



PROGRAMMABLE CONTROLLER FOR CHILLER – HEAT PUMPS SINGLE-CIRCUIT 2 COMPRESSORS



APPLICATION MANUAL

CODE 144HPR0N0E00

C-PRO NANO HPR0 APPLICATION MANUAL

Important

Read these instructions carefully before installation and use and follow all recommendations regarding installation and for the electric connection; keep these instructions for future reference.

The instrument must be disposed of according to local Standards regarding the collection of electric and electronic appliances.



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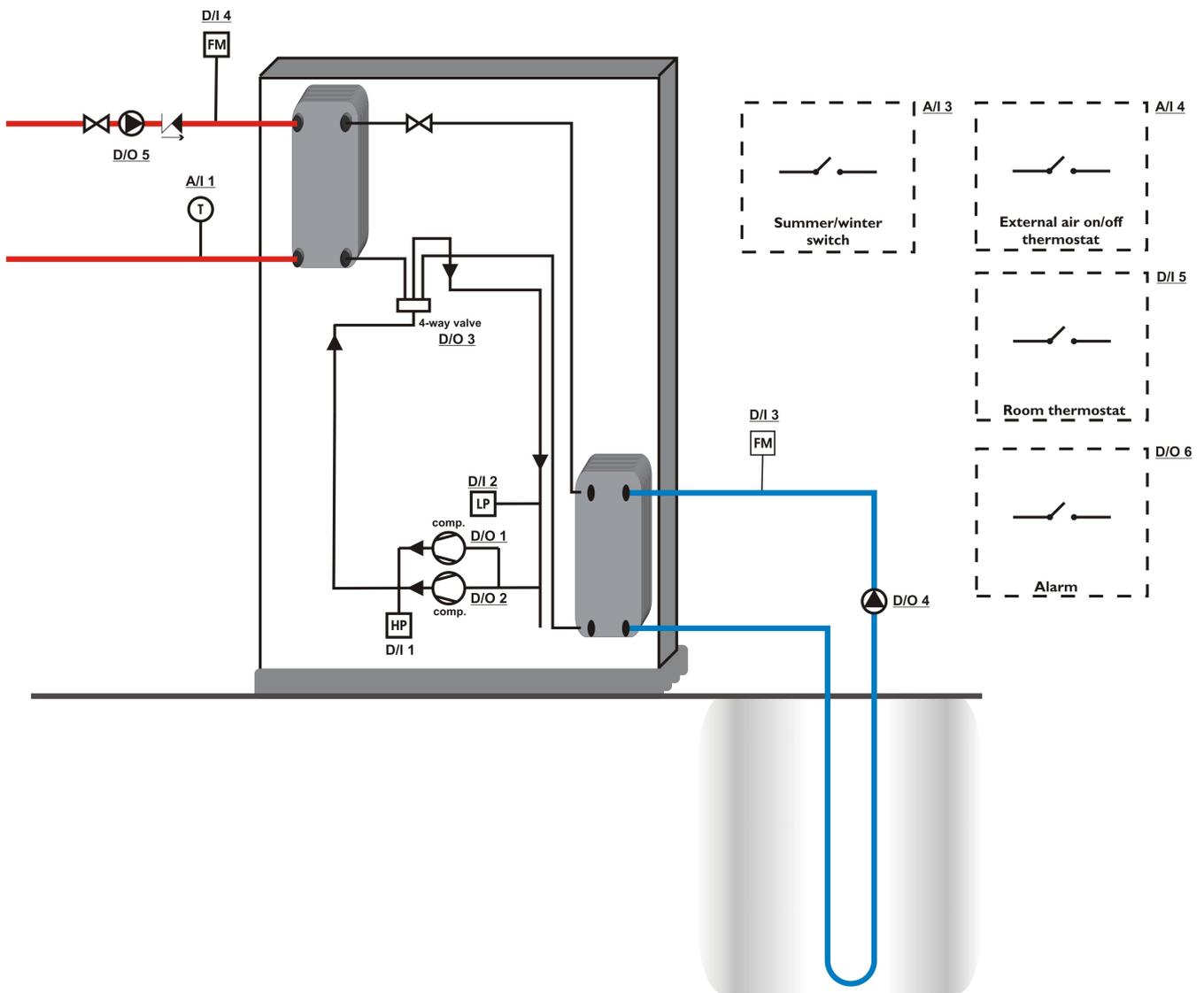
1 Application and organisation of I/O

The layouts attached describe the application (controlled unit and system). They indicate the presence of parts and components and not their precise position or other construction aspects of the units described.

The I/O tables state the necessities and the organisation of the controller inputs and outputs for the type of unit and system to be controlled.

HPR0: application layout

Heat pump unit – reversible (chiller) – (only) geothermic – 2 compressors – just one heating/cooling circuit – NO area control – INTRAbus.



1.1 I/O

For **HPR0** a C-PRO NANO (INTRAbus) must be used with the following features .

Total analogical inputs: 4. Total digital inputs: 5 (*). Total digital outputs: 6.

Total analogical outputs: 1 + 2 optionals (not present on this application).

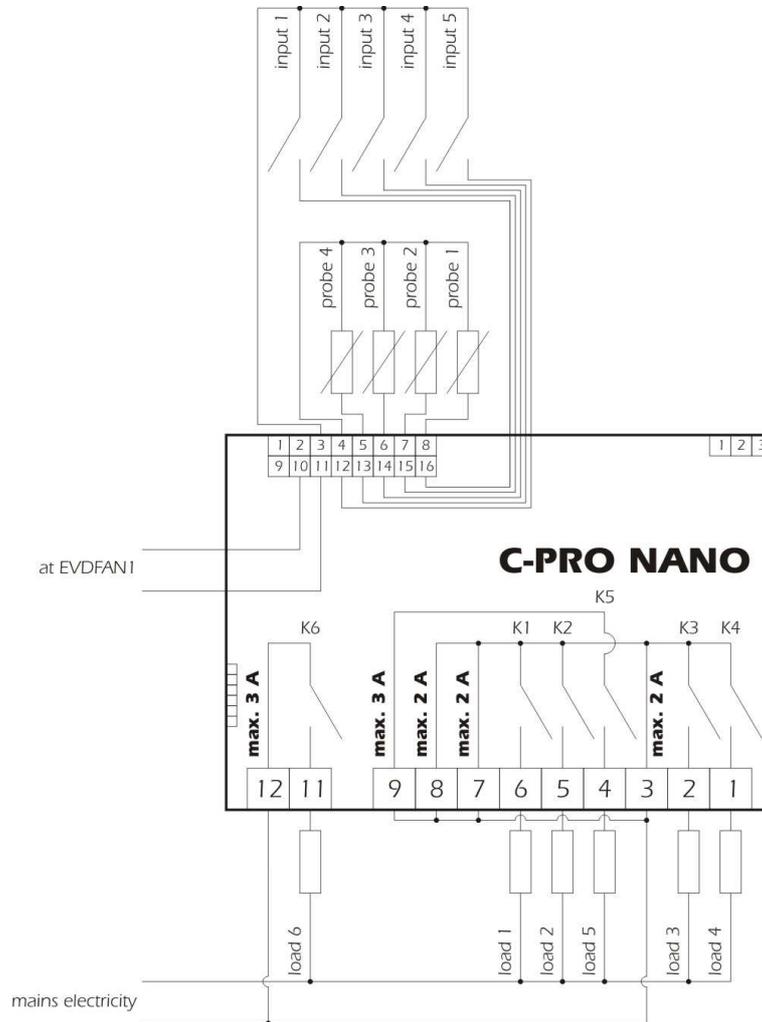
(* **Note:** A total number of 7 digital inputs are used in this application for this purpose n°2 analogue inputs will be used as digital inputs.

