	0	56	R/W
0x0799	1946	HA06	0	0	56	R/W
0x079A	1947	HA07	14	0	66	R/W
0x079B	1948	HA08	12	0	66	R/W
0x079C	1949	HA09	16	0	66	R/W
0x079D	1950	HB01[0]	2	0	42	R/W
0x079E	1951	HB01[1]	8	0	42	R/W
0x079F	1952	HB01[2]	14	0	42	R/W
0x07A0	1953	HB01[3]	22	0	42	R/W
0x07A1	1954	HB01[4]	20	0	42	R/W
0x07A2	1955	HB01[5]	4	0	42	R/W
0x07A3	1956	HB01[6]	26	0	42	R/W
0x07A4	1957	HB01[7]	28	0	42	R/W
0x07A5	1958	HB01[8]	36	0	42	R/W
0x07A6	1959	HC01[0]	1	0	7	R/W
0x07A7	1960	HC01[1]	2	0	7	R/W
0x07A8	1961	HC03[0]	0	0	9	R/W
0x07A9	1962	HC03[1]	0	0	9	R/W
0x07AA	1963	HC05[0]	0	0	5	R/W
0x07AB	1964	HC05[1]	0	0	5	R/W
0x07AC	1965	HCF1	10	10	2000	R/W
0x07AD	1966	HD01[0]	1	0	24	R/W
0x07AE	1967	HD01[1]	2	0	24	R/W
0x07AF	1968	HD01[2]	5	0	24	R/W
0x07B0	1969	HD01[3]	6	0	24	R/W
0x07B1	1970	HD01[4]	10	0	24	R/W
0x07B2	1971	HD01[5]	12	0	24	R/W
0x07B3	1972	HD01[6]	18	0	24	R/W

0x07B5	1974	PC75_TimeForceCmpBackEnv_HIDDEN	300	0	999	R/W
0x07B6	1975	PC72_EnvProtSpeed_HIDDEN	55	20	120	R/W
0x07B7	1976	PG03_ModCmp_Model	0	0	7	R/W
0x07B8	1977	PG04_EnInverter	0	0	1	R/W
0x07B9	1978	PM94_TaraturaTsuction	0.0	-36.0	36.0	R/W
0x07BA	1979	PV26_StandByPosition	0.00	0.00	100.00	R/W
0x07BB	1980	PV27_AlarmPosition	0.00	0.00	100.00	R/W
0x07BC	1981	PV28_PID_SH_Filter	10	1	255	R/W
0x07BD	1982	PV29_PID_FastActionLevel	100	1	100	R/W
0x07BE	1983	PV30_PID_FastActionThreshold	-1.0	-18.0	0.0	R/W
0x07BF	1984	PV31_PID_DeadZoneHi	1.0	0.0	45.0	R/W
0x07C0	1985	PV32_PID_SmartBandThreshold	3.0	0.0	45.0	R/W
0x07C1	1986	PV33_DaysToResync	1	0	255	R/W
0x07C2	1987	PV34_LP_setpoint	0.00	0.00	290.00	R/W
0x07C3	1988	PV70_LoSH_hysteresis	0.5	0.0	45.0	R/W
0x07C4	1989	PV71_LoSH_delay	3	0	255	R/W
0x07C5	1990	PV72_HiSH_hysteresis	1.0	0.0	45.0	R/W
0x07C6	1991	PV73_HiSH_delay	3	0	255	R/W
0x07C7	1992	PV74_LP_hysteresis	0.30	0.20	1.00	R/W
0x07C8	1993	PV75_LP_delay	3	0	255	R/W
0x07C9	1994	PV76_MOP_hysteresis	1.0	0.0	18.0	R/W
0x07CA	1995	PV77_MOP_delay	3	0	255	R/W
0x07CB	1996	PV78_MOP_Band	8.0	0.0	45.0	R/W
0x07CC	1997	PV79_MOP_Filter	15	0	255	R/W
0x07CD	1998	PV80_MOP_maxDSH	7.0	0.0	45.0	R/W
0x07CE	1999	PV81_MOP_Bypass	10	0	255	R/W
0x07CF	2000	PV82_LOP_hysteresis	1.0	0.0	18.0	R/W
0x07D0	2001	PV83_LOP_delay	3	0	255	R/W
0x07D1	2002	PV90_ValveType	1	0	4	R/W
0x07D2	2003	PV91_GenericValve_MinSteps	0	0	4900	R/W
0x07D3	2004	PV92_GenericValve_MaxSteps	1000	0	4900	R/W
0x07D4	2005	PV93_GenericValve_OvrSteps	1500	0	4900	R/W
0x07D5	2006	PV94_GenericValve_StepRate	100	25	1000	R/W
0x07D6	2007	PV95_GenericValve_DrivingMode	2	0	2	R/W