I/O	Description
Analogue Inputs	
A/I 1	Heating/cooling outlet / condit. (NTC)
A/I 2	
A/I 3	Summer - Winter (ON-OFF potential-free contact)
A/I 4	External thermostat (ON-OFF potential-free contact)
Serial ports (RS 485 and INTRABUS)	
TTL (RS 485)	TTL with ext interf. EVIF becomes RS485 Modbus RTU
INTRAbus	towards c-pro EVCO instruments
Digital Inputs	
D/I 1	High pressure switch (ON-OFF potential-free contact)
D/I 2	Low pressure switch (ON-OFF potential-free contact)
D/I 3	Geothermic circuit flow switch (ON-OFF potential-free contact)
D/I 4	Outlet circuit flow meter (ON-OFF potential-free contact)
D/I 5	Room thermostat (ON-OFF potential-free contact)
Analogue Outputs	
A/O 1	<i>PWM output not used</i>
A/O 2	<i>Optional (4-20 mA/0-10 V) : not present</i>
A/O 3	<i>Optional (4-20 mA/0-10 V) : not present</i>
Digital Outputs	
D/O 1	compressor 1
D/O 2	compressor 2
D/O 3	CYCLE INVERSION 4-WAY VALVE
D/O 4	Geothermic circuit pump
D/O 5	Heating/air conditioning outlet circuit pump
D/O 6	General alarm

N.B.: All contacts arriving at the controller inputs must be potential free contacts, without voltage.

1.2 Connection lay out for C-PRO NANO INTRABUS

Below find the connection lay out of the C-PRO NANO controller with tables relative to the meaning of the inputs and outputs.



C-PRO NANO connections

Connector 1: Connection for the relay outputs		
Conn.	Code	Description
C1-1	DO4	Relay n.4 normally open contact
C1-2	DO3	Relay n.3 normally open contact
C1-3	COMMON 1	Common relays n.1,2,3,4
C1-4	DO5	Relay n.5 normally open contact
C1-5	DO2	Relay n.2 normally open contact
C1-6	DO1	Relay n.1 normally open contact
C1-7	COMMON 1	Common relays n.1,2,3,4
C1-8	COMMON 1	Common relays n.1,2,3,4
C1-9	COMMON DO5	Common relay n.5
C1-10		Not used
C1-11	DO6	Relay n.6 normally open contact

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Connector 2: Connection for the upload/download parameters and/or output pen for RS485 module and/or controller flash download module

Connector 3: Connector for the analogue output

Conn.	Code	Description (Version V+I)
C3-1	AO2	0-10Vdc
C3-2	GND	Common analogue output
C3-3	AO3	4-20mA
Description (Version I+I)		
<i>C3-1</i>	<i>AO2</i>	<i>4-20mA</i>
<i>C3-2</i>	<i>GND</i>	<i>Common analogue output</i>
<i>C3-3</i>	<i>AO3</i>	<i>4-20mA</i>
Description (Version V+V)		
C3-1	AO2	0-10Vdc
C3-2	GND	Common analogue output
C3-3	AO3	0-10Vdc

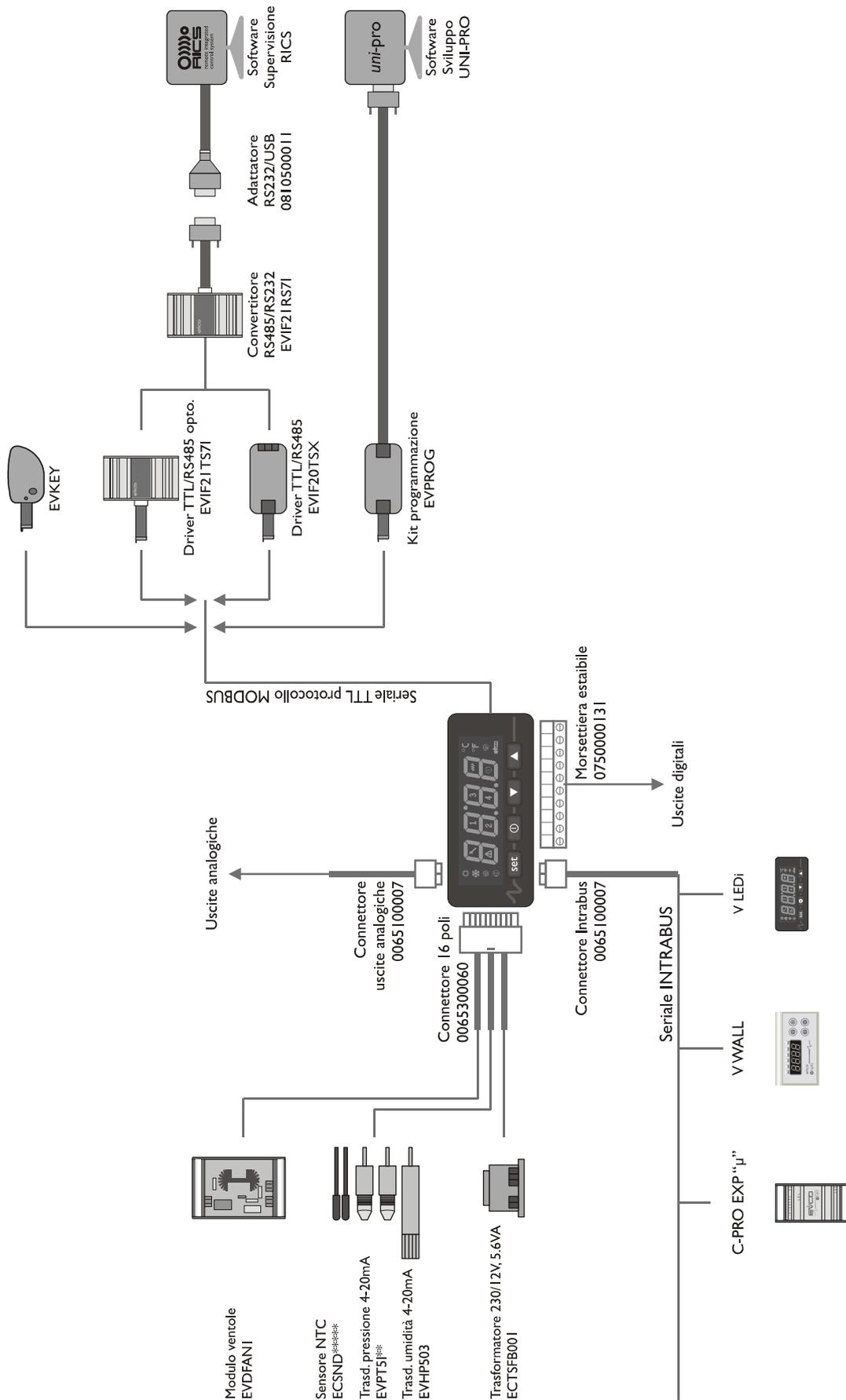
Connector 4: Connector for low voltage signals

Conn.	Code	Description
C4-1	12Vac (Power)	Instrument power supply (12Vac/dc)
C4-2	Not connected	Not connected
C4-3	GND	Common analogue and digital inputs
C4-4	GND	Common analogue and digital inputs
C4-5	AI4	Analogue input n.4 (for NTC probes or 0/4-20 mA transducers)
C4-6	AI3	Analogue input n.3 (for NTC probes or 0/4-20 mA transducers)
C4-7	AI2	Analogue input n.2 (for NTC probes)
C4-8	AI1	Analogue input n.1 (for NTC probes)
C4-9	12Vac (Power)	Instrument power supply (12Vac/dc)
C4-10	12Vdc	Current transducers and phase cut module power supply (max. 50 mA, not protected against short circuit)
C4-11	AO1	Jog output for phase cut module
C4-12	DI5	Digital input n.5
C4-13	DI4	Digital input n.4
C4-14	DI3	Digital input n.3
C4-15	DI2	Digital input n.2
C4-16	DI1	Digital input n.1

Connector 5: Connector for the remote keyboard and expansion of I/O

Conn.	Code	Description
C5-1	12Vdc	Remote keyboard power supply (12Vdc max 50mA, not protected against short circuits) (Note: any expansion must be powered locally)
C5-2	GND	Common
C5-3	DATA	Serial live

1.3 Network components and accessories



2 Functioning

Translation of terms used and notes

Digital inputs

Inter été/hiver = summer/winter switch (cooling/heating)

Pressostat HP = HIGH pressure switch

Pressostat BP = LOW pressure switch

Contrôleur de débit d'eau circuit chauffage = OUTLET circuit flow switch

Contrôleur de débit d'eau circuit chauffage = GEOTHERMIC circuit flow switch

Thermostat d'ambiance = ROOM thermostat (inserts compressor 1)

Thermostat d'ambiance = EXTERNAL thermostat (inserts compressor 2)

Analogue Inputs

Sonde de départ d'eau = OUTLET temperature probe

Digital outputs

Vanne 4 voies = 4-way valve (cycle inversion)

Compressor 1

Compressor 2

Circulateur chauffage = OUTLET circuit pump

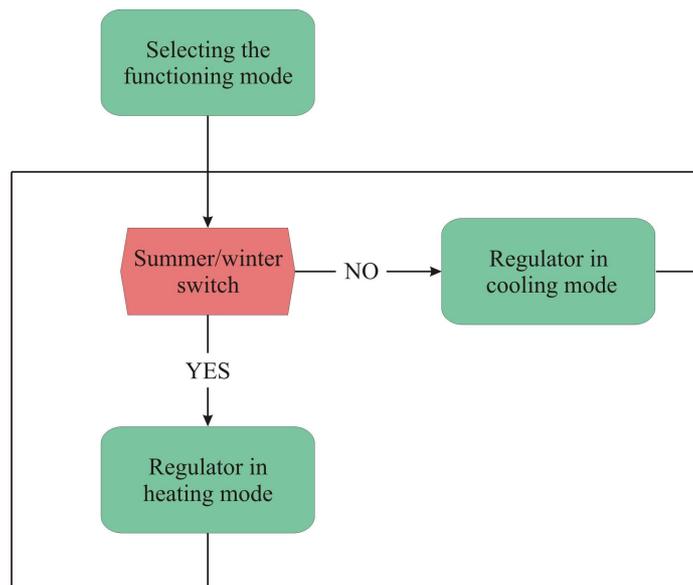
Circulateur capteur = GEO circuit pump

Set

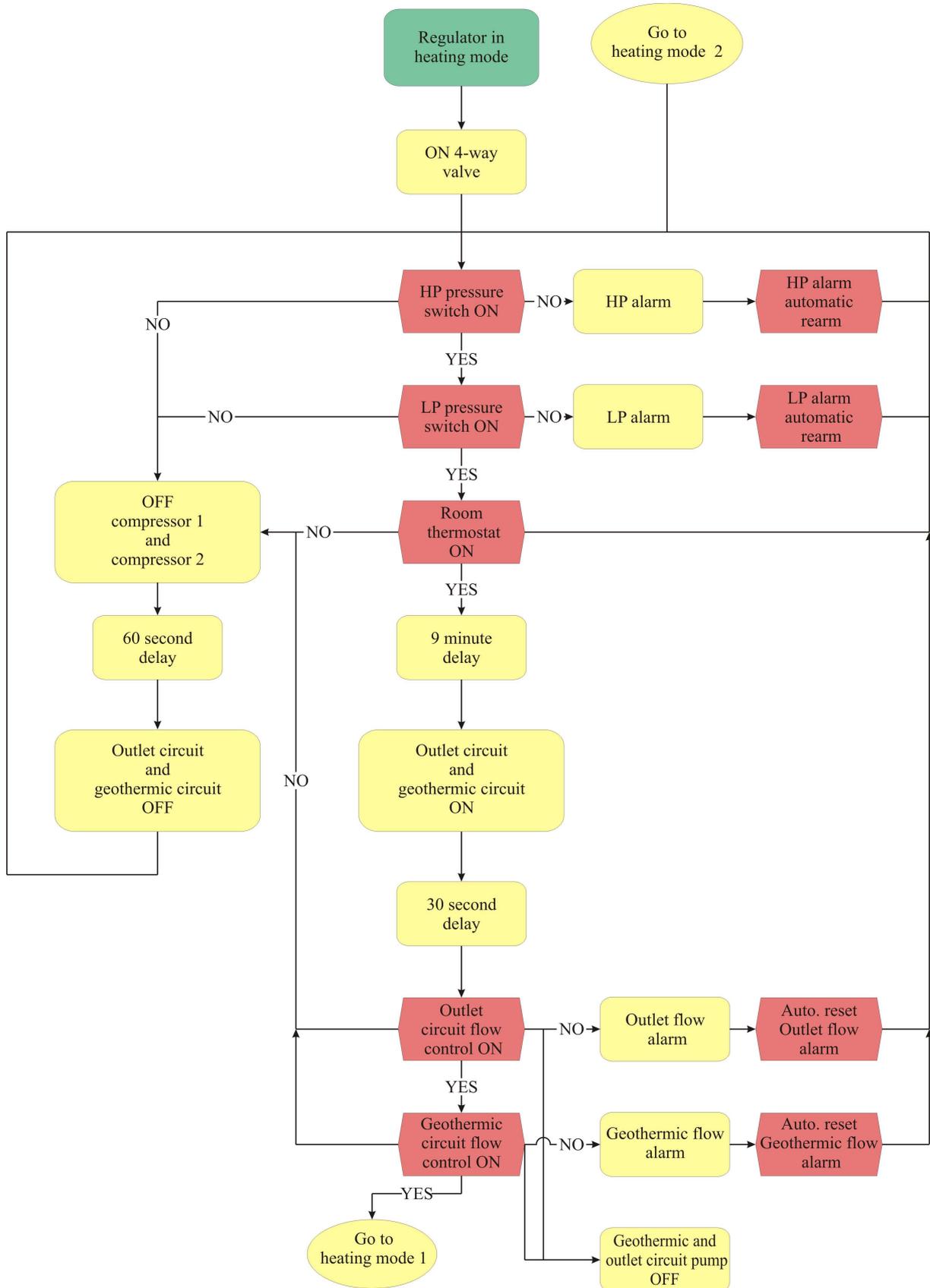
Consigne 1 = OUTLET temperature set in functioning mode: "heating"