0x07D7	2008	PV96_GenericValve_DutyCycleForce	100	50	100	R/W
0x07D8	2009	HCD1_Delay	0	0	50	R/W
0x07D9	2010	HCI1_Impulse	20	1	50	R/W
0x07DA	2011	PC73_enabEnvelop_HIDDEN	1	0	1	R/W
0x07DB	2012	PC74_minOUTbristolCmp_HIDDEN	10.00	0.00	100.00	R/W
0x07E3	2020	PC80_LimitMin_Unloading	100.00	0.00	100.00	R/W
0x07E4	2021	PC81_SetCool_Unloading	25.0	0.1	95.0	R/W
0x07E5	2022	PC82_SetHeat_Unloading	15.0	0.0	176.0	R/W
0x07E6	2023	PC83_DiffUnloading	5.0	0.1	36.0	R/W
0x07E8	2025	PC85_Enable_ReturnOil	0	0	2	R/W
0x07E9	2026	PC86_Oil_WaitTime	5	0	999	R/W
0x07EA	2027	PC87_Oil_ForceCmpTime	60	0	999	R/W
0x07EB	2028	PC88_MinPerc_Oil	40.00	0.00	100.00	R/W
0x07EC	2029	Pr28_TipoAzionePerAntigelo	3	0	3	R/W
0x07ED	2030	Pd30_Enable_Tank_Resistor	0	0	1	R/W
0x07EE	2031	Pd31_SetPoint_Tank_Resistor	3.0	-10.0	86.0	R/W
0x07EF	2032	Pd32_Diff_Tank_Resistor	5.0	0.0	36.0	R/W
0x07F0	2033	PP15_Antigrip_PumpOFF_Days	3	0	30	R/W
0x07F1	2034	PP16_Antigrip_PumpON_Time	30	5	999	R/W
0x07F2	2035	PV65_TimeDeltaSH_NZ	5	1	60	R/W
0x07F3	2036	PV66_DeltaNegSH_NZ	0.2	0.1	2.0	R/W
0x07F4	2037	PV67_DeltaPosSH_NZ	1.0	0.1	2.0	R/W
0x07F5	2038	PF01_FansRegType	0	0	4	R/W
0x07F6	2039	PF61_FansReg_V1	20.00	0.00	100.00	R/W
0x07F7	2040	PF62_FansReg_V2	40.00	0.00	100.00	R/W
0x07F8	2041	PF63_FansReg_V3	60.00	0.00	100.00	R/W
0x07F9	2042	PF64_FansReg_V4	80.00	0.00	100.00	R/W
0x07FA	2043	PC57_minRPSForceVar_HIDDEN	2.0	0.0	20.0	R/W
0x07FB	2044	PP36_setHT_ACS	70.0	0.0	194.0	R/W
0x07FC	2045	PP37_diffHT_ACS	10.0	0.0	36.0	R/W
0x07FD	2046	PP38_setHT_PS	100.0	0.0	266.0	R/W
0x07FE	2047	PP39_diffHT_PS	10.0	0.0	36.0	R/W
0x07FF	2048	PM95_TaraturaAux1	0.0	-36.0	36.0	R/W
0x0800	2049	PM96_TaraturaAux2	0.0	-36.0	36.0	R/W

0x0801	2050	PU01_typeAux1	0	0	1	R/W
0x0802	2051	PU02_setAux1	20.0	-50.0	302.0	R/W
0x0803	2052	PU03_diffAux1	2.0	0.0	36.0	R/W
0x0804	2053	PU04_minOutAux1	0.00	0.00	100.00	R/W
0x0805	2054	PU05_maxOutAux1	100.00	0.00	100.00	R/W
0x0806	2055	PU06_minTypeAOaux1	1	0	1	R/W
0x0807	2056	PU21_typeAux2	0	0	1	R/W
0x0808	2057	PU22_setAux2	20.0	-50.0	302.0	R/W
0x0809	2058	PU23_diffAux2	2.0	0.0	36.0	R/W
0x080A	2059	PU24_minOutAux2	0.00	0.00	100.00	R/W
0x080B	2060	PU25_maxOutAux2	100.00	0.00	100.00	R/W
0x080C	2061	PU26_minTypeAOaux2	1	0	1	R/W

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