Consigne 2 = OUTLET temperature set in functioning mode: "cooling"

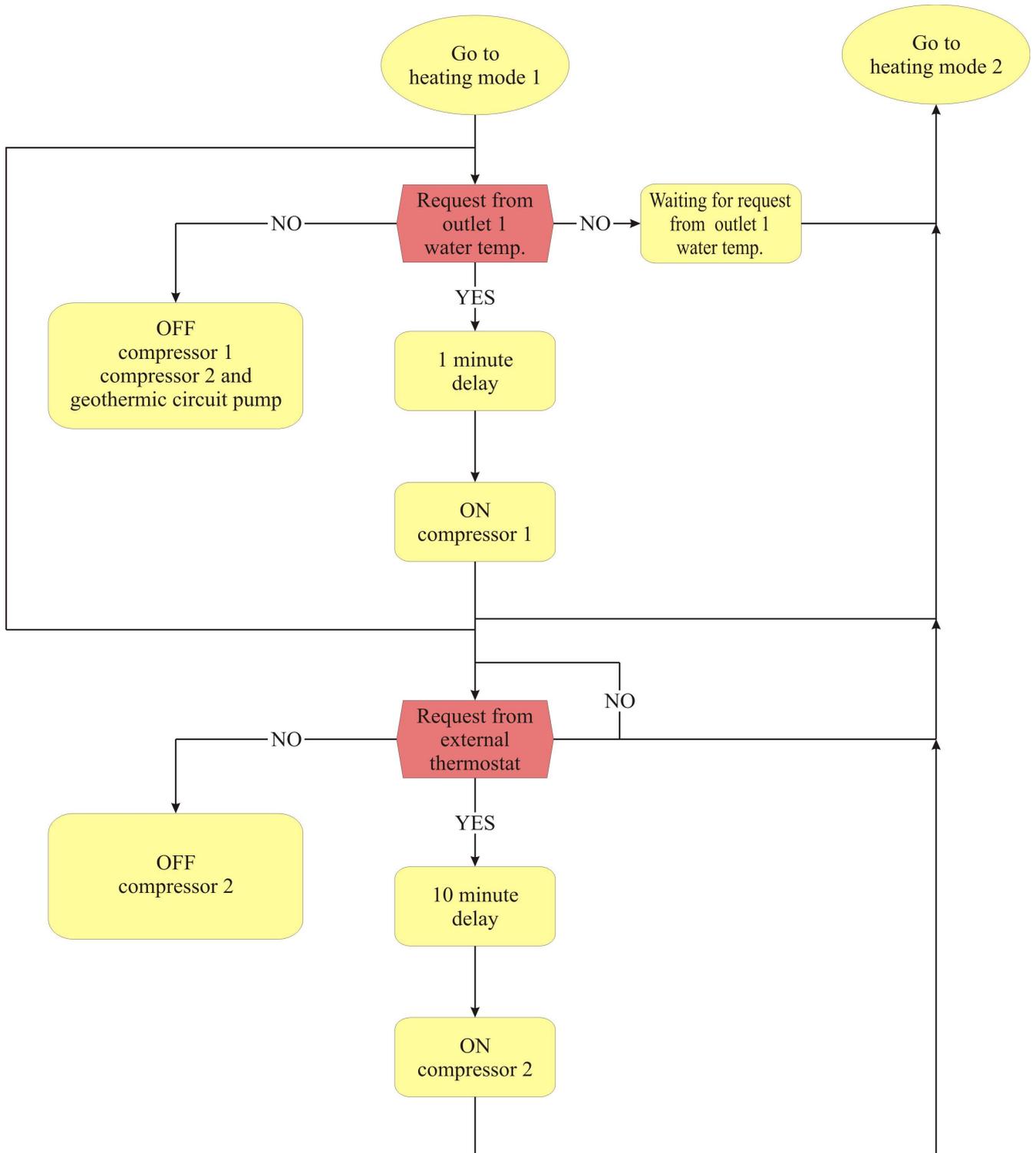
Selecting the functioning mode



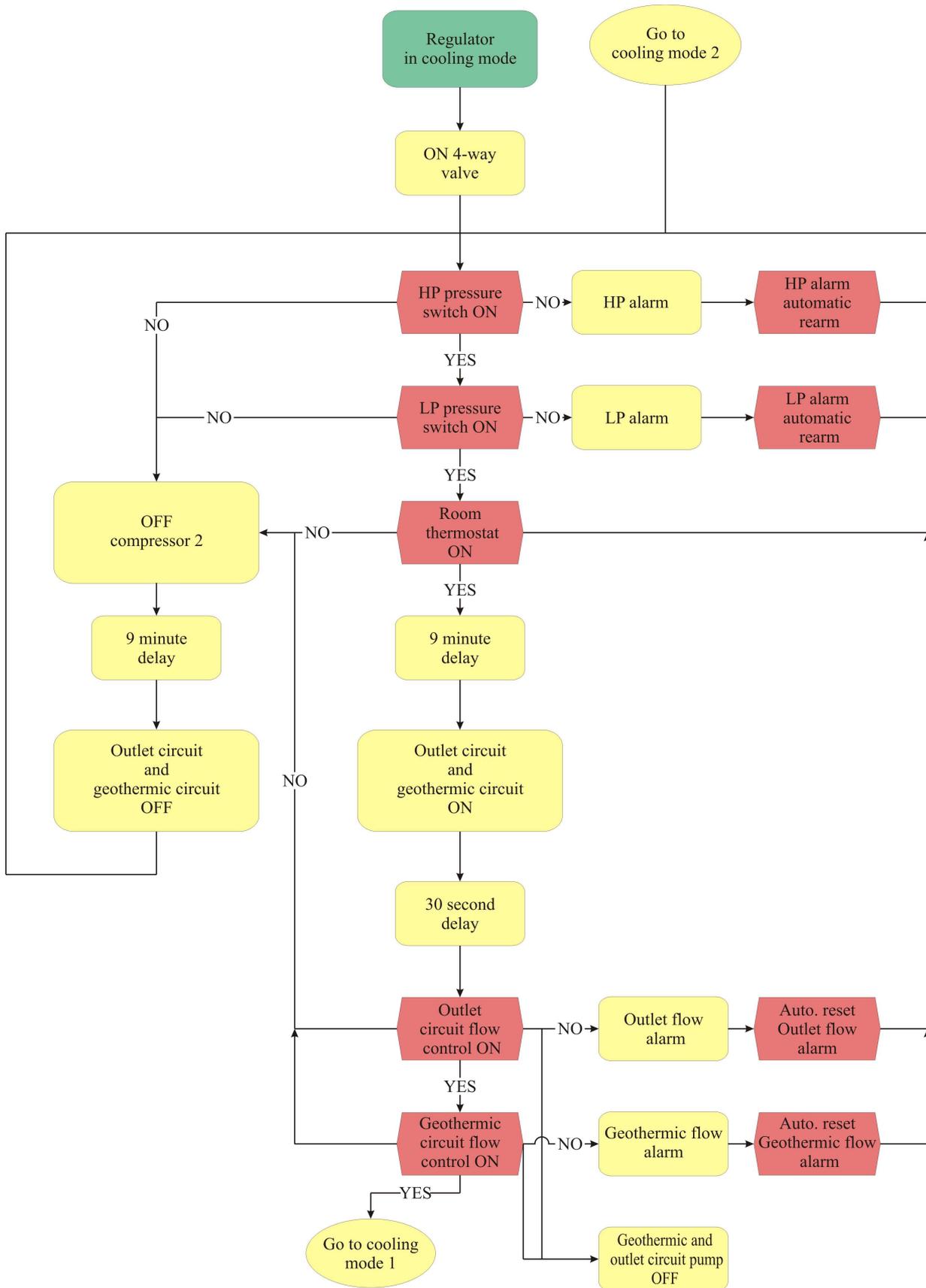
Heating mode 1



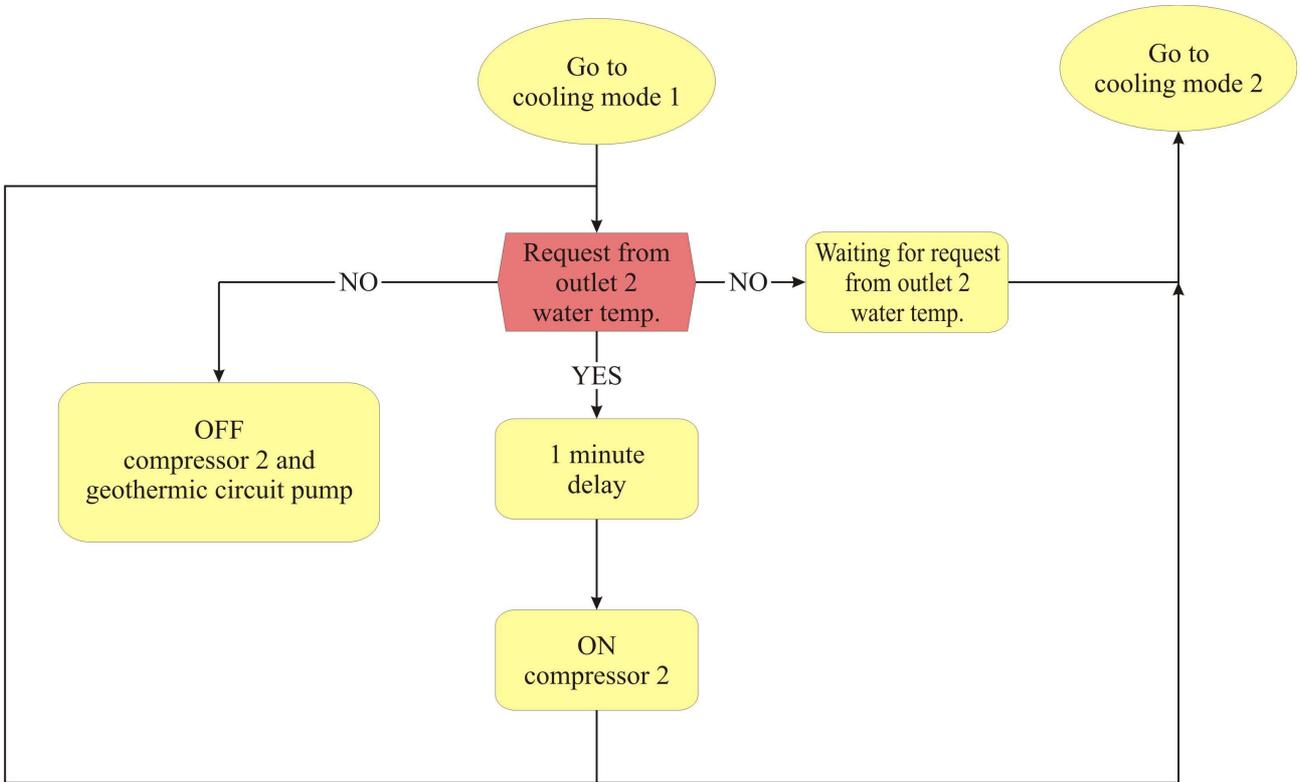
Heating mode 2



Cooling mode 1



Cooling mode 2



N.B.: Set and timing can be set on the controller

3 User Interface

3.1 Display and keyboard

The following interface is envisioned for the application:

- A 4 display interface with 7 Built-In segments with icons
- With 4 keys with navigation/editing the pages and they differ for display



The following icons are also used:

- Summer icon: identifies the cooling functioning mode (summer - chiller): if the heat regulation requests, it is on in fixed mode, otherwise it is off.
- Winter icon: identifies the heating functioning mode (winter - heat pump): if the heat regulation requests, it is on in fixed mode, otherwise it is off.
- Fans icon: not used
- Pumps icon: identifies the state of the pumps (geothermic and flow). If on, the pumps result as running, otherwise it is off. If flashing, it signals that the flow switch has intervened in at least one of the two circuits (no water - liquid alarm).
- Maintenance icon: not used
- Alarm icon: identifies the presence or not of alarms. Alarms are present if it is on, otherwise it remains off. When flashing, it signals the presence of a new alarm not yet viewed. The icon flashes if there are alarms when the machine is off.
- Icons 1,2: identify the state of the individual compressors. If on, the compressor is functioning, otherwise it is off. The flashing indicates that the compressor has been stopped for a pressure switch intervention (HIGH or LOW pressure alarm).
- External ventilated heat exchanger anti-freeze resistance icon: not used
- Stand-by icon: not used
- Defrosting icon: not used
- °C/°F icon: used only in °C

3.2 List of pages

This paragraph presents the main pages and menus found in the application. As shown previously, the main menu is divided into 3 levels: user, maintenance - installer and manufacturer.

The menus have the following structure:

- Main Menu
 - User menu (Level 1)
 - Maintenance technician - installer menu (Level 2)
 - Functioning branch maintenance technician menu
 - Calibration branch maintenance technician menu
 - Compressors branch maintenance technician menu
 - Pumps branch maintenance technician menu
 - Safety conditions branch maintenance technician menu
 - Parameters map branch maintenance technician menu
 - I/O branch maintenance technicians menu
 - Manufacturer menu (Level 4)
 - Configurations branch manufacturer menu

3.3 Password

A level is associated to every menu that conditions access to the various menus.

A password is associated to every level, which allows access to the various functions present in that determined menu. Once the correct password has been entered the protected function can be accessed. Two effects are obtained by entering a password correctly:

- release of the correlated level
- release of the sub-levels

Every level password can be modified from the same level or higher levels. For example, all passwords of lower levels can be modified from the manufacturer level, using the appropriate page. The range of values that can be set for the password is -999/9999.

After 4 minutes that no key is pressed, the password expires and must be set again.

3.4 Main OFF page

The main OFF page changes depending on the reason for which the unit is off. There are three possibilities:

1. **Unit OFF**: unit switched-off using key
2. **Unit OFF from Alarm**: unit switched-on using key but switched-off due to unit block alarms.
3. **Unit OFF from Change-over**: unit switched-on using key but switched-off due to summer-winter change-over (this state remains until the pumps are switched-off)

Note: The MANUFACTURER menu can only be accessed if the unit is in one of these states.

3.5 Main ON page

The main page displays the temperature of the outlet water and the relative icons on at that moment.

By pressing the DOWN key for about 2 seconds from this page, enter MENU.
From MENU, by pressing the ESC key, go back to the main page.

3.6 Main Menu

The main menu does not have a level and is the access point for all other system menus.

USEr (*USER* Menu)
MAin (*MAINTENANCE-INSTALLER* menu)
CoSt (*MANUFACTURER* menu)
StAt (*MACHINE STATUS* menu)

From this page, select which menu to enter using the UP and DOWN keys and press the ENTER key to confirm.

By pressing ESC from this menu, go back to the initial page.

3.7 StAt menu

If *StAt* is selected from the main menu, some main system states are displayed:

Unit: indicates the state in which the machine is operating (**OFF**, **ChIL**, **pdC**)
CMP1: state of compressor 1 (**OFF**, **tOn**, **On**, **tOFF**)
CMP2: state of compressor 2 (**OFF**, **tOn**, **On**, **tOFF**)
PMP1: state of the outlet circuit pump (**OFF**, **tOn**, **On**, **tOFF**)
PMP2: state of the geothermic circuit pump (**OFF**, **tOn**, **On**, **tOFF**)
fLw1: state of the outlet circuit flow switch (**OFF**, **tOn**, **On**, **ALAr**)
fLw2: state of the geothermic circuit flow switch (**OFF**, **tOn**, **On**, **tAL**, **ALAr**)

By pressing ENTER on the label, see the value of the relative state, by pressing ESC go back to the main menu mask. This menu is not protected by a password.

3.8 User Menu

The user level password or higher must be entered in order to display/modify the parameters present in this branch.

SPC1 (summer - cooling setpoint)
SPH1 (winter - heating setpoint)
SSC1 (summer setpoint offset)
SSH1 (winter setpoint offset)
PSd1 (USER password)

3.9 Maintenance technician - Installer menu

The maintenance technician - installer level password or higher must be entered in order to display/modify the parameters present in this branch.

Func (*FUNCTIONING* Menu)
CAL (*CALIBRATION* Menu)
CoMP (*COMPRESSORS* Menu)
PuMP (*PUMPS* Menu)
SEcu (*SAFETY* Menu)
MAP (*PARAMETERS MAPS* Menu)
I-O (*I/O STATE* menu)
PSd2 (*MAINTENANCE TECHNICIAN- INSTALLER* Password)

In this menu it is possible to view the state of the various devices, inputs and outputs used by the application.

In the *FUNCTIONING* menu it is allowed to set the data of the last maintenance operation performed

In the *CALIBRATION* menu it is possible to set a correction to be made to the measurement of the outlet probe in order to compensate any errors owing to wiring and positioning of the probe.

In the *COMPRESSORS* menu it is possible to set the parameters relative to functioning and the protections of the compressors (timing, signalling delays, etc).

In the *PUMPS* menu it is possible to set the parameters relative to functioning and the protections of the pumps (flow switches, timing, signalling delays, etc).

In the *SAFETY DEVICES* menu, find all parameters that concern the alarms and the management of the safety conditions for the devices:

- enablings
- signal delays
- type of reset...

The *PARAMETERS MAPS* menu can only be reached if the machine is OFF. In this menu it is possible to save or reload the parameters from a programming key and, if necessary, to reset the factory parameters. In this menu, after every operation, it is necessary to switch the instrument off and back on again to make the modification operational.

3.10 Manufacturer Menu

The Manufacturer level password must be entered in order to display/modify the parameters present in this branch. Moreover, this level can only be accessed with machine OFF (with just instrument powered).

ConF (*SYSTEM* menu)
PSd4 (*MANUFACTURER* Password)

This menu contains all machine configuration parameters.
It also allows to configure the logic of the inputs and outputs.

3.11 Project and Firmware Versions

Press the UP+DOWN keys at the same time for about 2 seconds and successively press ENTER on the **InFo** label.

The information regarding the versions of the project and the controller firmware are displayed in sequence, precisely:

Project Number <-> Project Version <-> Project Revision <->

Firmware Number <-> Firmware Version <-> Firmware Revision

Use the UP and DOWN keys to scroll the information. To return to the application pages, press the ESC key.

4 List of Parameters

The same parameters organisation used for *c-pro CHILL* can be maintained.

For the parameters and functions of the *c-pro HPR0* application, see the following table.

As an example, the codes used with CHIL have been maintained (that will appear on the LED display), but which will be “re-organised” regarding numbering depending on this new application.

Code	Parameter description	Default	Min	Max	U.M.	Menu	Notes
USER PARAMETERS							
PSd1	Modify the password to User level	0	-999	9999		UT	
OUTLET SET							
SPC1	Sets the summer outlet setpoint value (cooling)	8.5	PC21	PC22	°C	UT	
SSC1	Sets the summer outlet setpoint offset value	0.0	-20.0	20.0	°C	UT	
SPH1	Sets the winter outlet setpoint value (heating)	44.0	PC23	PC24	°C	UT	
SSH1	Sets the winter outlet setpoint offset value	0.0	-20.0	20.0	°C	UT	
MAINTENANCE TECHNICIAN - INSTALLER PARAMETERS							
PSd2	Sets the Maintenance technician - Installer level password	0	-999	9999		IS-V	
PM91	Sets the last date maintenance was performed on the system (year)	2007	2007	2060		MA-F	
PM92	Sets the last date maintenance was performed on the system (month)	1	1	12		MA-F	
PM93	Sets the last date maintenance was performed on the system (day)	1	1	31		MA-F	
CALIBRATION							
PM81	Calibration of the heating water outlet temperature probe	0.0	-20.0	20.0	°C	MA-CA	
COMPRESSORS							
PC04	Minimum time for which the compressor must remain on even if switch-off has been requested	20	0	999	Sec	IS-C	
PC05	Minimum time for which the compressor must remain off even if switch-on has been requested	120	0	999	Sec	IS-C	
PC06	Minimum time that must pass between two switch-ons of the same compressor.	360	0	999	Sec	IS-C	
PC07	Minimum time for switch-on of compressor 1	60	0	999	Sec	IS-C	
PC08	Minimum time for switch-on of compressor 2 (winter mode)	10	0	20	Min	IS-C	
PC09	Minimum time for switch-on of compressor 2 (summer mode)	60	0	999	Sec	IS-C	
PC10	Compressor 1 block delay due to high temperature	240	0	999	Sec	IS-C	
OUTLET SET LIMITS							
PC21	Outlet summer setpoint minimum value	5.0	-15.0	SPC1	°C	IS-R	
PC22	Outlet summer setpoint maximum value	20.0	SPC1	23.0	°C	IS-R	
PC23	Outlet winter setpoint minimum value	30.0	23.0	SPH1	°C	IS-R	
PC24	Maximum value of the winter setpoint	44.0	SPH1	70.0	°C	IS-R	
PUMPS and FLOW SWITCHES							
PP04	Minimum time that must pass between the switch-on of the pumps and switch-on of the first compressor	60	1	999	Sec	IS-P	
PP05	Minimum time that must pass between switch-	60	1	999	Sec	IS-P	

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	off of the unit and pumps switch-off						
PP06	Pumps switch-on delay	9	1	20	Min	IS-P	
PP07	pumps switch-off delay (winter mode)	60	1	999	Sec	IS-P	
PP08	pumps switch-off delay (summer mode)	9	1	20	Min	IS-P	
ALARMS							
PA01	Flow switches alarm delay from pumps switch-on	30	1	999	Sec	IS-S	
PA02	Flow switch alarm delay	10	1	999	Sec	IS-P	
PA03	Low pressure alarm delay after start-up of the first compressor	240	1	999	Sec	IS-P	
PA04	Probe error delay	10	0	240	Sec	IS-P	
DEFAULT PARAMETERS							
PH15	Reset the factory parameters default	No (0)	No (0)	Yes (1)		IS-V	Wait for the value 0 to be read again on completion of reset
MANUFACTURER PARAMETERS							
PSd4	Manufacturer level password	0	-999	9999		CO-Pa	
I/O CONFIGURATION							
PH05	Enables switch-on/off of the machine by pressing the ESC/Stand-By key	Yes (1)	No (0)	Yes (1)		IS-V	
PH06	Enables functioning mode change from switch	Yes (1)	No (0)	Yes (1)		IS-V	
PH16	Sets the logic of the relay used for the inversion 4-way valve 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-V	
PH17	Sets the logic of the digital inputs used for management of the alarms: 0: Normally open NO 1: Normally closed NC	NC	NO (0)	NC (1)		IS-V	
PH18	Sets the logic of the relay used for the alarms 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-V	
PH19	Sets the logic of the digital input used for summer/winter change-over: 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-V	
PH20	Sets the logic of the digital input used for flow control (flow switch): 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-V	
PH21	Sets the logic of the digital input used for thermostats control: 0: Normally open NO 1: Normally closed NC	NO	NO (0)	NC (1)		IS-V	
PH43	Sets the analogue input A/I 3 : 0: Probe disabled 1: ON OFF potential free contact (SUM-WIN)	1	0	1		IS-V	
PH44	Sets the type of universal analogue input A/I4 0: Probe disabled 1: ON OFF potential free contact (Ext. Aria ext)	1	0	1		IS-V	
PH52	Sets the display of the Evco icon 0: No 1: Yes	Yes (1)	No (0)	Yes (1)		IS-V	

HARDWARE CONFIGURATION

Those eventually necessary (to be defined in the design phase)						
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5 Controls and regulations

5.1 Machine state

The unit is switched-on/off using the relative **On/Off key** :

Switch-on - press the relative key for 2 seconds: if all of the other conditions enabled are present, the machine goes to “ON”.

Switch-off - press the relative key for 2 seconds: the machine goes to “OFF” mode.

The unit can be switched-off due to change-over or summer/winter mode change taking place with unit on. The unit will switch back on when the pumps have switched-off.

The machine On/Off key is the ESC key.

5.1.1 OFF state due to alarm

When the machine is on, a further state exists **OFF due to alarm**, which switches the nit and all devices off until the alarm condition has been reset. If switch-off using key is requested in this state, the power plant goes to the relative OFF state. The alarm causing this state is the broken outlet probe alarm.

The machine works normally again when the alarm has been reset.

5.2 Checking the functioning mode

The *c-pro HPR0* - reversible version - was developed as a unit able to work as a heat pump or chiller, supplying water for heating or air conditioning according to system request

The unit will function as *Chiller or Heat Pump*, passing from one situation to the other automatically depending on the “Summer/Winter” control (A/I 3)

The operational mode can assume the following values:

<i>“SEAS” state</i>	<i>Operational mode</i>	<i>Description</i>
<i>Off=0=COLd</i>	<i>Chiller</i>	<i>Summer functioning mode</i>
<i>On=1=HEAt</i>	<i>Heat Pump</i>	<i>Winter functioning mode</i>

The DO03 cycle inversion valve is activated during winter functioning mode (Heat Pump).

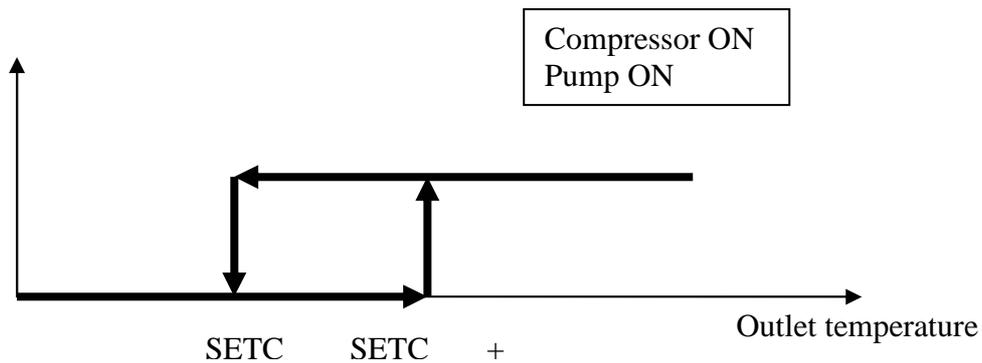
Warning - The operational mode can also be varied with the machine on: in this case, the machine switches off respecting all timings. It therefore changes-over and switches back on automatically.

5.3 Regulation and management of the compressors

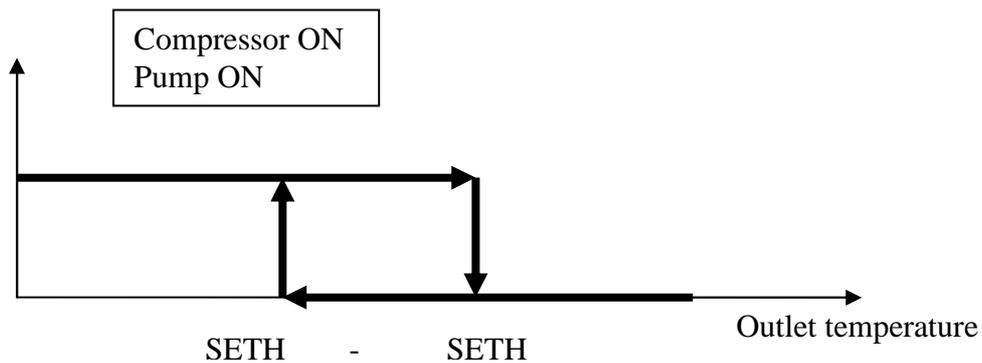
The controller can manage up to a maximum of 2 compressors. Digital outputs for switch-on/off and protection inputs (pressure switches) are associated with every compressor. Switch-on/off is defined depending on the set/outlet temperature, some timing and request of the room thermostat and the indoor thermostat.

The compressor switch-on control takes place on the basis of the outlet temperature AI1.

The following figure shows the behaviour of the regulation in the case of summer functioning (chiller). The regulation requests compressor switch-on on the basis of the outlet temperature value. In this regulation, the band is shifted completely over the setpoint.



However, in winter functioning mode (heat pump), the band is shifted completely below the set-point:



5.4 Compressors status

The compressor has one functioning state associated, which can be seen via the relative LED or in the states mask from the main menu. The compressor assumes the following states:

- *On*: “**On**” appears on the state mask
- *Switch-on stand-by*: the compressor is in stand-by due to the switch-on protection times. “**tOn**” appears on the state mask
- *Off*: “**OFF**” appears on the state mask
- *Switch-off stand-by*: the compressor is in stand-by due to the switch-off protection times. “**tOFF**” appears on the state mask

5.5 Protection times

Below find a list of all times relative to the management of the compressors

These times are used to protect the mechanical means from the various peaks to which they are subjected.

The settings are unique for the two compressors in this application.

Compressors switch-on minimum time. Once activated, the compressor will remain on for this period of time before it can be switched off. (parameter PC04)

Compressors switch-off minimum time. Minimum time that must pass from last switch-off before the compressor can be switched back on again. (parameter PC05)

Minimum time between switch-ons of the same compressor. Establishes the minimum time that must pass between two switch-ons of the same compressor . (parameter PC06)

Compressor 1 switch-on minimum time. Minimum time for which the switch-on condition of the first compressor to be switched-on must remain. (parameter PC07)

Compressor 2 switch-on minimum time (HP). Minimum time for which the switch-on condition of the second compressor to be switched-on must remain (in winter mode). (parameter PC08)

Compressor 2 switch-on minimum time (chiller). Minimum time for which the switch-on condition of the second compressor to be switched-on must remain (in summer mode). (parameter PC09)

Compressor 1 switch-off delay after high pressure alarm. Compressor block delay after HP alarm. (parameter PC10)

Minimum time between pump switch-on and switch-on of the first compressor. Once both pumps have been activated, the compressors will wait for a delay that can be set by parameter to be started. (parameter PP04)

5.6 Safety Inputs

The program DOES NOT envision the management of a “compressor thermal switch” safety input for every compressor. It only envisions HIGH and LOW pressure compressors protection, via mechanical ON-OFF pressure switches.

5.7 Management of the geothermic circulation pumps and heating/cooling

The application can manage the unit and system pumps. A safety digital input and a digital output for switch-on/off can be associated at every use.

5.8 Pump status

The pumps are each controlled by a dedicated digital output (see I/O table).

Functioning takes place on call of the ON-OFF thermostats (EXT and/or INT) and/or outlet temperature. The pump is activated as a consequence of the room thermostat request, with switch-on/off delay times (that can be set) indicated on the functioning (flow) lay outs.

A functioning state is associated to the pumps in the states mask from the main menu. For example, the pumps assume the following states:

- *On*: **“On”** appears on the state mask
- *Switch-on stand-by*: they are in stand-by for the switch-on protection times. **“tOn”** appears on the state mask
- *Off*: **“OFF”** appears on the state mask
- *Alarm*: following the intervention of the flow switch, **“ALAr”** appears on the state mask.

5.9 Pump protection times

These times are used to ensure the correct sequence and priority in switch-on or switch-off. The controller manages a unique safety device (flow switch) for each pump.

The relative insertion or alarm delay times can be enabled and set by the specific parameters. The settings are unique for the two pumps in this application.

The compressor switches off in the same way as the thermostat switch-off request, while the pump remains on for a time period that can be set.

In the event of breakdown (Flow switch Alarm) of one of the two pumps, the compressors and pumps are switched-off

Minimum time between unit switch-off and pumps switch-off. Once the unit is switched-off, the pumps will remain on for this period of time before switching-off. (parameter PP05)

Pumps activation delay. Once the unit is switched-on and has the consents necessary for pumps switch-on (see diagram), the pumps will switch-on after this period of time (parameter PP06)

Pumps switch-off delay. If the consent is lost for maintaining the ON mode of the pumps (see diagram), the pumps will switch-off after this period of time (winter mode) (parameter PP07)

Pumps switch-off delay. If the consent is lost for maintaining the ON mode of the pumps (see diagram), the pumps will switch-off after this period of time (summer mode) (parameter PP08)

5.10 Flow switches management

The 2 unit flow switches are managed separately: heating/air conditioning circuit, geothermic circuit, but the setting of the “*Flow switches alarm delay*” is unique for the two flow switches.

On expiry of the *Flow switches alarm delay* time, if the contact signals no flow, the alarm is given immediately, stopping the pump and preventing compressor switch-on.

During normal functioning, the flow sensor is monitored continuously: if the contact signals no flow for a period of time exceeding the delay, the alarm is given immediately, switching off any compressors that are functioning.

The flow switch alarm has manual reset using the front key of the controller.

5.11 Management of high pressure alarm from pressure switch

Via the digital input D/I 1, connected to the mechanical HIGH pressure switch, it is possible to intervene when a maximum pressure in the cooling circuit is exceeded. With the *high pressure alarm*, compressor 2 is stopped and, with the persistence of the alarm, after a certain period of time (that can be set by parameter PC10) compressor 1 is also stopped (stop unit). The alarm has manual reset using the front key of the controller.

5.12 Management of low pressure alarm from pressure switch

Via the digital input D/I 2, connected to the mechanical pressure switch, it is possible to intervene when a minimum pressure occurs in the cooling circuit intake. The *low pressure alarm* causes the immediate shutdown of the cooling circuit, stopping any compressors running and preventing others from switching-on.

On start-up of the first compressor, the alarm is delayed by a certain time (that can be set by “*LOW pressure delay*” PA03), so as not to allow the compressors to pressurise the circuit. The alarm has manual reset using the front key of the controller.

6 Programming

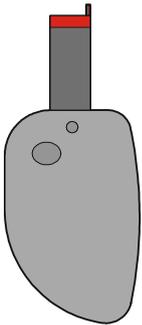
The instrument can be programmed from front key or using the programming key.

Programming key

It is possible to save the value of all system parameters in the programming key and allow copying into one or more compatible instruments. The saving or reset operation can only be performed with machine OFF, by connecting the key to the programming container.

To save a particular parameters map in the key:

- Enter the *InSt->MAP* menu and select “Stor” using the UP and DOWN keys.
- Press the SET (ENTER) key: the transfer of the parameters into the key is highlighted by the flashing of the relative LED.
- Wait for flashing to end: if the LED is green, the operation has concluded correctly, otherwise the LED is red.



To copy a parameters map from the key to the instrument:

- Enter the *InSt->MAP* menu and select “rESt” using the UP and DOWN keys.
- Press the SET (ENTER) key: the transfer of the parameters from the key into the instrument is highlighted by the flashing of the relative LED.
- Wait for flashing to end: if the LED is green, the operation has concluded correctly, otherwise the LED is red.

Note: The information relative to the product and relative version are saved in the key, in a way to allow the transfer of parameter maps only between compatible instruments.

7 Alarms

All alarms are envisioned with manual reset from controller front key.

In the event of an alarm:

- The alarm icon starts to flash

By pressing the ENTER key from the “Alar” menu, the code of the first active alarm is displayed.

Once the conditions that caused the alarm in the unit have been eliminated, the alarm can be reset manually. To perform this operation:

- be positioned on the page of the alarm to be reset
- hold the ENTER key down for about 2 seconds.

At this point, if there are no other alarms, the page indicating “none” will be shown, the alarm icon will switch-off and the machine will start to function normally again or the code relative to the next active alarm will be shown.

The consequences on unit functioning, which derive from an alarm that has occurred, remain valid until the user does not perform reset (deleting the message) the alarm manually.

Alarms Table

For the parameters and functions of the *c-pro HPR0* application, see the following table.

Code	Alarm description	Type	Consequence	Notes
AL01	Heating/Cooling circuit flow switch	M	Compressors OFF Pump off.	Delay can be set
AL02	Geothermic circuit flow switch	M	Compressors OFF Pump off.	Delay can be set
AL03	High pressure switch	M	All compressors progressive OFF	
AL04	Low pressure switch	M	All compressors OFF	Start delay and normal conditions that can be set
ES01	Outlet temp. probe broken or disconnected	M	Signal Unit off	

Notes: M = Manual alarm reset

Alarm relay

The controller manages an alarm relay. The relay is activated in the event of an alarm. Its intervention only stops with manual reset of the alarm from front key of the controller.

Via an appropriate parameter, it is possible to establish the logic (NO or NC) of the alarm relay output contact.

C-PRO NANO HPR0 APPLICATION MANUAL

Application manual C-PRO NANO HPR0

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